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

ENVIRONMENTAL MANAGEMENT PROGRAMME

FOR THE

THE PROPOSED INSTALLATION OF A BULK SEWERAGE PIPELINE, SEWERAGE BY-PASS PIPELINE AND STORMWATER OUTLETS ON RE/8662, STREET PARCEL RE/8581, RE/464, RE/8596, ERF 3645, AND STREET PARCEL RE/23074 IN ROSEMOOR, GEORGE, 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: George Municipality
P.O Box 19
George
6530

DATE: 7 May 2026

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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— (a)details of– (i)the EAP who prepared the EMPr; and (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— (i)planning and design; (ii)pre-construction activities; (iii)construction activities; (iv)rehabilitation of the environment after construction and where applicable post closure; and (v)where relevant, operation activities;	Section 9 - Environmental Impact Management: Planning and Design Phase Section 10 - Environmental Impact Management: Pre-construction Phase Section 11 - Environmental Impact Management : Construction Phase 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 — (i)avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii)comply with any prescribed environmental management standards or practices; (iii)comply with any applicable provisions of the Act regarding closure, where applicable; and (iv)comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	Section 9 - Environmental Impact Management: Planning and Design Phase Section 10 - Environmental Impact Management: Pre-construction Phase Section 11 - Environmental Impact Management: Construction Phase 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 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 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 Section 10 - Environmental Impact Management: Pre-construction Phase Section 11 - Environmental Impact Management: Construction Phase Section 12 - Environmental Impact Management: Post Construction Rehabilitation Phase & Operational Phase 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 Section 10 - Environmental Impact Management: Pre-construction Phase

	Section 11 - Environmental Impact Management: Construction Phase 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 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 Section 10 - Environmental Impact Management: Pre-construction Phase Section 11 - Environmental Impact Management: Construction Phase Section 12 - Environmental Impact Management: Post Construction Rehabilitation Phase & Operational Phase Section 15 - Roles and Responsibilities Section 17 - Monitoring, Record Keeping and Reporting
(m)an environmental awareness plan describing the manner in which— (i)the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (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/BS/RM/GM/04/26
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DETAILS OF PERSONS WHO COMPILED THIS DOCUMENT:

Role:	Name:	E-Mail Address:	Qualifications:
Author:	Michael Bennett	michael@sescc.net	• B.Sc. Environmental and Geographical Sciences, Ocean and atmospheric Science (UCT) • EAPASA # 2021/3163
Co-Author	Christiaan Smit	Christiaan@sescc.net	• MPhil in Environmental Management (SU) • PGD in Environmental Management (SU) • B.Sc in Biodiversity and Ecology (SU)

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.

MICHAEL BENNETT **(Director - Environmental Assessment Practitioner, Report Writer):**
Michael studied at the University of Cape Town completing a Bachelor of Science degree majoring in Environmental and Geographic Science and Ocean and Atmospheric Science. Michael joined SES in 2014 and has extensive experience in assessments and monitoring and has worked on a variety of technical projects. See Appendix G for his curriculum vitae. Michael is registered with EAPASA as a certified Environmental Practitioner (EAPASA # 2021/3163).

CHRISTIAAN SMIT (**Candidate Environmental Practitioner, Co-Writer)**
Christiaan graduated from the University of Stellenbosch completing his Masters on the Ocean Economy and also holds a BSc in Biodiversity and Ecology with a post graduate Diploma in Environmental Management. Christiaan joined the SES team in 2024 and is gaining experience in conducting assessments by working with and being mentored by his experienced colleagues.

1. Introduction

Sharples Environmental Services cc (SES) has been appointed by *Lyners Engineers* on behalf of *the George Municipality,* to complete the Environmental Management Programme (EMPr) as part of the Basic Assessment Process for the proposed installation of a bulk sewerage pipeline, sewerage by-pass pipeline and stormwater outlets on RE/8662, Street Parcel RE/8581, RE/464, RE/8596, Erf 3645, and Steet Parcel RE/23074 in Rosemoor, George, Western Cape Province.

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 George Municipality* (as the Implementing Agent) and any person/s acting on behalf of the *George 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 *George 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 *George 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 *George 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 George 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) have been appointed by Lyners Engineers on behalf of the George Municipality to compile the Basic Assessment Report of the proposed installation of a sewerage pipeline, sewerage by pass line, and additional stormwater outlet structures in Rosemoor, George, Western Cape. Please refer to the figures below for the locality of the proposed pipeline routes and stormwater outlet structures.



Figure 1: Locality Map.



Figure 2: Close-up Locality Map of Bulk Sewerage Pipeline.

The pipeline will be approximately 1038m in length with varying diameters (250mm and 400mm). Approximately 230m of the pipeline will have a diameter of 250mm and approximately 808m of the pipeline will have a diameter of 400mm. The pipeline will also connect to adjoining manholes which are part of the sewerage upgrades for Rosemoor (these will occur within existing roads). Please refer to the Figures below for the layout plans of the Rosemoor Sewer Upgrades and Sewerage Pipeline.

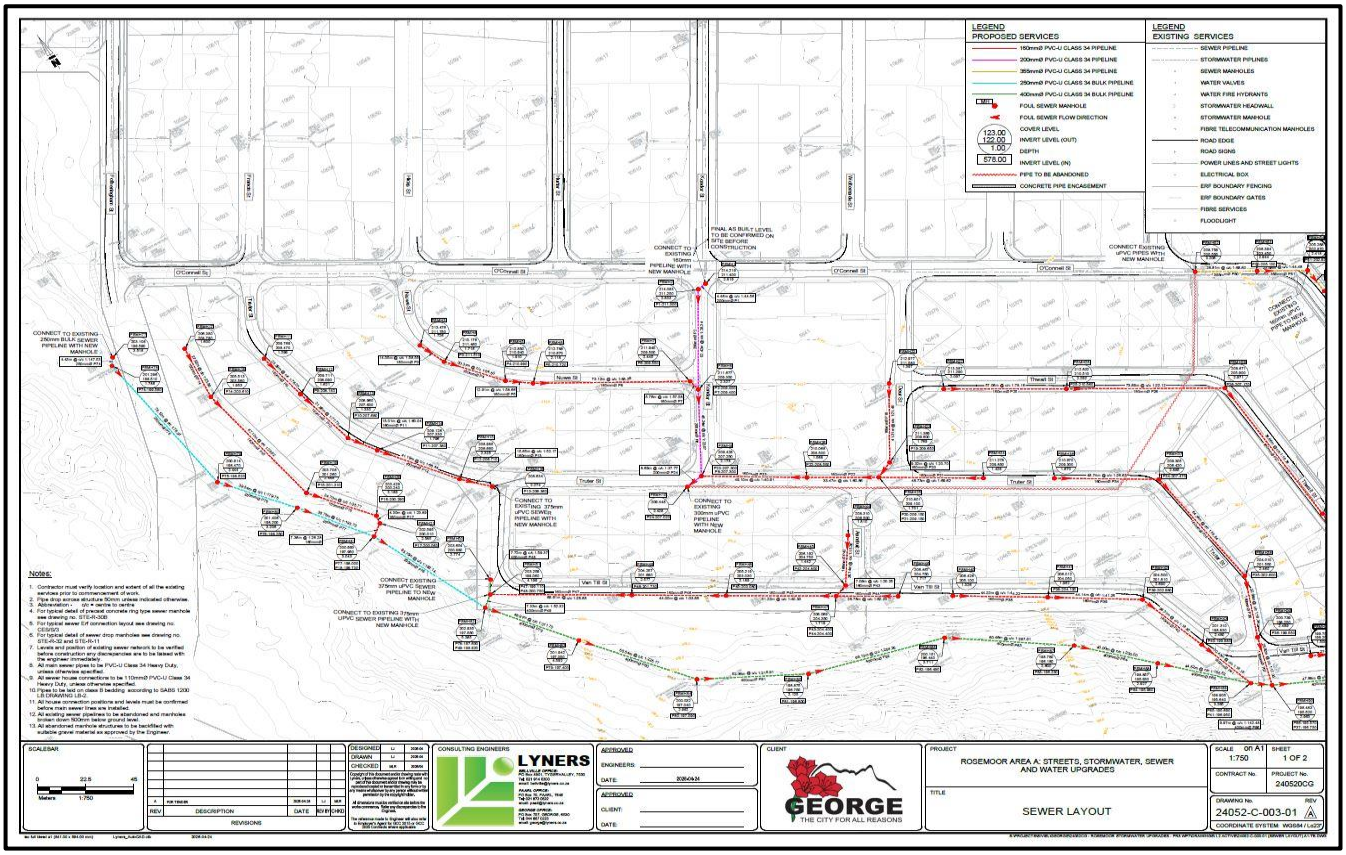


Figure 3: Proposed Sewerage Upgrades for Rosemoor.

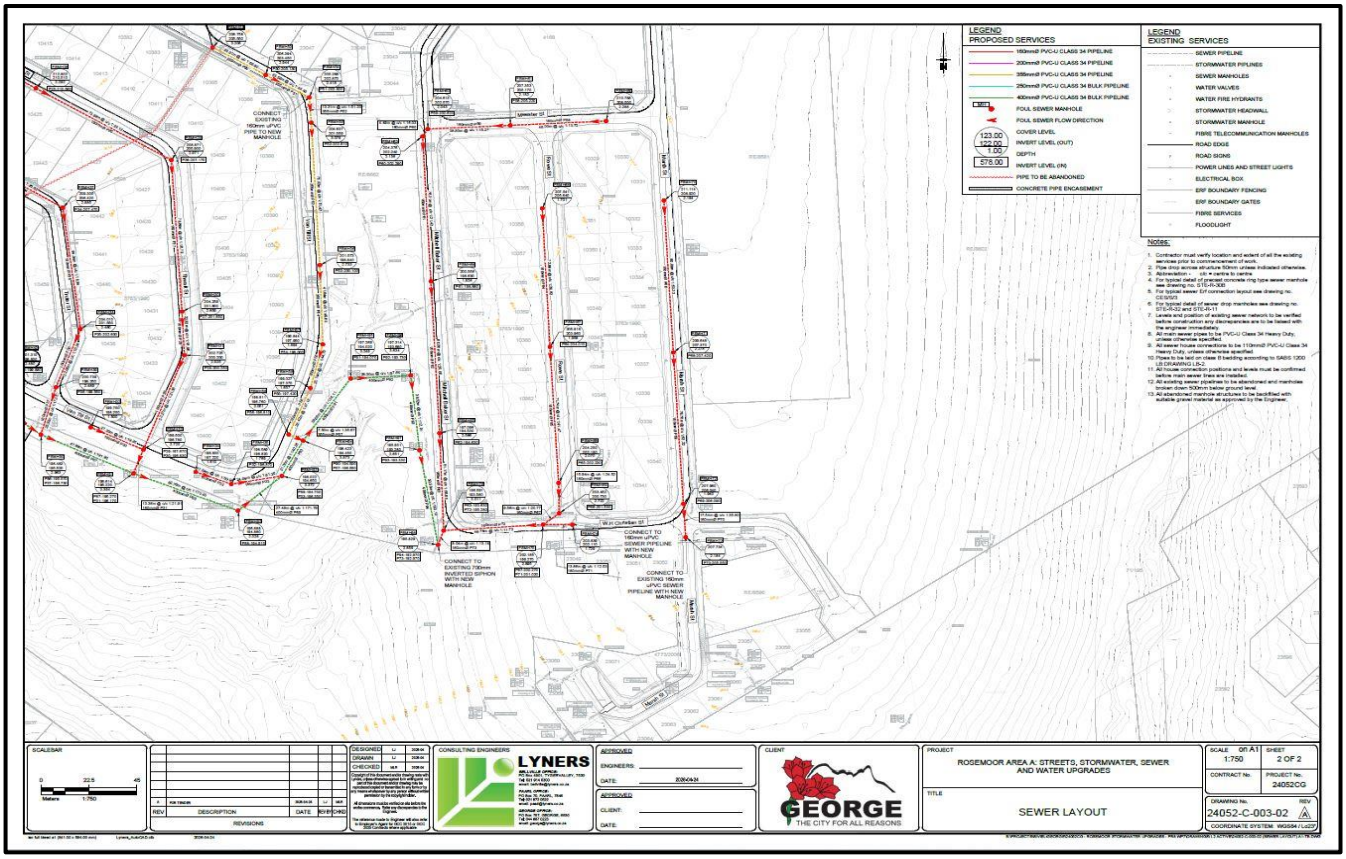


Figure 4: Proposed Sewerage Upgrades for Rosemoor.



Figure 5: Proposed Sewerage By-Pass Line.

The proposed sewerage by-pass pipeline will be approximately 142m in length with a diameter of 500mm.

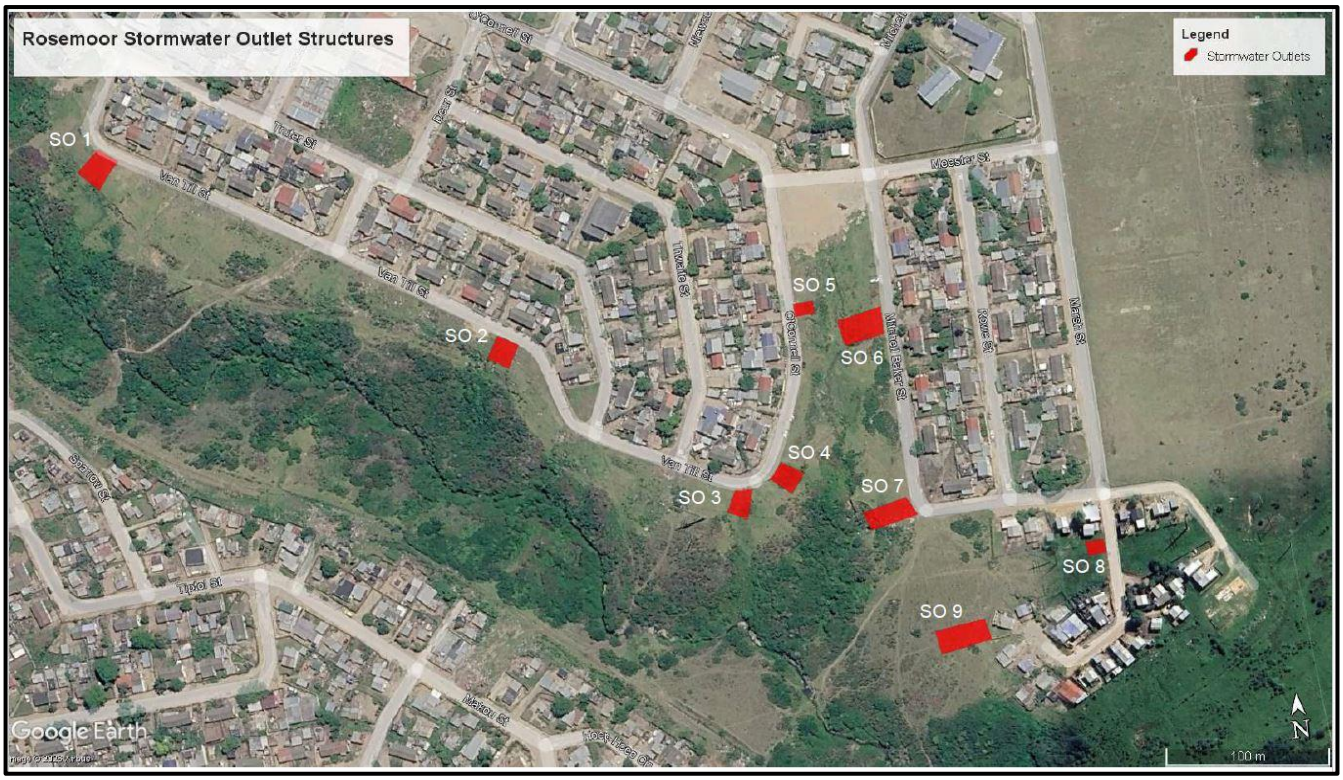


Figure 6: Proposed Stormwater Outlet Structures.

Nine stormwater outlet structures are proposed to be constructed, as illustrated in Figure 6 above. The stormwater outlet structures will each have a development footprint of approximately 36m^2, which will equal a total development footprint of 324m^2.

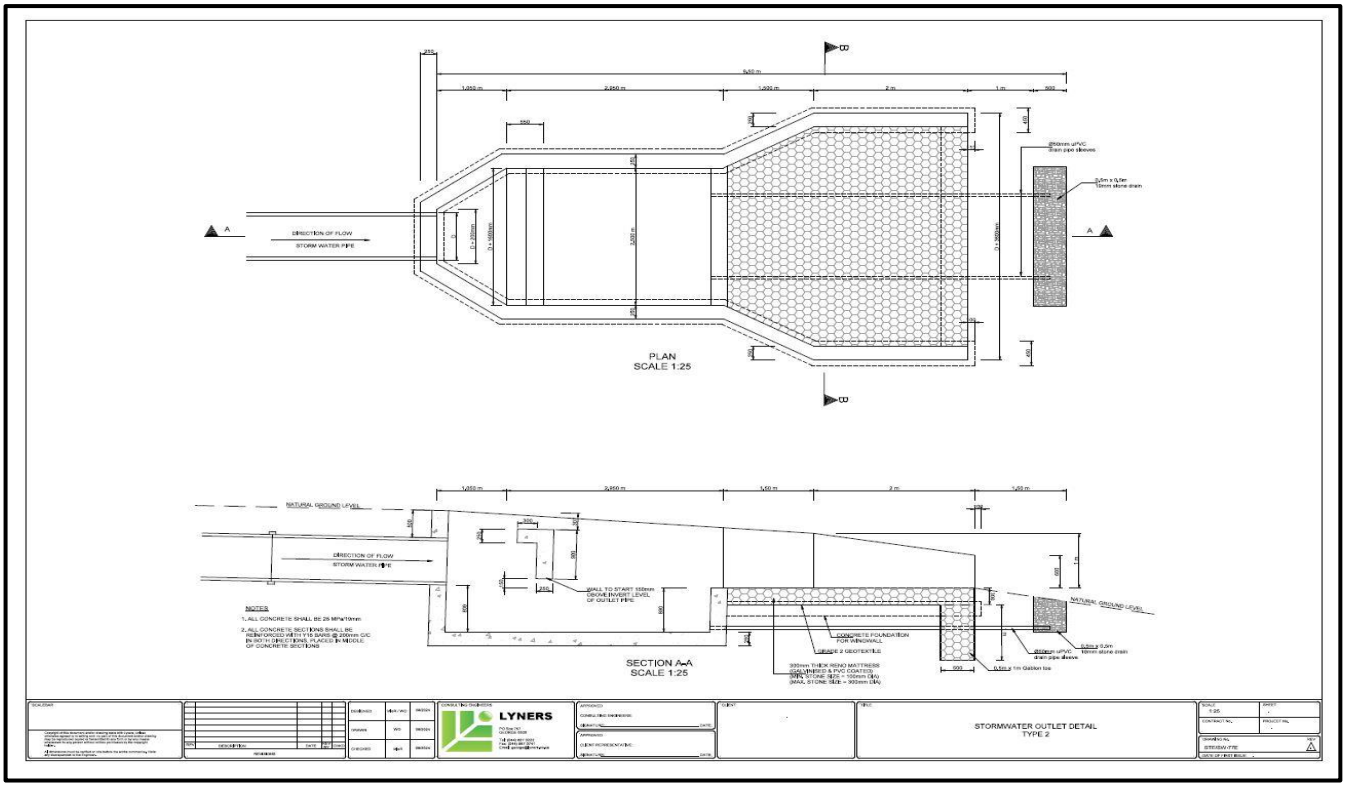


Figure 7: Stormwater Outlet Structure Design Drawing.

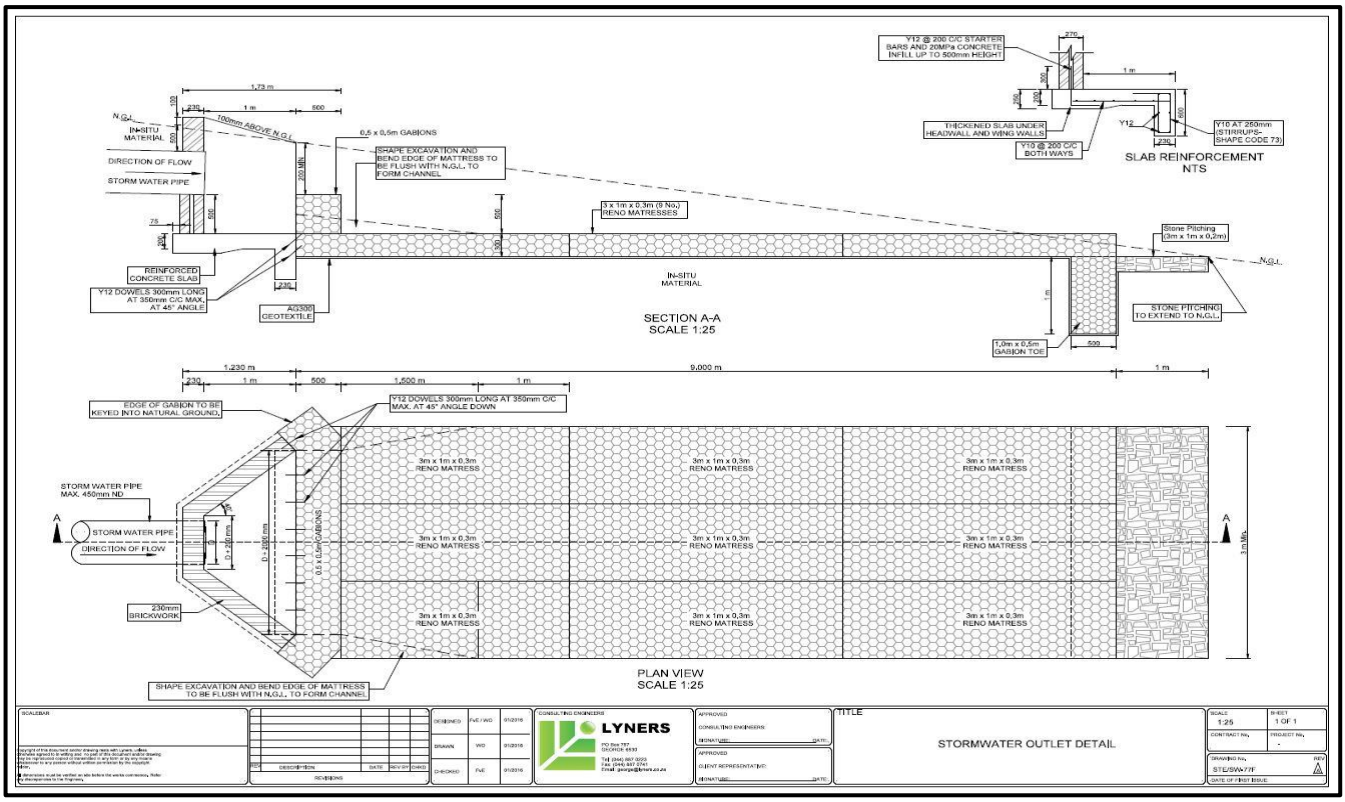


Figure 8: Stormwater Outlet Structure Design Drawing.

Table 1: Summary Table: Site and Erf Details

Province	Western Cape
District Municipality	Garden Route District Municipality
Local Municipality	George Municipality
Ward number	Ward 5, 17 and 6
Erf name	• RE/8662 • Street Parcel RE/8581 • RE/464 • RE/8596 • Erf 3645 • Street Parcel RE/23074

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—** (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or **(ii) infrastructure or structures with a physical footprint of 100 square metres or more;** where such development occurs— (a) within a watercourse; (b) in front of a development setback; or **(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —** excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (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; (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; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (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.
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— (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (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.
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 Maintenance management plan. **i. Western Cape** **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;** **ii. Within critical biodiversity areas identified in bioregional plans;** **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; **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 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—** (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or **(ii) infrastructure or structures with a Physical footprint of 10 square metres or more;** **where such development occurs—** **(a) within a watercourse;** (b) in front of a development setback; or **(c) if no development setback has been adopted, within 32metres of a watercourse, measured from the edge of a watercourse;** excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. **i. Western Cape** **i. Outside urban areas:** (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas listed in terms of an international convention; **(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** (gg) Core areas in biosphere reserves; or (hh) Areas on the estuary side of the development setback line or in an estuarine functional zone where no such setback line has been determined.

5.2 Other applicable legislation

The *George 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 *George 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

The site is accessed from directly from the adjacent road network.

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).

Please refer to the figures below for the No-Go Maps:



Figure 9: No-Go Map.



Figure 10: No-Go Map - Bulk Sewerage Pipeline and Stormwater Outlets.



Figure 11: No-Go Map - Sewerage By-Pass Pipeline.

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. It must be ensured that the ECO is consulted on possible site camp locations before they are established to ensure that the establishment of the site camp does not trigger listed activities.



Figure 12: Site Camp locations.

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.

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

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.

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 wetland needs to be conducted in a conscious manner. The Aquatic Assessment completed by Confluent explains that impacts to the wetland can be mitigated through the implementation of the mitigation measures and adherence to the EMPr. The following mitigation measures must be adhered to during construction:

- Excavators and all other machinery and vehicles must be checked for oil and fuel leaks daily. No machinery or vehicles with leaks are permitted to work in the wetland;
- Refuelling and fuel storage areas, and areas used for the servicing or parking of vehicles and machinery, must be located on impervious bases and should have bunds around them (sized to contain 110 % of the tank capacity) to contain any possible spills;
- Chemical toilets should be provided on-site at 1 toilet per 10 persons;
- Waste from chemical toilets must be disposed of regularly (at least once a week) in a responsible manner by a registered waste contractor;
- Cement/concrete used in the construction must not be mixed on bare ground or within the delineated extent of the wetlands. An 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;
- Workers must be properly instructed in the proper care of the environment, especially with respect to poaching, disturbance of nesting and roosting areas, disposal of human waste, garbage etc.;
- Construction areas to be inspected on a regular basis (at least weekly) by an appropriately qualified ECO for signs of disturbance, sedimentation and pollution during the construction phase. If signs of disturbance, sedimentation or pollution are noted, immediate action should be taken to remedy the situation and, if necessary, a freshwater ecologist should be consulted for advice on the most suitable remediation measures.
- Construction activities must be timed to coincide with low rainfall probability (dry season) to avoid erosion of exposed banks;
- A silt fence must be placed downslope of the trench, along the length of the pipeline alignment;
- No laydown areas, stockpiling of construction materials or excavated topsoil is permitted within delineated wetland areas;
- Construction must be sequenced so that installation of the pipeline can take place with the minimum possible delay. Disturbance/excavation of areas where the pipeline is to be installed

must be undertaken only when final placement can follow immediately following the initial disturbance;

- A construction schedule must be developed and clearly defined so as to avoid multiple sites being exposed and unattended to at any moment in time. The completion date for each phase of development must be indicated and all clearing, excavation, and stabilisation operations must be completed before moving onto the next phase;
- Following backfilling of the trench, exposed unvegetated slopes must be stabilised with appropriate geotextiles (e.g. SoilSaver®) or vegetated with appropriate indigenous vegetation. Banks must be regraded to match existing slopes/contours; and
- Wooden stakes must be used to anchor erosion control mats as there is a high probability that metal stakes will be stolen.
- Construction within wetland seep areas must be confined to clearly demarcated areas so as to prevent unnecessary disturbance of wetland habitat outside of these areas;
- Where crossing through delineated wetland habitat is unavoidable, use less disruptive methods if these are feasible. For example, horizontal directional drilling (HDD) can be used to install the pipeline beneath the wetland, avoiding surface disturbance;
- Restrict construction activities to designated corridors and limit vehicle and equipment movement to reduce soil compaction and habitat damage;
- Revegetation of disturbed wetland areas must be actively encouraged. The pipeline route is currently well covered by indigenous wetland vegetation which could be used to revegetate the trench post-construction. 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 backfilled in trench;
- During excavation of the trench, topsoil and subsoil must be separated and, when backfilled, must be replaced in sequence (i.e. subsoil followed by topsoil); and
- Once construction has been completed, the trench must be backfilled and the original topography, soil structure, and hydrology must be restored as much as possible to ensure water can flow freely and the vegetation can re-establish.
- Areas where instream construction activities will take place must be confined to clearly demarcated areas so as to prevent unnecessary disturbance of instream and riparian habitat outside of these areas; and
- A single point of access must be used to access each site.

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

Should any heritage resources, including evidence of graves and human burials, archaeological material and paleontological material be discovered during the execution of the activities, all works must be stopped immediately and Heritage Western Cape must be notified without delay.

Heritage Western Cape:

T: 021 483 5059

E: hwc.hwc@westerncape.gov.za

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. • 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. • 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.	*George 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. • 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. • All amendments to the EMPr specified in the EA must be applied to the EMPr unless agreed otherwise in writing with the Competent Authority. • Amendments to the EMPr must be approved in writing by the Competent Authority. • Public participation may be required on the proposed EMPr amendments. The Competent Authority must be consulted for clarity on these requirements.	*George 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. • Failure to accurately demarcate working areas may result in increased disturbance footprint. • 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. • Demarcation of working area and no-go areas must be done in accordance with Section 7.2 of this EMPr. • 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

<u>Impact Management Objective:</u> 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). • Failure to properly demarcate and set up site facilities may result in disorganised construction activities and unnecessary disturbance to the site. • 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. • 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. • 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. Site facilities are appropriately located on site. 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.	

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 permanent or temporary loss of indigenous vegetation cover
- Limit the loss of flora Species of Conservation Concern
- Prevent the susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species
- Limit the susceptibility of some areas to erosion associated with slopes and proximity to watercourses
- Limit the disturbance to ecological processes
- Limit the disturbance to aquatic and riparian processes
- Prevent the loss of faunal Species of Conservation Concern
- Limit the loss of faunal habitat
- Limit the loss of faunal processes
- Limit pollution of the wetland caused by construction activities
- Limit mobilisation of sediment caused by excavation of the trench
- Limit disturbance of wetland habitat caused by excavation of the trench (sewerage pipeline)
- Limit disturbance of aquatic habitat caused by excavation of the bed & banks (stormwater outlets)
- 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 PERMANENT OR TEMPORARY LOSS OF INDIGENOUS VEGETATION COVER

***Impact Management Objective:* To limit the permanent or temporary loss of indigenous vegetation cover.**			
Potential impact to avoid	• Permanent or temporary loss of indigenous vegetation due to clearance activities. • Permanent or temporary loss of indigenous vegetation outside of the construction footprint.		
Impact Management Outcome	Impact on indigenous vegetation 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
• No clearing outside of the development footprint to take place. • Areas surrounding the footprints should be revegetated on completion of construction.		Contractor	Construction phase
Performance Indicator	Impact on indigenous vegetation is limited to the construction footprint and only to what is required to undertake the activities.		

OBJECTIVE 2: LIMIT THE LOSS OF FLORA SPECIES OF CONSERVATION CONCERN

***Impact Management Objective:* To limit the loss of flora Species of Conservation Concern**			
Potential impact to avoid	• Loss of flora Species of Conservation Concern 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
• A flora search and rescue is unlikely to be required and no protected flora were found to be present within a natural context.		Contractor	Construction phase
Performance Indicator	Only the approved footprint and a reasonable working corridor is disturbed by construction activities.		

OBJECTIVE 3: PREVENT THE SUSCEPTIBILITY OF POST CONSTRUCTION DISTURBED AREAS TO INVASION BY EXOTIC AND ALIEN INVASIVE SPECIES

***Impact Management Objective:* To prevent the susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species**			
Potential impact to avoid	• Post construction invasion by exotic and alien species in disturbed areas.		
Impact Management Outcome	Exotic and alien invasive species invasion in disturbed areas are prevented.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion. • Exotic and Alien species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, attached as Appendix F to this EMPr.		Contractor	Construction phase
Performance Indicator	Exotic and Alien Species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, Appendix F of this EMPr.		

OBJECTIVE 4: LIMIT THE SUSCEPTIBILITY OF SOME AREAS TO EROSION ASSOCIATED WITH SLOPES AND PROXIMITY TO WATERCOURSES

***Impact Management Objective:* To limit the susceptibility of some areas to erosion associated with slopes and proximity to watercourses**			
Potential impact to avoid	• Susceptibility of some areas to erosion associated with slopes and proximity to watercourses.		
Impact Management Outcome	Susceptibility of some areas to erosion associated with slopes and proximity to watercourses is prevented.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• Suitable measures must be implemented where constructed on slopes to protected against erosion. • Areas must be rehabilitated, and a suitable indigenous grass seed mix planted where natural vegetation re-establishment does not occur.		Contractor	Construction phase
Performance Indicator	Erosion control measures are implemented in areas associated with slopes and proximity to watercourses.		

OBJECTIVE 5: LIMIT THE DISTURBANCE TO ECOLOGICAL PROCESSES

Impact Management Objective: ***To limit the disturbance to ecological processes.***			
Potential impact to avoid	• Disturbance to ecological processes during construction.		
Impact Management Outcome	Disturbance to ecological processes during the construction phase is limited.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion. • Exotic and Alien species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, attached as Appendix F to this EMPr.		Contractor	Construction phase
Performance Indicator	Exotic and Alien Species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, Appendix F of this EMPr.		

OBJECTIVE 6: LIMIT THE DISTURBANCE TO AQUATIC AND RIPARIAN PROCESSES

Impact Management Objective: ***To limit the disturbance to aquatic and riparian processes.***			
Potential impact to avoid	• Disturbance to aquatic and riparian processes during construction.		
Impact Management Outcome	Disturbance to aquatic and riparian processes during the construction phase is limited.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• Adequate measures to be implemented for erosion control in excavations during and after construction.		Contractor	Construction phase

• Where possible, design of discharge points should accommodate measures to trap and reduce discharge of solid waste into watercourses (paper, plastic, etc), that would allow for easier ongoing cleanup. • It is imperative that trenches near the watercourses (and the site as a while) are not left open for extended periods of time during construction		
Performance Indicator	Exotic and Alien Species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, Appendix F of this EMPr.	

OBJECTIVE 7: PREVENT THE LOSS OF FAUNAL SPECIES OF CONSERVATION CONCERN

***Impact Management Objective:* To prevent the loss of faunal Species of Conservation Concern.**		
Potential impact to avoid	• Loss of faunal Species of Conservation Concern during the construction phase.	
Impact Management Outcome	Loss of faunal Species of Conservation Concern during the construction phase is prevented.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
• Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • A faunal search and rescue is unlikely to be required, and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert.	Contractor	Construction phase
Performance Indicator	Adherence to the Terrestrial Biodiversity Specialist's Mitigation Measures during the construction phase.	

OBJECTIVE 8: LIMIT THE LOSS OF FAUNAL HABITAT

***Impact Management Objective:* To limit the loss of faunal habitat.**	
Potential impact to avoid	• Loss of faunal habitat during the construction phase.

Impact Management Outcome	Impact on faunal habitat 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
• Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert.		Contractor	Construction phase
Performance Indicator	Impact on faunal habitat is limited to the construction footprint and only to what is required to undertake the activities.		

OBJECTIVE 9: LIMIT THE LOSS OF FAUNAL PROCESSES

***Impact Management Objective:* To limit the loss of faunal processes.**			
Potential impact to avoid	• Loss of faunal processes during the construction phase.		
Impact Management Outcome	Impact on faunal processes 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 habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint above current baseline levels would be of low significance if mitigation measures are adhered to.		Contractor	Construction phase
Performance Indicator	Impact on faunal processes is limited to the construction footprint and only to what is required to undertake the activities.		

OBJECTIVE 10: LIMIT POLLUTION OF THE WETLAND CAUSED BY CONSTRUCTION ACTIVITIES

***Impact Management Objective:* To limit the pollution of the wetland caused by construction activities.**

Potential impact to avoid	• Pollution of the wetland caused by construction activities.	
Impact Management Outcome	Pollution of the wetland caused by construction activities is limited.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
• Excavators and all other machinery and vehicles must be checked for oil and fuel leaks daily. No machinery or vehicles with leaks are permitted to work in the wetland; • Refuelling and fuel storage areas, and areas used for the servicing or parking of vehicles and machinery, must be located on impervious bases and should have bunds around them (sized to contain 110 % of the tank capacity) to contain any possible spills; • Chemical toilets should be provided on-site at 1 toilet per 10 persons; • Waste from chemical toilets must be disposed of regularly (at least once a week) in a responsible manner by a registered waste contractor; • Cement/concrete used in the construction must not be mixed on bare ground or within the delineated extent of the wetlands. An 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; • Workers must be properly instructed in the proper care of the environment, especially with respect to poaching, disturbance of nesting and roosting areas, disposal of human waste, garbage etc.; • Construction areas to be inspected on a regular basis (at least weekly) by an appropriately qualified ECO for signs of disturbance, sedimentation and pollution during the construction phase. If signs of disturbance, sedimentation or pollution are noted, immediate action should be taken to remedy the situation and, if necessary, a freshwater ecologist should be consulted for advice on the most suitable remediation measures.	Contractor	Construction phase
Performance Indicator	Wetland is monitored during construction by the ECO, and Aquatic Specialist Mitigation Measures are adhered to.	

OBJECTIVE 11: LIMIT MOBILISATION OF SEDIMENT CAUSED BY EXCAVATION OF THE TRENCH

***Impact Management Objective:* To limit the mobilisation of sediment caused by the excavation of the trench.**		
Potential impact to avoid	• Mobilisation of sediment and subsequent erosion caused by the excavation of the trench.	
Impact Management Outcome	Mobilisation of sediment and subsequent erosion during the excavation of the trench is limited.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
• Construction activities must be timed to coincide with low rainfall probability (dry season) to avoid erosion of exposed banks; • A silt fence must be placed downslope of the trench, along the length of the pipeline alignment; • No laydown areas, stockpiling of construction materials or excavated topsoil is permitted within delineated wetland areas; • Construction must be sequenced so that installation of the pipeline can take place with the minimum possible delay. Disturbance/excavation of areas where the pipeline is to be installed must be undertaken only when final placement can follow immediately following the initial disturbance; • A construction schedule must be developed and clearly defined so as to avoid multiple sites being exposed and unattended to at any moment in time. The completion date for each phase of development must be indicated and all clearing, excavation, and stabilisation operations must be completed before moving onto the next phase; • Following backfilling of the trench, exposed unvegetated slopes must be stabilised with appropriate geotextiles (e.g. SoilSaver®) or vegetated with appropriate indigenous vegetation. Banks must be regraded to match existing slopes/contours; and • Wooden stakes must be used to anchor erosion control mats as there is a high probability that metal stakes will be stolen.	Contractor	Construction phase
Performance Indicator	Sedimentation and erosion measures are implemented during the excavation of the trench and adherence to the Aquatic Specialist Mitigation Measures.	

OBJECTIVE 12: LIMIT DISTURBANCE OF WETLAND HABITAT CAUSED BY EXCAVATION OF THE TRENCH (SEWERAGE UPGRADE)

***Impact Management Objective:* To limit the disturbance of wetland habitat caused by the excavation of the trench (sewerage upgrade).**		
Potential impact to avoid	• Disturbance to wetland habitat caused by the excavation of the trench (sewerage upgrade).	
Impact Management Outcome	Disturbance to the wetland habitat caused by the excavation of the trench (sewerage upgrade) is limited.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
• Construction within wetland seep areas must be confined to clearly demarcated areas so as to prevent unnecessary disturbance of wetland habitat outside of these areas; • Where crossing through delineated wetland habitat is unavoidable, use less disruptive methods if these are feasible. For example, horizontal directional drilling (HDD) can be used to install the pipeline beneath the wetland, avoiding surface disturbance; • Restrict construction activities to designated corridors and limit vehicle and equipment movement to reduce soil compaction and habitat damage; • Revegetation of disturbed wetland areas must be actively encouraged. The pipeline route is currently well covered by indigenous wetland vegetation which could be used to revegetate the trench post-construction. 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 backfilled in trench; • During excavation of the trench, topsoil and subsoil must be separated and, when backfilled, must be replaced in sequence (i.e. subsoil followed by topsoil); and • Once construction has been completed, the trench must be backfilled and the original topography, soil structure, and hydrology must be restored as much as possible to ensure water can flow freely and the vegetation can re-establish. • Areas where instream construction activities will take place must be confined to clearly demarcated areas so as to prevent unnecessary disturbance of instream and riparian habitat outside of these areas; and • A single point of access must be used to access each site.	Contractor	Construction phase

Performance Indicator	The Aquatic Specialist Mitigation Measures are adhered to during the excavation of the trench (sewerage upgrade).

OBJECTIVE 13: LIMIT DISTURBANCE OF AQUATIC HABITAT CAUSED BY EXCAVATION OF THE BED & BANKS (STORMWATER OUTLETS)

***Impact Management Objective:* To limit the disturbance of aquatic habitat caused by excavation of the bed & banks (stormwater outlets).**		
Potential impact to avoid	• Disturbance to aquatic habitat caused by the excavation of the bed & banks (stormwater outlets).	
Impact Management Outcome	Disturbance to the aquatic habitat caused by the excavation of the bed & banks (stormwater outlets) is limited.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
• Areas where instream construction activities will take place must be confined to clearly demarcated areas so as to prevent unnecessary disturbance of instream and riparian habitat outside of these areas; and • A single point of access must be used to access each site.	Contractor	Construction phase
Performance Indicator	The Aquatic Specialist Mitigation Measures are adhered to during the excavation of the bed & banks (stormwater outlets).	

OBJECTIVE 14: JOB CREATION

***Impact Management Objective:* To create employment opportunities with potential for skills transfer, for members of the local community.**		
Potential impact to avoid	• Temporary job opportunities. • 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. • 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
- Limit the permanent or temporary loss of indigenous vegetation cover
- Limit the loss of flora Species of Conservation Concern
- Prevent the susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species
- Limit the susceptibility of some areas to erosion associated with slopes and proximity to watercourses
- Limit the disturbance to ecological processes
- Limit the disturbance to aquatic and riparian processes
- Prevent the loss of faunal Species of Conservation Concern
- Limit the loss of faunal habitat
- Limit the loss of faunal processes

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. • Failure to remove all construction related equipment, machinery and site facilities may pose an impact to the natural environment. • 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. 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. • 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 contaminated soil must be collected and disposed of as hazardous waste. • 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. • Burying or burning of waste or rubble on site is prohibited. • 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. • 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). • 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. • 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. • 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. • It is recommended that follow-up alien clearing be conducted 6 months after construction is complete. • 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. • Compacted soils have been scarified/ ripped and stabilised. • All disturbed/exposed surfaces have been provided with a suitable covering and/or stabilised. • No alien vegetation is evident on site.	

OBJECTIVE 2: LIMIT THE PERMANENT OR TEMPORARY LOSS OF INDIGENOUS VEGETATION COVER

***Impact Management Objective:* To limit the permanent or temporary loss of indigenous vegetation cover.**		
Potential impact to avoid	• Permanent or temporary loss of indigenous vegetation due to clearance activities. • Permanent or temporary loss of indigenous vegetation outside of the construction footprint.	
Impact Management Outcome	Impact on indigenous vegetation 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
• No clearing outside of the development footprint to take place. • Areas surrounding the footprints should be revegetated on completion of construction.	Contractor	Construction phase

Performance Indicator	Impact on indigenous vegetation is limited to the construction footprint and only to what is required to undertake the activities.

OBJECTIVE 3: LIMIT THE LOSS OF FLORA SPECIES OF CONSERVATION CONCERN

***Impact Management Objective:* To limit the loss of flora Species of Conservation Concern**		
Potential impact to avoid	• Loss of flora Species of Conservation Concern 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
• A flora search and rescue is unlikely to be required and no protected flora were found to be present within a natural context.	Contractor	Site closure / Rehabilitation phase
Performance Indicator	Only the approved footprint and a reasonable working corridor is disturbed by construction activities.	

OBJECTIVE 4: PREVENT THE SUSCEPTIBILITY OF POST CONSTRUCTION DISTURBED AREAS TO INVASION BY EXOTIC AND ALIEN INVASIVE SPECIES

***Impact Management Objective:* To prevent the susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species**			
Potential impact to avoid	• Post construction invasion by exotic and alien species in disturbed areas.		
Impact Management Outcome	Exotic and alien invasive species invasion in disturbed areas are prevented.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion. • Exotic and Alien species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, attached as Appendix F to this EMPr.		Contractor	Site closure / Rehabilitation phase
Performance Indicator	Exotic and Alien Species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, Appendix F of this EMPr.		

OBJECTIVE 5: LIMIT THE SUSCEPTIBILITY OF SOME AREAS TO EROSION ASSOCIATED WITH SLOPES AND PROXIMITY TO WATERCOURSES

***Impact Management Objective:* To limit the susceptibility of some areas to erosion associated with slopes and proximity to watercourses**			
Potential impact to avoid	• Susceptibility of some areas to erosion associated with slopes and proximity to watercourses.		
Impact Management Outcome	Susceptibility of some areas to erosion associated with slopes and proximity to watercourses is prevented.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• Suitable measures must be implemented where constructed on slopes to protected against erosion. • Areas must be rehabilitated, and a suitable indigenous grass seed mix planted where natural vegetation re-establishment does not occur.		Contractor	Site closure / Rehabilitation phase
Performance Indicator	Erosion control measures are implemented in areas associated with slopes and proximity to watercourses.		

OBJECTIVE 6: LIMIT THE DISTURBANCE TO ECOLOGICAL PROCESSES

***Impact Management Objective:* To limit the disturbance to ecological processes.**			
Potential impact to avoid	• Disturbance to ecological processes during construction.		
Impact Management Outcome	Disturbance to ecological processes during the construction phase is limited.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion. • Exotic and Alien species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, attached as Appendix F of this EMPr.		Contractor	Site closure / Rehabilitation phase
Performance Indicator	Exotic and Alien Species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, Appendix F of this EMPr.		

OBJECTIVE 7: LIMIT THE DISTURBANCE TO AQUATIC AND RIPARIAN PROCESSES

***Impact Management Objective:* To limit the disturbance to aquatic and riparian processes.**			
Potential impact to avoid	• Disturbance to aquatic and riparian processes during construction.		
Impact Management Outcome	Disturbance to aquatic and riparian processes during the construction phase is limited.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• Adequate measures to be implemented for erosion control in excavations during and after construction. • Where possible, design of discharge points should accommodate measures to trap and reduce discharge of solid waste into watercourses (paper, plastic, etc), that would allow for easier ongoing cleanup.		Contractor	Site closure / Rehabilitation phase

• It is imperative that trenches near the watercourses (and the site as a while) are not left open for extended periods of time during construction		
Performance Indicator	Exotic and Alien Species must be managed in conjunction with the Site Specific Alien and Invasive Species Management Plan, Appendix F of this EMPr.	

OBJECTIVE 8: PREVENT THE LOSS OF FAUNAL SPECIES OF CONSERVATION CONCERN

***Impact Management Objective:* To prevent the loss of faunal Species of Conservation Concern.**		
Potential impact to avoid	• Loss of faunal Species of Conservation Concern during the construction phase.	
Impact Management Outcome	Loss of faunal Species of Conservation Concern during the construction phase is prevented.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
• Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • A faunal search and rescue is unlikely to be required, and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert.	Contractor	Site closure / Rehabilitation phase
Performance Indicator	Adherence to the Terrestrial Biodiversity Specialist's Mitigation Measures during the construction phase.	

OBJECTIVE 9: LIMIT THE LOSS OF FAUNAL HABITAT

***Impact Management Objective:* To limit the loss of faunal habitat.**		
Potential impact to avoid	• Loss of faunal habitat during the construction phase.	
Impact Management Outcome	Impact on faunal habitat 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

• Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert.	Contractor	Site closure / Rehabillitation phase
Performance Indicator	Impact on faunal habitat is limited to the construction footprint and only to what is required to undertake the activities.	

OBJECTIVE 10: LIMIT THE LOSS OF FAUNAL PROCESSES

***Impact Management Objective:* To limit the loss of faunal processes.**		
Potential impact to avoid	• Loss of faunal processes during the construction phase.	
Impact Management Outcome	Impact on faunal processes 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 habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint above current baseline levels would be of low significance if mitigation measures are adhered to.	Contractor	Site closure / Rehabilitation phase
Performance Indicator	Impact on faunal processes is limited to the construction footprint and only to what is required to undertake the activities.	

12. Environmental Impact Management Operational Phase

Increasing the pipe diameter of the bulk sewerage pipeline is likely to reduce the frequency of sewage spills and pipe blockages occurring. The most serious impacts related to stormwater discharge relates to the input of high volumes of water at high velocity, which has already caused erosion of wetland seep habitat. Considering that all outlets currently discharge stormwater into the Meul River and associated wetland habitat, the intensity of impact has been assessed relative to the current scenario. In this respect the addition of energy dissipation structures designed to reduce the velocity of the water discharged which will help to prevent erosion problems and represents a positive impact. The local community will also benefit from the improved efficiency and reliability of the municipal waste water network. The following objectives are applicable to the positive operational impacts:

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

- Possible blockages and spills from upgraded bulk sewer pipeline are prevented/reduced due to the increased pipe diameter
- Modification to wetland habitat caused by discharge of stormwater runoff is prevented/reduced due to the new energy dissipation structures (Stormwater Outlets).
- Improve efficiency and reliability of the municipal waste water network

OBJECTIVE 1: POSSIBLE BLOCKAGES AND SPILLS FROM UPGRADED BULK SEWER PIPELINE ARE PREVENTED/REDUCED DUE TO THE INCREASED PIPE DIAMETER.

Impact Management Objective: ***Possible blockages and spills from upgraded bulk sewer pipeline are prevented/reduced due to the increased pipe diameter.***		
Potential impact to be promoted:	• Possible blockages and spills from upgraded bulk sewer pipeline are prevented/reduced due to the increased pipe diameter.	
Impact Management Outcome	Possible blockages and spills are prevented.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
• The pipeline must be inspected on a routine basis to ensure that is free of any blockages and debris and is operating according to design specifications.	*George Municipality*	Operational Phase
Performance Indicator	• Pipeline is inspected on a regular basis.	

OBJECTIVE 2: MODIFICATION TO WETLAND HABITAT CAUSED BY DISCHARGE OF STORMWATER RUNOFF IS PREVENTED/REDUCED DUE TO THE NEW ENERGY DISSIPATION STRUCTURES (STORMWATER OUTLETS).

***Impact Management Objective:* Modification to wetland habitat caused by discharge of stormwater runoff is prevented/reduced due to the new energy dissipation structures (Stormwater Outlets).**			
Potential impact to be promoted:	• Modification to wetland habitat caused by discharge of stormwater runoff is prevented/reduced due to the new energy dissipation structures (Stormwater Outlets).		
Impact Management Outcome	The risk of modification to wetland habitat caused by discharge of stormwater runoff is prevented/reduced.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• The stormwater outlet structures must be inspected on a routine basis to ensure that is free of any blockages and debris and is operating according to design specifications; • The bed and banks of the river must be routinely inspected (especially following heavy rainfall events) to ensure that the outlet structure is not causing unnecessary erosion of the bed and banks of the river. Any erosion observed must immediately be attended to through appointment of a suitably qualified aquatic specialist; • All gabion structures must be inspected on a routine basis to ensure that the baskets are intact and that rocks have not displaced. Any faults must be immediately repaired; and • Gabion structures must be lined with geotextiles to prevent the migration of fines that would otherwise undermine these structures.		George Municipality	Operational Phase
Performance Indicator	• Stormwater outlet structures are inspected on a regular basis.		

OBJECTIVE 3: IMPROVE EFFICIENCY AND RELIABILITY OF THE MUNICIPAL WASTE WATER NETWORK

Impact Management Objective: ***Improve efficiency and reliability of the municipal waste water network.***			
Potential impact to be promoted	• Efficiency and reliability of the municipal waste water network is improved.		
Impact Management Outcome	The local community benefits from the improved efficiency and reliability of the municipal waste water network.		
IMPACT MANAGEMENT ACTIONS			
Mitigation measure		Responsible party	Time period
• No mitigation measures for this net positive benefit.		George Municipality	Operational Phase
Performance Indicator	• Efficiency and reliability of the municipal waste water network is improved		

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: THE PROPOSED INSTALLATION OF A BULK SEWERAGE PIPELINE, SEWERAGE BY-PASS PIPELINE AND STORMWATER OUTLETS ON RE/8662, STREET PARCEL RE/8581, RE/464, RE/8596, ERF 3645 AND STREET PARCEL RE/23074 IN ROSEMOOR, GEORGE, WESTERN CAPE PROVINCE



Prepared for:
George Municipality

Date:
May 2026

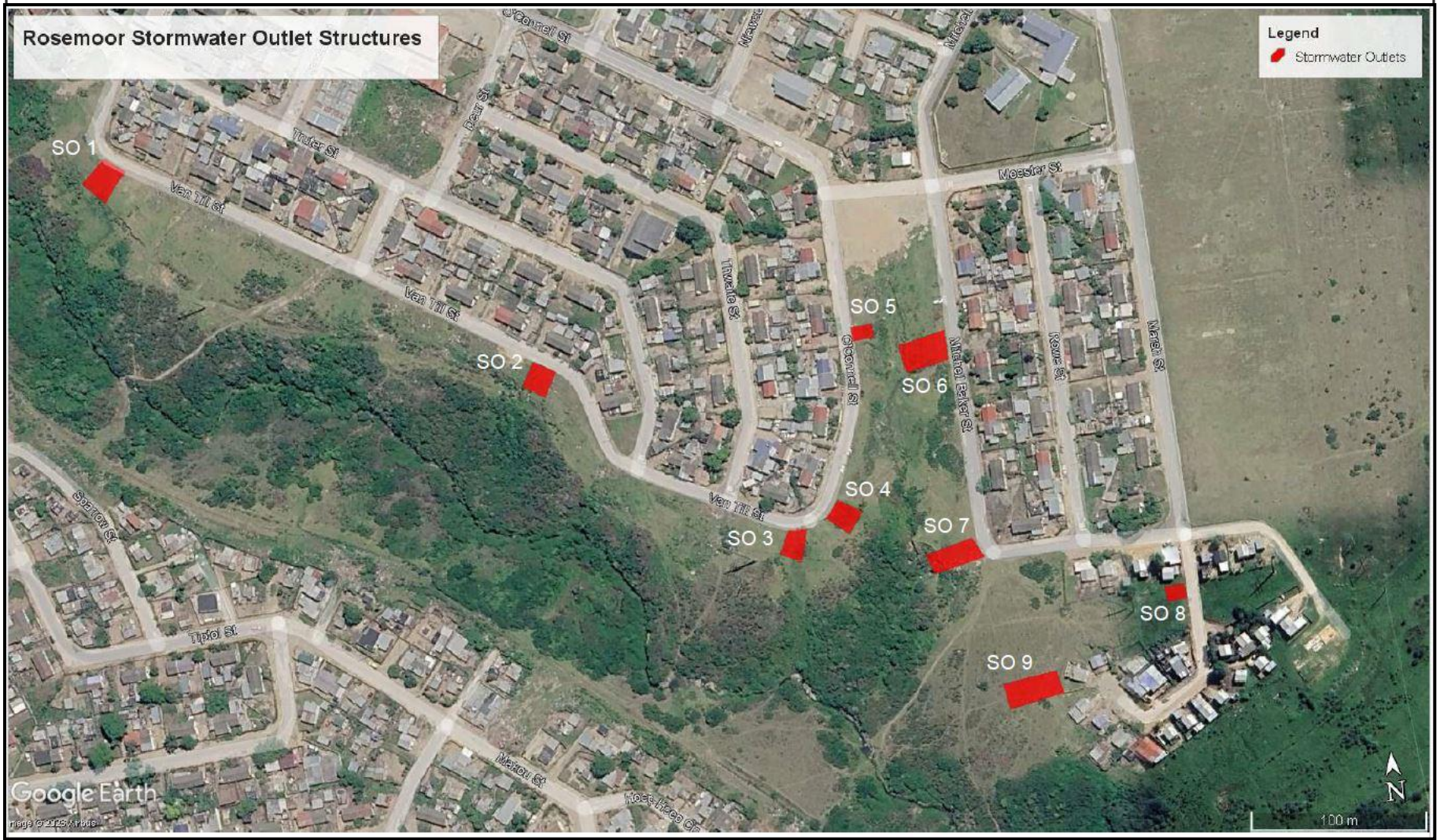
APPENDIX A: FIGURE 2: THE PROPOSED INSTALLATION OF A BULK SEWERAGE PIPELINE, SEWERAGE BY-PASS PIPELINE AND STORMWATER OUTLETS ON RE/8662, STREET PARCEL RE/8581, RE/464, RE/8596, ERF 3645 AND STREET PARCEL RE/23074 IN ROSEMOOR, GEORGE, WESTERN CAPE PROVINCE – SEWERAGE BY-PASS LINE.



Prepared for:
George Municipality

Date:
May 2026

APPENDIX A: FIGURE 3: THE PROPOSED INSTALLATION OF A BULK SEWERAGE PIPELINE, SEWERAGE BY-PASS PIPELINE AND STORMWATER OUTLETS ON RE/8662, STREET PARCEL RE/8581, RE/464, RE/8596, ERF 3645 AND STREET PARCEL RE/23074 IN ROSEMOOR, GEORGE, WESTERN CAPE PROVINCE – STORMWATER OUTLET STRUCTURES.



Prepared for:
George Municipality

Date:
May 2026

APPENDIX A: FIGURE 4: THE PROPOSED INSTALLATION OF A BULK SEWERAGE PIPELINE, SEWERAGE BY-PASS PIPELINE AND STORMWATER OUTLETS ON RE/8662, STREET PARCEL RE/8581, RE/464, RE/8596, ERF 3645 AND STREET PARCEL RE/23074 IN ROSEMOOR, GEORGE, WESTERN CAPE PROVINCE – BULK SEWERAGE PIPLEINE.



Prepared for:
George Municipality

Date:
May 2026

APPENDIX A: FIGURE 5: MAP WITH GPS COORDINATES FOR THE BULK SEWERAGE PIPELINE



APPENDIX A:FIGURE 6: MAP WITH GPS COORDINATES FOR THE STORMWATER OUTLET STRUCTURES



APPENDIX A:FIGURE 7: MAP WITH GPS COORDINATES FOR THE SEWERAGE BY-PASS PIPELINE



APPENDIX A:FIGURE 8: MAP WITH GPS COORDINATES FOR SITE CAMP



APPENDIX A:FIGURE 9: MAP WITH GPS COORDINATES FOR SITE CAMP

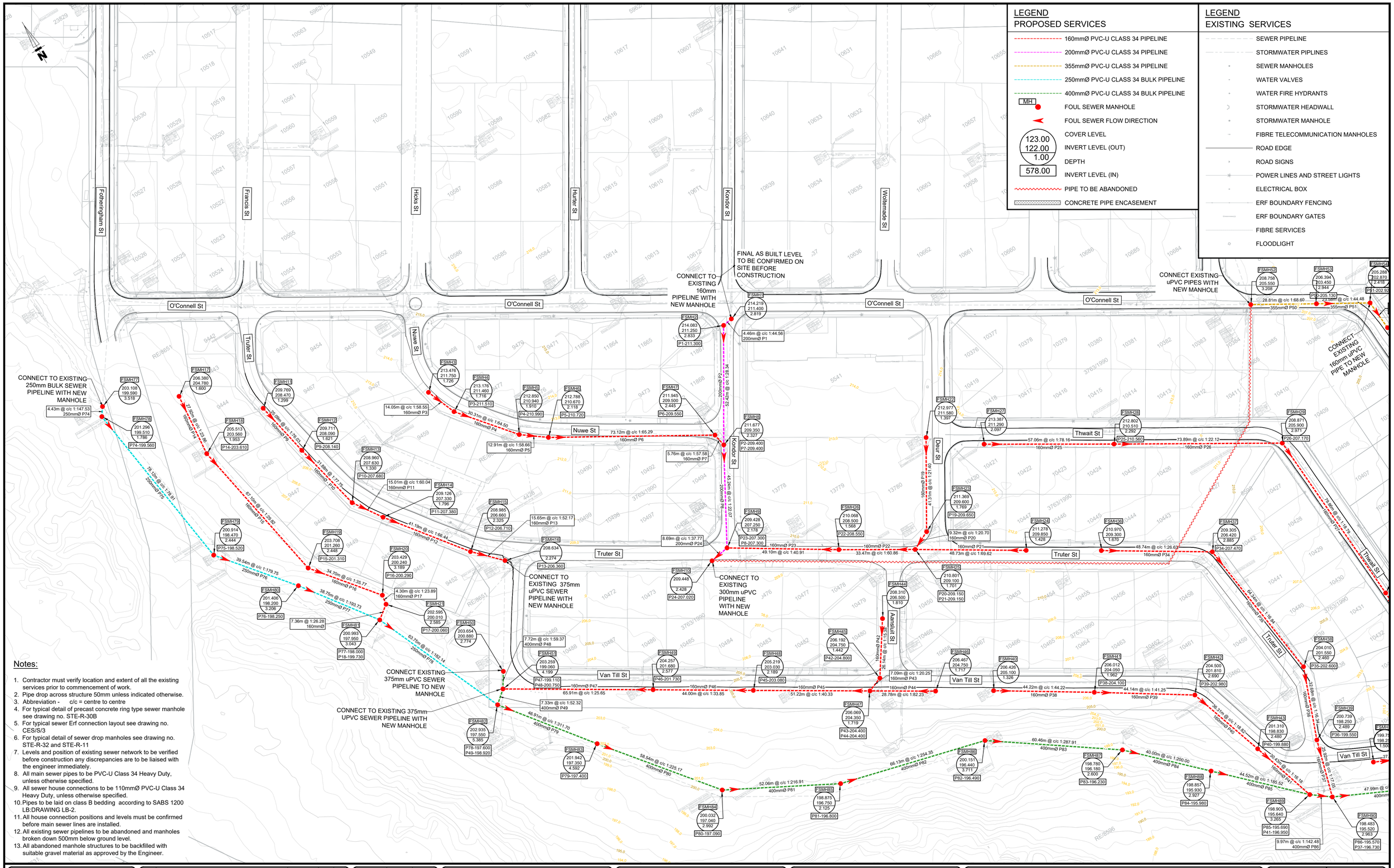


APPENDIX A:FIGURE 10: MAP WITH GPS COORDINATES FOR SITE CAMP



APPENDIX B: SITE DEVELOPMENT PLANS

Appendix B1 – Rosemoor Sewerage Upgrades Layout



SCALEBAR

0 22.5 45

Meters 1:750

REV	DESCRIPTION	DATE	REV BY	CHKD
A	FOR TENDER	2026-04-24	LJ	MLR

REVISIONS

DESIGNED	LJ	2026-04
DRAWN	LJ	2026-04
CHECKED	MLR	2026/04

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All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 or GCC 2025 Contracts where applicable

CONSULTING ENGINEERS

LYNERS

BELLVILLE OFFICE:
PO Box 4901, TYGERVALLEY, 7530
Tel: 021 914 0300
email: bellville@lyners.co.za

PAARL OFFICE:
PO Box 70, PAARL, 7646
Tel: 021 872 0622
email: paarl@lyners.co.za

GEORGE OFFICE:
PO Box 757, GEORGE, 6530
Tel: 044 887 0223
email: george@lyners.co.za

APPROVED

ENGINEERS: _____

DATE: 2026-04-24

APPROVED

CLIENT: _____

DATE: _____

CLIENT

GEORGE
THE CITY FOR ALL REASONS

PROJECT

ROSEMOOR AREA A: STREETS, STORMWATER, SEWER AND WATER UPGRADES

TITLE

SEWER LAYOUT

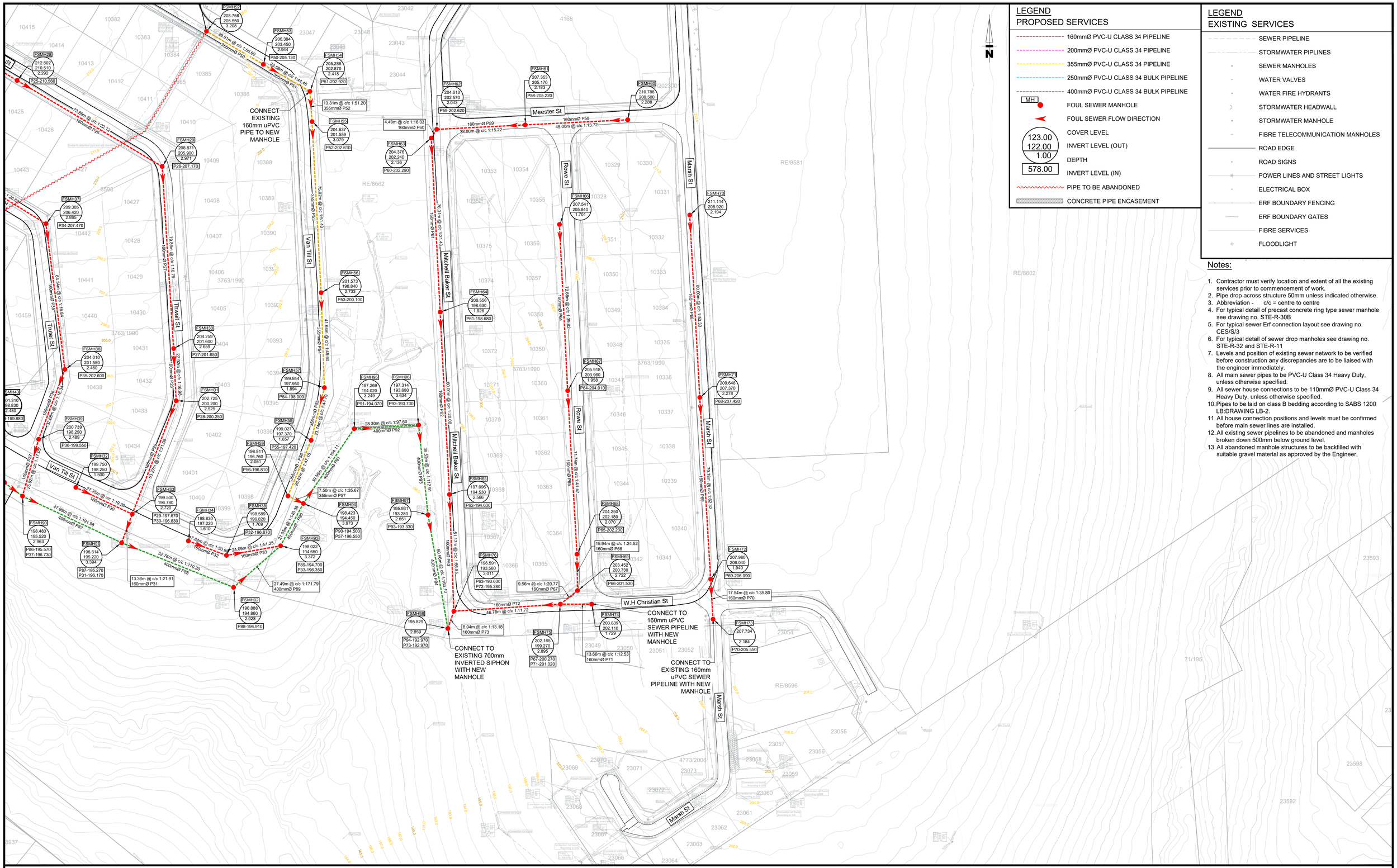
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DRAWING No. 24052-C-003-01 REV A

COORDINATE SYSTEM: WGS84 / Lo23°

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LEGEND
PROPOSED SERVICES

- 160mmØ PVC-U CLASS 34 PIPELINE
- 200mmØ PVC-U CLASS 34 PIPELINE
- 355mmØ PVC-U CLASS 34 PIPELINE
- 250mmØ PVC-U CLASS 34 BULK PIPELINE
- 400mmØ PVC-U CLASS 34 BULK PIPELINE
- MH — FOUL SEWER MANHOLE
- FOUL SEWER FLOW DIRECTION
- 123.00 / 122.00 / 1.00 — COVER LEVEL / INVERT LEVEL (OUT) / DEPTH
- 578.00 — INVERT LEVEL (IN)
- PIPE TO BE ABANDONED
- CONCRETE PIPE ENCASEMENT

LEGEND
EXISTING SERVICES

- SEWER PIPELINE
- STORMWATER PIPLINES
- SEWER MANHOLES
- WATER VALVES
- WATER FIRE HYDRANTS
- STORMWATER HEADWALL
- STORMWATER MANHOLE
- FIBRE TELECOMMUNICATION MANHOLES
- ROAD EDGE
- ROAD SIGNS
- POWER LINES AND STREET LIGHTS
- ELECTRICAL BOX
- ERF BOUNDARY FENCING
- ERF BOUNDARY GATES
- FIBRE SERVICES
- FLOODLIGHT

Notes:

1. Contractor must verify location and extent of all the existing services prior to commencement of work.
2. Pipe drop across structure 50mm unless indicated otherwise.
3. Abbreviation - c/c = centre to centre
4. For typical detail of precast concrete ring type sewer manhole see drawing no. STE-R-30B
5. For typical sewer Erf connection layout see drawing no. CES/S/3
6. For typical detail of sewer drop manholes see drawing no. STE-R-32 and STE-R-11
7. Levels and position of existing sewer network to be verified before construction any discrepancies are to be liaised with the engineer immediately.
8. All main sewer pipes to be PVC-U Class 34 Heavy Duty, unless otherwise specified.
9. All sewer house connections to be 110mmØ PVC-U Class 34 Heavy Duty, unless otherwise specified.
10. Pipes to be laid on class B bedding according to SABS 1200 LB:DRAWING LB-2.
11. All house connection positions and levels must be confirmed before main sewer lines are installed.
12. All existing sewer pipelines to be abandoned and manholes broken down 500mm below ground level.
13. All abandoned manhole structures to be backfilled with suitable gravel material as approved by the Engineer,

SCALEBAR

0 22.5 45
Meters 1:750

REV	DESCRIPTION	DATE	REV BY	CHKD
A	FOR TENDER	2026-04-24	LJ	MLR

REVISIONS

DESIGNED	LJ	2026-04
DRAWN	LJ	2026-04
CHECKED	MLR	2026-04

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All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 or GCC 2025 Contracts where applicable

CONSULTING ENGINEERS
LYNERS
BELLVILLE OFFICE: PO Box 4901, TYGERVALLEY, 7530 Tel: 021 914 0300 email: bellville@lyners.co.za
PAARL OFFICE: PO Box 70, PAARL, 7646 Tel: 021 872 0622 email: paarl@lyners.co.za
GEORGE OFFICE: PO Box 757, GEORGE, 6530 Tel: 044 887 0223 email: george@lyners.co.za

APPROVED
ENGINEERS: _____
DATE: 2026-04-24

APPROVED
CLIENT: _____
DATE: _____

CLIENT
GEORGE
THE CITY FOR ALL REASONS

PROJECT
ROSEMOOR AREA A: STREETS, STORMWATER, SEWER AND WATER UPGRADES

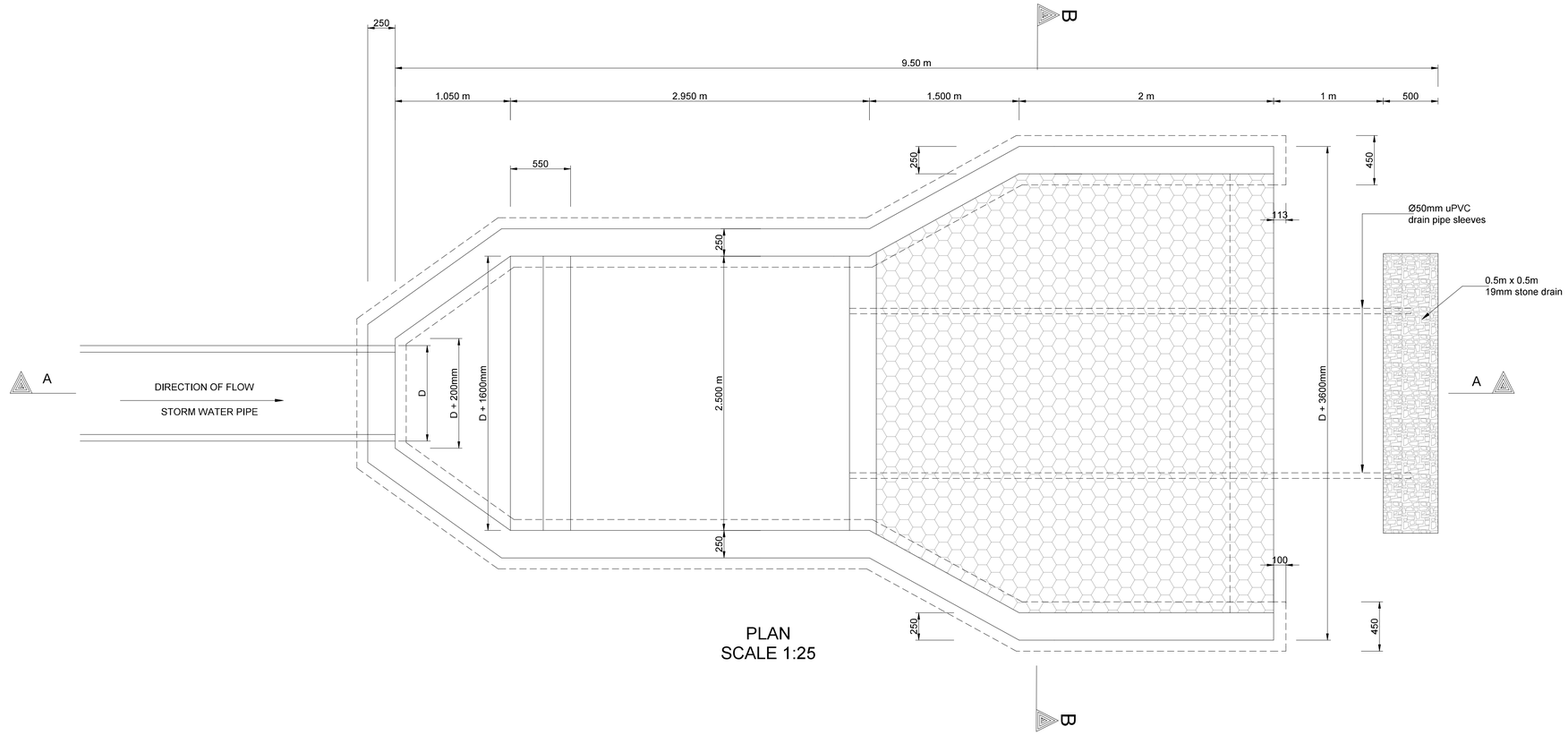
TITLE
SEWER LAYOUT

SCALE	SHEET
1:750 on A1	2 OF 2
CONTRACT No.	PROJECT No. 24052CG

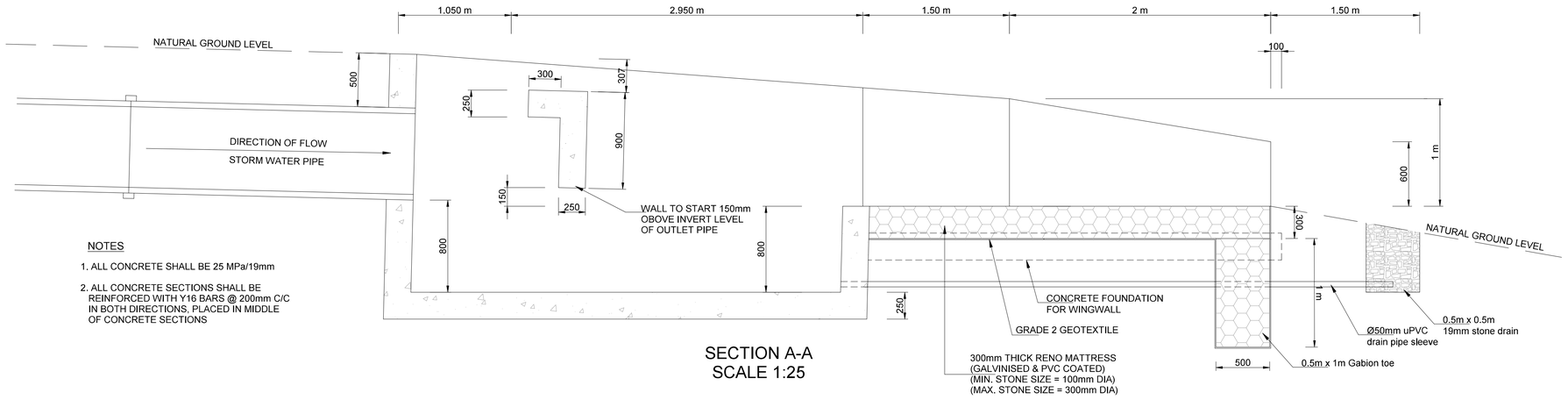
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COORDINATE SYSTEM: WGS84 / Lo23°

Appendix B1 – Rosemoor Stormwater Outlet Structures Layout and Design Drawings


Rosemoor Stormwater Outlet Structures
Legend
Stormwater Outfall
SO 1
SO 2
SO 3
SO 4
SO 5
SO 6
SO 7
SO 8
SO 9
Google Earth
N



PLAN
SCALE 1:25



NOTES

1. ALL CONCRETE SHALL BE 25 MPa/19mm
2. ALL CONCRETE SECTIONS SHALL BE REINFORCED WITH Y16 BARS @ 200mm C/C IN BOTH DIRECTIONS, PLACED IN MIDDLE OF CONCRETE SECTIONS

SECTION A-A
SCALE 1:25

SCALEBAR

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REV	DESCRIPTION	DATE	REV BY	CHKD

REVISIONS

DESIGNED	MleR / WO	08/2024
DRAWN	WO	08/2024
CHECKED	MleR	08/2024

CONSULTING ENGINEERS
LYNERS
PO Box 757
GEORGE 6530
Tel: (044) 887 0223
Fax: (044) 887 0741
Email: george@lyners.co.za

APPROVED
CONSULTING ENGINEERS:
SIGNATURE:_____ DATE:

APPROVED
CLIENT REPRESENTATIVE:
SIGNATURE:_____ DATE:

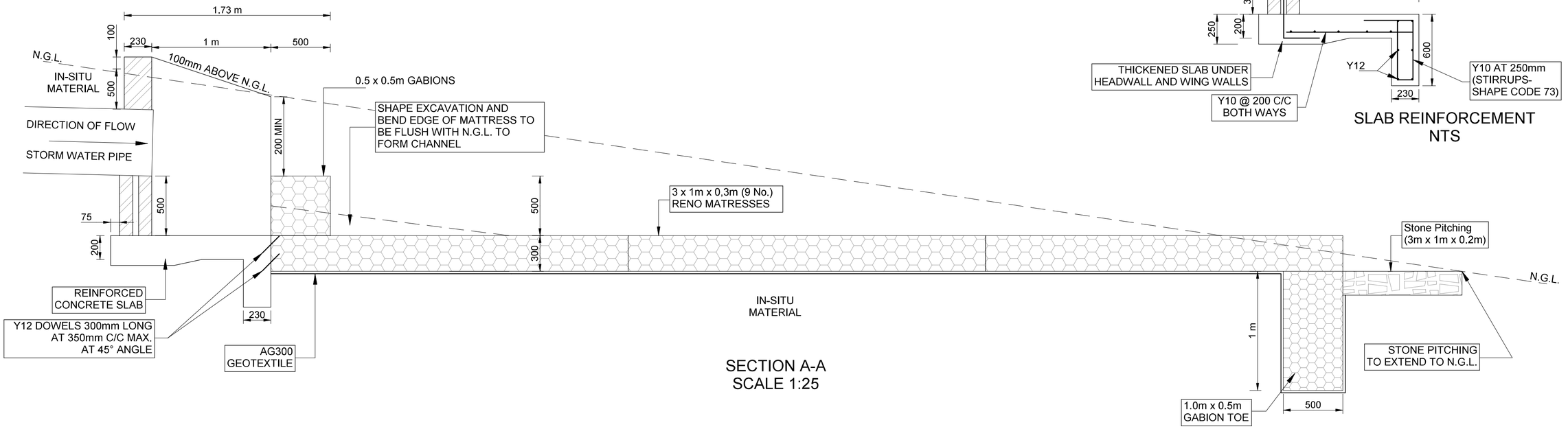
CLIENT
-

TITLE
STORMWATER OUTLET DETAIL
TYPE 2

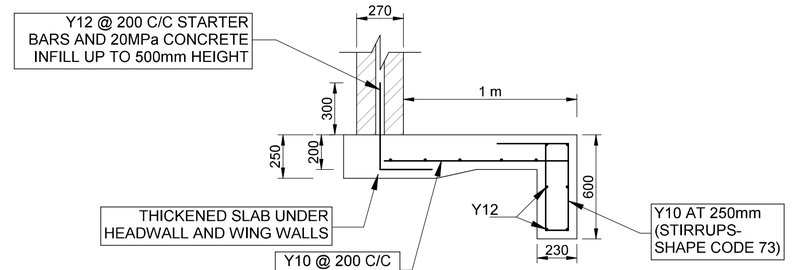
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CONTRACT No.	PROJECT No.
	-

DRAWING No. STE/SW-77E REV A

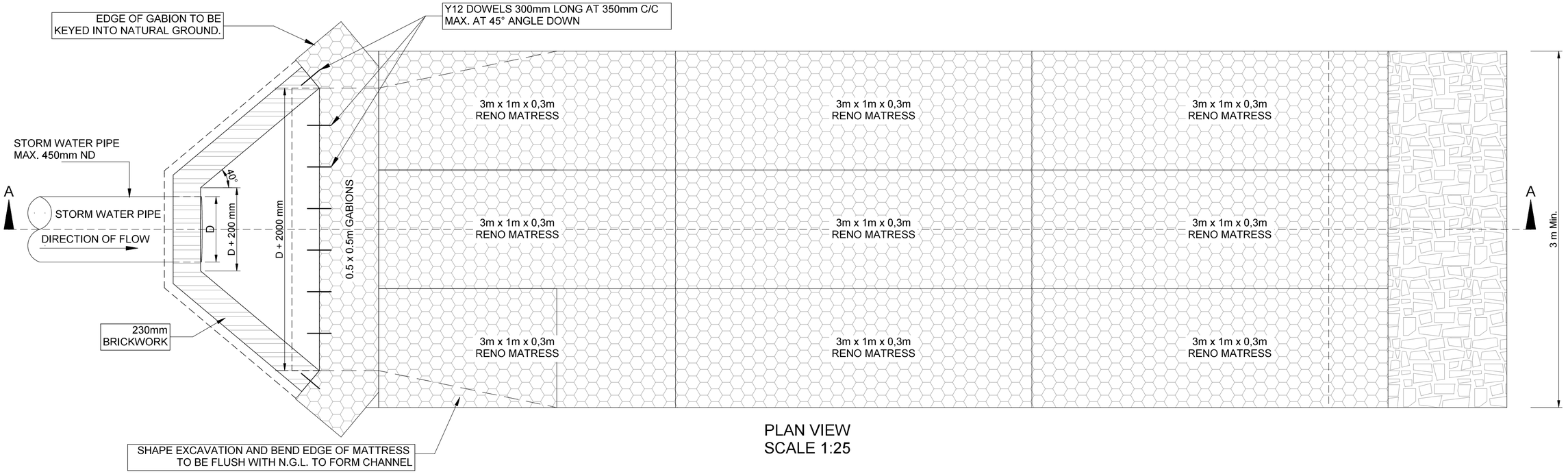
DATE OF FIRST ISSUE: -



SECTION A-A
SCALE 1:25



SLAB REINFORCEMENT
NTS



PLAN VIEW
SCALE 1:25

SCALEBAR

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REV	DESCRIPTION	DATE	REV BY	CHKD

REVISIONS

DESIGNED	FvE / WO	01/2016
DRAWN	WO	01/2016
CHECKED	FvE	01/2016

CONSULTING ENGINEERS
LYNERS
PO Box 757
GEORGE 6530
Tel: (044) 887 0223
Fax: (044) 887 0741
Email: george@lyners.co.za

APPROVED
CONSULTING ENGINEERS:
SIGNATURE: DATE:

APPROVED
CLIENT REPRESENTATIVE:
SIGNATURE: DATE:

TITLE

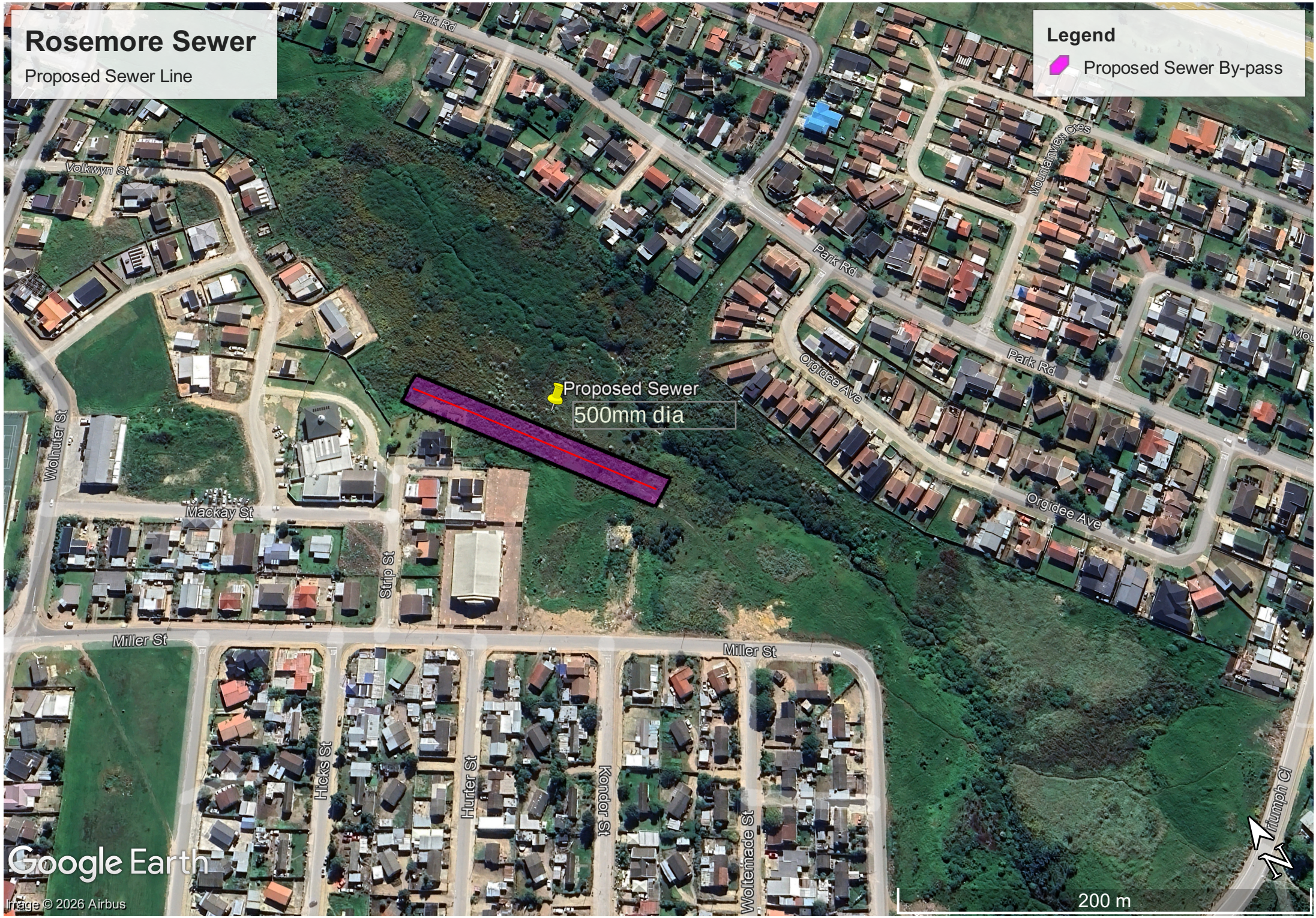
STORMWATER OUTLET DETAIL

SCALE	SHEET
1:25	1 OF 1
CONTRACT No.	PROJECT No.
	-

DRAWING No. STE/SW-77F REV A

DATE OF FIRST ISSUE:

Appendix B1 – Rosemoor Sewerage By-Pass Pipeline


Rosemore Sewer
Proposed Sewer Line
Legend
Proposed Sewer By-pass
Proposed Sewer
500mm dia
Park Rd
Volkwyn St
Mountainview Cres
Park Rd
Park Rd
Orgidee Ave
Orgidee Ave
Wolhuter St
Mackay St
Strip St
Miller St
Miller St
Hicks St
Hurter St
Kondor St
Woltemade St
Triumph Cl
Google Earth
Image © 2026 Airbus
200 m
N

APPENDIX C: ENVIRONMENTAL AWARENESS GUIDELINE

GEORGE
TEL: +27 (0) 44 873 4923 **FAX:**+27 (0) 44 874 5953
EMAIL: info@sescc.net **WEBSITE:** www.sescc.net
ADDRESS: 102 Merriman Street, George, 6530
PO BOX: 9087, George, 6530

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.







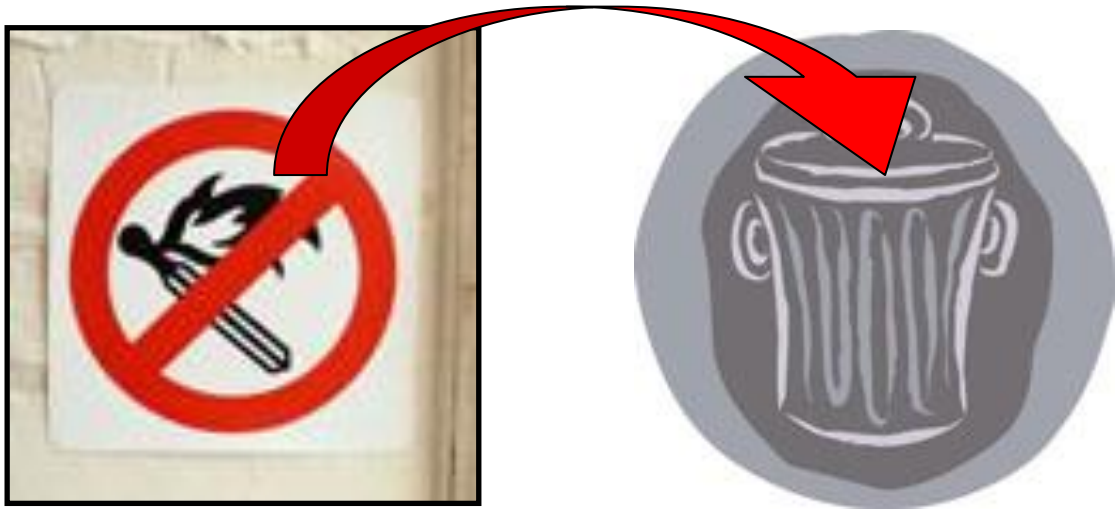


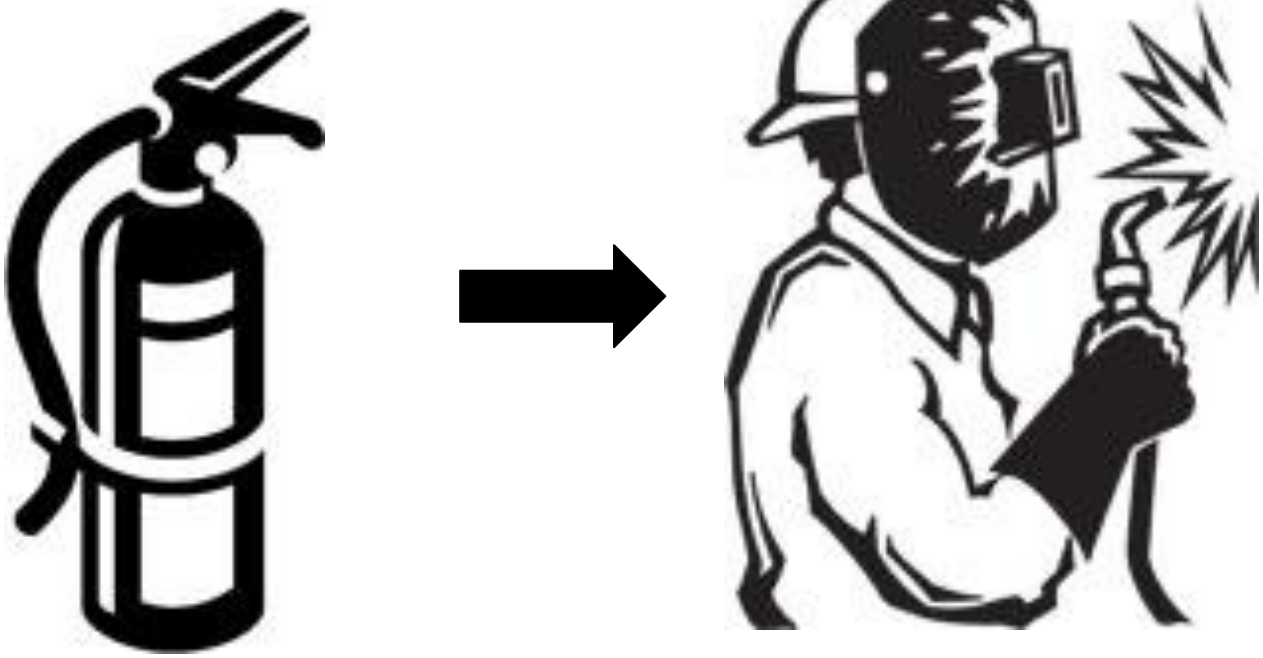
Fire Control:
Vuur Beheer:
Ulawulo Lemililo:

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

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

CHRISTIAAN CHARL SMIT

PERSONAL

Profession: Candidate Environmental Assessment Practitioner and Environmental Control Officer
Nationality: South African
Languages: English (read, write and speak) & Afrikaans (read, write and speak)
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

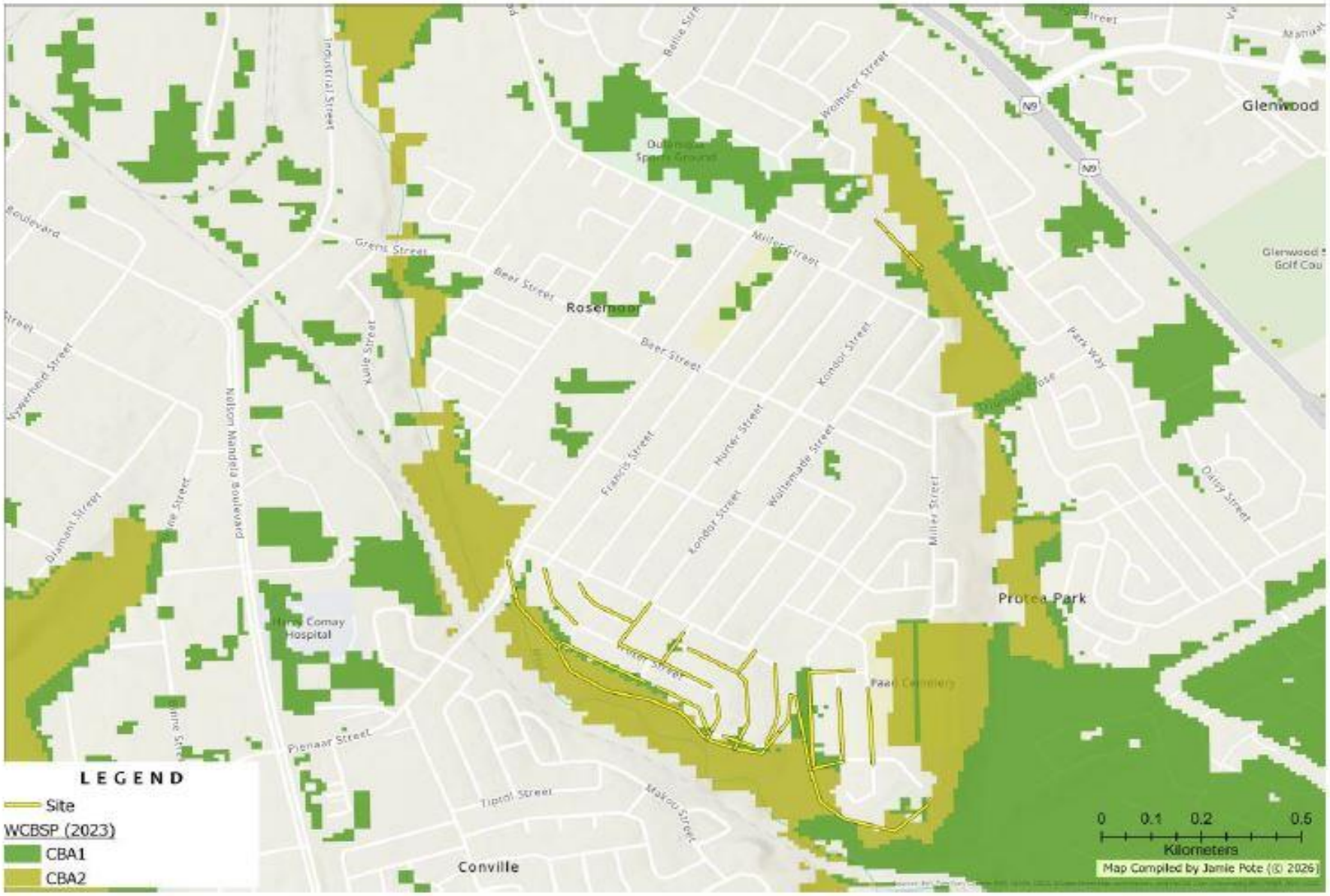
APPENDIX E: FIGURE 1: MAP SHOWING THE DELINEATED EXTENT OF SEEP WETLANDS ALONG THE MEUL RIVER AND ITS EASTERN TRIBUTARY.



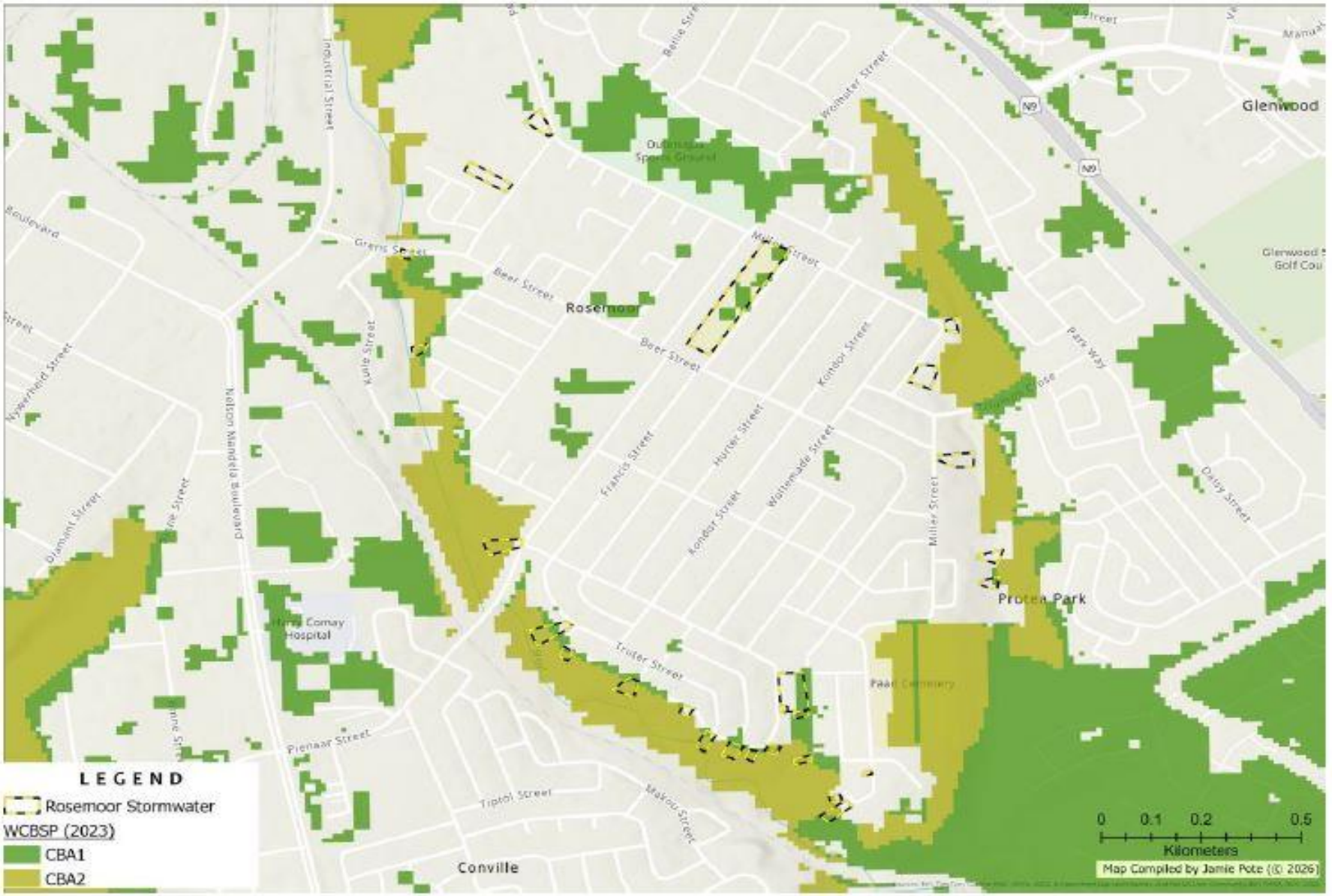
APPENDIX E: FIGURE 2: MAP SHOWING THE DELINEATED EXTENT OF SEEP WETLANDS ALONG THE MEUL RIVER AND ITS EASTERN TRIBUTARY. THE PIPELINE CROSSES A STORMWATER CHANNEL AT THE POSITION INDICATED BY THE RED ARROW.



APPENDIX E: FIGURE 3: WESTERN CAPE BIODIVERSITY SPATIAL PLAN (WCBSP, 2023) –THE SITE DOES OVERLAP WITH SOME DESIGNATED CBA 1, CBA 2 AND ESA 2 AREAS (SEWERAGE PIPELINES).



APPENDIX E: FIGURE 4: WESTERN CAPE BIODIVERSITY SPATIAL PLAN (WCBSP, 2023) –THE SITE DOES OVERLAP WITH SOME DESIGNATED CBA 1, CBA 2 AND ESA 2 AREAS (STORMWATER OUTLETS).



APPENDIX E: FIGURE 5: NO-GO MAP.



APPENDIX E: FIGURE 6: NO-GO MAP – BULK SEWERAGE PIPELINE AND STORMWATER OUTLETS.



APPENDIX E: FIGURE 7: NO-GO MAP – SEWERAGE BY-PASS PIPELINE.



APPENDIX F: SITE SPECIFIC ALIEN AND INVASIVE SPECIES MANAGEMENT PROGRAMME

forestry, fisheries
& the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

Private Bag X447, Pretoria, 0001, Environment House, 473 Steve Biko Road, Pretoria, 0002 Tel: +27 12 399 9000, Fax: +27 86 625 1042

Ref: 14.7.8.2.3.147
4**Enquiries:** Mr Stiaan Kotze
Tel: (021) 441 2816 **Email:** SKotze@dffe.gov.za

Sharples Environmental Services
Unit 17 Cathedral Square
Cathedral Street
GEORGE
6530

Attention: Michael Jon Bennett

Email: michael@sescc.net

Dear Mr Bennett

INVASIVE SPECIES MONITORING, CONTROL AND ERADICATION PLAN OF FOR "THE PROPOSED INSTALLATION OF A BULK SEWERAGE PIPELINE, SEWERAGE BY-PASS PIPELINE AND STORMWATER OUTLETS ON RE/8662, STREET PARCEL RE/8581, RE/464, RE/8596, ERF 3645 AND STREET PARCEL RE/23074 IN ROSEMOOR, GEORGE, WESTERN CAPE PROVINCE.

1. I refer to the following:
   1.1. Invasive Species Monitoring, Control and Eradication Plan of for the Proposed Installation Of A Bulk Sewerage Pipeline, Sewerage By-Pass Pipeline And Stormwater Outlets On Re/8662, Street Parcel Re/8581, Re/464, Re/8596, Erf 3645 And Street Parcel Re/23074 In Rosemoor, George, Western Cape submitted to the Department of Forestry, Fisheries and the Environment (DFFE) on 01 April 2026 compiled by Michael Jon Bennett. The plan was prepared for George Municipality.

2. Having reviewed the Invasive Species Monitoring, Control and Eradication Plan I have noted the following:
   2.1. The plan includes the entire property.
   2.2. The listed invasive plant species present on your property and their categories.
   2.3. The combined integrated control methods (mechanical, chemical and biological) will be used to control listed invasive species on your property.
   2.4. The Invasive Species Monitoring, Control and Eradication Plan will be implemented for three (3) years and all invasive plant species will be under control by end 2029; and there after annual follow up is recommended to keep the portion clean.

 The processing of personal information by the Department of Forestry, Fisheries and the Environment is done lawfully and not excessively for the purpose of processing in compliance with the POPI Act, any codes of conduct issued by the Information Regulator in terms of the POPI Act, and/or relevant legislation providing appropriate security safeguards for the processing of personal information of others.

3. In view of the above background, the Department is satisfied that the submitted Invasive Species Monitoring, Control and Eradication plan meets the requirements of such plans as provided in Chapter 4, sub section 76 of the National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004) and the Alien and Invasives Species Regulations, 2020.

4. A progress report must be submitted to the DFFE every year or at the completion of each management unit to outline the progress that has been made. Moreover, a close out report must be submitted to the department after clearing have been completed.
   The close out report must, among other things include:
   a. Description of the control methods used and the way they were implemented
   b. Assessment including fixed-point photography of the cleared areas; and
   c. Management, utilisation or disposal of plant materials (biomass) after clearing.

5. Should you wish to correspond further on this matter kindly quote Reference:14/2/8/2/3/147. Enquiries may be directed to the contact person highlighted at the top of this correspondence.

Yours sincerely

SKotze

Mr Stiaan Kotze
Environmental Management Inspector
Department of Forestry, Fisheries and the Environment
Designation: Control Biodiversity Officer: Competent Authority
Branch: Regulatory Compliance and Monitoring
Date: 05/05/2026

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

SITE SPECIFIC ALIEN AND INVASIVE SPECIES MANAGEMENT PROGRAMME

FOR THE

THE PROPOSED INSTALLATION OF A BULK SEWERAGE PIPELINE, SEWERAGE BY-PASS PIPELINE AND STORMWATER OUTLETS ON RE/8662, STREET PARCEL RE/8581, RE/464, RE/8596, ERF 3645 AND STREET PARCEL RE/23074 IN ROSEMOOR, GEORGE, 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: George Municipality
P.O Box 19
George
6530

DATE: 31 March 2026

SES REF NO: AMP/RSU/GRG/03/26
DEA&DP REF.NO.: 16/3/3/6/7/1/D2/47/0443/25

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Appendix B1: Terrestrial Biodiversity Compliance Statement and Assessment - Sewer
Appendix B2: Terrestrial Biodiversity Compliance Statement and Assessment - Stormwater
Appendix C: DFFE Pesticide Policy

Section	
1	**PROJECT DETAILS**

PROJECT DETAILS:		
Project Name:	**The proposed installation of a bulk sewerage pipeline, sewerage by-pass pipeline and stormwater outlet structures on RE/8662, Street Parcel RE/8581, RE/464, RE/8596, Erf 3645, Street Parcel RE/23074, Erf 23052, Erf 23068 and Erf 23069 in Rosemoor, George, Western Cape Province.**	
DEADP Reference Number:	**16/3/3/6/7/1/D2/47/0443/25**	
Erf Name and Portion Number:	• **RE/8662** • **Street Parcel RE/8581** • **RE/464** • **RE/8596** • **Erf 3645** • **Street Parcel RE/23074**	
SG Codes:	**RE/8662**	**C02700020000866200000**
	Street Parcel RE/8581	**C02700020000858100000**
	RE/464	**C02700020000046400000**
	RE/8596	**C02700020000859600000**
	Erf 3645	**C02700020000364500000**
	Street Parcel RE/23074	**C02700020002307400000**
GPS Co-ordinates of Pipeline Route:	**Starting point co-ordinates**	**34 ° 3' 4.01" S** **22° 12' 59.52'' E**
	Middle point co-ordinates	**34° 2' 37.75" S** **22° 13' 7.42" E**
	End point co-ordinates	**34° 2' 22.32" S** **22° 12' 51.14" E**
GPS Co-ordinates of Pipeline Route:	**Starting point co-ordinates**	**33° 58' 16.97" S** **22° 29' 3.52" E**
	Middle point co-ordinates	**33° 58' 19.58" S** **22° 29' 5.88" E**
	End point co-ordinates	**33° 58' 20.66" S** **22° 29' 6.86" E**
GPS Co-ordinates of Stormwater Outlet Structures:	**SO 1**	**33° 58' 49.79" S** **22° 28' 40.86" E**
	SO 2	**33° 58' 54.29" S** **22° 28' 49.80" E**
	SO 3	**33° 58' 57.77" S** **22° 28' 55.04" E**
	SO 4	**33° 58' 57.37" S** **22° 28' 56.04" E**
	SO 5	**33° 58' 54.11" S** **22° 28' 56.84" E**
	SO 6	**33° 58' 54.59" S** **22° 28' 58.12" E**
	SO 7	**33° 58' 58.33" S** **22° 28' 58.43" E**
	SO 8	**33° 58' 59.38" S** **22° 29' 3.02" E**
	SO 9	**33° 59' 1.17" S** **22° 29' 0.71" E**
Municipality:	**George Municipality**	
Province:	**Western Cape**	
Applicant:	**George Municipality**	
EAP:	**Sharples Environmental Services cc** **EAP: Michael Jon Bennett (EAPASA: 2021/3163)** **Candidate EAP: Christiaan Smit (EAPASA: 2024/8297)**	
Date:	**25 March 2026**	
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Section	
2	**PURPOSE OF THIS ALIEN AND INVASIVE SPECIES MANAGEMENT PLAN**

This Alien and Invasive Species Management Plan has been prepared for the George Municipality, for the construction and post construction rehabilitation activities associated with the proposed installation of a bulk sewerage pipeline, sewerage by-pass pipeline and stormwater outlet structures on RE/8662, Street Parcel RE/8581, RE/464, RE/8596, Erf 3645, Street Parcel RE/23074, Erf 23052, Erf 23068 and Erf 23069 in Rosemoor, George, Western Cape Province.

This Alien 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 minimizes 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:

Sharples Environmental Services cc (SES) have been appointed by Lyners Engineers on behalf of the George Municipality to compile the Basic Assessment Report of the proposed installation of a sewerage pipeline, sewerage by pass line, and additional stormwater outlet structures in Rosemoor, George, Western Cape. Please refer to the figures below for the locality of the proposed pipeline routes and stormwater outlet structures.

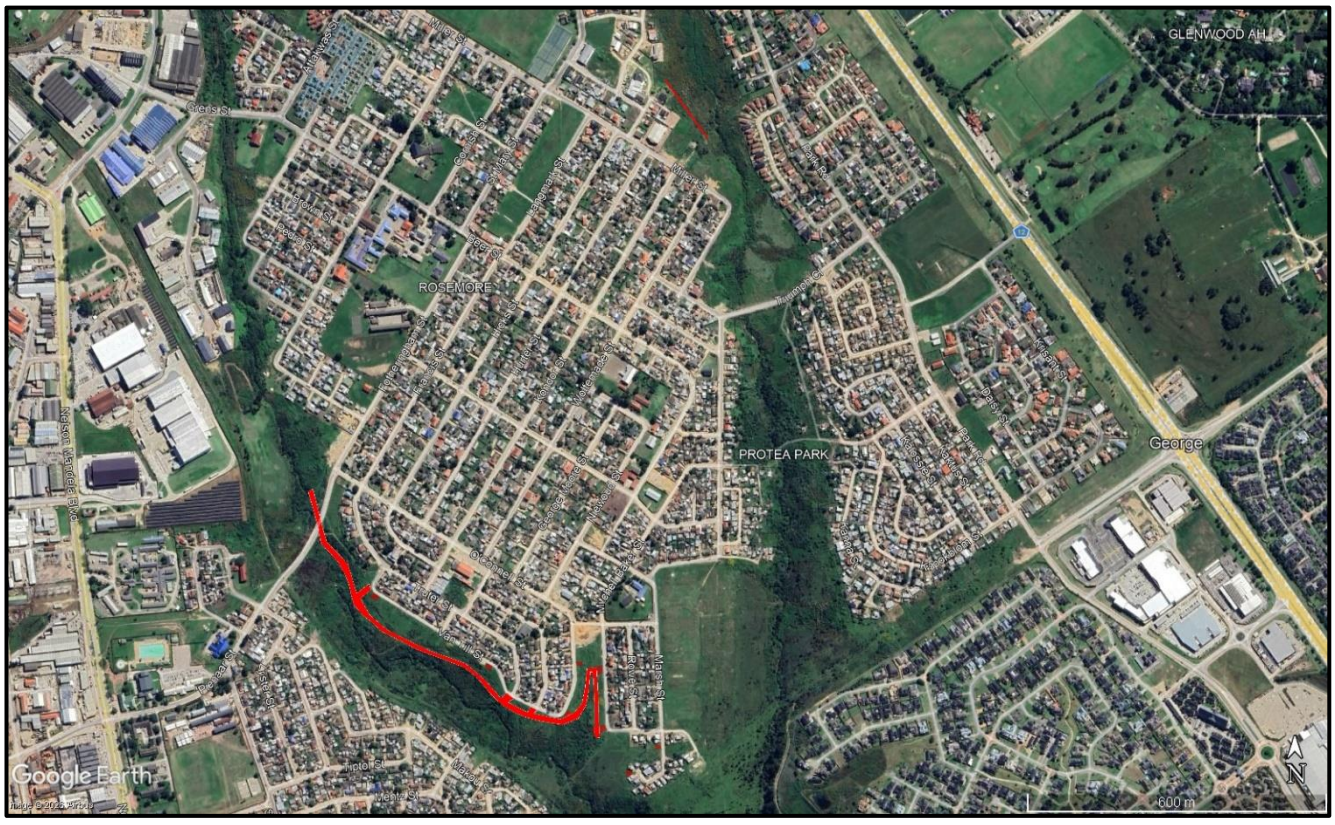


Figure 1: Locality Map of Bulk Sewerage Pipeline.



Figure 2: Close-up Locality Map of Bulk Sewerage Pipeline.

The pipeline will be approximately 1038m in length with varying diameters (250mm and 400mm). Approximately 230m of the pipeline will have a diameter of 250mm and approximately 808m of the pipeline will have a diameter of 400mm. The pipeline will also connect to adjoining manholes which are part of the sewerage upgrades for Rosemoor (these will occur within existing roads). Please refer to the Figures below for the layout plans of the Rosemoor Sewer Upgrades and Sewerage Pipeline.

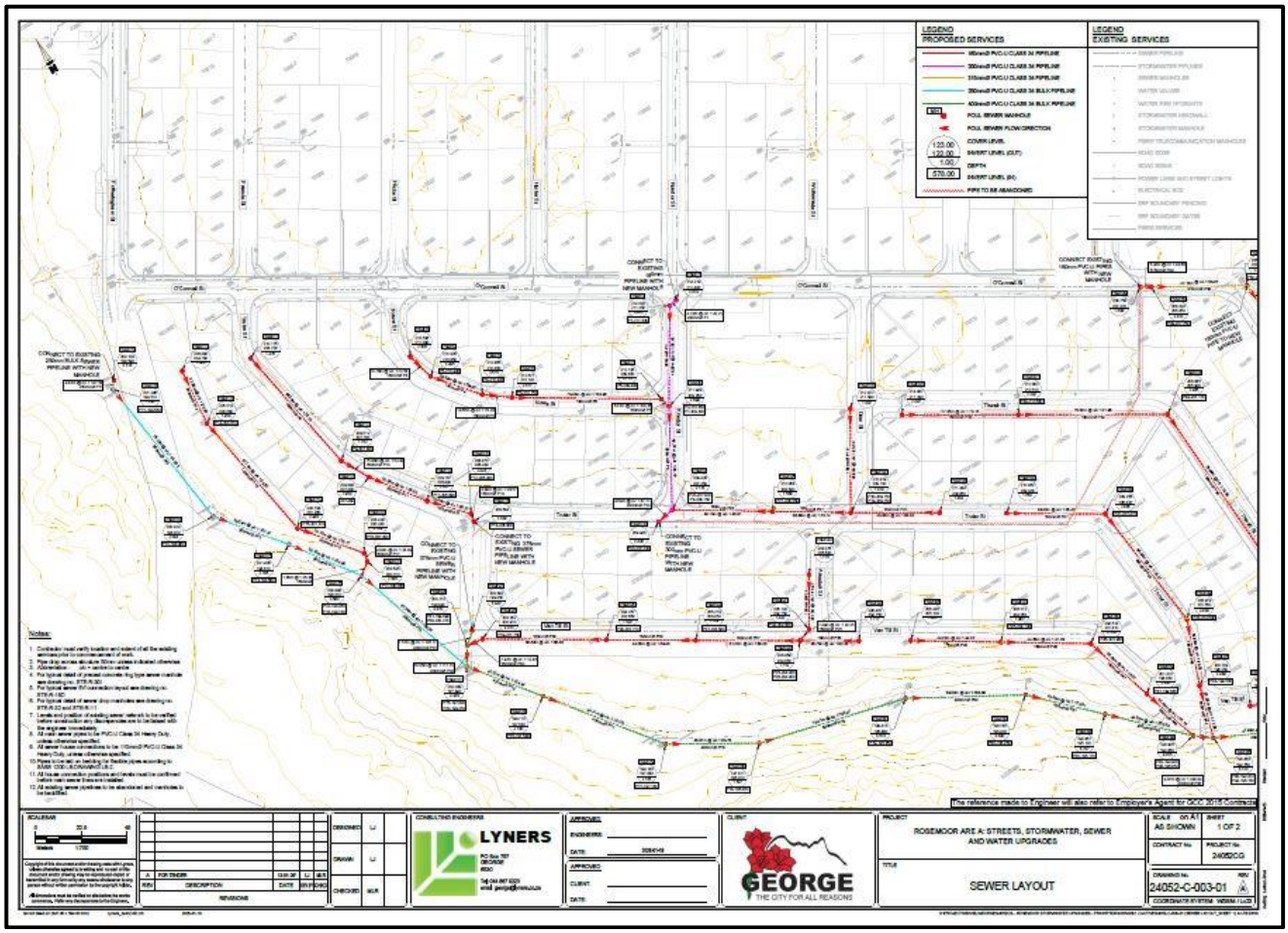


Figure 3: Proposed Sewerage Upgrades for Rosemoor.

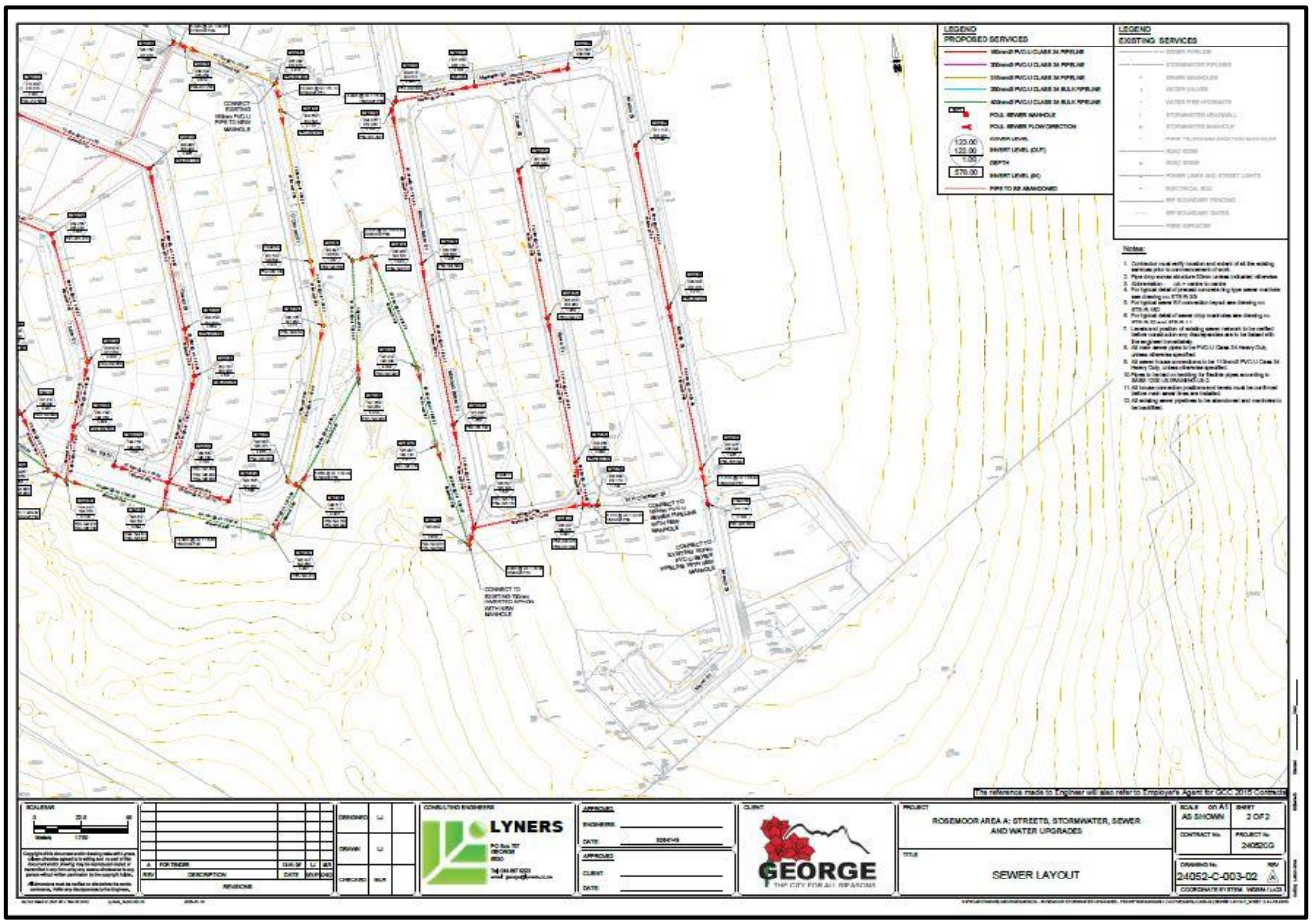


Figure 4: Proposed Sewerage Upgrades for Rosemoor.

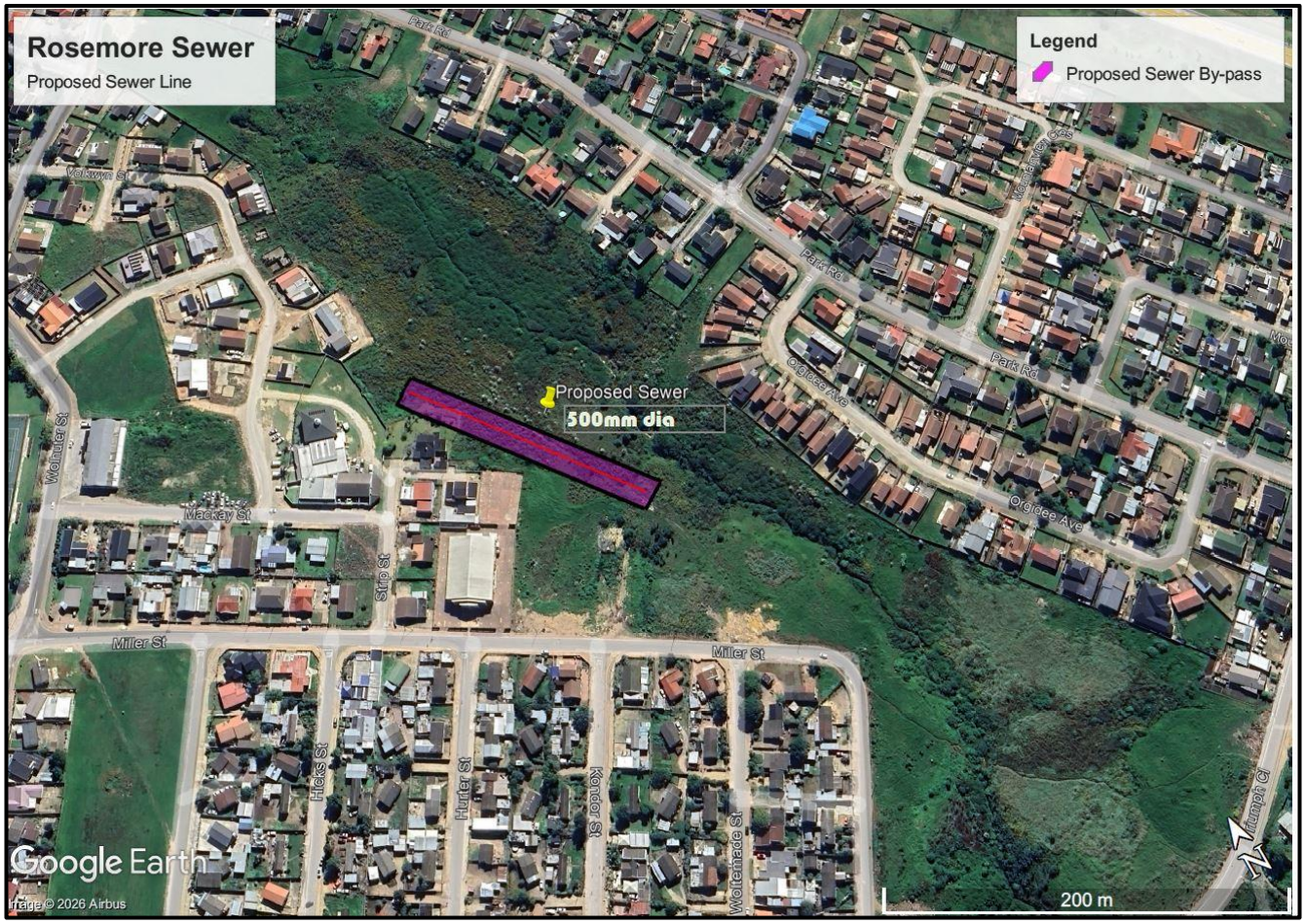


Figure 5: Proposed Sewerage By-Pass Line.

The proposed sewerage by-pass pipeline will be approximately 142m in length with a diameter of 500mm.

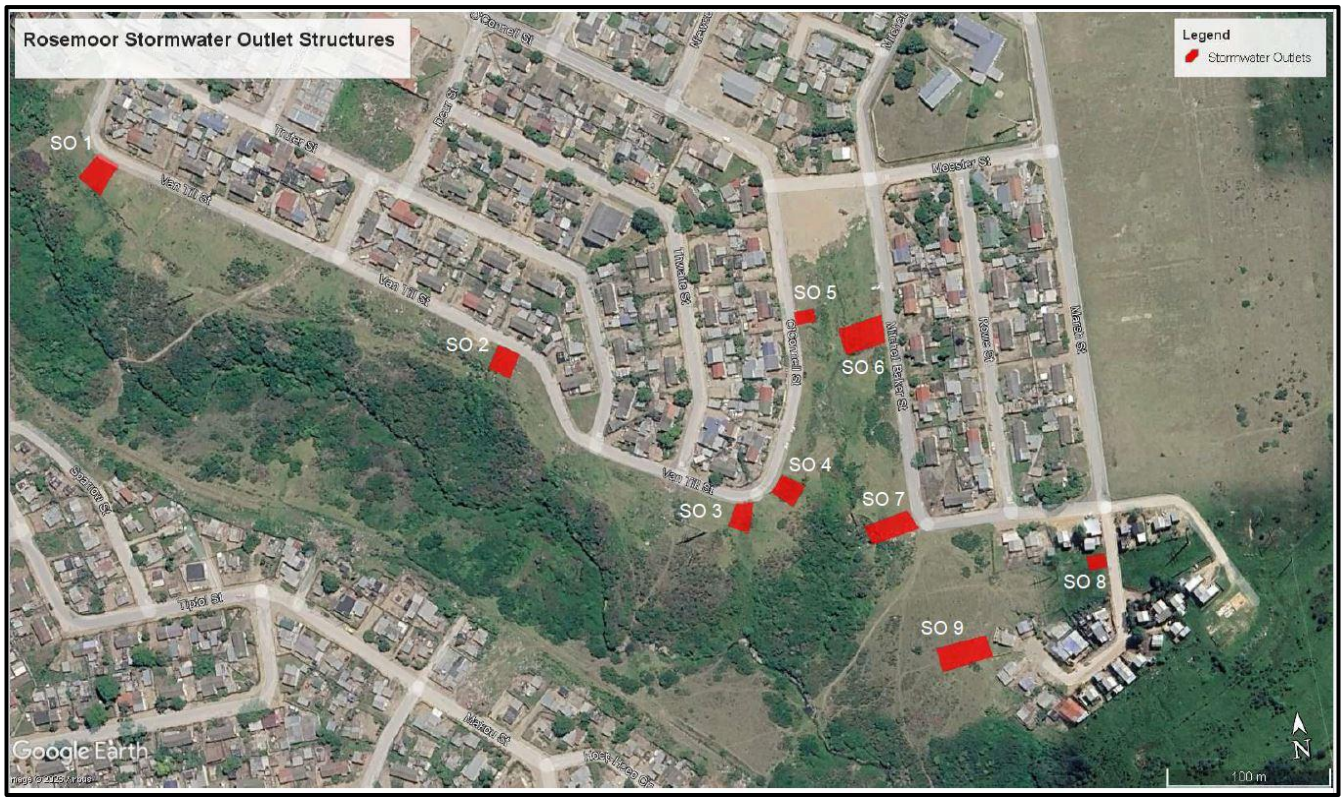


Figure 6: Proposed Stormwater Outlet Structures.

Nine stormwater outlet structures are proposed to be constructed, as illustrated in Figure 6 above. The stormwater outlet structures will each have a development footprint of approximately 36m^2, which will equal a total development footprint of 324m^2.

Vegetation on Site:
Jamie Pote was appointed to compile a Terrestrial Biodiversity Compliance Statement and Assessment 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 site:

- **Baseline Biodiversity Description:**

  The site is located within a transformed developed urban area on slopes adjacent to somewhat incised watercourses, draining in a southerly direction. The only remaining vegetation cover is comprised of a narrow band of vegetation along eh banks of the watercourses, as well as some grassed and landscaped gardens within the suburbs (Figure 7 to Figure 24).

  The site is comprised predominantly of transformed areas which include the dwellings, surfaced roads, sidewalks and landscaped gardens (Figure 1-6). The areas having 'natural' vegetation cover are generally confined to the undeveloped areas surrounding the watercourse which runs west to east on the south side of the project area. The proposed sewer infrastructure is generally located within these areas, where leaks due to inadequate infrastructure can discharging into the watercourses.

  Several different main habitats can be differentiated within the vegetated area:
  1. Transformed: Includes hardened surfaces such as paved roads, sidewalks, landscaped gardens and grassed areas including parks and road verges (Figure 7 to Figure 10). Comprises almost the entire 160mm & 315 mm sewer pipeline component.
  2. Degraded Riverine: Historically would have contained riparian and riverine elements associated with the watercourse, but significantly degraded 'natural' vegetation composed predominantly of kikuyu grass, ruderal weeds, garden escapees, as well as occasional pioneer shrubs, herbs, grasses and some remnant small trees (Figure 11 to Figure 20).
  3. Secondary (Grassy): Portion of sewer on eastern side, was likely historically Garden Route Granite Fynbos, but was at some stage transformed to what appears to have been for cultivation use. Vegetation is currently a secondary grassy vegetation.
  4. Watercourse: Watercourses are significantly degraded (Figure 21 to Figure 22) and modified. Only a small crossing on the east side is required and it significantly modified at crossing point and also has an existing sewer present.

<u>Transformed Areas:</u>

Transformed areas (Figure 7 to Figure 10) are comprised of hardened surfaces within the inhabited area and includes paved roads, sidewalks, landscaped gardens (not affected) and road verges. No indigenous terrestrial vegetation is present in these areas, other than planted trees on sidewalks and road verges that include predominantly exotic species and some gardens around the adjacent dwelling. Any small, vegetated areas that are present, generally comprised of Kikuyu grass (Cenchrus clandestinus, previously Pennisetum clandestinum) and Kweek (Cynodon dactylon) as well as several creeping ruderal weeds such as Arctotheca prostrata (Prostrate Cape Milkweed). More often than not, any unsurfaced areas are comprised of bare soils as a result of human, animal and vehicular traffic compaction.



Figure 7: Typical urban street



Figure 8: Typical urban street



Figure 9: Typical urban street



Figure 10: Typical urban street

Vegetated areas:

Vegetated areas (Figure 11 to Figure 20) along the slopes adjacent to watercourses are significantly disturbed and vegetation cover is comprised primarily of exotic Kikuyu grass (*Cenchrus clandestinus*, previously *Pennisetum clandestinum*) and *Senecio angulatus* (Cape Ivy) as groundcovers, with a range of ruderal and invasive weed species including herbs and shrubs *Ricinus communis* (Castor Oil plant), Bugweed (*Solanum mauritianum*), *Canna indica*, Inkberry (*Cestrum laevigatum*), *Lantana camara, Nidorella ivifolia, Amaranthus* spp. (Amaranth), *Verbena bonariensis, Iris pseudacorus*, *Cirsium vulgare* (Thistle), *Senna didymobotrya* (Peanut-Butter Cassia), *Phytolacca octandra* (Inkweed), *Urtica urens* (Nettle) and *Vinca major* (Periwinkle) and *Rubus* sp. (Bramble). Common trees include *Sambucus nigra* (European Black Elderberry) and *Acacia mearnsii* (Black Wattle), as well as *Leptospermum scoparium* (Broom tree), *Sesbania punicea* (Sesbania), *Acacia melanoxylon* (Blackwood), and *Melia azedarach* (Syringa). Clumps of *Cortaderia selloana* (Pampas Grass) is also common along the water courses. A wide range of garden escapees are also present, likely coming from dumped garden waste, or the nearby gardens mostly non-indigenous species (Delicious Monster).

Remnant indigenous elements include *Arctotheca prostrata* (Prostrate Cape Milkweed), *Carpobrotus deliciosus* (Sourfig), Wild Dagga (*Leonotis leonurus*), Arum lily (*Zantedeschia aethiopica*), *Senecio angulatus* and *Searsia rehmanniana*. While *Senecio angulatus* is an indigenous species, it can become invasive in disturbed areas and the creeping vine-like growth from allows it to effectively smother other vegetation.

The percentage of natural vegetation within this habitat is likely between 5 and 10 % comprising a few scratted elements. The vegetation present is not representative of the Critically Endangered Garden Route Granite Fynbos.



Figure 11: Typical vegetated watercourse bank (Kikuyu).



Figure 12: Typical vegetated watercourse bank (Kikuyu).



Figure 13: Typical vegetated watercourse bank (Kikuyu).



Figure 14: Typical vegetated watercourse bank (Kikuyu).



Figure 15: Typical vegetated area (Kikuyu).



Figure 16: Typical vegetated area (Kikuyu).



Figure 17: Typical vegetated area (Kikuyu).



Figure 18: Typical vegetated area (Cape Ivy).



Figure 19: Typical vegetated area (Kikuyu & weeds).



Figure 20: Typical vegetated area (Kikuyu & weeds).

Watercourses

Watercourses (Figure 21 to Figure 22) are significantly disturbed and/or modified with vegetation also comprised predominantly of exotic and invasive species. Cover is primarily also exotic Kikuyu grass (*Cenchrus clandestinus*, previously *Pennisetum clandestinum*) and *Senecio angulatus* (Cape Ivy), as well as *Cortaderia selloana* (Pampas Grass) and *Sambucus nigra* (European Black Elderberry) trees and the reed *Arundo donax* (Giant Reed). Riparian vegetation is not easily distinguished from surrounding vegetation due to the proliferation of weeds that are common to both habitats.

Remnant indigenous elements are occasional and include the odd tuft of Arum lily (*Zantedeschia aethiopica*), clumps of *Typha capensis* (Bulrushes), occasional indigenous reeds (*Phragmites australis*) and occasional tufts of remnant sedges, including *Juncus effusus*, *Cyperus polystachyos and Cyperus textilis.*



Figure 21: Watercourse at crossing point.



Figure 22: Watercourse at crossing point.

Secondary (Grassy)

Secondary (Grassy) vegetation is present along a portion of the eastern end of the sewer (Figure 23 to Figure 24), where the sewer exits the watercourse area onto a small ridge outside of what would have been riverine vegetation. The section was likely the only portion of the route that would have historically had Garden Route Granite Fynbos vegetation. However, it is now comprised of secondary grassy vegetation and was likely cultivated in the past (pre-2003) and was possibly originally part of a garden or small holding. No indigenous terrestrial vegetation representative of Garden Route Granite Fynbos is present. Grassy vegetation is comprised of Kikuyu grass (Cenchrus clandestinus, previously Pennisetum clandestinum), Kweek (Cynodon dactylon) and Weeping lovegrass (Eragrostis curvula).



Figure 23: Secondary (Grassy) vegetation.



Figure 24: Secondary (Grassy) vegetation.

The proposed development is unlikely to have any significant impact on any 'intact' or natural indigenous vegetation of any significant ecological value.

Present Ecological State:

In summary the following general observations can be noted regarding the site:

- The area in and around the site is completely transformed and or degraded as a result of urban development and associated processes including dumping of refuse and garden waste and other pollution sources, with the occasional remnant scattered indigenous species. No elements of species typical to Garden Route Granite Fynbos were observed within vegetated areas along the watercourses.
- Alien invasion and weeds are high to very high, comprising most of the vegetation along the watercourses and surrounding vegetated areas.
- Ecological processes are thus primarily significantly modified within the sewer servitude, as natural and indigenous vegetation elements are largely absent from within the site.
- Fauna species include mainly species typical of urbanized and transformed areas, perhaps having the occasional visit from less common species that typically occur in natural areas that are in transit through urban area or are acclimated to the urbanized environment.

Vegetation and Ecological Processes and Corridors:

Landscape corridors are a combination of Critical Biodiversity Areas (areas required to meet conservation targets) and Ecological Support Areas that link habitats, as well as linking inland mountains to the coastline (and therefore beyond municipal boundaries). Rivers and their associated riparian or riverbank habitats often provide the basis for many of these large-scale (landscape level) ecological processes.

Critical Biodiversity Areas (CBA) are generally regarded as being critical for meeting conservation objectives for vegetation units in an optimal manner. Where a vegetation unit is not under threat (i.e Least Concern status), there is some flexibility, ito alternatives; however, as conservation status increases (a vegetation unit is under threat due to high levels of transformation), alternative options to meet conservation targets are significantly reduced. CBA1 areas are generally natural or near natural, whereas

CBA 2 are degraded and/or transformed areas where restoration would be required and/or recommended.

Ecological Support areas (ESA) are supporting zones or areas which must be safeguarded as they are needed to prevent degradation of Critical Biodiversity Areas ad formal Protected Areas. Although many ESA's consist of natural veld, there are areas of land – partially or wholly transformed or degraded – that have been classified as ESA even though they are no longer in a natural state. Although these areas are heavily degraded or transformed they still play an important role in supporting ecological processes. This is particularly the case with riparian areas, some key catchment areas, and key pieces of corridors. ESA 1 areas are generally natural or near natural, whereas ESA 2 are degraded and/or transformed areas where restoration would be required and/or recommended. An ESA that is vegetated but not natural or near natural can still serve to retain some connectivity and support ecological processes, but in a significantly reduced manner. For example, trees in an apple orchard will provide perches for some birds and grassy groundcover will still allow for movement of some small animals such as rodents and reptiles. Certain species are significantly more at risk, as they may not be able to adapt to a modified environment, whereas others may not be affected.

While the site falls within a broader important ecologically connected area along the watercourses, the specific site is significantly transformed and surrounded by developed erven and paved roads. Remnant vegetation along watercourse is significantly degraded and transformed and thus provides limited 'natural' ecological value in its current state. It will serve limited connectivity support but does not and is not likely to support any substantial populations of at-risk species of conservation concern that are not adaptable to modified environments, nor provide ecological services and processes typically associated with the Critically Endangered Garden Route Granite Fynbos that occurs in the broader area. The watercourse corridors will however serve as broad level artificial habitat corridors for general movement faunal species around the broader area, but since no flora species typical of the unit are present, flora related ecological processes (such as pollination and seed dispersal) would be absent. The proposed activity, having a negligible footprint within significantly modified habitat, is thus unlikely to significantly impact or disturb these processes nor likely to alter current species composition from current baseline levels, as it will be a temporary activity and will likely return to a pre-construction state within two years.

Flora & Fauna:

No endemic and range restricted species were recorded to be present. Several species are known from the surrounding area, but unlikely to be affected by the proposed activity. The proposed activity, having a negligible footprint within a significantly modified habitat, is thus unlikely to significantly impact any species population or current species composition from current baseline levels, as it will be a temporary activity and will likely return to a pre-construction state within two years.

Table 1: Flora Species of Special Concern:

SCIENTIFIC NAME	STATUS	COMMENT/PRESENCE
Diosma passerinoides	NEST (M), Vu	Total population size estimated to be <5 000 mature individuals, based on records of 18 out of 25 subpopulations where species is indicated to be rare, uncommon, or only a few plants present, and with survey data of seven subpopulations indicating that the largest subpopulation consists of no more than 500 mature individuals. These populations are declining due to a number of different threats such as invasive alien plants, habit degradation in the form grazing and habitat loss due to protea cultivation. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Lampranthus pauciflorus	NEST (M), En	EOO 1270 km², four known locations remain after most of this species' habitat has been transformed for coastal development. Habitat loss continues, especially around

		Plettenberg Bay, Mossel Bay and Knysna. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Leucospermum glabrum	NEST (M), En	Somewhat widespread distribution including a population in the northern areas of George. A restricted endemic with an extent of occurrence (EOO) ranging between 1620 and 1642 km², and an area of occupancy (AOO) of between 152 and 156 km². This species occurs as scattered small subpopulations with the total population not exceeding 2500 mature individuals, and each subpopulation having fewer than 250 plants. The mountains where this species occurs have been extensively surveyed. Road verges and significantly disturbed watercourses do not provide suitable habitat for this species. Not recorded on site, which is not typical of preferred habitat.
Sensitive species 1024	NEST (M), En	A range-restricted and very rare species known from four small, severely fragmented subpopulations. It has an extent of occurrence (EOO) of 971 km². The population consists of 2 500 mature individuals, and the largest subpopulation has less than 200 plants. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Sensitive species 1032	NEST (M), Vu	Somewhat widespread distribution including a population in the northern areas of George. Not recorded on site but found in surrounding area. Road verges and significantly disturbed watercourses do not provide suitable habitat for this species.
Sensitive species 500	NEST (M), En	Somewhat widespread distribution. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Sensitive species 800	NEST (M), Vu	Formerly a very common species, now remaining mostly as small, isolated subpopulations on fragments of natural vegetation within its lowland distribution range. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.

As per Table 1 above, no Endangered or Critically Endangered flora species were confirmed to be [resent nor are known to be present in the affected area. Most likely species that do occur in the broader surrounding area include Leucospermum glabrum & Sensitive Species 1032, however non were observed on the site. The species Disoma passerinoides, Lampranthus pauciflorus, Sensitive Species 1024, Sensitive Species 500 & Sensitive Species 800 have records in a much broader area and no records indicate a local presence.

Site observations also confirmed none being present, also confirmed to not be the typical habitat for several of the species, hence the footprint does not provide suitable habitat for these species.

Alien Invasive Species:

On 18 September 2020, the Minister of Environmental Affairs published the Alien and Invasive Species Regulations ("the Regulations") which came into effect on the 18 October 2020 in a bid to curb the negative effects of IAPs. The Regulations call on landowners and sellers of land alike to assist the Department of Environmental Affairs to conserve our indigenous fauna and flora and to foster sustainable use of our land. Non-adherence to the Regulations by a landowner or a seller of land can result in a criminal offense punishable by a fine of up to R 5 million (R10 million in case of a second offence) and/or a period of imprisonment of up to 10 years.

- Category 1a and 1b listed invasive species must be controlled and eradicated.

- Category 2 plants may only be grown if a permit is obtained, and the property owner ensures that the invasive species do not spread beyond his or her property.
- The growing of category 3 species is subject to various exemptions and prohibitions.

Some invasive plants are categorized differently in different provinces. For example: The Spanish Broom plant is categorized as a category 1b (harmful) invasive plant in the Eastern Cape and Western Cape, but it is a category 3 (less harmful) invasive plant in the other seven provinces.

Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Landowners are under legal obligation to control alien plants occurring on their properties. Alien Invasive Plants require removal according to the Conservation of Agricultural Resources Act 43 of 1983 (CARA) and the National Environmental Management: Biodiversity Act (10 of 2004; NEMBA): Alien and Invasive Species Lists (GN R598 and GN R599 of 2014). Alien control programs are long-term management projects and a clearing plan, which includes follow up actions for rehabilitation of the cleared area, is essential. This will save time, money, and significant effort. Collective management and planning with neighbours allow for more cost-effective clearing and maintenance considering aliens seed as easily dispersed across boundaries by wind or water courses. All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing. A general rule of thumb is to first target lightly infested areas before tackling densely invaded areas and prioritize sensitive areas such as riverbanks and wetlands. Alien grasses are among the worst invaders in lowland ecosystems adjacent to farms but are often the most difficult to detect and control.

Many exotic invasive and other weed species were noted within the site and surrounding area. Proliferation of weedy and exotic species often indicate disturbance especially during or after construction. A list of species is included in Table .. During construction it is highly likely that species currently not on site could be introduced through the construction process. A weed management (Alien Management Plan) is recommended after construction to counter the weed proliferation that would be expected after construction.

Section 5	ALIEN SPECIES IDENTIFIED ON SITE

The following alien species were identified by the specialist as occurring on site:

Table 2: Alien Invasive and Other Weed Species and Status:

SCIENTIFIC NAME	COMMON NAME	FAMILY	STATUS	PRESENCE
Acacia mearnsii	Black Wattle	Fabaceae	CARA 1b	Present, common
Acacia melanoxylon	Blackwood	Fabaceae	CARA 2	Present, common
Canna Indica	Indian shot	Cannaceae	CARA 1b	Present, common
Cenchrus clasdestinus	Kikuyu Grass	Poaceae	CARA 1b	Present, common
Cestrum (Pennisetum) laevigatum	Inkberry	Solanaceae	CARA 1b	Present, dominant
Cirsium vulgare	Scotch thistle	Asteraceae	CARA 1b	Present, common
Cortaderia selloana	Pampas grass	Poaceae	CARA 1b	Present, common
Iris pseudacorus	Yellow flag	Iridaceae	CARA 1a	Present, occasional
Lantana camara	Lantana	Verbenaceae	CARA 1b	Present, occasional
Leptospermum scoparium	Australian myrtle (Tea tree)	Asteraceae	CARA 1b	Present, common
Melia azedarach	Syringa	Meliaceae	CARA 1b	Present, common
Phragmites australis	Spanish reed	Poaceae	CARA 1b	Present, common
Phytolacca americana	Pokeweed	Phytolaccaceae	CARA 2	Present, occasional
Ricinus communis	Castor Oil Plant	Euphorbiaceae	CARA 2	Present, common
Rubus cuneifolius	Bramble	Rosaceae	CARA 1b	Present, common
Sambucus nigra	European elder	Adoxaceae	CARA 1b	Present, common
Senna didymobotrya	Peanut Butter Cassia	Fabaceae	CARA 1b	Present, occasional
Sesbania punicea	Sesbania	Fabaceae	CARA 1b	Present, occasional
Solanum mauritianum	Bugweed	Solanaceae	CARA 1b	Present, common
Solanum sisymbriifolium	Wild tomato	Solanaceae	CARA 1b	Present, occasional
Urtica urens	Nettle	Urticaceae	Weed	Present, occasional
Verbena bonariensis	Wild verbena	Verbenaceae	CARA 1b	Present, occasional
Vinca major	Greater periwinkle	Apocynaceae	CARA 1b	Present, occasional

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. • Identify and map all Category 1b species. • Record density and extent (GPS and photo record).
2.	Control Methods	• Control methods must adhere to Section 7 of this Alien Management Plan. • 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. • Avoid clearing during heavy rainfall periods to prevent soil erosion.
4.	Disposal	All plant material must be: • Removed from site, or • Stacked and dried in a demarcated area (if safe), or • Disposed of at a registered waste facility where necessary. • No dumping in natural areas or watercourses.
5.	Monitoring	• Clearing activities to be supervised by the ECO. • Monthly monitoring during construction. • 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. • Subsequent follow-ups every 3–6 months during first year. • Thereafter annually for at least 3 years.
2.	Stump Treatment:	• Immediate application of systemic herbicide to cut surfaces. • Ensure no untreated stumps remain.
3.	Seed Bank Management	• Disturbed soil areas must be stabilised quickly. • 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. • No clearing outside approved areas.
2. Vehicle & Equipment Hygiene:	• Construction vehicles must arrive free of soil and plant material. • No storage of contaminated soil near natural vegetation
3. Stockpile Management:	• No stockpiling within 10–20 m of watercourses or buffers. • Prevent wind or water dispersal of seeds.
4. Stormwater Control	• Install erosion control measures. • 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. • Replace topsoil during rehabilitation phase.
2. Revegetation:	• Encourage natural regeneration where feasible. • Supplement with locally indigenous species if required. • Avoid planting invasive or ornamental species.
3. Erosion Control:	• Use brush packing where appropriate. • Install silt fencing and berms where necessary.
4. Rehabilitation Monitoring:	• Assess vegetation cover percentage. • Ensure no new alien dominance.
5. Success Criteria:	• No Category 1b regrowth. • Indigenous vegetation cover stabilised. • 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. • Binding on the Applicant and all contractors.
2. ECO Monitoring:	• Monthly monitoring during construction. • Post-construction monitoring every 6 months for 3 years (recommended).
3. Reporting:	• Alien clearing activities to be included in ECO reports. • Non-compliance to be recorded and corrective action implemented immediately.
4. Training:	• Contractors and workers must receive environmental induction. • Awareness of listed invasive species and legal obligations.

5. Legal Compliance:	• Compliance with:
	  o NEMBA (Act 10 of 2004)
	  o Alien & Invasive Species Regulations
	  o NEMA Duty of Care (Section 28)

6. Responsibility:	• The Applicant remains legally responsible for ongoing control of invasive species.

Section	CLEARING METHODOLOGY
7	

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

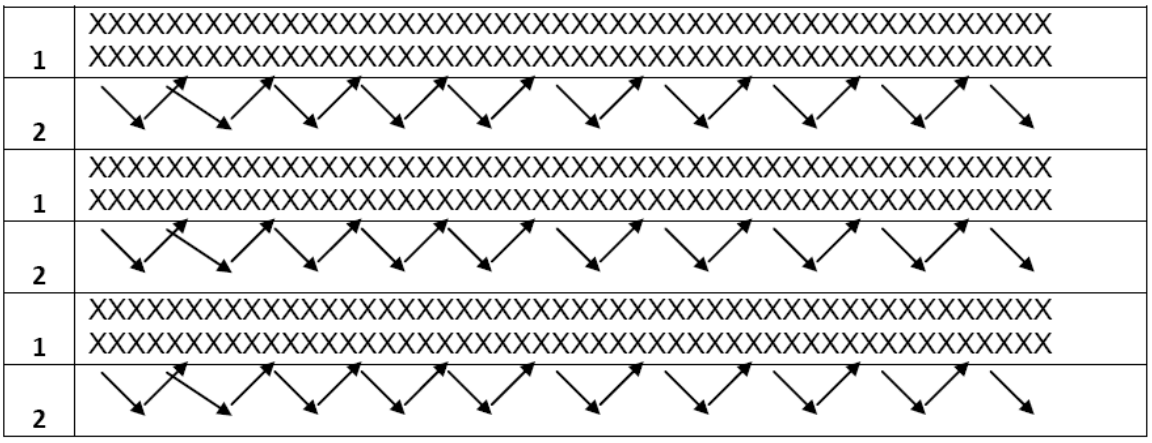
- Follow-up visitation no later than three months after initial operation.
- Follow-up control will be needed because soil stored seed may stay dormant in soil for up to 50 years.
- Follow-up control will involve a combination of hand pulling and foliar spraying.
- Seedlings, saplings and coppice can 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 – George Municipality

George 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
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

Appendix A2: EAPASA REGISTRATION OF AUTHOR:

Environmental Assessment Practitioners Association of South Africa

Registration No. 2021/3163

Herewith certifies that

MICHAEL JON 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 April 2026

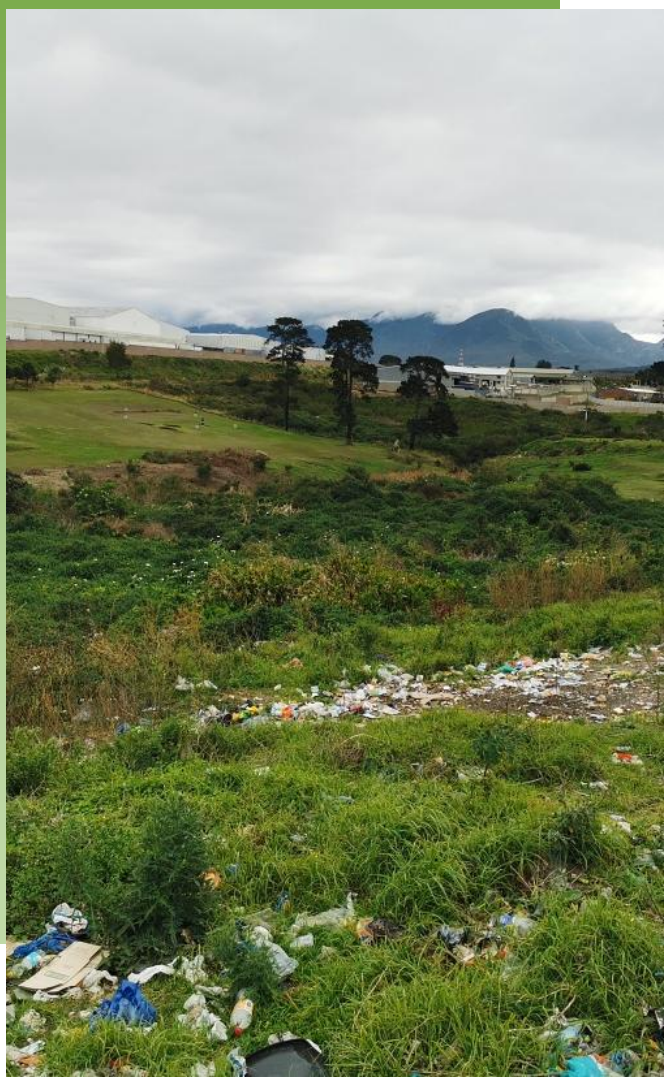
Expires: 31 March 2027

Chairperson

Registrar

SAQA
SOUTH AFRICAN QUALIFICATIONS AUTHORITY

Appendix B1: Terrestrial Biodiversity Compliance Statement and Assessment - Sewer



Terrestrial Biodiversity Compliance Statement and Assessment

Rosemoor Sewer Infrastructure

Date: 23/03/2026
Version: Draft
Author: J. Pote

Terrestrial Biodiversity Compliance Statement and Assessment

Rosemoor Sewer Infrastructure

Compiled by: **Jamie Pote** (Pr. Sci. Nat.)
Postnet Suite 57, Private Bag X13130, Humewood, Port Elizabeth, 6013, South Africa
jamiepote@live.co.za +27 (0)76 888 9890

Compiled for: **Sharples Environmental Services**

Date of report: **23/03/2026**

Draft Report

This Report has been prepared with all reasonable skill, care and diligence within the scope of appointment by Mr Jamie Pote, with consideration to the resources devoted to it by agreement with the client, incorporating our Standard Terms and Conditions of Business.
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Revisions

Report/Revision Version	Date:	Approved by:
First Draft	2026/03/23	Jamie Pote
Revisions/Comments		
Final Draft		
IAP comments		
Final Version		

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1 Introduction & Background

1.1 Background

Sharples Environmental Services cc (SES) has been appointed by Lyners Engineers on behalf of the George Municipality (applicant), to conduct the Environmental Impact Assessment process for the proposed upgrading of sewer infrastructure in Rosemoor, George, Western Cape (Figure 1). As part of this application, a Terrestrial Biodiversity, Plant & Animal Specialist Assessment is required. This report has been updated to include additional infrastructure added to the layout in 2026.



Figure 1: Site locality.

1.2 Purpose of Report

The "*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 Act, when applying for Environmental Authorisation*", as published on 20 March, 2020 in National Gazette, No. 43110 in terms of NEMA (Act 107 of 1998) sections 24(5)(a), (h) and 44, lists protocols and minimum report requirements for environmental impacts on terrestrial biodiversity and provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation. The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the National web based Environmental Screening Tool. Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration, identified by the screening tool, must be confirmed by undertaking a **site sensitivity verification**, which must include the following.

1. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.

2. The site sensitivity verification must be undertaken through the use of:
    a. a desk top analysis, using satellite imagery.
    b. a preliminary on -site inspection; and
    c. any other available and relevant information.
3. The outcome of the site sensitivity verification must be recorded in the form of a report that:
    a. confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool.
    b. contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity; and
    c. is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

The National Web Based Screening Tool was used to generate the potential environmental sensitivity of the site which has then been compared to various online and other databases and information sources in order to verify and confirm the validity of the screening tool findings. This was further supported with on-site observations and analysis of most recent aerial photography.
This terrestrial biodiversity site verification has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

1.3 Activity Description

The blue (160mm), red (dashed line - 315mm & solid line – 250mm), orange (400mm) and grey (500mm) lines in Figure 2 below show the proposed sewer infrastructure that will be upgraded. The 160 and 315mm lines will mostly be within existing roads and road reserve, whereas the 250mm, 400mm and 600 mm will be within vegetated areas including in proximity to or traversing watercourses.

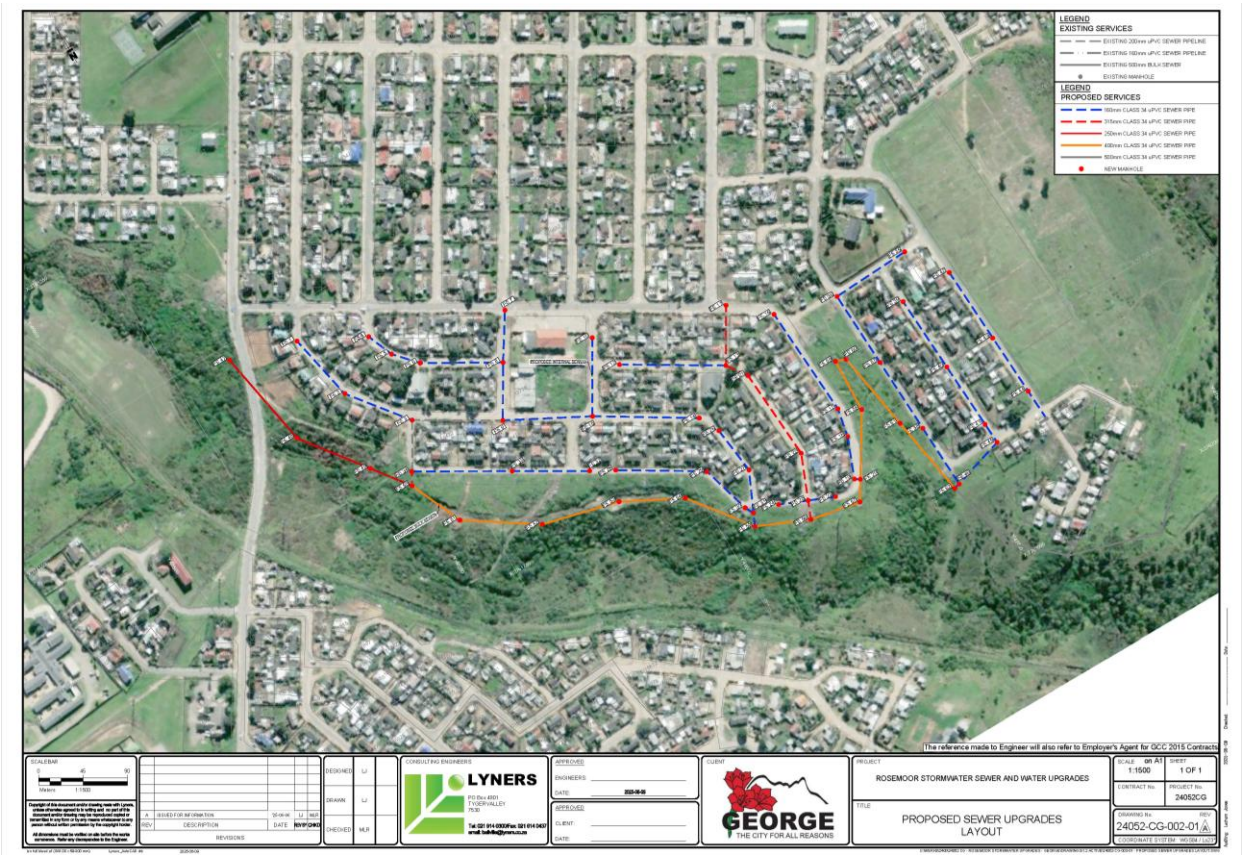


Figure 2: Proposed Rosemoor Sewer Infrastructure.

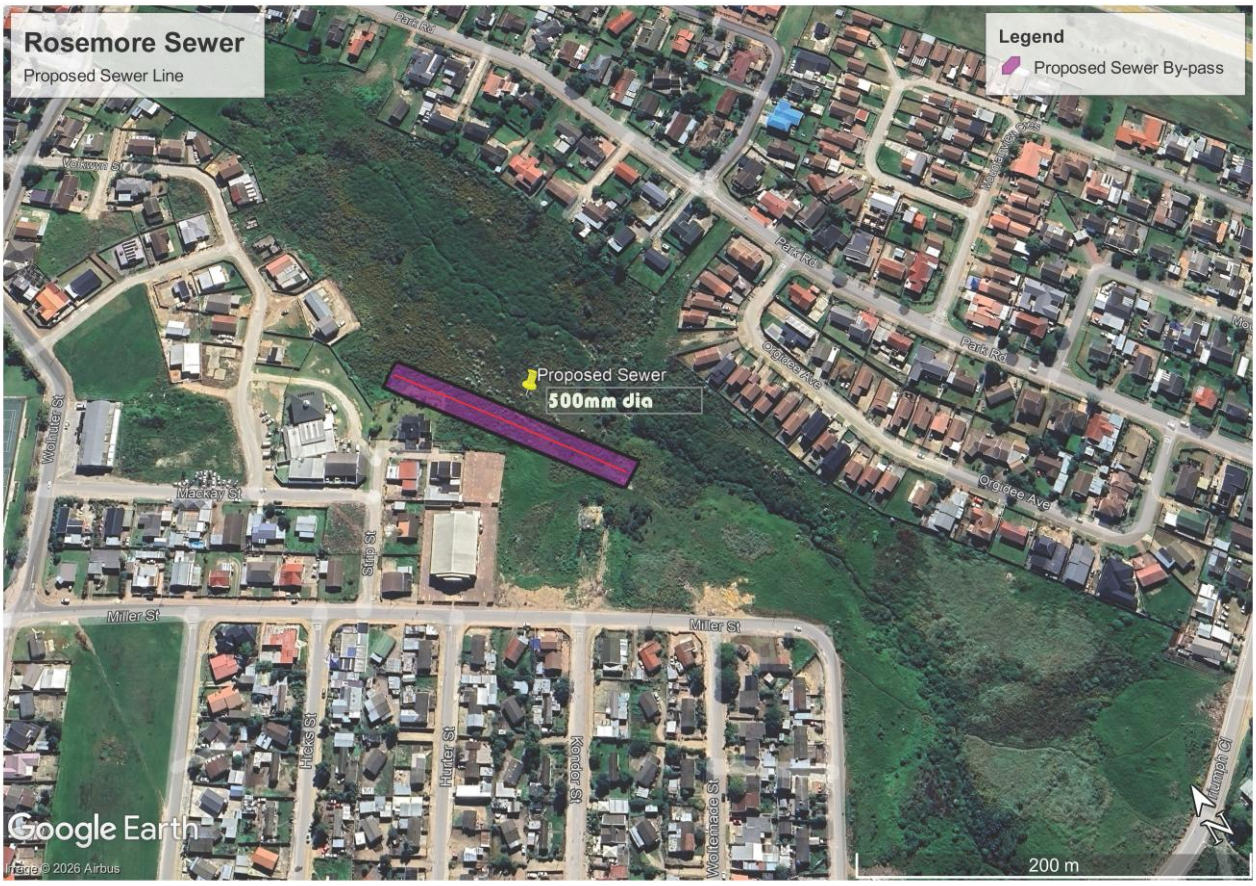


Figure 3: Proposed Rosemoor Sewer Infrastructure (additional northern section).

An additional pipeline was added to the layout in 2026 (Figure 3), and the report has been updated to reflect the additional section.

Portions of the proposed sewer pipeline will be installed adjacent to existing sewer infrastructure that broadly follows the same route. The construction activity (simplified) will include the excavation of a trench along the proposed route, installation of pipeline, construction of manhole covers and other concrete infrastructure, infill of excavated material, after which the sewer will be operational. Note: Since the installation of the pipeline is a temporary activity the 'operational phase is deemed to also be equivalent to the Site Closure and Rehabilitation Phase. The activity would thus be deemed to be temporary, other than manhole covers, which will be permanent but cover a small visible footprint. During the active lifetime of the sewer, ad hoc maintenance may be required which could require excavation, removal and replacement of defective component, followed by infill of excavation and would likely be limited to a small section of defective pipeline.

1.4 Methodology and Approach

The proposed methodology and approach followed in this assessment are outlined below:

- Conduct a comprehensive desktop study and identify potential risks relating to vegetation and flora of the site and surrounding area, for a Terrestrial Biodiversity Assessment Report. This will include the relevant Regional Planning and legislated frameworks, which will also be represented in a series of associated maps.
- Conduct a detailed site visit to assess the following:
  - Detailed field survey of vegetation, flora and habitats present.

  - Comprehensive species list, highlighting species that are of special concern, threatened, Red Data species and species requiring permits for destruction/relocation in terms of NEMBA and the Provincial Nature Conservation Ordinance No. 19 of 1974.
  - Detailed mapping of the various habitat units and assessment of habitat integrity, ecological sensitivity, levels of degradation and transformation, alien invasion and Species of Conservation Concern, the outcome being a detailed sensitivity map ranked into high, medium or low classes.
- Reporting will be comprised of a preliminary summary, with identification of anticipated impacts and risks for any scoping phase report (where applicable), a draft detailed Assessment Report (for public review and comment) and a Final Assessment Report for submission. The draft and final detailed reports will include the following:
  - Indicate any assumptions made and gaps in available information. Assessment of all the vegetation types and habitat units within the relevant Regional Planning Frameworks.
  - A detailed species list highlighting the various Species of Conservation Concern categories (endemic, threatened, Red Data species and other protected species requiring permits for destruction/relocation and invasive/exotic weeds).
  - Description and assessment of the habitat units and site sensitivities ranked into high, medium or low classes based on sensitivity and conservation importance. A standard methodology has been developed based on other projects in the specific area.
  - Assessment of Impacts and Mitigation Measure, as well as specific measure that may be required for alternative development plans.
  - A comprehensive EMPr for inclusion in the reports and EMP with specific management actions for construction and Operation.
  - A habitat sensitivity map will be compiled, indicting the sensitivities as described above.
  - A map indicating buffers (if required) to accommodate Regional Planning and any other requirements.

This terrestrial biodiversity compliance statement and assessment has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

1.5 Data sources and references

Data sources that were utilised for this report include the following:

- National (DFFE) Web Based Screening Tool – to generate the sites potential environmental sensitivity.
- National Vegetation Map 2018 (NVM, 2018), Mucina & Rutherford (2006) and National Biodiversity Assessment or Red Listed Ecosystems (NBA/RLE, 2022) – description of vegetation types, species (including endemic) and most recent vegetation unit conservation status.
- National and Regional Legislation including Provincial Nature Conservation Ordinance (P.N.C.O). NEM:BA Threatened or Protected Species (ToPS).
- Botanical Database of Southern Africa (BODATSA) and New Plants of Southern Africa (POSA) – lists of plant species and potential species of concern found in the general area (SANBI.)
- International Union for Conservation of Nature (IUCN) - Red List of Threatened Species.
- Animal Demography Unit Virtual Museum (VM) – potential faunal species.
- Global Biodiversity Information Facility (GBIF) – potential flora & faunal species distributions.
- National Red Books and Lists - mammals, reptiles, frogs, dragonflies & butterflies.
- National Freshwater Ecosystem Priority Areas assessment (NFEPA, 2011) - important catchments.
- National Protected Areas Expansion Strategy (NPAES, 2018) and South Africa Protected Area database (2020) – protected area information.

- SANBI BGIS – All other biodiversity GIS datasets.
- Western Cape Biodiversity Spatial Plan (2023) and any other relevant bioregional plans.
- Aerial Imagery – Google Earth, ESRI, Chief Surveyor General (http://csg.dla.gov.za).
- Cadastral and other topographical country data - Chief Surveyor General (http://csg.dla.gov.za).
- Other sources may include peer-reviewed journals, regional and local assessments, and studies in the general location of the project and its area of influence, landscape prioritization schemes (Key Biodiversity Areas), systematic conservation planning assessments and plans (as above), and any pertinent masters and doctoral theses, among others.

This terrestrial biodiversity assessment has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

1.5.1 Site visit

A site inspection was conducted on **04 December 2025**, during late spring/early summer and a follow up site visit (early autumn) for additional infrastructure. The site falls within a temperate climate with rainfall occurring throughout the year but is often higher in winter. For the purposes of this report, a single site visit is deemed to be adequate, specifically due to the disturbed nature of the site.

1.5.2 Assumptions, Uncertainties and Gaps in Knowledge

The findings and recommendations of this report may be susceptible to the following uncertainties and limitation:

- No assessment has been made of aquatic aspects relating to any wetlands, pans, and rivers/seeps and/or estuaries or marine ecosystems outside of the scope of a terrestrial biodiversity report. Refer to separate reporting.
- Any botanical surveys based upon a limited sampling time-period, may not reflect the actual species composition of the site due to seasonal variations in flowering times. Additionally, the composition of fire adapted vegetation may vary depending on level of maturity or time since last burn. As far as possible, site collected data has been supplemented with desktop and database-centred distribution data.
- As far as possible, site collected data has been supplemented with desktop and database-centred distribution data as well as previous studies undertaken in the area.

2 Policy

2.1 Legislation Framework

In terms of NEMA EIA Regulations (07 April 2014, as amended), the following is applicable[1]:

- In terms of section 52 of NEMBA *(Activity (a)(i))*, the vegetation unit Garden Route Granite Fynbos, has a **Critically Endangered** status as per National Biodiversity Assessment (2022).
- In terms of the Western Cape Biodiversity Spatial Plan (WCBSP, 2023), designated Critical Biodiversity Area 1 & 2 and Ecological Support Area 2 overlaps partially with the site.

1 *The listed activities itemized are only those with Biodiversity relevance to this report and is not a complete list.*

Listing Notice 1:
Activity 12: The development of—
(xii) infrastructure or structures with a physical footprint of 100 square metres or more.
where such development occurs—
(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse: —
excluding—
(dd) where such development occurs within an urban area; or
(ee) where such development occurs within existing roads or road reserves.

The proposed activity is located within an urban area; hence the activity is not applicable.

Activity 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—
~~i. will occur behind a development setback.~~

The proposed activity will exceed the excavation of more than 10 cubic meters from within 32m of a watercourse, hence will be triggered.

Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—
(i) the undertaking of a linear activity; or
(ii) ~~maintenance purposes undertaken in accordance with a maintenance management plan.~~

The proposed activity is linear, hence not applicable.

Listing Notice 2:
None are applicable.

Listing Notice 3:
Activity 10: The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes –
(i) with an internal diameter of 0,36 metres or more; or
(ii) with a peak throughput of 120 litres per second or more;
excluding where—
(a) such infrastructure is for bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve; or
(b) where such development will occur within an urban area.
The proposed activity is located within an urban area; hence the activity is not applicable.

Activity 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 maintenance management plan.
(a) In Eastern Cape, Free State, Gauteng, Limpopo, North-West and Western Cape provinces:
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~~.
ii. Within critical biodiversity areas identified in bioregional plans.
The proposed activity will potentially exceed clearing of more than 300m² of indigenous vegetation from within designated Critical Biodiversity Areas as well as designated Critically Endangered vegetation, resulting from excavations and installation of sewer pipelines and associated infrastructure.

Activity 14: The development of—
(ii) infrastructure or structures with a physical footprint of 10 m² or more, where such development occurs—
(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse

(f) In Western Cape:
i. Outside urban areas, in:
(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.

The proposed activity will include structures of more than 10m² within 32m of a watercourse within designated Critical Biodiversity Area and Ecological Support Areas, however, is situated within an urban area.

In terms of the EIA Listing Notices, listing notice 3, the proposed sewer pipeline activity triggers the need for a Basic Assessment process. This Terrestrial Biodiversity Assessment will primarily deal with the activities triggering listed activities 12 (LN 1) and 14 (LN 3) in terms of ecological and terrestrial biodiversity aspects.

Other potentially relevant legislation, which will be evaluated as required, includes the following:

- Liability for any environmental damage, pollution, or ecological degradation: Arising from all -related activities occurring inside or outside the area to which the permission/right/permit relates is the responsibility of the rights holder. The National Water Act and NEMA both oblige any person to take all reasonable measures to prevent pollution or degradation from occurring, continuing, or reoccurring (polluter pays principle). Where a person/company fails to take such measures, a relevant authority may direct specific measures to be taken and, failing that, may carry out such measures and recover costs from the person responsible.
- Public participation: Public consultation and participation processes prior to granting licences or authorisations can be an effective way of ensuring that the range of ways in which the activities impact on the environment, social and economic conditions are addressed, and considered when the administrative discretion to grant or refuse the licence is made.
- Constitution of Republic of South Africa (1996): Section 24(a) of the Constitution states that everyone has the right *'to an environment that is not harmful to their health or well-being'*. Construction activities must comply with South African constitutional law by conducting their activities with due diligence and care for the rights of others.
- Western Cape Nature and Environmental Conservation Ordinance 19 of 1974: Lists Protected species, requiring permits for removal (Department of Economic Development, Environmental Affairs and Tourism).
- Water Use Authorisations: The National Water Act (No. 36 of 1998): Requires that provision is made both in terms of water quantity and quality for 'the reserve', namely, to meet the ecological requirements of freshwater systems and basic human needs of downstream communities. It is essential in preparing an EMP that any impacts on water resources be they surface water or groundwater resources, and/ or impacts on water quality or flow, are carefully assessed, and evaluated against both the reserve requirement and information on biodiversity priorities. This information will be required in applications for water use licenses or permits and/or in relation to waste disposal authorisations.
- Conservation of Agricultural Resources Act 43 of 1993: Lists Alien invasive species requiring removal.

2.2 Systematic Planning Frameworks

A screening of Systematic Planning Framework for the region has been undertaken (summarised in Table 1), that included the following features:

- National Environmental Screening Tool
- Critically Endangered, Endangered and Vulnerable Ecosystems
- Critical Biodiversity and Ecological Support Areas
- River and Wetland Freshwater Ecosystem Priority Areas (FEPAs) and buffers
- Protected Areas (and buffers) and National Protected Area Expansion Strategy areas (NPAES).

- Critical Habitat for listed endemic or protected species.

Table 1: Summary of Regional Planning Biodiversity features.

FEATURE[2]	DESCRIPTION	IMPLICATIONS/COMMENT
National Environmental Screening Tool (Terrestrial Biodiversity)	Very High Terrestrial Biodiversity Low, Medium & High Plant & Animal Species sensitivities Very High Aquatic sensitivity	CBA 1 & 2, ESA 2, Critically Endangered ecosystem & SWSA Several Plant & Animal Species flagged by the screening tool. CBA 1, SWSA & Wetlands
National Vegetation Map (NVM, 2024)	Garden Route Granite Fynbos	Critically Endangered
Critically Endangered and Endangered Ecosystems (NBA 2022)	Garden Route Granite Fynbos	Assessment to determine risks.
Vulnerable Ecosystems (NBA)	None	N/A
Western Cape Biodiversity Spatial Plan (2023)	Critical Biodiversity Area 1 & 2	Assessment to determine risks.
Protected Areas (SAPAD, 2025)	None	N/A
Protected Areas (WC BSP, 2025)	None	N/A
NPAES (Draft 2018)	None	N/A
NPAES (2010)	None	N/A
Strategic Water Source Areas (SWSA)	Outeniqua SWSA	Impacts to site may have risks to downstream water sources. Refer to aquatic assessment.
Freshwater Ecosystem Priority Areas (FEPA's)	None	Refer to aquatic assessment.
Regional Hotspots & Regions of Endemism	Cape Floristic Region Hotspot	Specific activity and site unlikely to pose any risk to broader biodiversity hotspot.
Important Bird Areas (IBA's)	None	N/A
Key Biodiversity Areas (KBA's)	None	N/A
Marine/Coastal areas	None	N/A
RAMSAR sites	None	N/A
Within 32 m of Watercourse	Sewer will be within 32m of watercourses	Refer also to aquatic assessment.
Within 100 m of River	None.	N/A
Estuary	None	N/A
Within 500 m of Wetland	Valley Bottom Wetlands are associated with the watercourses in the area.	May have impacts to associated terrestrial flora and fauna. Refer to aquatic assessment.
Forest	None	N/A
Surrounding Land Uses	Surrounding land primarily used for urban dwellings.	Site and surrounding area are transformed and/or with scattered secondary vegetation elements.
Critical Habitat for listed endemic/ protected species	No specific populations of threatened species were identified within the footprint, and the affected footprint is largely disturbed or comprised of secondary vegetation. There are	

[2] Refer to Figure 8 to Figure 12.

FEATURE[2]	DESCRIPTION	IMPLICATIONS/COMMENT
	several red listed species in the su6rrounding area and vegetation units that are known to have limited distributions, however none were recorded within the footprint.	

2.2.1 National Environmental Screening Tool

The DFFE Screening Tool indicates the following, summarised in Table 1:

- Terrestrial Biodiversity is Very High (Figure 4).
- Plant species sensitivity is Low &Moderate (Figure 5).
- Animal Species sensitivity is Moderate & High (Figure 6).
- Aquatic Sensitivity is Very High (Figure 7).

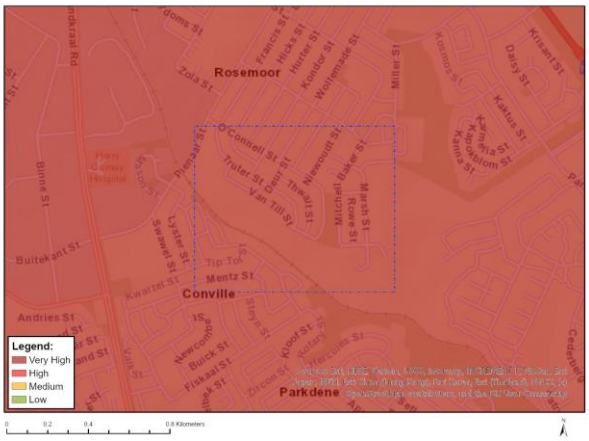


Figure 4: Terrestrial Biodiversity Sensitivity

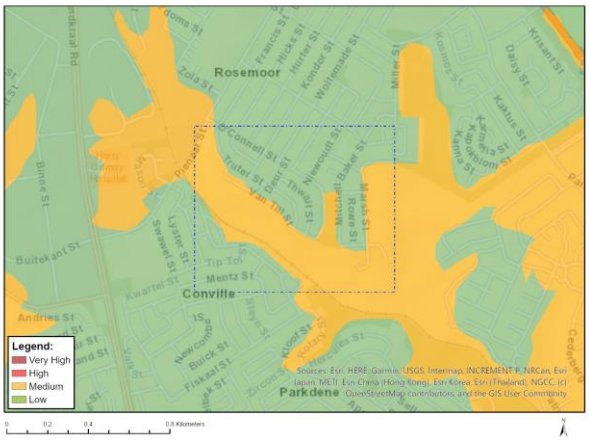


Figure 5: Plant Species Sensitivity

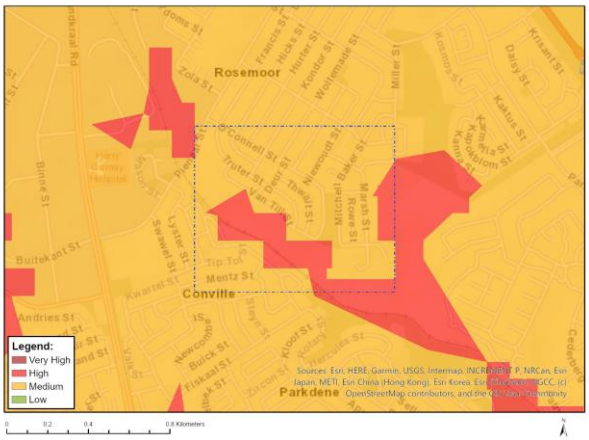


Figure 6: Animal Species Sensitivity

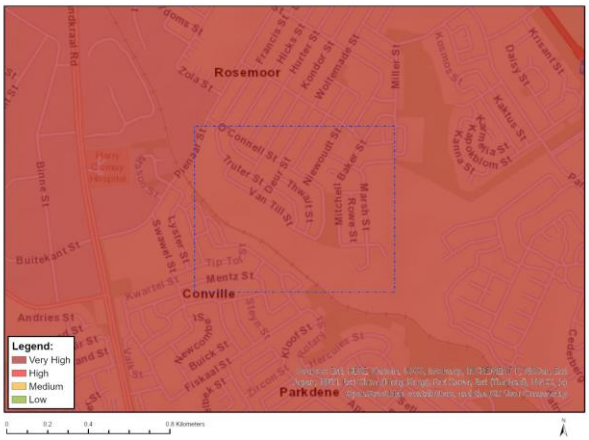


Figure 7: Aquatic Sensitivity

Table 2: Summary of Screening tool designations.

Terrestrial Sensitivity	**Feature(s) in proximity**
Very High	CBA 1: Terrestrial, CBA2: Terrestrial, SWSA (Outeniqua) & Garden Route Granite Fynbos (Critically Endangered)
High	None
Medium	None
Low	Present
Plant Sensitivity	
Very High	None
High	None

Medium	*Lampranthus pauciflorus, Leucospermum glabrum, Diosma passerinoides, Sensitive species 1024, 1032, 800 & 500.*
Low	Present
Animal Sensitivity	
Very High	None
High	*Circus ranivorus* & *Bradypterus sylvaticus* (Birds)
Medium	*Afrixalus knysnae* (Amphibian), *Chlorotalpa duthieae*, Sensitive species 8 (Mammal) & *Aneuryphymus montanus* (Insects)
Low	Present
Aquatic Sensitivity	
Very High	CBA: Wetland, SWSA (SW Outeniqua) & Wetlands (Unchanneled Valley-bottom)
High	None
Medium	None
Low	None

NOTE: as per point 1.5 of the Terrestrial Biodiversity Specialist Assessment and Minimum Report Content Requirements:
'If any part of the proposed development footprint falls within an area of 'very high' sensitivity, the assessment and reporting requirements prescribed for the 'very high' sensitivity apply to the entire footprint, excluding linear activities for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.' The terrestrial biodiversity sensitivity for such features is thus deemed low.
This site assessment will physically screen for the presence of the listed, and other possible species or sensitivities that are not identified in the screening tool. Not all features are directly affected, but being in proximity, the risks associated with the activity will be investigated further and addressed in the report.

2.2.2 Vegetation of Southern Africa

The National Vegetation Type (NBA, 2018, Figure 8) indicated for the site and surrounding area are Garden Route Granite Fynbos, having a *Critically Endangered* status, as per National Biodiversity Red Listed Ecosystems Assessment (NBA/RLE, 2022).

Garden Route Granite Fynbos (FFg 5)

VT 46 Coastal Renosterbosveld (70%) (Acocks 1953). South Coast Renosterveld (22%) (Moll & Bossi 1983). LR 2 Afromontane Forest (67%) (Low & Rebelo 1996). BHU 100 Knysna Afromontane Forest (64%), BHU 28 Blanco Fynbos/Renosterveld Mosaic (36%) (Cowling et al. 1999b, Cowling & Heijnis 2001).

Distribution: Western Cape Province: Garden Route. Three main blocks south of the Outeniqua Mountains on the coastal plain from Botterberg west of Brandwaghoogte (south of Robinson Pass) to Groot Brak River; the largest block from Groot Brak River to Woodfield near the Wilderness (with a few strips along the coast from Bothastrand to the Wilderness); lastly, north of the lakes from Woodville to Hoogekraal Pass, west of Karatara.
Altitude: 0–300 m.
Vegetation & Landscape Features: Moderately undulating plains and undulating hills on the coastal forelands. Dense proteoid and ericoid shrubby grassland. Proteoid and graminoid fynbos are dominant with ericaceous fynbos in seeps. In the west, most remnants of this type are dominated by proteas. Eastwards graminoid and ericaceous fynbos are dominant on the flat plateaus, with proteas confined to the steep slopes.

Geology & Soils: George Batholith of the Cape Granite Suite. Deep, prismacutanic- and pedocutanic-dominated soils typical of Db land types (mainly).
Climate: MAP 350–880 mm (mean: 600 mm), with a slight low in early winter. Mean daily maximum and minimum temperatures 27.8°C and 6.8°C for January–February and July, respectively. Frost incidence 2 or 3 days per year.
Important Taxa: Tall Shrubs: *Passerina corymbosa* (d), *Cliffortia serpyllifolia*, *Protea coronata, P. lanceolata, P. neriifolia.* Low Shrubs: *Erica discolor variant 'speciosa'* (d), *E. peltata* (d), *Phylica confusa* (d), *Syncarpha paniculata* (d), *Agathosma ovata, Anthospermum prostratum, Aspalathus asparagoides, Cliffortia falcata, Cullumia bisulca, Erica canaliculata, E. diaphana, E. formosa, Eriocephalus africanus, Hermannia angularis, Leucadendron salignum, Lobelia tomentosa, Metalasia pungens, Mimetes cucullatus, Pelargonium fruticosum, Relhania calycina*. Succulent Shrub: *Lampranthus sociorum*. Semiparasitic Shrubs: *Osyris compressa, Thesium virgatum.* Semiparasitic Epiphytic Shrub: *Viscum capense*. Geophytic Herb: *Schizaea pectinata*. Graminoids: *Tetraria cuspidata* (d), *Brachiaria serrata, Eragrostis capensis, Ficinia nigrescens, Heteropogon contortus, Pentaschistis eriostoma, Restio triticeus, Themeda triandra*.
Conservation: Critically Endangered (2022). Target 23%. Only about 1% conserved in the proposed Garden Route National Park. About 70% has been transformed for, cultivation (56%), pine plantations (7%) and by urban development (6%). Remnants are largely confined to isolated pockets on steeper slopes.
Erosion: Moderate and High. Very few patches of this type remain in a pristine condition as most of it has been converted to pasture by liming, bush-cutting and frequent burning, and augmented with pasture grasses. Western remnants suggest that proteoid fynbos might have been dominant historically. It is easily converted to graminoid fynbos by regular fires and augmentation with pasture grasses.
References: Drews (1980b), Hoare et al. (2000).

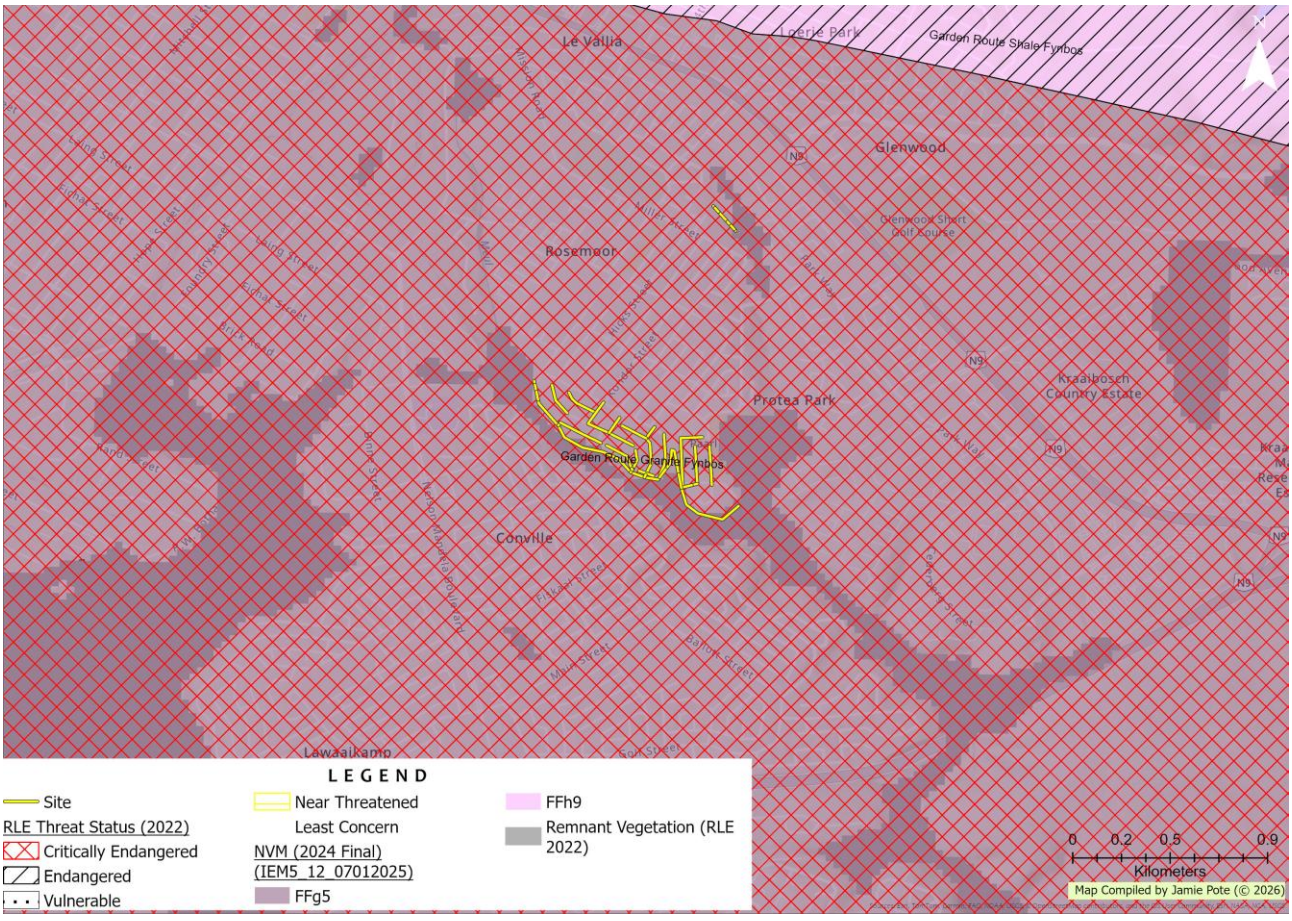


Figure 8: National Biodiversity Assessment Vegetation Type and Conservation Status (NBA, 2018). Darker shaded areas indicative of remnant vegetation.

2.2.3 Western Cape Biodiversity Spatial Plan (WCBSP, 2023) – Terrestrial

The Western Cape Biodiversity Spatial Plan (2023, Figure 9) indicates that most of the proposed Sewer pipeline footprints fall within transformed roads and road reserves, with predominantly the 250mm & 400 mm lines within areas designated CBA 1 & 2 and ESA 2, which are associated with the watercourses and surrounding vegetation that are undeveloped within the urban area.

The Biodiversity Spatial Plan indicates areas of land as well as aquatic features which must to be safeguarded in their natural state if biodiversity is to persist and ecosystems are to continue functioning. Land in this category is referred to as a Critical Biodiversity Area. CBAs incorporate:

I. areas that need to be safeguarded in order to meet national biodiversity thresholds.
II. areas required to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or
III. important locations for biodiversity features or rare species.

Ecological Support Areas (ESAs) are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may be an ecological process area that connects and therefore sustains Critical Biodiversity Areas or a terrestrial feature. None are present withi the site or immediate vicinity. Defining criteria and recommended activities are summarised in Table 3 below.

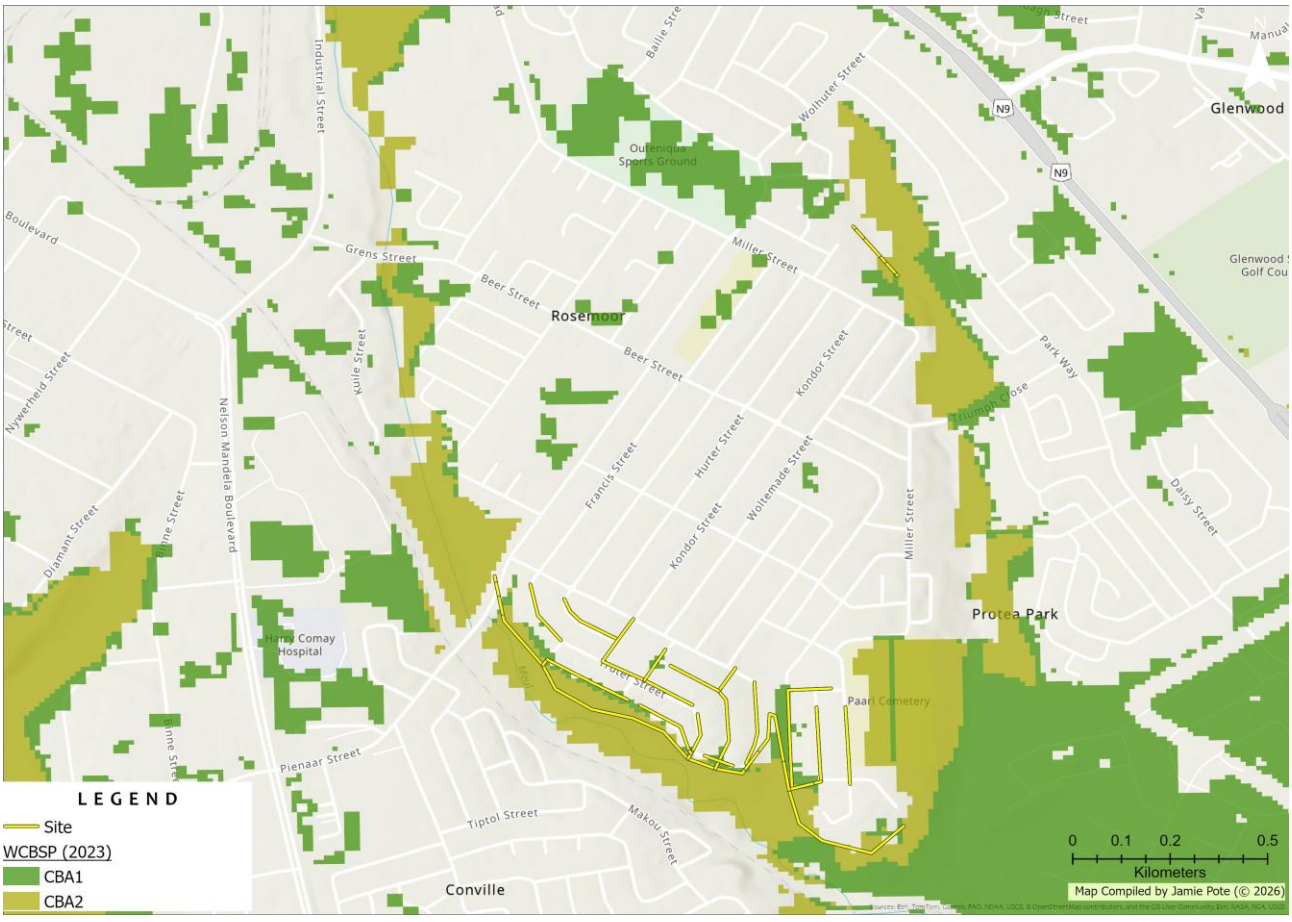


Figure 9:Western Cape Biodiversity Spatial Plan (WCBSP, 2023) –The site does overlap with some designated CBA 1, CBA 2 and ESA 2 areas.

Table 3: Criteria defining Critical Biodiversity Areas (Source: WC BSP, 2023)

CBA MAP CATEGORY:	DEFINING CRITERIA
Protected Areas (Not Present)	Areas that are proclaimed as protected areas under national or provincial legislation.

CBA MAP CATEGORY:	DEFINING CRITERIA
	Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity. A benchmark for biodiversity.
Critical Biodiversity Areas 1 (CBA) (Present)	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 habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
Critical Biodiversity Areas 1 (CBA 2) (Present)	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 functional, natural, or near-natural state, with no further loss of natural habitat. These areas should be rehabilitated.
Ecological Support Areas 1 (ESA 1) (Not Present)	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PA's or CBA's and are often vital for delivering ecosystem services. Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
Ecological Support Areas 2 (ESA 2) (Not Present)	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PA's or CBA's and are often vital for delivering ecosystem services. Restore and/or manage to minimise impact on ecological infrastructure functioning; especially soil and water-related services.
Other Natural Areas (ONA) (Present)	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem. Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high-impact land uses.
No Natural Area Remaining (NNAR) (Present)	Areas that have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets. These areas may still provide limited biodiversity and ecological infrastructure functions, even if they are never prioritised for conservation action. Manage in a biodiversity-sensitive manner, aiming to maximise ecological functionality. Offers the most flexibility regarding potential land uses, but some authorisation may still be required for high impact land uses.

2.2.4 Protected areas

The South Africa Protected Areas Database (SAPAD) database, a comprehensive database of various protected area categories, is updated on a quarterly basis, and provides a comprehensive source of all national and private nature reserves, world heritage sites and other formal legally protected conservation areas situated within South Africa (Figure 10).

When projects are located in legally protected and internationally recognized areas, clients should ensure that project activities are consistent with any national land use, resource use, and management criteria (including Protected Area Management Plans, National Biodiversity Strategy and Action Plans (NBSAP's), or similar documents).

The proposed site does not overlap with any SAPAD designated Protected Areas and is unlikely to have any impacts of significance to any species or processes associated with any nearby Protected Areas. Nearest Protected Areas within 10 km of the site include Blydskap Private Nature Reserve (4.6 km SE), Cape Floral Kingdom Protected Areas (4.6 km NW), Garden Route National Park (4.2 km NE), George

Private Nature Reserve (3.8 km SE), Katrivier Nature Reserve (1.6 km N), Van Kervel Nature Reserve (2.6 km NW), Kwelanga Private Nature Reserve (6.4 km S), Kleinbaai Private Nature Reserve (6 km SE), Kaaimans River Gorge Private Nature Reserve (5.7 km NE). The watercourses associated with the proposed sewer infrastructure are subsidiaries of the Meul River, which flows in a southerly direction and passes along the southern boundary of the George Private Nature Reserve.

The site is not within or in proximity to any designated NPAES areas, where any impacts may arise.

Activities that improve water quality, due to reduction in leaks and discharge by increasing capacity, are likely to have a positive indirect impact in the downstream areas including protected areas.

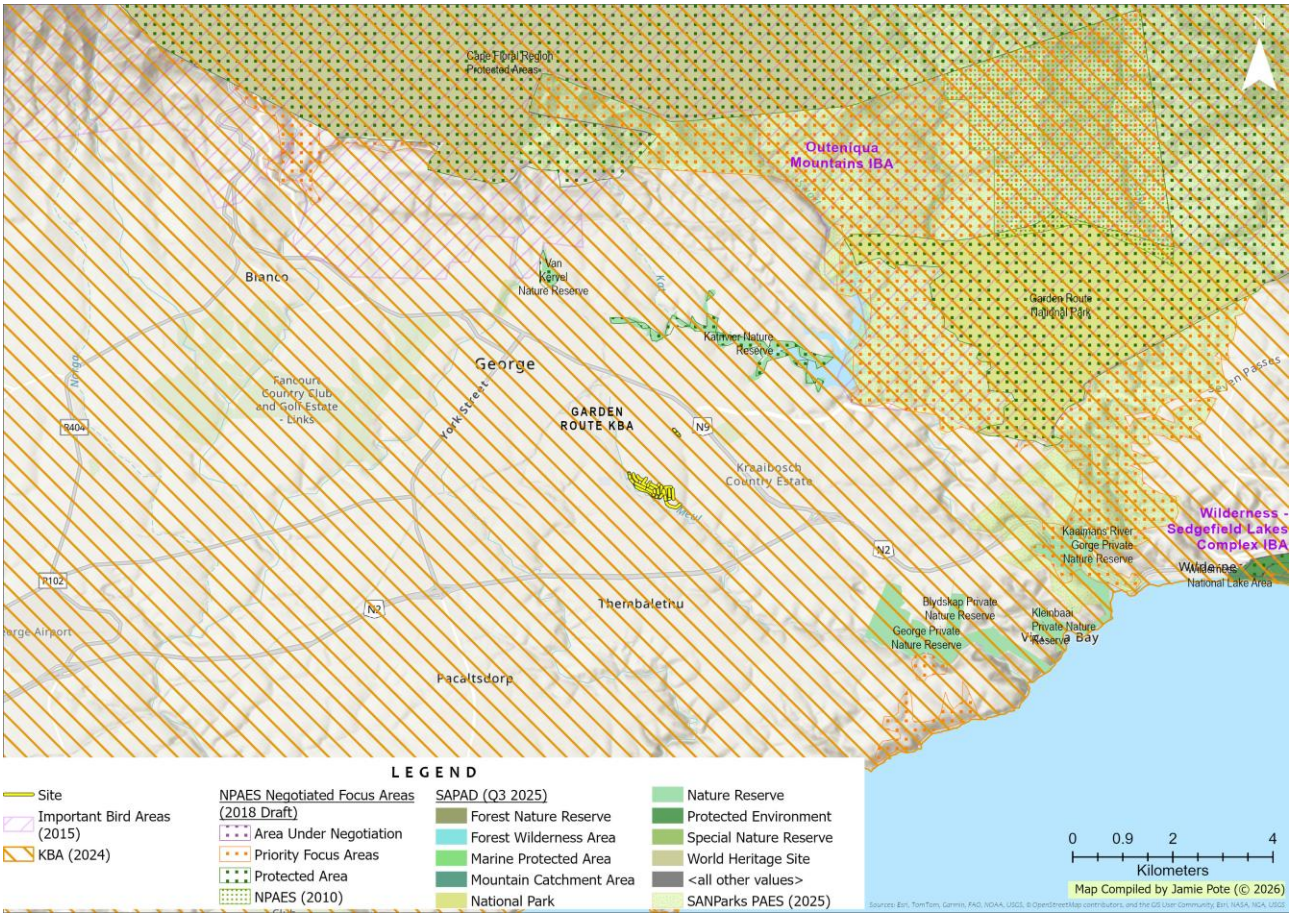


Figure 10: Protected Areas.

2.2.5 Key Biodiversity Areas

The site is situated within the Garden Route KBA, which covers and extensive area within eh eastern and western cape provinces. Subsequently, while 132 potential triggers (habitat and species) are flagged within the KBA, most are localised and thus only applicable to a small area within the boundary of the designated KBA area which includes terrestrial, marine, freshwater habitat and species. The specific triggers that are relevant to this site are addressed in the respective sections pertaining to the vegetation unit and species of conservation concern.

2.2.6 Important Bird Areas

The site is not situated within or near nay designated Important Bird Area (Figure 10). The nearest IBA is the Outeniqua mountains IBA situated just over 3 km to the north and east. While the surrounding area

may have transient bird species visitors that are associated with the IBA, it is unlikely that the specific activity, within an urban and significantly transformed and degraded area is likely to have any impact of significance to such occurrences.

2.2.7 Garden Route Biodiversity Sector Plan (2010)

The Garden Route BSP (GRBSP, 2007, Figure 11) identified the vegetation as being Grassy Fynbos (associated with the slopes) and Rivers & Floodplain (associated with the watercourses). The Garden Route BSP further indicates that portions of the site partially intersect with designated Critical Biodiversity Area along the watercourses and possibly representing historically intact or remnant vegetation. The Garden Route BSP is largely integrated with and/or superseded by the Western Cape BSP and National Vegetation Map, which is also updated to represent changing land use, but indicates that the later plans are broadly aligned with the earlier GRBSP.



Figure 11: Garden Route Biodiversity Sector Plan (2007) vegetation designation and CBA/ESA status.

2.2.8 Rivers, Watercourses and Wetlands

The site is situated within along roads within an urban area, on slopes that drain into the adjacent slightly incised watercourses. The slopes directly adjacent to the watercourses are generally undeveloped and have vegetation cover, although mostly secondary with grasses, weeds and other pioneer annual species. The condition and status of the vegetation cover, including riparian vegetation, is included in the vegetation description section below. The non-perennial watercourses associated with the Rosemoor area drain in a southerly direction into the Meul River, which flows southwards to the coast.

Wetlands potentially comprise Valley bottom wetlands that are associated with the local watercourses. Aquatic assessment is outside the scope of this assessment but will consider aspects that relate to terrestrial processes and species.

Upgrading of sewer infrastructure implemented correctly is likely to reduce leakages along riverbanks and ease discharge of effluent into the watercourse. Within the urban context, wetlands in the vicinity of the site may be subject to effluent discharge due to inadequate sewer infrastructure and are likely already modified and/or affected by sewerage discharge from leaks and are thus unlikely to be affected above baseline levels.

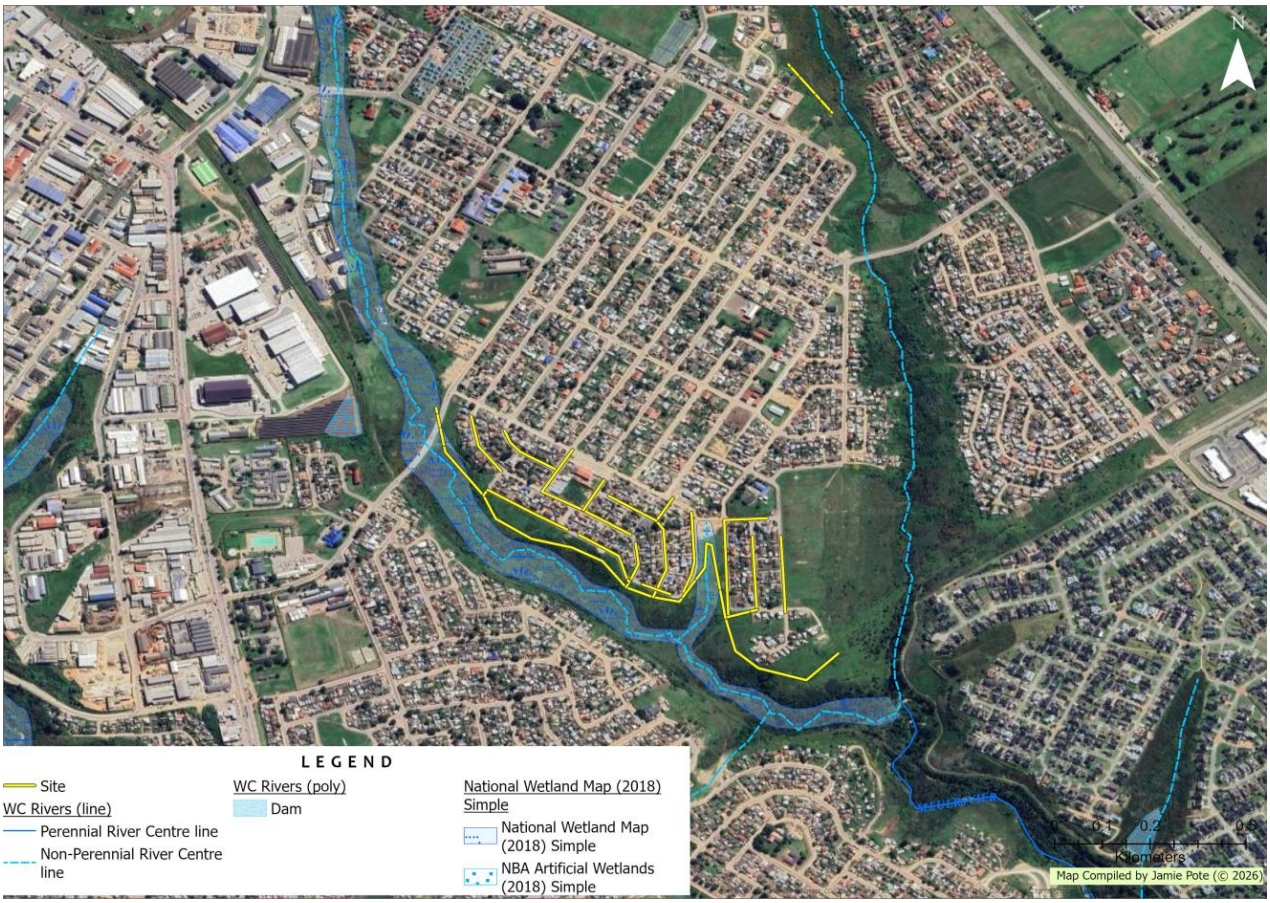


Figure 12: Rivers. Wetlands and Estuaries associated with the site.

3 Biodiversity Risk Identification and Assessment

3.1 Baseline Biodiversity Description

The site is located within a transformed developed urban area on slopes adjacent to somewhat incised watercourses, draining in a southerly direction. The only remaining vegetation cover is comprised of a narrow band of vegetation along eh banks of the watercourses, as well as some grassed and landscaped gardens within the suburbs (Figure 15 to Figure 30). .

The site is comprised predominantly of transformed areas which include the dwellings, surfaced roads, sidewalks and landscaped gardens (Figure 33). The areas having '*natural*' vegetation cover are generally confined to the undeveloped areas surrounding the watercourse which runs west to east on the south

side of the project area. The proposed sewer infrastructure is generally located within these areas, where leaks due to inadequate infrastructure can discharging into the watercourses.

Several different main habitats can be differentiated within the vegetated area:

1. Transformed: Includes hardened surfaces such as paved roads, sidewalks, landscaped gardens and grassed areas including parks and road verges (*Figure* 15 to *Figure* 18). Comprises almost the entire 160mm & 315 mm sewer pipeline component.
2. Degraded Riverine: Historically would have contained riparian and riverine elements associated with the watercourse, but significantly degraded 'natural' vegetation composed predominantly of kikuyu grass, ruderal weeds, garden escapees, as well as occasional pioneer shrubs, herbs, grasses and some remnant small trees (*Figure* 19 to *Figure* 28).
3. Secondary (Grassy): Portion of sewer on eastern side, was likely historically Garden Route Granite Fynbos, but was at some stage transformed to what appears to have been for cultivation use. Vegetation is currently a secondary grassy vegetation.
4. Watercourse: Watercourses are significantly degraded (*Figure* 29 to *Figure* 30) and modified. Only a small crossing on the east side is required and it significantly modified at crossing point and also has an existing sewer present.

Figure 15 to *Figure* 30 provide a general overview of the site.

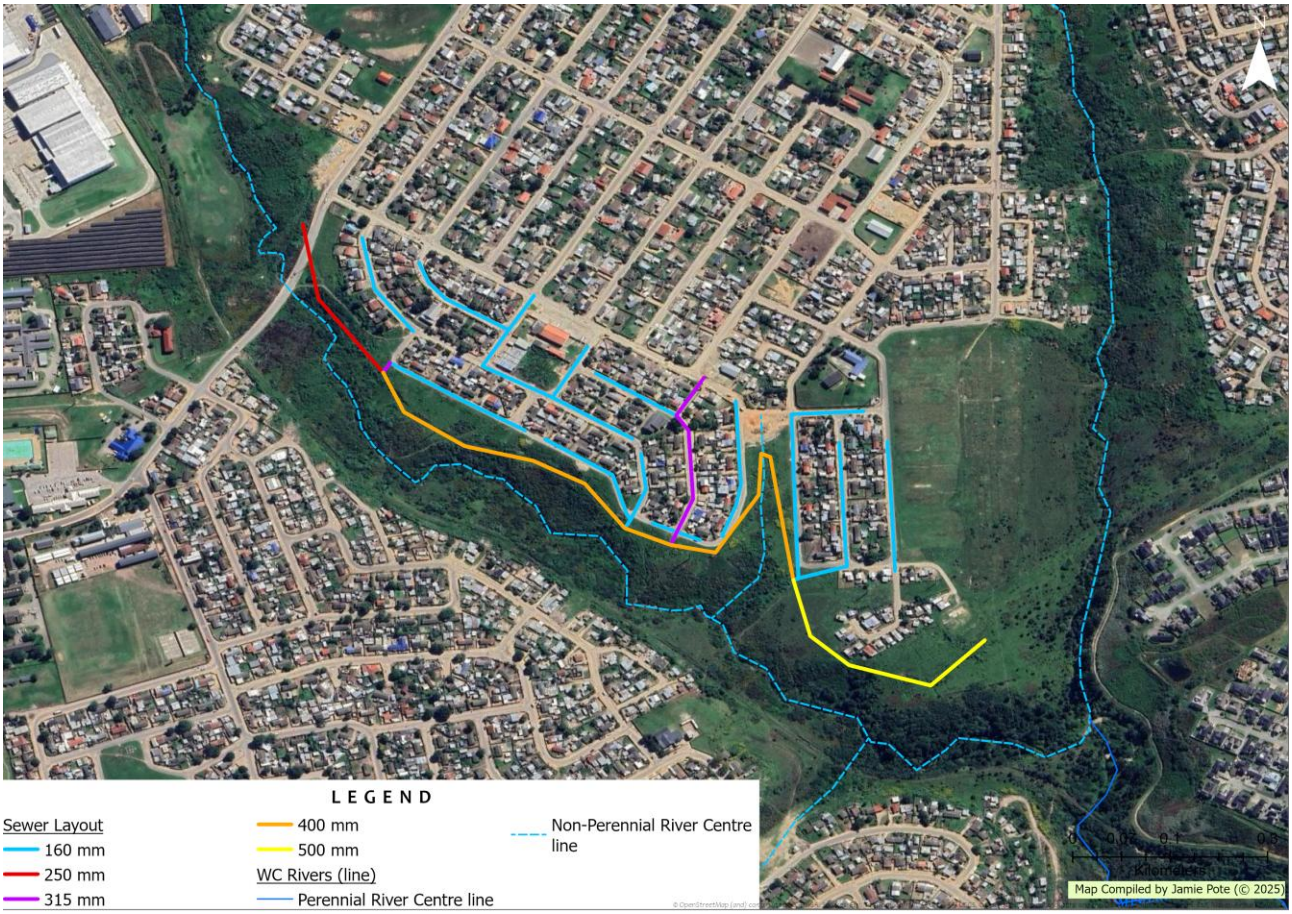


Figure 13: Aerial photo of the site.



Figure 14: Aerial photo of the site (additional northern section).

Transformed

Transformed areas (*Figure* 15 to *Figure* 18) are comprised of hardened surfaces within the inhabited area and includes paved roads, sidewalks, landscaped gardens (not affected) and road verges. No indigenous terrestrial vegetation is present in these areas, other than planted trees on sidewalks and road verges that include predominantly exotic species and some gardens around the adjacent dwelling. Any small, vegetated areas that are present, generally comprised of Kikuyu grass (*Cenchrus clandestinus*, previously *Pennisetum clandestinum*) and Kweek (*Cynodon dactylon*) as well as several creeping ruderal weeds such as *Arctotheca prostrata* (Prostrate Cape Milkweed). More often than not, any unsurfaced areas are comprised of bare soils as a result of human, animal and vehicular traffic compaction.



Figure 15: Typical urban street.



Figure 16: Typical urban street.



Figure 17: Typical urban street.



Figure 18: Typical urban street.

Vegetated Areas

Vegetated areas (*Figure* 19 to *Figure* 28) along the slopes adjacent to watercourses are significantly disturbed and vegetation cover is comprised primarily of exotic Kikuyu grass (*Cenchrus clandestinus*, previously *Pennisetum clandestinum*) and *Senecio angulatus* (Cape Ivy) as groundcovers, with a range of ruderal and invasive weed species including herbs and shrubs *Ricinus communis* (Castor Oil plant), Bugweed (*Solanum mauritianum*), *Canna indica*, Inkberry (*Cestrum laevigatum*), *Lantana camara, Nidorella ivifolia, Amaranthus* spp. (Amaranth), *Verbena bonariensis*, *Iris pseudacorus*, *Cirsium vulgare* (Thistle), *Senna didymobotrya* (Peanut-Butter Cassia), *Phytolacca octandra* (Inkweed), *Urtica urens* (Nettle) and *Vinca major* (Periwinkle) and *Rubus* sp. (Bramble). Common trees include *Sambucus nigra* (European Black Elderberry) and *Acacia mearnsii* (Black Wattle), as well as *Leptospermum scoparium* (Broom tree), *Sesbania punicea* (Sesbania), *Acacia melanoxylon* (Blackwood), and *Melia azedarach* (Syringa). Clumps of *Cortaderia selloana* (Pampas Grass) is also common along the water courses. A wide range of garden escapees are also present, likely coming from dumped garden waste, or the nearby gardens mostly non-indigenous species (Delicious Monster).

Remnant indigenous elements include *Arctotheca prostrata* (Prostrate Cape Milkweed), *Carpobrotus deliciosus* (Sourfig), Wild Dagga (*Leonotis leonurus*), Arum lily (*Zantedeschia aethiopica*), *Senecio angulatus* and *Searsia rehmanniana*. While *Senecio angulatus* is an indigenous species, it can become invasive in disturbed areas and the creeping vine-like growth from allows it to effectively smother other vegetation.

The percentage of natural vegetation within this habitat is likely between 5 and 10 % comprising a few scratted elements. The vegetation present is not representative of the Critically Endangered Garden Route Granite Fynbos.



Figure 19: Typical vegetated watercourse bank (Kikuyu).



Figure 20: Typical vegetated watercourse bank (Kikuyu).



Figure 21: Typical vegetated watercourse bank (Kikuyu).


Figure 22: Typical vegetated watercourse bank (Kikuyu).



Figure 23: Typical vegetated area (Kikuyu).


Figure 24: Typical vegetated area (Kikuyu).


Figure 25: Typical vegetated area (Kikuyu).


Figure 26: Typical vegetated area (Cape Ivy).



Figure 27: Typical vegetated area (Kikuyu & weeds).



Figure 28: Typical vegetated area (Kikuyu & weeds).

Watercourses

Watercourses (*Figure* 29 to *Figure* 30) are significantly disturbed and/or modified with vegetation also comprised predominantly of exotic and invasive species. Cover is primarily also exotic Kikuyu grass (*Cenchrus clandestinus*, previously *Pennisetum clandestinum*) and *Senecio angulatus* (Cape Ivy), as well as *Cortaderia selloana* (Pampas Grass) and *Sambucus nigra* (European Black Elderberry) trees and the reed

Arundo donax (Giant Reed). Riparian vegetation is not easily distinguished from surrounding vegetation due to the proliferation of weeds that are common to both habitats.

Remnant indigenous elements are occasional and include the odd tuft of Arum lily (*Zantedeschia aethiopica*), clumps of *Typha capensis* (Bulrushes), occasional indigenous reeds (*Phragmites australis*) and occasional tufts of remnant sedges, including *Juncus effusus*, *Cyperus polystachyos and Cyperus textilis.*



Figure 29: Watercourse at crossing point.



Figure 30: Watercourse at crossing point.

Secondary (Grassy)

Secondary (Grassy) vegetation is present along a portion of the eastern end of the sewer (*Figure* 15 to *Figure* 18), where the sewer exits the watercourse area onto a small ridge outside of what would have been riverine vegetation. The section was likely the only portion of the route that would have historically had Garden Route Granite Fynbos vegetation. However, it is now comprised of secondary grassy vegetation and was likely cultivated in the past (pre-2003) and was possibly originally part of a garden or small holding. No indigenous terrestrial vegetation representative of Garden Route Granite Fynbos is present. Grassy vegetation is comprised of Kikuyu grass (*Cenchrus clandestinus*, previously *Pennisetum clandestinum*), Kweek (*Cynodon dactylon*) and Weeping lovegrass (*Eragrostis curvula*).



Figure 31: Secondary (Grassy) vegetation.



Figure 32: Secondary (Grassy) vegetation.

The proposed development is unlikely to have any significant impact on any 'intact' or natural indigenous vegetation of any significant ecological value.

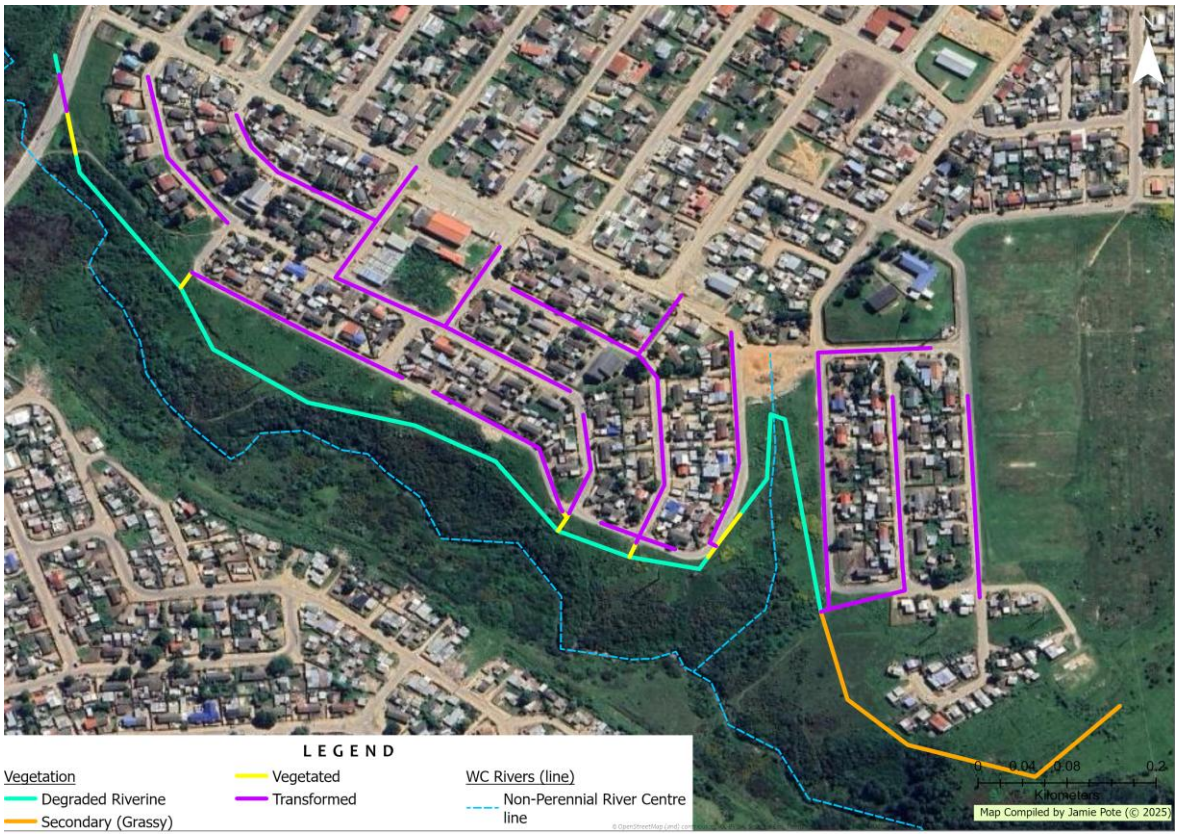


Figure 33: Mapped vegetation of the site (Overview).



Figure 34: Mapped vegetation of the site (Overview) – additional northern section.

3.1.1 Present Ecological State

In summary, the following general observations can be noted regarding the site:

- The area in and around the site is completely transformed and or degraded as a result of urban development and associated processes including dumping of refuse and garden waste and other pollution sources, with the occasional remnant scattered indigenous species. No elements of species typical to Garden Route Granite Fynbos were observed within vegetated areas along the watercourses
- Alien invasion and weeds are high to very high, comprising most of the vegetation along the watercourses and surrounding vegetated areas.
- Ecological processes are thus primarily significantly modified within the sewer servitude, as natural and indigenous vegetation elements are largely absent from within the site.
- Fauna species include mainly species typical of urbanised and transformed areas, perhaps having the occasional visit from less common species that typically occur in natural areas that are in transit through urban area or are acclimated to the urbanised environment.

3.1.2 Vegetation and Ecological Processes and Corridors

Landscapes corridors are a combination of Critical Biodiversity Areas (areas required to meet conservation targets) and Ecological Support Areas that link habitats, as well as linking inland mountains to the coastline (and therefore beyond municipal boundaries). Rivers and their associated riparian or riverbank habitats often provide the basis for many of these large-scale (landscape level) ecological processes.

Critical Biodiversity Areas (CBA) are generally regarded as being critical for meeting conservation objectives for vegetation units in an optimal manner. Where a vegetation unit is not under threat (i.e. Least Concern status), there is some flexibility, ito alternatives; however, as conservation status increases (a vegetation unit is under threat due to high levels of transformation), alternative options to meet conservation targets are significantly reduced. CBA 1 areas are generally natural or near natural, whereas CBA 2 are degraded and/or transformed areas where restoration would be required and/or recommended.

Ecological Support Areas (ESA) are supporting zones or areas which must be safeguarded as they are needed to prevent degradation of Critical Biodiversity Areas and formal Protected Areas. Although many ESA's consist of natural veld, there are areas of land - partially or wholly transformed or degraded -that have been classified as ESA even though they are no longer in a natural state. Although these areas are heavily degraded or transformed, they still play an important role in supporting ecological processes. This is particularly the case with riparian areas, some key catchment areas, and key pieces of corridors. ESA 1 areas are generally natural or near natural, whereas ESA 2 are degraded and/or transformed areas where restoration would be required and/or recommended. An ESA that is vegetated but not natural or near natural can still serve to retain some connectivity and support ecological processes, but in a significantly reduced manner. For example, trees in an apple orchard will provide perches for some birds and grassy groundcover will still allow for movement of some small animals such as rodents and reptiles. Certain species are significantly more at risk, as they may not be able to adapt to a modified environment, whereas others may not be affected.

While the site falls within a broader important ecologically connected area along the watercourses, the specific site is significantly transformed and surrounded by developed erven and paved roads. Remnant vegetation along watercourse is significantly degraded and transformed and thus provides limited

'natural' ecological value in its current state. It will serve limited connectivity support but does not and is not likely to support any substantial populations of at-risk species of conservation concern that are not adaptable to modified environments, nor provide ecological services and processes typically associated with the Critically Endangered Garden Route Granite Fynbos that occurs in the broader area. The watercourse corridors will however serve as broad level artificial habitat corridors for general movement faunal species around the broader area, but since no flora species typical of the unit are present, flora related ecological processes (such as pollination and seed dispersal) would be absent. The proposed activity, having a negligible footprint within significantly modified habitat, is thus unlikely to significantly impact or disturb these processes nor likely to alter current species composition from current baseline levels, as it will be a temporary activity and will likely return to a pre-construction state within two years.

3.1.3 Flora & Fauna

No endemic and range restricted species were recorded to be present. Several species are known from the surrounding area, but unlikely to be affected by the proposed activity. The proposed activity, having a negligible footprint within significantly modified habitat, is thus unlikely to significantly impact any species population or current species composition from current baseline levels, as it will be a temporary activity and will likely return to a pre-construction state within two years.

Red Listed, Endemic and Protected Flora

The site falls within the general distribution range of several endemic species and other species with a highly localised distribution, some of which are Critically Endangered, Endangered, Vulnerable or Rare. Some of these species are also only from a single or a few populations.

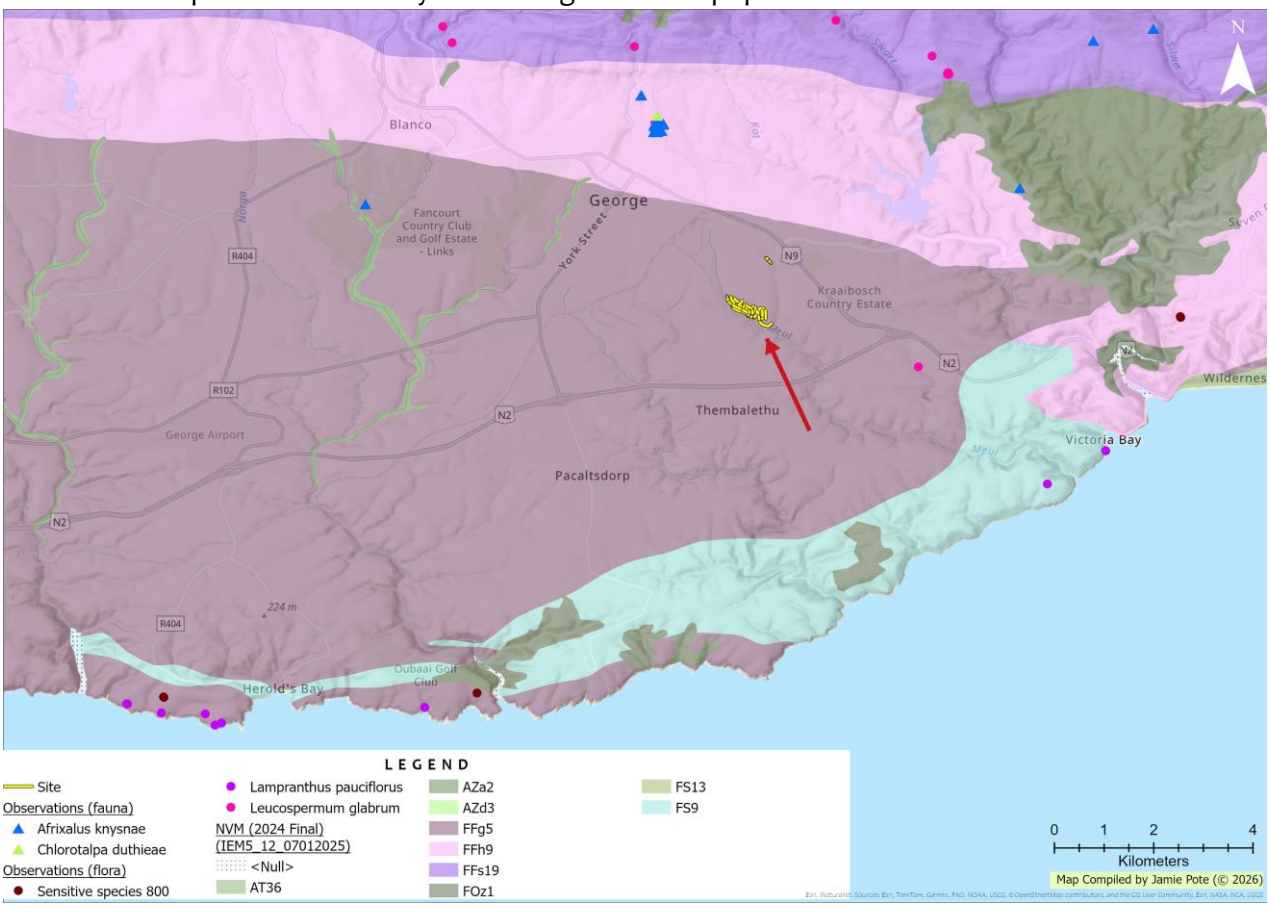


Figure 35: Distribution records of flora and fauna Species of Conservation Concern (GBIF, 26 July 2024) with known records in the vicinity of the site. NOTE some distribution records may have an offset for biosecurity purposes and/or accuracy errors but will non the less give an indication of general locality.

Table 4: Flora Species of Special Concern

SCIENTIFIC NAME	STATUS[3]	COMMENT/PRESENCE
Diosma passerinoides	NEST (M), Vu	Total population size estimated to be <5 000 mature individuals, based on records of 18 out of 25 subpopulations where species is indicated to be rare, uncommon, or only a few plants present, and with survey data of seven subpopulations indicating that the largest subpopulation consists of no more than 500 mature individuals. These populations are declining due to a number of different threats such as invasive alien plants, habit degradation in the form grazing and habitat loss due to protea cultivation. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Lampranthus pauciflorus	NEST (M), En	EOO 1270 km², four known locations remain after most of this species' habitat has been transformed for coastal development. Habitat loss continues, especially around Plettenberg Bay, Mossel Bay and Knysna. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Leucospermum glabrum	NEST (M), En	Somewhat widespread distribution including a population in the northern areas of George. A restricted endemic with an extent of occurrence (EOO) ranging between 1620 and 1642 km², and an area of occupancy (AOO) of between 152 and 156 km². This species occurs as scattered small subpopulations with the total population not exceeding 2500 mature individuals, and each subpopulation having fewer than 250 plants. The mountains where this species occurs have been extensively surveyed. Road verges and significantly disturbed watercourses do not provide suitable habitat for this species. Not recorded on site, which is not typical of preferred habitat.
Sensitive species 1024	NEST (M), En	A range-restricted and very rare species known from four small, severely fragmented subpopulations. It has an extent of occurrence (EOO) of 971 km². The population consists of 2 500 mature individuals, and the largest subpopulation has less than 200 plants. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Sensitive species 1032	NEST (M), Vu	Somewhat widespread distribution including a population in the northern areas of George. Not recorded on site but found in surrounding area. Road verges and significantly disturbed watercourses do not provide suitable habitat for this species.
Sensitive species 500	NEST (M), En	Somewhat widespread distribution. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Sensitive species 800	NEST (M), Vu	Formerly a very common species, now remaining mostly as small, isolated subpopulations on fragments of natural vegetation within its lowland distribution range. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.

As per Table 4, no Endangered or Critically Endangered flora species were confirmed to be present nor are known to be present in the affected area. Most likely species that do occur in the broader surrounding area include *Leucospermum glabrum* & Sensitive species 1032, however none were observed on the site. The species *Diosma passerinoides, Lampranthus pauciflorus, Sensitive species 1024, Sensitive species 500 & Sensitive species 800* have records in a much broader are and no records indicate a local presence.

Site observations also confirmed none being present, also confirmed to not be the typical habitat for several of the species, hence the footprint does not provide suitable habitat for these species.

3 **PNCO** - Provincial Nature Conservation Ordinance (1974); **NFA** - National Forests Act of (1998); ToPS – Threatened or Protected Species; **IUCN:** CR - Critically - Endangered, En - Endangered, Vu - Vulnerable; LC - Least Concern.

Red Listed and Protected Fauna

As per Table 5, no Endangered or Critically fauna species were found to be present nor are known to be present in close proximity to the affected area or are likely to be directly affected by the proposed activity. The site falls within the general distribution range of a single faunal SCC as indicated in Table 5 below, however none are confirmed to be present. Since the project footprint is relatively small, is situated directly adjacent to urban and disturbed areas and also surrounded by extensive outlying areas of natural habitat, any disturbance or displacement associated with increased activity or habitat destruction as a direct result of the activity is unlikely to pose a significant negative impact faunal species and in particular the species of special concern.

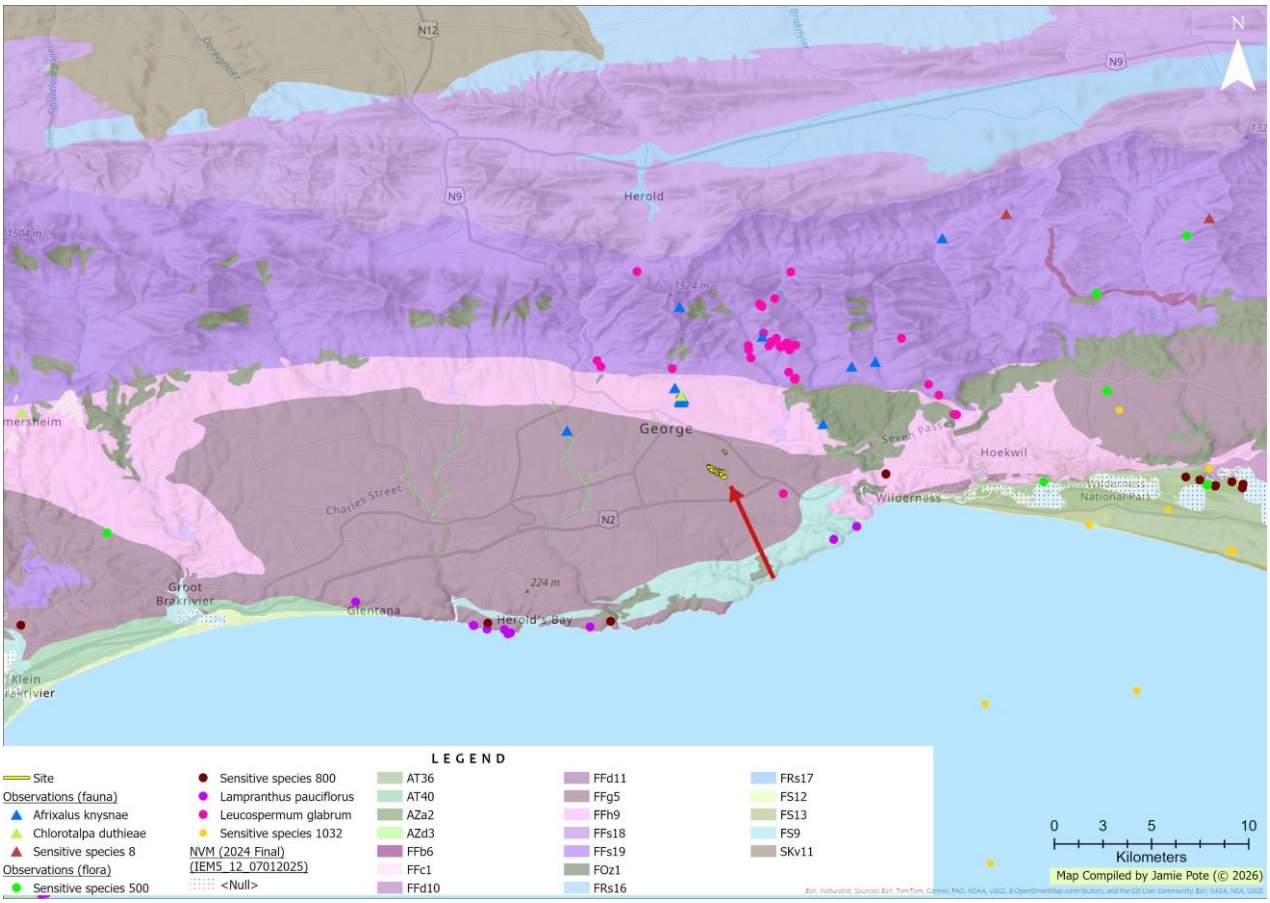


Figure 36: Distribution records of flora and fauna Species of Conservation Concern (GBIF, 26 July 2024) with known records from the broader area. NOTE some distribution records may have an offset for biosecurity purposes but will non the less give an indication of general locality (i.e. locality records in the sea).

Table 5: Fauna Species of Special Concern (SCC)

SCIENTIFIC NAME	COMMON NAME	STATUS[4]	COMMENT/PRESENCE
Mammals			
Chlorotalpa duthieae	Duthies Golden Mole	NEST (M), Vu	Known form the broader area, no evidence of any Golden Moles on site, which is primarily a landscaped garden and largely surrounded by compacted material.
Sensitive species 8		NEST (M), Vu	Not recorded on site but records indicate a presence in the surrounding area. May be a transient visitor in developed areas, but not likely to be affected above baseline levels due

4 **PNCO -** Provincial Nature Conservation Ordinance (1974); ToPS – Threatened or Protected Species, **IUCN:** Cr - Critically - Endangered, En - Endangered, Vu - Vulnerable; LC - Least Concern.

SCIENTIFIC NAME	COMMON NAME	STATUS[4]	COMMENT/PRESENCE
			to the proposed activity within a densely populated part of an urban area.
Birds			
Bradypterus sylvaticus	Knysna warbler	NEST (H)	Unlikely to be affected above baseline levels by the proposed activity in an already transformed footprint.
Circus ranivorus	African Marsh Harrier	NEST (H)	
Reptiles			
None			
Amphibians			
Afrixalus knysnae	*Knysna Spiny Reed Frog*	NEST (M), En	Unlikely to be present nor affected by the proposed temporary activity in a transformed footprint. While aquatic and other suitable habitat is in principle present, it is not deemed suitable due to the high levels of pollution in the watercourse and also the disturbed nature of the surrounding vegetation Not recorded.
Invertebrates			
Aneuryphymus montanus	Yellow-winged Agile Grasshopper	NEST (M), Vu	No records from vicinity and not recorded on site. Unlikely to be present nor affected by the proposed temporary activity in a transformed landscape. Not recorded.

Records indicate that the species *Chlorotalpa duthieae*, Sensitive species & *Afrixalus knysnae* have been recorded in the wider area, however none are likely to occur on the site. There is no evidence of any Golden Moles being present and while aquatic habitat is present, it is not deemed suitable due to the high levels of pollution in the watercourse and also the disturbed nature of the vegetation.

The birds *Bradypterus sylvaticus* & *Circus ranivorus*, as well as the insect *Aneuryphymus montanus*, while likely occurring in the surrounding area where natural vegetation is intact and more extensive, are unlikely to be affected by the proposed activity which will have a small and highly localised footprint. Improved sewer management is also likely to improve overall aquatic health after construction.

Site observations also confirmed none being present, also confirmed to not be the typical habitat for several of the species, hence the footprint does not provide suitable habitat for these species.

No fauna PNCO permits are anticipated to be required but are recommended as a precaution as small species such as lizards, geckos and snakes may be present in the rocky landscaped areas.

Alien Invasive Species

On 18 September 2020, the Minister of Environmental Affairs published the Alien and Invasive Species Regulations ("the Regulations") which came into effect on the 18 October 2020 in a bid to curb the negative effects of IAPs. The Regulations call on landowners and sellers of land alike to assist the Department of Environmental Affairs to conserve our indigenous fauna and flora and to foster sustainable use of our land. Non-adherence to the Regulations by a landowner or a seller of land can result in a criminal offence punishable by a fine of up to R 5 million (R 10 million in case of a second offence) and/or a period of imprisonment of up to 10 years.

- Category 1a and 1b listed invasive species must be controlled and eradicated.
- Category 2 plants may only be grown if a permit is obtained, and the property owner ensures that the invasive species do not spread beyond his or her property.
- The growing of Category 3 species is subject to various exemptions and prohibitions.

Some invasive plants are categorised differently in different provinces. *For example*: the Spanish Broom plant is categorised as a category 1b (harmful) invasive plant in Eastern Cape and Western Cape, but it is a category 3 (less harmful) invasive plant in the other seven provinces.

Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Landowners are under legal obligation to control alien plants occurring on their properties. Alien Invasive Plants require removal according to the Conservation of Agricultural Resources Act 43 of 1983 (CARA) and the National Environmental Management: Biodiversity Act (10 of 2004; NEMBA): Alien and Invasive Species Lists (GN R598 and GN R599 of 2014). Alien control programs are long-term management projects and a clearing plan, which includes follow up actions for rehabilitation of the cleared area, is essential. This will save time, money, and significant effort. Collective management and planning with neighbours allow for more cost-effective clearing and maintenance considering aliens seeds as easily dispersed across boundaries by wind or water courses. All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing. A general rule of thumb is to first target lightly infested areas before tackling densely invaded areas and prioritize sensitive areas such as riverbanks and wetlands. Alien grasses are among the worst invaders in lowland ecosystems adjacent to farms but are often the most difficult to detect and control.

Many exotic invasive and other weed species were noted within the site and surrounding area. Proliferation of weedy and exotic species often indicate disturbance especially during or after construction. A list of species is included in Table 6. During construction it is highly likely that species currently not on site could be introduced through the construction process. A weed management programme is recommended after construction to counter the weed proliferation that would be expected after construction.

Table 6: Alien (exotic) invasive and other weed species and status.

SCIENTIFIC NAME	COMMON NAME	FAMILY	STATUS[5]	PRESENCE
Acacia mearnsii	Black Wattle	Fabaceae	CARA 1b	Present, common
Acacia melanoxylon	Blackwood	Fabaceae	CARA 2	Present, common
Canna indica	Indian shot	Cannaceae	CARA 1b[6]	Present, common
Cenchrus clandestinus	Kikuyu grass	Poaceae	CARA 1b	Present, common
Cestrum (Pennisetum) laevigatum	*Inkberry*	Solanaceae	CARA 1b	Present, dominant.
Cirsium vulgare	Scotch thistle	Asteraceae	CARA 1b	Present, common
Cortaderia selloana	Pampas grass	Poaceae	CARA 1b	Present, common
Iris pseudacorus	Yellow flag	Iridaceae	CARA 1a	Present, occasional
Lantana camara	Lantana	Verbenaceae	CARA 1b	Present, occasional
Leptospermum scoparium	Australian myrtle (Tea tree)	Asteraceae	CARA 1b	Present, common
Melia azedarach	Syringa	Meliaceae	CARA 1b	Present, common
Phragmites australis	*Spanish Reed*	Poaceae	CARA 1b	Present, common.
Phytolacca americana	Pokeweed	Phytolaccaceae	CARA 2	Present, occasional
Ricinus communis	Castor Oil Plant	Euphorbiaceae	CARA 2	Present, common
Rubus cuneifolius	Bramble	Rosaceae	CARA 1b	Present, common
Sambucus nigra	European elder	Adoxaceae	CARA 1b	Present, common
Senna didymobotrya	Peanut butter Cassia	Fabaceae	CARA 1b	Present, occasional
Sesbania punicea	Sesbania	Fabaceae	CARA 1b	Present, occasional
Solanum mauritianum	Bugweed	Solanaceae	CARA 1b	Present, common
Solanum sisymbriifolium	Wild tomato	Solanaceae	CARA 1b	Present, occasional
Urtica urens	Nettle	Urticaceae	Weed	Present, occasional
Verbena bonariensis	Wild verbena	Verbenaceae	CARA 1b	Present, occasional
Vinca major	Greater periwinkle	Apocynaceae	CARA 1b	Present, occasional

[5] CARA - Conservation of Agricultural Resources Act (1993); National List of Invasive Species in Terms Sections 70(1), 71(3) and 71A (2016); Weed – an exotic ruderal weed species, not indigenous but not a declared invasive species.
[6] 1b in protected areas and wetlands, not listed elsewhere.

Eradication protocol

The act required the removal of these species, being the responsibility of the landowner/contractor. Several other common weed species are also present which should also be managed as part of post construction management,

Specific eradication and management procedures must be stipulated in the EMP as to the methods to be implemented to remove and control the various alien invasive species as they tend to require species specific techniques. A management plan should be incorporated into the EMP, and a detailed action plan compiled and implemented by the ECO.

3.1.4 Aquatic Habitat

Aquatic systems do not function in isolation and in terms of ecological processes, the aquatic systems are intricately linked to the terrestrial system. In this case the riverine and riparian community that drains the surrounding urban landscape forms an integral link between upstream and downstream communities and as a corridor for various faunal especially avifaunal species. Based on the flora species composition, this is largely an artificial ecological landscape, and while it may support an associated faunal assemblage, the proposed activity is unlikely to significantly alter the associated composition and processes above current baseline levels.

3.1.5 Terrestrial Vegetation Sensitivity Assessment

An overall vulnerability assessment of proposed activity, incorporating key vegetation and ecological indicators was undertaken and includes the following key criteria:

- relative levels of *intactness* in terms of overall loss of indigenous vegetation cover.
- presence, diversity, and abundance of *species of special concern* (weighted in favour of local endemic species).
- extent of *invasion* (severity and overall ecological impact), as well as the degree to which successful rehabilitation could take place.
- overall degradation incorporating above factors.
- relative importance of the vegetation communities relative to regional conservation status - indicated as vulnerability of the area because of loss.

Intactness

Three basic classes are differentiated as follows:

- **Low**: > 75 % of original vegetation has been removed or lost; and/or no species of special concern present that are critically endangered, endangered, or endemic with highly localised distribution.
- **Moderate**: 25 - 75 % of original vegetation has been removed/lost; and or presence of species of special concern but not having high conservation status or high levels of endemicity or highly localised distributions.
- **High**: < 25 % of original vegetation has been removed or lost; and or presence of species with a highly endemicity and or high conservation status (endangered or critically endangered).

Intactness for the site is **Very Low**.

Alien Invasion

Three classes are differentiated as follows:

- **Low**: no or few scattered individuals.

- **Moderate:** individual clumps of invasives present but cover less than 50% or original area.
- **High:** dense, impenetrable stands of invasives present, or cover > 50 % of area with substantial loss functioning. Rehabilitation will most likely require specialised techniques over an extended period (> 5 years).

Alien invasion for the site is **Very High**.

Degradation

Overall Degradation is determined from the above alien invasion and intactness scores, according to the following matrix:

INTACTNESS	INVASION		
	LOW	MODERATE	HIGH
High	Pristine	Near Pristine	Moderately Degraded
Moderate	Near Pristine	Moderately Degraded	**Severely Degraded**
Low	Moderately Degraded	Severely Degraded	**Transformed**

Degradation for the site is **Very High** (Transformed and/or Severely Degraded)

Overall Sensitivity score

Overall vulnerability (or Sensitivity) of the vegetation within the site is calculated according to the following matrix which combines degradation and overall conservation status of the vegetation units of the site.

DEGRADATION	CONSERVATION STATUS			
	LEAST CONCERN	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED
Severely degraded/ Transformed	Very Low/Low	Low	Moderate	Moderate - High
Moderately degraded	Low	Moderate	High	High
Ecologically Pristine or near Pristine (no such areas identified)	Moderate	Moderate - High	High	Very High (No-Go area)

Habitat Sensitivity

- All of the portions of sewer within the residential area (roads and road verges) and are designated a VERY LOW SENSITIVITY.
- LOW SENSITITITY areas are vegetated but generally kikuyu grass and limited to a few sections where the sewer enters the vegetated area.
- Almost the entire vegetated area (i.e. the areas of the route that are adjacent to the watercourse but on the upper banks where little to no natural riverine vegetation persists are designated a MODERATE sensitivity, where exotic and invasive species comprise most of the vegetation cover, but with some indigenous elements.
- VERY HIGH sensitivity portions are designated where Watercourses and riparian vegetation, although primarily exotic species) is present. This is limited to a single area where a 'watercourse' crossing is present. The high sensitivity is given more for the sake of highlighting that additional precautions will be required during construction, being a watercourse, rather than elevated ecological sensitivity as the area is also highly modified. Since the primary objective is to improve sewerage management and improve capacity, the overall impact of the sewer pipelines is not significantly negative within the broader context of the site and surrounds.
- No VERY HIGH sensitivity areas are identified but limited to the terrestrial environment and excludes aquatic processes, which is outside of the scope of this terrestrial assessment.

The nominal and temporary short-term impact will be far outweighed by the long benefits of improving sewer capacity and potentially reducing the risk of sewerage leaks in the future.

3.1.6 No-Go Areas

No-go areas are not identified within the site. Caution to be exercised in proximity to planted Cycads.

3.1.7 Potential Development Footprints

The remainder of the site outside of the identified no-go areas above is considered to be developable.

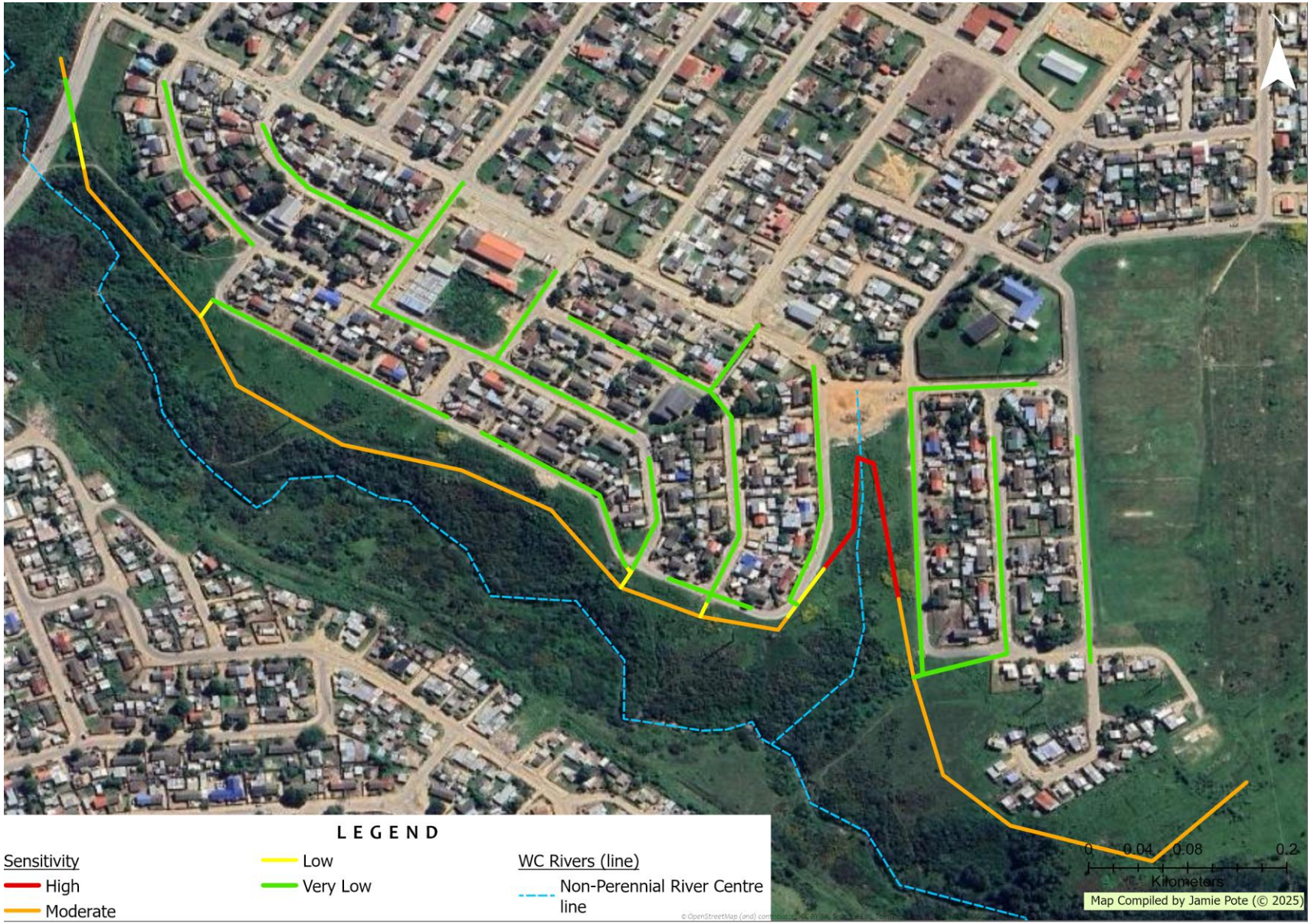


Figure 37: Vegetation Sensitivity of proposed site (Overview).

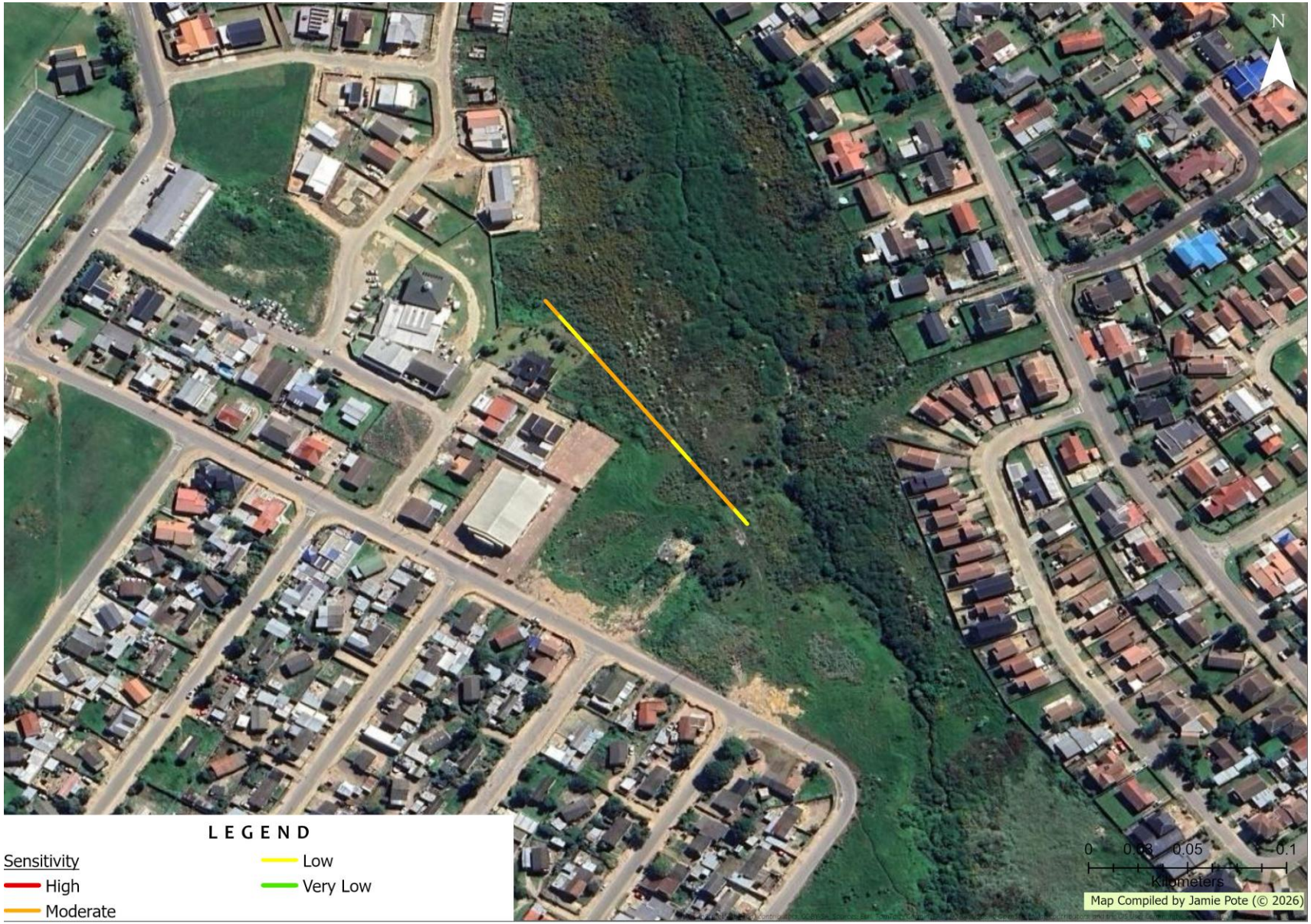


Figure 38: Vegetation Sensitivity of proposed site (Overview) – Additional northern section.

3.2 Risks and Potential Impacts to Biodiversity

3.2.1 Summary of actions, activities, or processes that require mitigation.

The main impacts associated with the unauthorised activity include the following and are described in Table 7:

1. Permanent or temporary loss of indigenous vegetation cover.
2. Loss of flora Species of Conservation Concern.
3. Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species.
4. Susceptibility of some areas to erosion associated with slopes and proximity to watercourses.
5. Disturbances to ecological processes.
6. Aquatic and Riparian processes.
7. Loss of faunal Species of Conservation Concern.
8. Loss of Faunal Habitat and processes.

3.2.2 Potential Terrestrial Biodiversity Impacts (Indirect)

No significant indirect impacts are anticipated.

3.2.3 Potential Terrestrial Biodiversity Impacts (Direct)

Overall impacts to terrestrial biodiversity are likely to be nominal, with loss resulting from removal of small footprints within the vegetated areas. As indicated in Figure 37, the proposed activity will require clearing of some vegetation along the watercourses in order to excavate temporary trenches install the sewer pipelines. The proposed activity, having a negligible footprint within significantly modified habitat, is thus unlikely to significantly impact terrestrial biodiversity above current baseline levels, as it will be a temporary activity and will likely return to a pre-construction state within two years.

Table 7: Potential Impacts to Terrestrial Biodiversity.

IMPACT	Nature of Impact
Vegetation	Permanent or temporary loss of indigenous vegetation cover because of site clearing. Site clearing before construction will result in the blanket clearing of vegetation within the affected footprint.
Flora Species[7]	Loss of flora Species of Conservation Concern during pre-construction site clearing activities. Several Species of Conservation Concern are known from surrounding areas, which could be destroyed during site preparation, none of which were confirmed to be present.
Alien Invasive Species	Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species and removal of exotic and alien invasive species during construction. Post construction disturbed areas having no vegetation cover are often susceptible to invasion by weedy and alien species, which can not only become invasive but also prevent natural flora from becoming established.
Erosion	Susceptibility of some areas to erosion because of construction related disturbances on slopes or in proximity to watercourses. Removal of vegetation cover and soil disturbance may result in some areas being susceptible to soil erosion after completion of the activity.
Ecological Processes	Disturbances to ecological processes: Activity may result in disturbances to ecological processes.

[7] Subject to findings of follow-up species survey.

IMPACT	Nature of Impact
Aquatic and Riparian processes	Aquatic and Riparian processes: None present/affected
Faunal Species	Loss of faunal SCC due to construction activities: Activities associated with bush clearing, killing of perceived dangerous fauna, may lead to increased mortalities among faunal species.
Faunal Habitat	Loss of Faunal Habitat: Activity may result in the loss of habitat for faunal species, which could result in disturbance and displacement of faunal species.
Faunal Processes	Impacts to faunal processes because of the activity

3.3 Assessment of Risks and Impacts to Biodiversity

3.3.1 Methodology to determine the significance ratings.

The assessment criteria utilised in the Basic Assessment Report are based on, and adapted from, the Guideline on Impact Significance, Integrated Environmental Management Information Series 5 (Department of Environmental Affairs and Tourism (DEAT), 2002) and the Guideline 5: Assessment of Alternatives and Impacts in Support of the Environmental Impact Assessment Regulations (DEAT, 2006).

Determination of Extent (Scale):

Site specific	On site or within 100 m of the site boundary, but not beyond the property boundaries.
Local	The impacted area includes the whole or a measurable portion of the site and property, but could affect the area surrounding the development, including the neighbouring properties and wider municipal area.
Regional	The impact would affect the broader region (e.g., neighbouring towns) beyond the boundaries of the adjacent properties.
National	The impact would affect the whole country (if applicable).

Determination of Duration:

Temporary	The impact will be limited to the construction phase.
Short term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than 8 months after the completion of the construction phase.
Medium term	The impact will last up to the end of the construction phase, where after it will be entirely negated in a period shorter than 3 years after the completion of construction activities.
Long term	The impact will continue for the entire operational lifetime of the development but will be mitigated by direct human action or by natural processes thereafter.
Permanent	This is the only class of impact that will be non-transitory. Such impacts are regarded to be irreversible, irrespective of what mitigation is applied.

Determination of Probability:

Improbable	The possibility of the impact occurring is very low, due either to the circumstances, design or experience.
Probable	There is a possibility that the impact will occur to the extent that provisions must therefore be made.
Highly probable	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up to mitigate the activity before the activity commences.
Definite	The impact will take place regardless of any prevention plans.

Determination of Significance (without mitigation):

No significance	The impact is not substantial and does not require any mitigation action.
Low	The impact is of little importance but may require limited mitigation.
Medium	The impact is of sufficient importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
Medium-High	The impact is of high importance and is therefore considered to have a negative impact. Mitigation is required to manage the negative impacts to acceptable levels.
High	The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.
Very High	The impact is critical. Mitigation measures cannot reduce the impact to acceptable levels. As such the impact renders the proposal unacceptable.

Determination of Significance (with mitigation):

No significance	The impact will be mitigated to the point where it is regarded to be insubstantial.
Low	The impact will be mitigated to the point where it is of limited importance.
Medium	Notwithstanding the successful implementation of the mitigation measures, the impact will remain of significance. However, taken within the overall context of the project, such a persistent impact does not constitute a fatal flaw.
High	Mitigation of the impact is not possible on a cost-effective basis. The impact continues to be of great importance, and taken within the overall context of the project, is considered to be a fatal flaw in the project proposal.

Determination of Reversibility:

Completely Reversible	The impact is reversible with implementation of minor mitigation measures
Partly Reversible	The impact is partly reversible but more intense mitigation measures
Barely Reversible	The impact is unlikely to be reversed even with intense mitigation measures
Irreversible	The impact is irreversible, and no mitigation measures exist

Determination of Degree to which an Impact can be Mitigated:

Can be mitigated	The impact is reversible with implementation of minor mitigation measures
Can be partly mitigated	The impact is partly reversible but more intense mitigation measures
Can be barely mitigated	The impact is unlikely to be reversed even with intense mitigation measures
Not able to mitigate	The impact is irreversible, and no mitigation measures exist

Determination of Loss of Resources:

No loss of resource	The impact will not result in the loss of any resources
Marginal loss of resource	The impact will result in marginal loss of resources
Significant loss of resources	The impact will result in significant loss of resources
Complete loss of resources	The impact will result in a complete loss of all resources

Determination of Cumulative Impact:

Negligible	The impact would result in negligible to no cumulative effects
Low	The impact would result in insignificant cumulative effects
Medium	The impact would result in minor cumulative effects
High	The impact would result in significant cumulative effects

Determination of Consequence significance:

Negligible	The impact would result in negligible to no consequences
Low	The impact would result in insignificant consequences
Medium	The impact would result in minor consequences
High	The impact would result in significant consequences

3.3.2 Assessment of Terrestrial Biodiversity Impacts

The proposed operations can result in a range of negative impacts on terrestrial ecosystems if not effectively managed. Table 7 describes impacts that may potentially occur in the site (as per DEDEAT guidelines) as well indicating the relevant EMP section. The predicted significance of these during the construction phase are summarised below.

Construction Phase

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Construction Phase		
Terrestrial Assessment Impact 1		
Potential impact and risk:	**Permanent or temporary loss of indigenous vegetation cover:** Permanent or temporary loss of indigenous vegetation cover because of site clearing. Site clearing before construction will result in the blanket clearing of vegetation within the affected footprint.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Short Term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Definite**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**Moderate**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • No clearing outside of development footprint to take place. • Areas surrounding the footprints should be revegetated on completion of construction.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**

Construction Phase		
Terrestrial Assessment Impact 2		
Potential impact and risk:	**Loss of flora Species of Conservation Concern:** Loss of flora Species of Conservation Concern during pre-construction site clearing activities. Several Species of Conservation Concern are known from surrounding areas, which could be destroyed during site preparation, none of which were confirmed to be present.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Short Term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**Moderate**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • A flora search and rescue is unlikely to be required and no protected flora were found to be present within a natural context.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Construction Phase		
Terrestrial Assessment Impact 3		
Potential impact and risk:	**Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species:** Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species and removal of exotic and alien invasive species during construction. Post construction disturbed areas having no vegetation cover are often susceptible to invasion by weedy and alien species, which can not only become invasive but also prevent natural flora from becoming established.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Medium**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Highly Probable**	

Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**Moderate**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Construction Phase		
Terrestrial Assessment Impact 4		
Potential impact and risk:	**Susceptibility of some areas to erosion associated with slopes and proximity to watercourses:** Susceptibility of some areas to erosion because of construction related disturbances on slopes or in proximity to watercourses. Removal of vegetation cover and soil disturbance may result in some areas being susceptible to soil erosion after completion of the activity.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Medium**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**Moderate**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	

Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • Suitable measures must be implemented where constructed on slopes to protected against erosion. • Areas must be rehabilitated, and a suitable indigenous grass seed mix planted where natural vegetation re-establishment does not occur.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Construction Phase		
Terrestrial Assessment Impact 5		
Potential impact and risk:	**Disturbances to ecological processes:** Disturbances to ecological processes: Activity may result in disturbances to ecological processes.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Short term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Construction Phase		
Terrestrial Assessment Impact 6		
Potential impact and risk:	**Aquatic and Riparian processes:** Aquatic and Riparian processes: None present/affected	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and very short term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	

Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium (-)**	
Degree to which the impact can be avoided:	**Moderate**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	**NO IMPACT**
Mitigation Measures: • Adequate measures to be implemented for erosion control in excavations during and after construction. • It is imperative that trenches near the watercourses (and the site as a while) are not left open for extended periods of time during construction.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Construction Phase		
Terrestrial Assessment Impact 7		
Potential impact and risk:	**Loss of faunal Species of Conservation Concern:** Loss of faunal SCC due to construction activities: Activities associated with bush clearing, killing of perceived dangerous fauna, may lead to increased mortalities among faunal species.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and very short term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	

Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Construction Phase		
Terrestrial Assessment Impact 8		
Potential impact and risk:	**Loss of Faunal Processes:** Impacts to faunal processes because of the activity	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and very short term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert. .		

Alternative:	Preferred Alternative	No-Go Alternative
Construction Phase		
Terrestrial Assessment Impact 9		
Potential impact and risk:	**Loss of Faunal Habitat:** Loss of Faunal Habitat: Activity may result in the loss of habitat for faunal species, which could result in disturbance and displacement of faunal species.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and very short term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**

Mitigation Measures:

- The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint above current baseline levels would be of low significance if mitigation measures are adhered to. Faunal Species
- Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity.
- A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure.
- No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert.

Site Closure & Rehabilitation Phase

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Operational Phase		
Terrestrial Assessment Impact 1		
Potential impact and risk:	**Permanent or temporary loss of indigenous vegetation cover:** Permanent or temporary loss of indigenous vegetation cover because of site clearing. Site clearing before construction will result in the blanket clearing of vegetation within the affected footprint.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Short Term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Definite**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • No clearing outside of development footprint to take place. • Areas surrounding the footprints should be revegetated on completion of construction.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Operational Phase		
Terrestrial Assessment Impact 2		
Potential impact and risk:	**Loss of flora Species of Conservation Concern:** Loss of flora Species of Conservation Concern during pre-construction site clearing activities. Several Species of Conservation Concern are known from surrounding areas, which could be destroyed during site preparation, none of which were confirmed to be present.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Short Term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	

Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • A flora search and rescue is unlikely to be required and no protected flora were found to be present within a natural context.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Operational Phase		
Terrestrial Assessment Impact 3		
Potential impact and risk:	**Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species:** Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species and removal of exotic and alien invasive species during construction. Post construction disturbed areas having no vegetation cover are often susceptible to invasion by weedy and alien species, which can not only become invasive but also prevent natural flora from becoming established.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Medium**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Highly Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**Moderate**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	

Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Operational Phase		
Terrestrial Assessment Impact 4		
Potential impact and risk:	**Susceptibility of some areas to erosion associated with slopes and proximity to watercourses:** Susceptibility of some areas to erosion because of construction related disturbances on slopes or in proximity to watercourses. Removal of vegetation cover and soil disturbance may result in some areas being susceptible to soil erosion after completion of the activity.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Medium**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**Moderate**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • Suitable measures must be implemented where constructed on slopes to protected against erosion. • Areas must be rehabilitated, and a suitable indigenous grass seed mix planted where natural vegetation re-establishment does not occur.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Operational Phase		
Terrestrial Assessment Impact 5		
Potential impact and risk:	**Disturbances to ecological processes:** Disturbances to ecological processes: Activity may result in disturbances to ecological processes.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and Short term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Operational Phase		
Terrestrial Assessment Impact 6		
Potential impact and risk:	**Aquatic and Riparian processes:** Aquatic and Riparian processes: None present/affected	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and very short term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium (-)**	
Degree to which the impact can be avoided:	**Moderate**	

Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	**NO IMPACT**
Mitigation Measures: • Adequate measures to be implemented for erosion control in excavations during and after construction. • It is imperative that trenches near the watercourses (and the site as a while) are not left open for extended periods of time during construction.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Operational Phase		
Terrestrial Assessment Impact 7		
Potential impact and risk:	**Loss of faunal Species of Conservation Concern:** Loss of faunal SCC due to construction activities: Activities associated with bush clearing, killing of perceived dangerous fauna, may lead to increased mortalities among faunal species.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and very short term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity.		

• A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert.

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Operational Phase		
Terrestrial Assessment Impact 8		
Potential impact and risk:	**Loss of Faunal Processes:** Impacts to faunal processes because of the activity	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and very short term**	
Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**
Mitigation Measures: • Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert.		

Alternative:	**Preferred Alternative**	**No-Go Alternative**
Operational Phase		
Terrestrial Assessment Impact 9		
Potential impact and risk:	**Loss of Faunal Habitat:** Loss of Faunal Habitat: Activity may result in the loss of habitat for faunal species, which could result in disturbance and displacement of faunal species.	
Nature of impact:	**Negative**	**NO IMPACT**
Extent and duration of impact:	**Local and very short term**	

Consequence of impact or risk:	**Low**	
Probability of occurrence:	**Probable**	
Degree to which the impact may cause irreplaceable loss of resources:	**Marginal loss of resource**	
Degree to which the impact can be reversed:	**High**	
Indirect impacts:	**None**	
Cumulative impact prior to mitigation:	**None**	
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (-)**	
Degree to which the impact can be avoided:	**High**	
Degree to which the impact can be managed:	**High**	
Degree to which the impact can be mitigated:	**Can be mitigated**	
Proposed mitigation:	**See below.**	
Residual impacts:	**None**	
Cumulative impact post mitigation:	**None**	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very Low (-)**	**NO IMPACT**

Mitigation Measures:

- The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint above current baseline levels would be of low significance if mitigation measures are adhered to. Faunal Species
- Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity.
- A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure.
- No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert.

Impacts to Aquatic & Riparian Processes are expected to be medium before mitigation and Low after mitigation. All other impacts are assessed to be of low significance before mitigation and can be reduced to very low (or insignificant) with the implementation of the mitigation measures.

Note: Since the installation of the pipeline is a temporary activity the 'operational phase is deemed to also be equivalent to the Site Closure and Rehabilitation Phase.

3.3.3 Potential Terrestrial Biodiversity Impacts (Cumulative)

No cumulative impacts are expected because of the development of the site providing recommendation and mitigation measures are adhered to, due to the limited disturbance area.

3.3.4 Terrestrial Biodiversity Impact Reversibility

In general, most impacts will have a high reversibility in the affected habitat as installation of sewer will be a temporary activity and will likely return to a pre-construction state within two years.

3.3.5 Impacts and Risks to Irreplaceable Biodiversity Resources

Risks to Irreplaceable Biodiversity Resources is low to very low.

3.3.6 Residual Risks and Uncertainties

No residual risks or uncertainties are anticipated.

3.4 Findings, Outcomes and Recommendations

3.4.1 Summary of Findings

- The vegetation on site is generally highly modified, degraded, transformed and/or comprising vegetation cover with little evidence of remnant natural vegetation (Garden Route Granite Fynbos).
- No Sensitive plant or Animal species identified as per the National Environmental Screening Tool were found to be present or likely to be present. The general vegetation cover along the remnant watercourses is primarily comprised of kikuyu grass (non-indigenous) and a wide range of invasive and weed herbaceous, shrub and tree species.
- Although areas are designated CBA 1 and CBA 2, these designations do not have remnant Garden Route Granite Fynbos vegetation. In terms of species composition. While the vegetated areas may provide habitat for faunal species, these are mostly species that are adapted to an urbanised environment.
- All of the portions of sewer within the residential area (roads and road verges) and are designated a VERY LOW SENSITIVITY.
- LOW SENSITITITY areas are vegetated but generally kikuyu grass and limited to a few sections where the sewer enters the vegetated area.
- Almost the entire vegetated area (i.e. the areas of the route that are adjacent to the watercourse but on the upper banks where little to no natural riverine vegetation persists are designated a MODERATE sensitivity, where exotic and invasive species comprise most of the vegetation cover, but with some indigenous elements.
- VERY HIGH sensitivity portions are designated where Watercourses and riparian vegetation, although primarily exotic species) is present. This is limited to a single area where a 'watercourse' crossing is present. The high sensitivity is given more for the sake of highlighting that additional precautions will be required during construction, being a watercourse, rather than elevated ecological sensitivity as the area is also highly modified. Since the primary objective is to improve sewerage management and improve capacity, the overall impact of the sewer pipelines is not significantly negative within the broader context of the site and surrounds.
- No VERY HIGH sensitivity areas are identified but limited to the terrestrial environment and excludes aquatic processes, which is outside of the scope of this terrestrial assessment.
- No No-go areas are identified within the site footprint.
- No significant direct, indirect or cumulative impacts are anticipated.

3.4.2 Recommendations & Mitigation Measures

- The proposed activity is unlikely to pose any significant risk to natural ecological processes; vegetarian or plant and animal species of conservation concern due to the limited footprint and significantly degraded and/or transformed nature of the site(s).
- No PNCO protected species were recorded within any of the proposed sewer pipeline footprints. PNCO (Provincial Nature Conservation Ordinance) permits are not likely to be required for any naturally occurring indigenous species.

- The proposed activity, having a negligible footprint within significantly modified habitat, is thus unlikely to significantly impact any ecological process, intact vegetation with an elevated conservation status or species above current baseline levels, as it will be a temporary activity and will likely return to a pre-construction state within two years.

Table 8 lists specific mitigation measures that must be implemented and adhered to. These must be considered to be conditions of authorisation.

Table 8: Specific Mitigation Measures and Recommendations

IMPACT	MITIGATION MEASURES
Vegetation	• No clearing outside of development footprint to take place. • Areas surrounding the footprints should be revegetated on completion of construction.
Flora Species	• A flora search and rescue is unlikely to be required and no protected flora were found to be present within a natural context.
Alien Invasive Species	• A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion.
Erosion	• Suitable measures must be implemented where constructed on slopes to protected against erosion. • Areas must be rehabilitated, and a suitable indigenous grass seed mix planted where natural vegetation re-establishment does not occur.
Aquatic and Riparian processes	• Adequate measures to be implemented for erosion control in excavations during and after construction. • It is imperative that trenches near the watercourses (and the site as a while) are not left open for extended periods of time during construction.
Faunal Processes	• The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint above current baseline levels would be of low significance if mitigation measures are adhered to.
Faunal Species	• Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert. .

3.5 Site Preparation and Vegetation Clearing Plan

No flora relocation is likely to be required before commencement, and flora permits are unlikely to be required.

No fauna relocation is likely to be required before commencement, and permits were unlikely to be required for any species of conservation concern but recommended as a precautionary measure for any small rodents and reptiles may occur, and since fauna are mobile, they may be transient to the area.

3.6 Open Space Management/Conservation Plan

None are applicable for this project.

3.7 Maintenance Management Plan

Ongoing maintenance is likely to be required in the long-term, which could include ongoing repairs to sewer pipelines. All measures of this report, including the EMPr should be adhered for any maintenance requirements during the operation phase. Any excavated areas must be stabilised and rehabilitated as per the measures indicated in this report.

4 Organizational Capacity and Competency

Successful Implementation will be in part be dependent on the organisational capacity and competency of the applicant and any implementing agents. The following aspects are likely to pose risk to the successful mitigation of the project:

- Budget constraints – budget allocated for environmental management tends to be inadequate for construction projects.
- Organisational Structure – implementing agents may or may not have adequate capacity and competency to ensure appropriate and adequate environmental management.

5 Emergency Preparedness and Response

Emergency Preparedness Plan must be included in the EMPr and should address specific measures relating to the following emergency risks:

- Fire management and response.
- Spill management and incident response.
- Waste management and incident response.
- Response to emergency site shutdown, including labour and protest actions.

6 Stakeholder Engagement

Possible Stakeholders relating to Biodiversity could include the following key groups:

- Neighbouring Property Owners
- Local Regional and National Conservation Authorities

No Stakeholder Engagement was conducted specifically by the Specialist. Stakeholder Engagement will be undertaken by the EAP as part of the environment application public participatory process. Any comments raised relating to Biodiversity will be addressed by the specialist in the final report.

7 Monitoring and Review

Key monitoring activities should include the following:

1. Pre-construction
   a) Ensure flora permits are in place timeously (PNCO only) – allow at least 1 or 2 months before commencement.
   b) Environmental Awareness and training (EAT) – Ensure all labour are informed and plant operators are aware of risks, issues, do's and don'ts and no-go areas.
2. Bush clearing
   a) Ensure working plant has no oil or hydraulic leaks
   b) Check delineated footprints area not exceeded.

3. Construction
   a) Regular checks on trenches for trapped animals and possible drowning risks
   b) Regular checks of fences for snares
4. Rehabilitation
   a) Check quality of topsoil and weed free.
   b) Check for weed regrowth and manage timeously (before seed is set)
5. Operation monitoring
   a) Weed management on ongoing basis.
   b) Erosion to be addressed on ongoing basis

8 Appendices

8.1 Appendix A: References

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- World Resources Institute (WRI): https://www.wri.org

8.2 Appendix B: Abbreviations & Glossary

8.2.1 Abbreviations

CARA	Conservation of Agricultural Resources Act, Act 43 of 1983
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs (*now DFFE, see below*)
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism
DFFE	The Department of Environmental Affairs was renamed the Department of Forestry, Fisheries & the Environment (DFFE) in April 2021, incorporating the forestry and fisheries functions from the previous Department of Agriculture, Forestry and Fisheries.
DEMC	Desired Ecological Management Class
DWS	Department of Water Affairs and Sanitation
DWAF	Department of Water Affairs and Forestry (former department name)
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMC	Ecological Management Class
EMP	Environmental Management Plan
EMPr	Environmental Management Programme report
ER	Environmental Representative
ESS	Ecosystem Services
IAP's	Interested and Affected Parties
IEM	Integrated Environmental Management
LM	Local Municipality
masl	meters above sea level
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, Act 107 of 1998
NFA	National Forests Act
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NFA	National Forest Act, Act 84 of 1998
PEMC	Present Ecological Management Class
PES	Present Ecological State
PNCO	Provincial Nature and Environment Conservation Ordinance (No. 19 of 1974).
RDL	Red Data List
RHS	Right Hand Side
RoD	Record of Decision
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SoER	State of the Environment Report
SSC	Species of Special Concern
ToPS	Threatened of Protected Species
ToR	Terms of Reference
+ve	Positive
-ve	Negative

8.2.2 Glossary

Alien Invasive Species (AIS)	An alien species whose introduction and/or spread threaten biological diversity (Convention on Biological Diversity). Note: "*Alien invasive species*" is considered to be equivalent to "*invasive alien species*". An alien species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity (*IUCN*).
Best Environmental Practice	The application of the most appropriate combination of environmental control measures and strategies (Stockholm Convention).
Best Management Practice	Established techniques or methodologies that, through experience and research, have proven to lead to a desired result (BBOP).
Biodiversity	Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.
Biodiversity Offset	Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure and ecosystem function and people's use and cultural values associated with biodiversity (BBOP).
Bioremediation	The use of organisms such as plants or microorganisms to aid in removing hazardous substances from an area. Any process that uses microorganisms, fungi, green plants, or their enzymes to return the natural environment altered by contaminants to its original condition.
Boundary	Landscape patches have a boundary between them which can be defined or fuzzy (Sanderson and Harris, 2000). The zone composed of the edges of adjacent ecosystems is the boundary.
Catchment	In relation to a watercourse or watercourses or part of a watercourse, means the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points.
Connectivity	The measure of how connected or spatially continuous a corridor, network, or matrix is. For example, a forested landscape (the matrix) with fewer gaps in forest cover (open patches) will have higher connectivity.
Corridors	Have important functions as strips of a landscape differing from adjacent land on both sides. Habitat, ecosystems or undeveloped areas that physically connect habitat patches. Smaller, intervening patches of surviving habitat can also serve as "steppingstones" that link fragmented ecosystems by ensuring that certain ecological processes are maintained within and between groups of habitat fragments.
Critically Endangered (CR)	A category on the IUCN Red List of Threatened Species which indicates a taxon is considered to be facing an extremely high risk of extinction in the wild (*IUCN*).
Cultural Ecosystem Services	The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including, e.g. knowledge systems, social relations, and aesthetic values (Millennium Ecosystem Assessment).
Cumulative Impacts	The total impact arising from the project (under the control of the developer), other activities (that may be under the control of others, including other developers, local communities, government) and other background pressures

	and trends which may be unregulated. The project's impact is therefore one part of the total cumulative impact on the environment. The analysis of a project's incremental impacts combined with the effects of other projects can often give a more accurate understanding of the likely results of the project's presence than just considering its impacts in isolation (BBOP).
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat(*IUCN*).
Degraded Habitat/Land	Land that has been impacted upon by human activities (including introduction of invasive alien plants, light to moderate overgrazing, accelerated soil erosion, dumping of waste), but still retains a degree of its original structure and species composition (although some species loss would have occurred) and where ecological processes still occur (albeit in an altered way). Degraded land is capable of being restored to a near-natural state with appropriate ecological management.
Disturbance	An event that significantly alters the pattern of variation in the structure or function of a system, while fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. Disturbance is generally considered a natural process.
Ecological Function	How each of the elements in the landscape interacts based on its life cycle events [Producers, Consumers, Decomposers Transformers]. Includes the capacity of natural processes and components to provide goods and services that satisfy human needs, either directly or indirectly.
Ecological Pattern	The contents and internal order of the landscape, or its spatial (and temporal) components. May be homogenous or heterogenous. Result from the ecological processes that produce them.
Ecological Process	Includes *Physical processes* [Climate (precipitation, insolation), hydrology, geomorphology]; *Biological processes* [Photosynthesis, respiration, reproduction]; *Ecological processes* [Competition, predator-prey interactions, environmental gradients, life histories]
Ecological Processes	Ecological processes typically only function well where natural vegetation remains, and where the remaining vegetation is well-connected with other nearby patches of natural vegetation. Loss and fragmentation of natural habitat severely threaten the integrity of ecological processes. Where basic processes are intact, ecosystems are likely to recover more easily from disturbances or inappropriate actions if the actions themselves are not permanent. Conversely, the more interference there has been with basic processes, the greater the severity (and longevity) of effects. Natural processes are complex and interdependent, and it is not possible to predict all the consequences of loss of biodiversity or ecosystem integrity. When a region's natural or historic level of diversity and integrity is maintained, higher levels of system productivity are supported in the long run, and the overall effects of disturbances may be dampened.
Ecological Structure	The composition, or configuration, and the proportion of different patches across the landscape. Relates to species diversity, the greater the diversity, the more complex the structure. A description of the organisms and physical features of environment including nutrients and climatic conditions.
Ecosystem	All the organisms of a habitat, such as a lake or forest, together with the physical environment in which they live. A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Ecosystem Services	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Supporting Ecosystem services are those that are necessary for the maintenance of all other ecosystem services. Some examples include biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat.
Ecosystem Status	Ecosystem status of terrestrial ecosystems is based on the degree of habitat loss that has occurred in each ecosystem, relative to two thresholds: one for maintaining healthy ecosystem functioning, and one for conserving the majority of species associated with the ecosystem. As natural habitat is lost in an ecosystem, its functioning is increasingly compromised, leading eventually to the collapse of the ecosystem and to loss of species associated with that ecosystem (Millennium Ecosystem Assessment).
Ecotone	The transitional zone between two communities. Ecotones can arise naturally, such as a lakeshore, or can be human created, such as a cleared agricultural field from a forest. The ecotonal community retains characteristics of each bordering community and often contains species not found in the adjacent communities. Classic examples of ecotones include fencerows; forest to marshlands transitions; forest to grassland transitions; or land-water interfaces such as riparian zones in forests. Characteristics of ecotones include vegetational sharpness, physiognomic change, and occurrence of a spatial community mosaic, many exotic species, ecotonal species, spatial mass effect, and species richness higher or lower than either side of the ecotone.
Edge	The portion of an ecosystem near its perimeter, where influences of the adjacent patches can cause an environmental difference between the interior of the patch and its edge. This edge effect includes a distinctive species composition or abundance in the outer part of the landscape patch. For example, when a landscape is a mosaic of perceptibly different types, such as a forest adjacent to a grassland, the edge is the location where the two types adjoin. In a continuous landscape, such as a forest giving way to open woodland, the exact edge location is fuzzy and is sometimes determined by a local gradient exceeding a threshold, as an example, the point where the tree cover falls below thirty-five percent.
Emergent Tree	Trees that grow above the top of the canopy
Endangered (En)	Endangered terrestrial ecosystems have lost significant amounts (more than 60 % lost) of their original natural habitat, so their functioning is compromised. A taxon (species) is Endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild (*IUCN*).
Endemic	A plant or animal species, or a vegetation type, which is naturally restricted to a defined region or limited geographical area. Many endemic species have widespread distributions and are common and thus are not considered to be under any threat. They are however noted to be unique to a region, which can include South Africa, a specific province or a bioregion, vegetation type, or a localised area. In cases where it is highly localised or known only from a few or a few localities, and is under threat, it may be red listed either in terms of the South Africa Threatened Species Programme, NEMBA Threatened or Protected Species (ToPS) or the IUCN Red List of Threated Species.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Estuary	a partially or fully enclosed body of water - (a) which is open to the sea permanently or periodically; and

	(b) within which the sea water can be diluted, to an extent that is measurable, with fresh water drained from land.
Evolutionary Processes	The process by which genetic changes have taken place and continue to take place in populations of plants and animals over successive generations in response to environmental changes. Evolutionary Processes includes the mechanisms that produce the biodiversity of life and include Mutation and Migration (Gene Flow), Genetic Drift, Natural Selection, Common Descent, Speciation, Sexual Selection, and Biogeography. Disruptions to evolutionary processes can prevent ecosystems and species from adapting to environmental change over time. Significant fragmentation is considered to be an important disrupter of evolutionary processes. Series of actions which enable new species to evolve in response to changing Biodiversity is maintained by ecological processes at the micro-scale (such as in pollination and nutrient cycling via microbial action) through to the mega-scale (natural events e.g. fire, flood; migration of species along river valleys or coastal areas, quality and quantity of water feeding rivers and estuaries; marine sand movement and the seasonal mountain-to-coast migration of birds that pollinate plants).
Exotic	Non-indigenous; introduced from elsewhere, may also be a *weed* or alien *invasive* species. Exotic species may be invasive or non-invasive.
Fragmentation (Habitat Fragmentation)	The 'breaking apart' of continuous habitat into distinct pieces. Causes land transformation, an important current process in landscapes as more and more development occurs.
Habitat	The home of a plant or animal species. Generally, those features of an area inhabited by animal or plant which are essential to its survival.
Habitat Banking	A market where credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage. Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time (IEEP).
IFC PS6	International Finance Corporation Performance Standard 6 – A standard guiding biodiversity conservation and sustainable management of living natural resources for projects financed by the International Finance Corporation (IFC)
Indicator	Information based on measured data used to represent an attribute, characteristic, or property of a system.
Indicator species	A species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem. They reflect the quality and changes in environmental conditions as well as aspects of community composition.
Indigenous	Native; occurring naturally in a defined area.
Indigenous Species (Native species)	A species that has been observed in the form of a naturally occurring and self-sustaining population in historical times (*Bern Convention 1979*). A species or lower taxon living within its natural range (past or present) including the area which it can reach and occupy using its natural dispersal systems (*modified after the Convention on Biological Diversity*)
Indirect Impact	Impacts triggered in response to the presence of a project, rather than being directly caused by the project's own operations (BBOP)
Instream habitat	Includes the physical structure of a watercourse and the associated vegetation in relation to the bed of the watercourse;
Intact Habitat / Vegetation	Land that has not been significantly impacted upon by man's activities. These are ecosystems that are in a near-pristine condition in terms of structure, species composition and functioning of ecological processes.
Intrinsic Value	The inherent worth of something, independent of its value to anyone or anything else.

Keystone Species	Species whose influence on ecosystem function and diversity are disproportionate to their numerical abundance. Although all species interact, the interactions of some species are more profound and far-reaching than others, such that their elimination from an ecosystem often triggers cascades of direct and indirect changes on more than a single trophic level, leading eventually to losses of habitats and extirpation of other species in the food web.
Landscape	An area of land that contains a mosaic of ecosystems, including human-dominated ecosystems (Millennium Ecosystem Assessment).
Landscape Approach	Dealing with large-scale processes in an integrated and multidisciplinary manner, combining natural resources management with environmental and livelihood considerations (FAO).
Landscape connectivity	The degree to which the landscape facilitates or impedes movement among resource patches.
Least threatened / Least Concern (LC)	These ecosystems have lost only a small proportion (more than 80 % remains) of their original natural habitat and are largely intact (although they may be degraded to varying degrees, for example by invasive alien species, overgrazing, or overharvesting from the wild). A taxon (species) is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category (*IUCN*).
Matrix	The "*background ecological system*" of a landscape with a high degree of connectivity.
Natural Forest (Indigenous Forest)	The definition of "*natural forest*" in the National Forests Act of 1998 (NFA) Section 2(1)(xx) is as follows: 'A natural forest means a group of indigenous trees. • whose crowns are largely contiguous. • or which have been declared by the Minister to be a natural forest under section 7(2)? This definition should be read in conjunction with Section 2(1)(x) which states that 'Forest' includes: • A natural forest, a woodland, and a plantation • The forest-produce in it; and • The ecosystems which it makes up. The legal definition must be supported by a technical definition, as demonstrated by a court case in the Umzimkulu magisterial district, relating to the illegal felling of Yellowwood (Podocarpus latifolius) and other species in the Gonqogonqo forest. From scientific definitions (also see Appendix B) we can define natural forest as: • A generally multi-layered vegetation unit • Dominated by trees that are largely evergreen or semi-deciduous. • The combined tree strata have overlapping crowns, and crown cover is >75% • Grasses in the herbaceous stratum (if present) are generally rare. • Fire does not normally play a major role in forest function and dynamics except at the fringes. • The species of all plant growth forms must be typical of natural forest (check for indicator species) • The forest must be one of the national forest types
Near Threatened (NT)	A taxon (species) is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable

	now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (*IUCN*).
Patch	A term fundamental to landscape ecology, is defined as a relatively homogeneous area that differs from its surroundings. Patches are the basic unit of the landscape that change and fluctuate, a process called patch dynamics. Patches have a definite shape and spatial configuration and can be described compositionally by internal variables such as number of trees, number of tree species, height of trees, or other similar measurements.
Protected Area	A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.
Range restricted species	Species with a geographically restricted area of distribution. Note: Within the IFC PS6, restricted range refers to a limited extent of occurrence (EOO): • For terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 square kilometres (km2).
Refugia	A location which supports an isolated or relict population of a once more widespread species. This isolation can be due to climatic changes, geography, or human activities such as deforestation and overhunting.
Rehabilitation	Measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised. Rehabilitation emphasizes the reparation of ecosystem processes, productivity and services, whereas the goals of restoration also include the re-establishment of the pre-existing biotic integrity in terms of species composition and community structure (BBOP).
Resilience	The capacity of a natural system to recover from disturbance (OECD).
Restoration	The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. An ecosystem has recovered when it contains sufficient biotic and abiotic resources to continue its development without further assistance or subsidy. It would sustain itself structurally and functionally, demonstrate resilience to normal ranges of environmental stress and disturbance, and interact with contiguous ecosystems in terms of biotic and abiotic flows and cultural interactions (IFC).
Riparian	Pertaining to, situated on or associated with the banks of a watercourse, usually a river or stream.
Riparian Habitat	Includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.
River Corridors	River corridors perform several ecological functions such as modulating stream flow, storing water, removing harmful materials from water, and providing habitat for aquatic and terrestrial plants and animals. These corridors also have vegetation and soil characteristics distinctly different from surrounding uplands and support higher levels of species diversity, species densities, and rates of biological productivity than most other landscape elements. Rivers provide for migration and exchange between inland and coastal biotas.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED).
Terrestrial	Occurring on, or inhabiting, land.
Threatened Species	Umbrella term for any species categorised as Critically Endangered, Endangered or Vulnerable by the IUCN Red List of Threatened Species (*IUCN*). Any species that

	is likely to become extinct within the foreseeable future throughout all or part of its range and whose survival is unlikely if the factors causing numerical decline or habitat degradation continue to operate (EU).
Traditional Ecological Knowledge	Knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, and forestry (CBD).
Transformation	In ecology, transformation refers to adverse changes to biodiversity, typically habitats or ecosystems, through processes such as cultivation, forestry, drainage of wetlands, urban development or invasion by alien plants or animals. Transformation results in habitat fragmentation – the breaking up of a continuous habitat, ecosystem, or land-use type into smaller fragments.
Transformed Habitat/Land	Land that has been significantly impacted upon as a result of human interferences/disturbances (such as cultivation, urban development, mining, landscaping, severe overgrazing), and where the original structure, species composition and functioning of ecological processes have been irreversibly altered. Transformed habitats are not capable of being restored to their original states.
Tributary	A small stream or river flowing into a larger one.
Untransformed Habitat/Land	Land that has not been significantly impacted upon by man's activities. These are ecosystems that are in a near-pristine condition in terms of structure, species composition and functioning of ecological processes.
Vulnerable (Vu)	Vulnerable terrestrial ecosystems have lost some (more than 60 % remains) of their original natural habitat and their functioning will be compromised if they continue to lose natural habitat. A taxon (species) is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild (*IUCN*).
Watercourse	Natural or man-made channel through or along which water may flow. 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 a reference to a watercourse includes, where relevant, its bed and banks;
Weed	An indigenous or non-indigenous plant that grows and reproduces aggressively, usually a ruderal pioneer of disturbed areas. Weeds may be unwanted because they are unsightly, or they limit the growth of other plants by blocking light or using up nutrients from the soil. They can also harbour and spread plant pathogens. Weeds are generally known to proliferate through the production of large quantities of seed.
Wetlands	A collective term used to describe lands that are sometimes or always covered by shallow water or have saturated soils, and where plants adapted for life in wet conditions usually grow.

8.3 Appendix C: Biodiversity Environmental Management Plan

Specific measures relating to management of Biodiversity Impacts that must be included in the project Environmental Management Programme (EMPr). This Environmental Management Plan (EMP) contains guidelines, operating procedures and rehabilitation control requirements, which will be binding on the holder of the environmental authorisation after approval of the EMP. The impacts identified and listed in Section 3.3 will be managed / controlled as set out under mitigating measures and as detailed in this section, which provides general management guidelines, which may or may not be appropriate, depending on the specific circumstances.

8.3.1 Protection of Flora and Fauna

The following actions must be implemented at construction phase, where deemed necessary.

- Search and rescue operations for Species of Conservation Concern *must* be undertaken before the commencement of site clearing activities.
- Indigenous vegetation encountered on the sites that are to be conserved and left intact.
- It is important that clearing activities are kept to the minimum and take place in a phased manner. This allows animal species to move into safe areas and prevents wind and water erosion of the cleared areas.
- Stripped vegetation *should* be temporarily stored during operations and to be used later to stabilise slopes. This excludes exotic invasive species.
- No animals are to be harmed or killed during the course of operations.
- Workers are NOT allowed to collect any flora or snare any faunal species. All flora and fauna remain the property of the landowner and *must* not be disturbed, upset or used without their expressed consent.
- It is the responsibility of the Contractor to provide sufficient fuel for cooking and heated as needed by the staff.
- No domestic animals are permitted on the sites.
- Trees and shrubs that are directly affected by the operations may be felled or cleared but only by the expressed written permission of the ECO.
- Rehabilitation of vegetation of the site *must* be done as described in the Rehabilitation Plans.

Flora Search and Rescue

The following flora relocation plan is recommended, where deemed necessary:

- Once the final layout has been determined the botanist will be consulted in order to finalise the plant relocation and vegetation clearing plan.
- Respective permits to be obtained.
- Flora search and rescue is to be conducted before vegetation clearing takes place.
- Areas should only be stripped of vegetation as and when required and once species of special concern have been relocated for that area.
- Once site clearing is to commence, the area to be cleared of vegetation will be surveyed by the vegetation and plant search and rescue team clearing under the supervision of the botanist to identify and remove species suitable for rescue and commence removal of plants.
- These species are to be replanted immediately in a suitable area of similar vegetation, where future development is unlikely to occur, or within a nearby protected area.

Fauna Search and Rescue

The following fauna relocation plan is recommended for inclusion in the EMP and Fauna removal permit applications, where deemed necessary:

- An on-foot search, conducted by a professional reptile handler/team, is to be carried out to search for reptiles within every possible habitat.

- Once caught, each reptile will be placed into transport containers suited for that individual reptile.
- The transport containers must be kept cool to decrease stress for the reptiles.
- The reptiles will be relocated as soon as possible after they have been caught.
- Professional equipment will be used to ensure limited harm to the reptiles and to prevent the team members from being bitten by venomous snakes.
- Nooses should not be used as they cause injury to lizards.
- Safety procedures will be in place for the release of the reptiles.
- Amphibians should be caught by hand and net.
- Amphibians must be placed into transport containers with damp substrates to avoid dehydration.
- Tadpoles may be collected, placed into water containers and released as soon as possible, where required.
- During release, the tadpoles will be allowed to acclimatize to the new water in terms of temperature, pH etc.
- Small mammals will be caught with nets and by hand. They will then be transported in carry cages and released as soon as possible.
- No immobilizers or tranquilizers will be used on the mammals.

8.3.2 Alien and Invasive Plan Management Plan

The following mitigation measures have been identified in order to ensure that the introduction and spread of alien invasive vegetation is minimised, where deemed necessary:

- Alien species must be removed from the site as per the National Environmental Management: Biodiversity Act (No. 10 of 2004) requirements.
- A suitable weed management strategy must be implemented in the construction phase and carried through the operational (Site Closure and Rehabilitation) phase.
- Weeds and alien species *must* be cleared by hand before the rehabilitation phase of the areas. Removal of alien plants are to be done according to the Working for Water Guidelines.
- The Contractor is responsible for the removal of alien species within all areas disturbed during construction activities. Disturbed areas include (but are not limited to) access roads, construction camps, site areas and temporary storage areas.
- In consultation with relevant authorities, the Engineer may order the removal of alien plants (when necessary). Areas within the confines of the site are to be included.
- All alien plant material (including brushwood and seeds) should be removed from site and disposed of at a registered waste disposal site. Should brushwood be utilised for soil stabilization or mulching, it must be seed free.
- After clearing is completed, an appropriate cover crop may be required, should natural re-establishment of grasses not take place in a timely manner.

8.3.3 Fires

The following mitigation measures have been identified in order to minimise fire risks, where deemed necessary:

- The Contractor must ensure that an emergency preparedness plan is in place in order to fight accidental fires or veld fires, should they occur. The adjacent landowners/users/managers *should* also be informed or otherwise involved.
- Enclosed areas for food preparation should be provided and the Contractor *must* strictly prohibit the use of open fires for cooking and heating purposes.
- The use of branches of trees and shrubs for fire-making *must* be strictly prohibited.
- The Contractor *should* take all reasonable and active steps to avoid increasing the risk of fire through their activities on-site. No fires may be lit except at places approved by the ECO.

- The Contractor *must* ensure that the basic fire-fighting equipment is to the satisfaction of the Local Emergency Services.
- The Contractor *must* supply all living quarters, site offices, kitchen areas, workshop areas, materials, stores and any other relevant areas with tested and approved fire-fighting equipment.
- Fires and "hot work" *must* be restricted to demarcated areas.
- A braai facility may be considered at the discretion of the Contractor and in consultation with the ECO. The area *must* be away from flammable stores. All events must be under management's supervision and a fire extinguisher *will* be immediately available. "Low-smoke" fuels must be used (e.g. charcoal) and smoke control regulations, if applicable, must be considered.
- The Contractor *must* take precautions when working with welding or grinding equipment near potential sources of combustion. Such precautions include having a suitable, tested and approved fire extinguisher immediately at hand and the use of welding curtains.

8.3.4 Soil Aspects

The following mitigation measures have been identified in order to minimise soil loss, where deemed necessary:

- Sufficient topsoil must be stored for later use during decommissioning, particularly from outcrop areas.
- Topsoil shall be removed from all areas where physical disturbance of the surface will occur.
- All available topsoil shall be removed after consultation with the botanist and horticulturalist prior to commencement of any operations.
- The removed topsoil shall be stored on high ground within the site footprint outside the 1:50 flood level within demarcated areas.
- Topsoil shall be kept separate from overburden and shall not be used for building or maintenance of roads.
- The stockpiled topsoil shall be protected from being blown away or being eroded. The application of a suitable grass seed/runner mix will facilitate this and reduce the minimise weeds.

8.3.5 Dust

The following mitigation measures have been identified in order to minimise dust, where deemed necessary:

- To manage complaints relation to impacts on the nearby communities, a dust register *will* be developed.
- If required, water spray vehicles *will* be used to control wind cause by strong winds during activities on the works.
- No over-watering of the site or road surfaces.
- Wind screens *should* be used to reduce wind and dust in open areas.

8.3.6 Infrastructural Requirements

The following mitigation measures have been identified in order to minimise impacts of infrastructure requirements, where deemed necessary:

Topsoil

- Topsoil shall be removed from all areas where physical disturbance of the surface will occur.
- All available topsoil shall be removed after consultation with the Regional Manager prior to commencement of any operations.

- The removed topsoil shall be stored on high ground within the footprint outside the 1:50 flood level within demarcated areas (Appendix 1)
- Topsoil shall be kept separate from overburden and shall not be used for building or maintenance of roads.
- The stockpiled topsoil shall be protected from being blown away or being eroded. The use of a suitable grass seed/runner mix will facilitate soil protection and minimise weeds/weed growth.

Stormwater and Erosion Control

- Stormwater Management Plans *must* be developed for the site and should include the following:
  - The management of stormwater during construction.
  - The installation of stormwater and erosion control infrastructure.
  - The management of infrastructure after completion of construction.
- Temporary drainage works may be required to prevent stormwater to prevent silt laden surface water from draining into river systems in proximity to the site. Stormwater *must* be prevented from entering or running off site.
- To ensure that site is not subjected to excessive erosion and capable of drainage runoff with minimum risk of scour, their slopes *should* be profiled at a maximum 1:3 gradient.
- Diversion channels *should* be constructed ahead of the open cuts, and above emplacement areas and stockpiles to intercept clean runoff and divert it around disturbed areas into the natural drainage system downstream of the site.
- Rehabilitation is necessary to control erosion and sedimentation of all eroded areas (where works will take place).
- Existing vegetation *must* be retained as far as possible to minimise erosion problems.
- It is importation that the rehabilitation of site is planned and completed in such a way that the runoff water will not cause erosion.
- Visual inspections *will* be done on a regular basis with regard to the stability of water control structure, erosion and siltation.
- Sediment-laden runoff from cleared areas *must* be prevented from entering rivers and streams.
- No river or surface water may be affected by silt emanating from the site.

Site Office / Camp Sites

- No site offices or camp sites will be constructed on the site under current operating conditions, existing structures will be used.

Operating Procedures in the Site

- Construction shall only take place within the approved demarcated site.
- Construction may be limited to the areas indicated by the Regional Manager on assessment of the application.
- The holder of the environmental authorisation shall ensure that operations take place only in the demarcated areas as described in this report.
- Watering to minimise the effect of dust generation should be carried out as frequently as necessary. Noise should also be kept within reason.
- No workers will be allowed to damage or collect any indigenous plant or snare any animal.
- Grass and vegetation of the immediate environment or adapted grass / vegetation will be re-established on completion of construction activities, where applicable.
- No firewood to be collected on site and the lighting of fires must be prohibited.
- Cognisance is to be taken of the potential for endangered species occurring in the area. It is considered unlikely, however, that these species will be affected by the proposed activity, or the access road.

Excavations

Whenever any excavation is undertaken, the following procedures shall be adhered to:

- Topsoil shall be handled as described in this EMP.
- Excavations shall take place only within the approved demarcated site.
- Excavations must follow the contour lines where possible.
- The construction site will not be left in any way to deteriorate into an unacceptable state.
- The excavated area must serve as a final depositing area for waste rock and overburden during the rehabilitation process.
- Once excavations have been filled with overburden, rocks and coarse natural materials and profiled with acceptable contours (including erosion control measures), the previous stored topsoil shall be returned to its original depth over the area.
- The area shall be fertilised, if necessary, to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix in order to propagate the locally occurring flora.

Rehabilitation of Processing and Excavation Areas

- On completion of construction, the surface of the processing areas especially if compacted due to hauling and dumping operations shall be scarified to a depth of at least 200 mm and graded to an even surface condition and the previously stored topsoil will be returned to its original depth over the area.
- The area shall be fertilised, if necessary, to allow vegetation to establish rapidly. The site shall be seeded with suitable grasses and local indigenous seed mix.
- Excavations may be used for the dumping of construction wastes. This *shall* be done in such a way as to aid rehabilitation.
- Waste (non-biodegradable refuse) will not be permitted to be deposited in the excavations.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the activity, be corrected and the area be seeded with a vegetation seed mix to his or her satisfaction. This *must* be done in conjunction with the ECO.
- Final rehabilitation *must* comply with the requirements mention in the Rehabilitation Plan.

8.3.7 Rehabilitation Plan

The following mitigation measures have been identified in order to maximise rehabilitation success, where deemed necessary.

Rehabilitation Objective

The overall objective of the rehabilitation plan is to minimize adverse environmental impacts associated with the activity whilst maximizing the future utilization of the property. Significant aspects to be borne in mind in this regard is, revegetation of undeveloped footprint and stability and environmental risk. The depression and immediate area of the working must also be free of alien vegetation. Additional broad rehabilitation strategies / objectives include the following:

- Rehabilitating the worked-out areas to take place concurrently within prescribed framework established in the EMP.
- All infrastructure, equipment, plant and other items used during the construction period will be removed from the site.
- Waste material of any description, including scrap, rubble and tyres, will be removed entirely from the site and disposed of at a recognised landfill facility. It will not be permitted to be buried or burned on site.
- Final rehabilitation shall be completed within a period specified by the Regional Manager.

Topsoil and Subsoil Replacement

Topsoil and subsoil will be stripped and stockpiled separately and only used in rehabilitation work towards the end of the operation. This is in contract to the gravel activity where rehabilitation and topsoil replacement was earmarked at the completion of each phase.
Stripped overburden will be backfilled into the worked-out areas where needed. Stripped topsoil will be spread over the re-profiled areas to an adequate depth to encourage plant regrowth. The vegetative cover will be stripped with the thin topsoil layer to provide organic matter to the relayed material and to ensure that the seed store contained in the topsoil is not diminished. Reseeding may be required should the stockpiles stand for too long and be considered barren from a seed bank point of view. Stockpiles should ideally be stored for no longer than a year.
The topsoil and overburden will be keyed into the reprofiled surfaces to ensure that they are not eroded or washed away. The topsoiled surface will be left fairly rough to enhance seedling establishment, reduce water runoff and increase infiltration.

Revegetation

All prepared surfaces will be seeded with suitable grass species to provide an initial ground cover and stabilize the soil surface. The following grass seed that is commonly available and suitable.

Botanical name	**Common name**	**Approx seed mixture /Ha**
Cynodon dactylon	Kweek	12 kg/ Ha
Eragrostis curvula	Weeping Love Grass	6 kg/ Ha
Eragrostis tef	Teff	2 kg/ Ha
Digitaria eriantha	Smuts Grass	4 kg/ Ha
Other indigenous veld grasses can be added to the seed mix		± 4 kg/Ha

The overall revegetation plan will, therefore, be as follows:

- Ameliorate the aesthetic impact of the site.
- Stabilise disturbed soil and rock faces.
- Minimize surface erosion and consequent siltation of natural water course located on site.
- Control wind-blown dust problems.
- Enhance the physical properties of the soil.
- Re-establish nutrient cycling.
- Re-establish a stable ecological system.

Every effort must be made to avoid unnecessary disturbance of the natural vegetation during operations.

Drainage and Erosion Control

To control the drainage and erosion at site the following procedures will be adopted:

- Areas where construction is completed should be rehabilitated immediately.
- Areas to be disturbed in future activities will be kept as small as possible (i.e. conducting the operations in phases), thereby limiting the scale of erosion.
- Slopes will be profiled to ensure that they are not subjected to excessive erosion but capable of drainage runoff with minimum risk of scour (maximum 1:3 gradient).
- All existing disturbed areas will be re-vegetated to control erosion and sedimentation.
- Existing vegetation will be retained as far as possible to minimize erosion problems.

Visual Impacts Amelioration

The overall visual impact of the proposed activities will be minimised by the following mitigating measures:

- Confining the footprint to an area as small as possible
- Re-topsoiling and vegetating all disturbed areas.

8.3.8 Monitoring and Reporting

Adequate management, maintenance and monitoring will be carried out annually by the applicant to ensure successful rehabilitation of the property until a closure certificate is obtained.
To minimise adverse environmental impacts associated with operations it is intended to adopt a progressive rehabilitation programme, which will entail carrying out the proposed rehabilitation procedures concurrently with activity.

8.3.9 Closure objectives and extent of alignment to pre-construction environment

Closure Objectives

The closure of the site will involve removal of all debris and rehabilitation of areas disturbed during the construction phase of the project. This will comprise the scarification of compacted areas, reshaping of areas, topsoiling and rehabilitating all prepared surfaces.

8.4 Appendix D: General Impact Rating Scale

To ensure a direct comparison between various specialist studies, six standard rating scales are defined and used to assess and quantify the identified impacts. This is necessary since impacts have several parameters that need to be assessed.
These scales are:

1. The Severity/ Benefit Scale, which assesses the importance of the impact from a purely technical perspective.
2. The Spatial Impact Scale, which assesses the extent or magnitude of the impact (the area that will be affected by the impact).
3. The Temporal Impact Scale, which assesses how long the impact will be felt. Some impacts are of a short duration, whereas others are permanent.
4. The Degree of Certainty Scale, which provides a measure of how confident the author feels about their prediction.
5. The Likelihood Scale, which provides an indication of the risk or chance of an impact taking place.
6. The Environmental Significance Scale, which assesses the importance of the impact in the overall context of the affected system or party.

To ensure integration of social and ecological impacts, to facilitate specialist assessment of impact significance, and to reduce reliance on value judgments, the severity of the impact within the scientific field in which it takes place (e.g. vegetation, fauna etc.) was assessed first. Thereafter, each impact was assessed within the context of time and space, and the probability of the impact occurring was quantified using the degree of certainty scale.
The impact was then assessed in the context of the whole environment to establish the "environmental significance" of the impact to the flora and vegetation.
The scales are described in detail below.

8.4.1 The Severity/ Beneficial Scale

The *severity scale* was used to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on an affected system (for ecological impacts) or an affected party. This methodology attempts to remove any value judgments from the assessment, although it relies on the professional judgment of the specialist.

NEGATIVE IMPACT	POSITIVE IMPACT
Very severe An irreversible and permanent change to the affected system(s)) which cannot be mitigated. For example, change in topography resulting from a quarry.	Very Beneficiary A permanent and very substantial benefit to the affected system(s) with no alternative to achieve this benefit.
Severe Long-term impacts on the affected system(s) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial A long-term impact and substantial benefit to the affected system(s). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
Moderately severe Medium- to long-term impact on the affected system(s) that could be mitigated.	Moderately beneficial A medium- to long-term impact of real benefit to the affected system(s) Other ways of optimising are equally difficult, expensive and time

NEGATIVE IMPACT	POSITIVE IMPACT
	consuming (or a combination of these), as achieving them in this way.
Slight Medium- to short term impacts on the affected system(s) Mitigation is very easy, cheap, less time consuming or not necessary.	Slightly beneficial A short- to medium-term impact and negligible benefit to the affected system(s) Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.
No effect The system(s) is not affected by the proposed development.	Do not know/Cannot know In certain cases, it may not be possible to determine the severity of the impact.

The severity of impacts can be evaluated with and without mitigation order to demonstrate how serious the impact is when nothing is done about it. For beneficial impacts, optimisation means anything that can enhance the benefits. However, mitigation or optimisation must be practical, technically feasible and economically viable.

8.4.2 Spatial and Temporal Scales

Two additional factors were considered when assessing the impacts, namely the relationship of the impact to Spatial and Temporal Scales.
The *spatial scale* (shown in italics) defines the impact at the following scales.

SPATIAL SCALE	EXPLANATION
Localised	at a localised scale (i.e. few hectares in extent). The specific area to which this scale refers is defined for the impact to which it refers.
Study Area	the site, some effects to surrounding area (*~10 km*)
District	the site, some effects to wider surrounding area (*~100 km*)
Regional	the site, some effects to surrounding area (*+250 km*)
National	Impacts will affect at a country level
International	Impacts extend beyond country boundary

The *temporal scale* (shown in italics) defines the impact at the following scales.

TEMPORAL SCALE	EXPLANATION
Short Term	Less than 5 years. Many construction phase impacts will be of a short duration
Medium Term	Between 5 and 20 years
Long Term	Between 20 and 40 years, and from a human perspective essentially permanent.
Permanent	Over 40 years and resulting in a permanent and lasting change.

8.4.3 The Degree of Certainty and the Likelihood Scale

It is also for each specialist to state the degree of certainty, or the confidence attached to their prediction of significance. For this reason, a 'degree of certainty' scale (shown in bold) must be used.

DEGREE	DESCRIPTION
Definite:	More than 90% sure of fact. To use this one will need to substantial supportive data.
Probable:	Between 70% and 90% sure of fact.
Possible:	Between 40% and 70% sure of fact.
Unsure:	Less than 40% sure of fact.

The risk or likelihood (shown in normal font) of impacts being manifested differs. There is no doubt that some impacts would occur, but certain other (usually secondary data) impacts are not as likely and may or may not result. Although these impacts maybe severe, the likelihood of them occurring may affect their overall significance and must therefore be considered. It is therefore necessary for the author to state his estimate of the likelihood of an impact occurring, using the following likelihood scale:

DEGREE	DESCRIPTION
Very unlikely	The chance of these impacts occurring is extremely slim, e.g. natural forces destroying a dam wall.
Unlikely	The risk of these impacts occurring is slight.
May occur	The risk of these impacts is more likely, although it is not definite.
Very Likely	Slight chance that this impact will not occur.
Definite	There is no chance that this impact will not occur.

8.4.4 The Environmental Significance Scale

The environmental significance scale is an attempt to evaluate the significance of an impact, the severity or benefit of which has already been assessed. This evaluation needs to be assessed in the relevant context, as an impact can either be ecological or social, or both. Since the severity of impacts with and without mitigation will already have been assessed, significance was only evaluated after mitigation. In many cases, this mitigation will take place, as it has been incorporated into project design. A six-point significance scale is applied as follows:

SIGNIFICANCE	DESCRIPTION
Very High (6)	Impacts considered to have a major and permanent change to natural environment and are rate as VERY HIGH, usually resulting to severe or very severe/ beneficial to highly beneficial effects.
High (5)	Long term change and are rated as HIGH resulting to severe or moderately severe effects/ beneficial to moderately beneficial.
Moderate (4)	Medium to long-term effects. Impacts are rated as MODERATE with moderately severe or moderately beneficial effects.
Low (3)	Medium to short term effects. Impacts are rated as MODERATE resulting in moderately severe or moderately beneficial effects.
Insignificant (2)	Short term effects are present. Impacts are rated as SLIGHT resulting in SLIGHTLY BENEFICIAL effects. Residual effects are present but are of no consequence.
No Significance (1)	No primary or secondary effects, resulting in NO SIGNIFICANT impact.
Do not Know (0)	Not possible to determine the significance of impacts

8.4.5 Absence of Data

In certain instances, an assessment must be produced in the absence of all the relevant and necessary data, due to paucity or lack of scientific information on the study area. It is more important to identify all the likely environmental impacts than to precisely evaluate the more obvious impacts. It is important to be on the conservative side in reporting likely environmental impacts. Because assessing impacts with a lack of data is more dependent on scientific judgment, the rating on the certainty scale cannot be too high. It is for these reasons that a degree of certainty scale has been provided, as well as the categories DON'T KNOW or CAN'T KNOW.

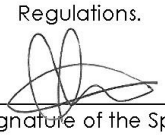
8.5 Appendix E: Declaration, Specialist Profile and Registration

DECLARATION OF THE SPECIALIST

Note: Duplicate this section where there is more than one specialist.

I Jamie Pote ....., as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that:

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

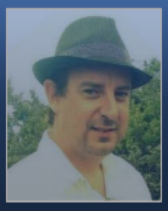


Signature of the Specialist: Date: 04 December 2025

N/A

Name of company (if applicable):

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Jamie Pote

SENIOR ECOLOGIST AND ENVIRONMENTAL SCIENTIST

CONTACT

(+27) 76 888 9890
jamiepote@live.co.za
Port Elizabeth, South Africa
Linkedin.com
Jamiepote
Bluesky-SA

ABOUT ME

16 years broad professional experience in Biodiversity, Ecological and Vegetation Assessments on over 220 projects in southern, western and central Africa. Senior Environmental Consultant and EAP on over 50 projects in the mining, infrastructure, housing and agricultural sectors. Environmental monitoring and auditing on over 50 civil infrastructure and construction projects. Have managed all aspects of projects from inception through to implementation. GIS mapping and analytics.

EDUCATION

Bachelor of Science
Rhodes University
2001 (Botany & Environmental Science)

Bachelor of Science (Honours)
Rhodes University
2002 (Botany)

Professional Natural Scientist
SACNASP
2016

SERVICES

Terrestrial Biodiversity/Ecological Assessments
Environmental & Ecological Risk-Assessments
Bioremediation, Restoration & Rehabilitation Plans
Environmental Management Plans & Programmes
GIS Mapping & Analysis & Web maps
Alien Invasive Management (Terrestrial)
Environmental Auditing & Monitoring (ECO)
Flora Search & Rescue & Relocation
Independent Environmental & Ecological review
Permit and License applications
Environmental & Mining Applications

EXPERIENCE AND CLIENTS

Key Sectors

- *Wind, Solar Energy Facilities*
- *Infrastructure and Housing*
- *Agriculture and Forestry*
- *Mining and Industrial*

Key Projects

- *Over 220 independent Biodiversity/Ecological Assessments throughout southern, western and central Africa.*
- *Mining applications and construction auditing on over 40 projects and more than 300 gravel borrow pits for the Eastern Cape Department of Roads and Public Works, Department of Transport and the South African National Roads Agency (SANRAL) throughout the Eastern Cape.*
- *South-End Precinct Mixed Use Development for Mandela Bay Development Agency - Environmental application, Ecological assessments and Construction monitoring.*
- *Coega Development Corporation IDZ projects – Ecological assessments, Flora search & rescue and Construction monitoring.*
- *Environmental applications, construction monitoring and auditing for a wide range of projects, including infrastructure and housing for various clients including the Department of Transport and SANRAL.*
- *Various agricultural expansion and infrastructure projects.*
- *Various wind and solar energy and associated infrastructure projects.*
- *Numerous infrastructure projects including electrical, water and roads.*
- Various Environmental Management and Rehabilitation Plans.

SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Jamie Robert Claude Pote

Registration Number: 115233

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice (Schedule 1 of the Act)

Ecological Science (Professional Natural Scientist)

Effective **20 July 2016** Expires **31 March 2026**

Chairperson

Chief Executive Officer

To verify this certificate scan this code

Mr Jamie Pote (BSc (Hons) PR. Sci. Nat.

PROJECT EXPERIENCE

PERFORMANCE STANDARD BIODIVERSITY AND CRITICAL HABITAT ASSESSMENTS (IFC PS6)

- DBSA Environmental & Social Safeguards Standards 9: Biodiversity Conservation and Sustainable Management Assessment: The Ilitha Fibre Project, Ethekwini 2021
- Critical Habitat & Biodiversity Assessment - Roggeveld Wind Energy Project 2020
- Biodiversity Assessment for Kalukundi Copper/Cobalt Mine, Democratic Republic of Congo 2008

TERRESTRIAL BIODIVERSITY ASSESSMENTS AND COMPLIANCE STATEMENTS

- Terrestrial Biodiversity Assessment (Addo BSD Offices) 2021
- Terrestrial Biodiversity Assessment (Blaauwater Farms) 2021
- Terrestrial Biodiversity Assessment (Buffelshoek Farm, Loerie) 2021
- Terrestrial Biodiversity & Aquatic Assessment & Review (Falcon Ridge Dam) 2021
- Terrestrial Biodiversity Assessment (Gubenxa Valley Deciduous Fruit) 2021
- Terrestrial Biodiversity Assessment (Little Chelsea Mixed-use) 2021
- Terrestrial Biodiversity Compliance Statement (Maidenhead Farm) 2021
- Terrestrial Biodiversity Review, Mulilo Total Hydra Storage Project Grid Interconnection 2021
- Terrestrial Biodiversity Compliance Statement (Lahlangubo River Bridge) 2021
- Terrestrial Biodiversity Assessment (Mbashe access roads - 3 sites) 2021
- Terrestrial Biodiversity Assessment (Burlington Farm Citrus Development, Cookhouse) 2020
- Terrestrial Biodiversity Compliance Statement: CHDM Cluster 9 Phase 3D Pipeline 2020
- Terrestrial Biodiversity Review, Mulilo Total Hydra Storage Project BESS 2020
- Terrestrial Biodiversity Assessment (Mbashe housing projects, Dutywa & Willowvale) 2020
- Terrestrial Biodiversity Assessment (Helpmekaar Dam, Tarkastad) 2020
- Terrestrial Biodiversity Assessment (Herbertsdale pipeline, Mossel Bay) 2020
- Terrestrial Biodiversity Assessment (Keurbooms Erf 155, Keurboomstrand) 2020
- Terrestrial Biodiversity Assessment (Lowmar Hydroelectric Project, Cradock) 2020
- Terrestrial Biodiversity Assessment (Mossel Bay Gas Power Plant) 2020
- Terrestrial Biodiversity Assessment (Erf 1820, Mthatha) 2020
- Terrestrial Biodiversity Assessment (Newlyn Manganese Terminal, Coega SEZ) 2020
- Terrestrial Biodiversity Assessment Thornhill Phase 2 Sanitation Link 2020

ENERGY PROJECTS (WIND FARM AND PHOTOVOLTAIC INFRASTRUCTURE)

- Preliminary Biodiversity Screening for Chrisdelina Ranch Agricultural Project, Kizenga District 2020
- Preliminary Biodiversity Screening and GIS mapping for Balekani Photovoltaic Solar Project 2020
- Preliminary Biodiversity Screening and GIS mapping for Sihhoye Photovoltaic Solar Project 2020
- Preliminary Biodiversity Screening and GIS mapping Mpaka Photovoltaic Solar Project 2020
- Preliminary Biodiversity Screening and GIS mapping for Chiwelwa Hydroelectric project 2020
- Ecological Assessment for Vermaak Boerdery Hydro Turbine (Cookhouse), Eastern Cape 2020
- Ecological Assessment for Windcurrent Wind Farm, Eastern Cape 2012
- Ecological Assessment for Universal Windfarm, NMB 2011
- Ecological Assessment for Inca Energy Windfarm, Northern Cape 2011
- Ecological Assessment for Broadlands Photovoltaic Farm, Eastern Cape 2011
- Botanical Assessment for Electrawinds Windfarm Coega, NMB 2010
- Botanical Assessment and Open Space Management Plan for Mainstream WEF Phase 2, Eastern Cape 2010

SPECIALISED ECOLOGICAL REPORTS AND REVIEWS

- Rebels Vlei Riparian delineation 2021

- Buck Kraal Dam Rehabilitation Plan Review 2020
- Rehabilitation Plan for Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- Green Star Rating Ecological Assessment for SANRAL office, Bay West City, NMBM 2015
- Section 24G Assessment and Rehabilitation Plan for Bingo Farm, Eastern Cape 2014
- Mapping and Ecological services for Congo Agriculture, Republic of Congo 2013
- Rehabilitation Plan for Nieu Bethesda, Eastern Cape 2011
- Mapping of pipeline for Kenton Water Board, Eastern Cape 2010
- Rehabilitation Plan for N2 Upgrade - Coega to Colchester, NMB 2010
- Representative for landowner group for Seaview burial Park, NMB 2010
- Botanical Sensitivity Analysis for LSDF, Greenbushes-Hunters Retreat, NMB 2008
- Forestry Rehabilitation Assessment Report for Amahlathi Forest Rehabilitation, Eastern Cape 2007
- Botanical & Riparian Assessment for Orange River Weirs-Boegoeberg, Douglas Dam and Sendelingsdrif, Northern Cape 2006
- Botanical Assessment for State of the Environment Report for Chris Hani District Municipality SoER, Eastern Cape 2003

ROAD AND RAILWAY INFRASTRUCTURE PROJECTS

- Ecological Assessment for CDC IDZ Mn Terminal, conveyor and railway line, NMB 2013
- Ecological Assessment Review for Penhoek Road widening, Eastern Cape 2012
- Ecological Assessment for R61 road widening, Eastern Cape 2012
- Botanical Assessment for Chelsea RD - Walker Drive Ext., NMB 2010
- Botanical Assessment for Motherwell - Blue Water Bay Road, NMB 2010
- Ecological Assessment for Port St John Road, Eastern Cape 2010
- Botanical Basic Assessment for Bholani Village Rd, Port St Johns, Eastern Cape 2009
- Botanical Report, EMP and Rehab Plan for Coega-Colchester N2 Upgrade, NMB 2009
- Botanical Assessment for Manganese Conveyor Screening Report, NMB 2008
- Ecological Assessment for Road Layout for Whiskey Creek- Kenton, Eastern Cape 2006

MINING PROJECTS

- Ecological Assessment for Bochum Borrow Pits, Limpopo 2013
- Ecological Assessment and Mining and Rehabilitation Plan for Greater Soutpansberg Mining Project, Limpopo (3 proposed Mines) 2013
- Ecological Assessment for Thulwe Road Borrow Pits, Limpopo 2013
- Ecological Assessment and Mining and Rehabilitation Plan for Baghana Mining, Ghana 2010
- Botanical Assessment for Zwartenbosch Quarry, Eastern Cape 2008
- Botanical description & map production for Quarry - Rudman Quarry, Eastern Cape 2008
- Botanical Basic Assessment, Rehab Plan & Maps for Borrow Pit - Rocklands/Patensie, Eastern Cape 2008
- Botanical Assessment & Maps for Sandman Sand Gravel Mine, Eastern Cape 2008
- Botanical Assessment & GIS maps for Shamwari Borrow Pit, Eastern Cape 2008
- Detailed Botanical Assessment, EMP and Rehab Plan for Kalukundi Copper/Cobalt Mine, Democratic Republic of Congo 2008
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit Humansdorp/Oyster Bay, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Cala, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Camdeboo, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Somerset East, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Nkonkobe, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Ndlambe, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Blue Crane Route, Eastern Cape 2008

- Botanical Assessment, EMP and Rehabilitation Plan for AWRM - Cathcart, Eastern Cape 2008
- Botanical Assessment, GIS maps and Rehab Plan for Mthatha Prospecting, Eastern Cape 2008
- Regional Botanical Map for mining prospecting permit, Welkom 2008
- Botanical Assessment for Scoping Report and Detailed Botanical Assessment and Rehab Plan for Elitheni Coal Mine, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Oyster Bay, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Bathurst/GHT, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit – Jeffreys Bay, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Storms River/Kareedouw, Eastern Cape 2007
- Biophysical Assessment for Humansdorp Quarry, Eastern Cape 2006
- Botanical Assessment, Rehab Plan & Maps for Quarry-Cathcart & Somerset East, Eastern Cape 2006
- Botanical Assessment, Rehab Plan & Maps for Quarry - Despatch Quarry, NMB 2006
- GIS Mapping & Botanical Assessment and Rehab Plan for Quarry - JBay Crushers, Eastern Cape 2006
- Botanical Assessment, EMP and Rehabilitation Plan for Polokwane Silicon Smelter, Limpopo 2006
- Application for Mining Permit for Bruce Howarth Quarry, Eastern Cape 2006

POWERLINE INFRASTRUCTURE PROJECTS

- Ecological Assessment: Dieprivier-Karreedouw 132kV Powerline realignment, Kouga LM 2016
- Eskom Ecological Walkdown: Dieprivier-Karreedouw 132 kV Powerline, Kouga LM 2016
- Eskom Solar one Ecological Walkdown: Nieuwehoop 400 kV powerline 2015
- Rehabilitation Plan and Auditing for Grassridge-Poseidon Powerline Rehab, Eastern Cape 2013
- Ecological Assessment for Dieprivier Karreedouw 132kV Powerline, Eastern Cape 2012
- Flora and Fauna search and Rescue plan for Van Stadens Windfarm Powerline, NMB 2012
- Botanical Assessment for Dedisa-Grassridge Powerline, Eastern Cape 2010
- Ecological Assessment for Grahamstown-Kowie Powerline, Eastern Cape 2010
- Species of Special Concern Mapping Transmission Line for San Souci to Nivens Drift 132kV powerline, NMB 2009
- Botanical Assessment for Eskom Powerline - Albany-Kowie, Eastern Cape 2009
- Botanical Assessment for Eskom 132 kV Dedisa Grassridge Power line-Coega, NMB 2006
- Botanical Assessment for Eskom Power line – Tyalara-Wilo, Eastern Cape 2006
- Botanical Assessment for Steynsburg - Teebus 132 kV powerline, Eastern Cape 2004

PIPELINE INFRASTRUCTURE PROJECTS

- Terrestrial Biodiversity Assessment for Thornhill Phase 2 Sanitation Link, Ndlambe, Eastern Cape 2020
- Botanical Assessment for Ngqamakhwe Regional Water Supply Scheme (Phase 3) 2018
- Ecological Assessment for Butterworth Emergency Bulk Water Supply Scheme 2017
- Ecological Assessment for Karringmelkspruit Emergency Bulk Water Supply (Lady Grey) 2017
- Ecological Assessment for Wanhoop-Willowmore Bulk Water Supply, Eastern Cape 2016
- Ecological Assessment for Steytlerville Bulk Water Supply, Eastern Cape (Phase 4) 2013
- Ecological Assessment for Steytlerville Bulk Water Supply, Eastern Cape (Phase 5) 2013
- Detailed Ecological Assessment for Suikerbos Pipeline, Gauteng 2012
- Basic Botanical Assessment for Wanhoop farm pipeline, Eastern Cape 2010
- Basic Botanical Assessment for Chatty Sewer, NMB 2010
- Species of Special Concern Mapping for Seaview Pipeline, NMB 2009
- Species of Special Concern Mapping for Chelsea Bulk Water Pipeline, NMB 2009
- Map Production for Russell Rd Stormwater, NMB 2008
- Basic Botanical Assessment for Albany Pipeline, Eastern Cape 2008
- Environmental Risk Assessment for Elands River pipeline, Eastern Cape 2007

- Detailed Botanical Assessment for Motherwell Pipeline, NMB 2007
- Detailed Botanical Assessment, GIS maps for Erasmuskloof Pipeline, Eastern Cape 2007
- Botanical & Floristic Report for Hankey pipeline, Eastern Cape 2006
- Detailed Botanical Assessment for Port Alfred water pipeline, Eastern Cape 2004

GENERAL INFRASTRUCTURE DEVELOPMENT PROJECTS

- Ecological Assessment for Amalinda crossing, BCM, Eastern Cape 2019
- Ecological Assessment for Cookhouse Bridge rehabilitation and temporary deviation, Eastern Cape 2019
- Ecological Assessment for Nelson Mandela University Access Road, NMB 2019
- Botanical Assessment for Zachtevlei Dam (Lady Grey), Eastern Cape 2017
- Botanical Assessment for Gcebula River bridge (Peddie), Eastern Cape 2017
- Botanical Assessment for Kouga Dam wall upgrade, Eastern Cape 2012
- Botanical Assessment for Jansenville Cemetery, Eastern Cape 2009
- Botanical Assessment for Radar Mast construction for South African Weather Service – BCM & NMB 2008
- Botanical Assessment and GIS mapping for golf course realignment for East London Golf Course, BCM, Eastern Cape 2007
- Botanical Assessment for PE Airport Extention, NMB 2006
- Botanical Assessment for Kidd's Beach Desalination Plant, BCM, Eastern Cape 2006

HOUSING DEVELOPMENT PROJECTS

- Terrestrial Biodiversity Assessment for Erf 1820 Mthatha, KSDM, Eastern Cape 2020
- Ecological Assessment for Erf 599 Walmer Mixed Use Development, Nelson Mandela Bay 2019
- Ecological Assessment Portion 21-23 and 41 of Farm 807, Gonubie, Buffalo City 2019
- Ecological Assessment for Emerald Sky Housing Project, BCMM 2019
- Ecological Assessment for Erf 14, Kabega, Port Elizabeth 2017
- Ecological Assessment for Fairwest Rental Housing, Port Elizabeth 2017
- Ecological Assessment for Hankey Housing, Kouga District Municipality 2015
- Ecological Assessment for Lebowakgoma Housing, Limpopo 2013
- Ecological Assessment for Giyani Development, Limpopo 2013
- Ecological Assessment for Palmietfontein Development, Limpopo 2013
- Ecological Assessment for Seshego Development, Limpopo 2013
- Botanical Assessment for Sheerness Road, BCM, Eastern Cape 2013
- Ecological Assessment for Ethembeni Housing, NMB 2012
- Ecological Assessment for Pelana Housing, Limpopo 2012
- Flora Search and Rescue Plan for Kwanobuhle Housing, Western Cape 2011
- Botanical Assessment for The Crags 288/03, Western Cape 2010
- Ecological Assessment Revision Report for Fairview Housing, NMB 2010
- Botanical Assessment, EMP and Open Space Management Plan for Hornlee Housing Development, Western Cape 2010
- Botanical Assessment for Little Ladywood, Western Cape 2010
- Botanical Assessment and Open Space Management Plan for Motherwell NU31, NMB 2010
- Botanical Assessment and Open Space Management Plan for Plett 443/07, Western Cape 2010
- Botanical Assessment for Willow Tree Farm, NMB 2010
- Botanical Assessment for Kouga RDP Housing, Eastern Cape 2009
- Botanical Assessment for Fairview Erf 1226 (Wonderwonings), NMB 2009
- Species List Compilation for Zeekoerivier Humansdorp, Eastern Cape 2009
- Botanical Assessment for Woodlands Golf Estate (Farm 858), BCM, Eastern Cape 2009

- Botanical Assessment for Plettenberg Bay - 438/4, Western Cape 2009
- Vegetation Assessment for Kwanokuthula RDP housing project, Western Cape 2008
- Site screening assessment for Greenbushes Site screening, NMB 2008
- Botanical Assessment for Fairfax development, Eastern Cape 2008
- Botanical Assessment for Plettenberg Bay Brakkloof 50&51, Western Cape 2008
- Botanical Assessment, GIS mapping for Theescombe Erf 325, NMB 2008
- Site Screening for Mount Road, NMB 2008
- Botanical Assessment for Greenbushes Farm 40 Swinburne 404, NMB 2008
- Botanical Assessment for Greenbushes 130, NMB 2008
- Botanical Assessment for Greenbushes Kuyga no. 10, NMB 2008
- Botanical Assessment for Plettenberg Bay - 438/24, Western Cape 2007
- Botanical Assessment for Plettenberg Bay - Olive Hills 438/7, Western Cape 2007
- Botanical Assessment for Gonubie Portion 809/9, BCM, Eastern Cape 2006
- Botanical Assessment for Glengariff Farm 723, BCM, Eastern Cape 2006
- Botanical Assessment for Gonubie Portion 809/10, BCM, Eastern Cape 2006
- Botanical Assessment for Gonubie Portion 809/4 & 5, BCM, Eastern Cape 2006
- Botanical Assessment for Plettenberg bay - Ladywood 438/1&3, Western Cape 2006
- Botanical Assessment and Rehab Plan for Winterstrand Desalination Plant, BCM 2006
- Botanical Assessment for Bosch Hoogte, NMB 2006
- Botanical Assessment for Plettenberg bay Farm 444/38, Western Cape 2006
- Botanical Assessment for Plettenberg Bay - 444/27, Western Cape 2006
- Botanical Assessment for Leisure Homes, BCM, Eastern Cape 2006
- Botanical Basic Assessment for Trailees Wetland Assessment, Eastern Cape 2005
- Botanical Assessment and Rehab Plan for Arlington Racecourse - PE, NMB 2005
- Botanical Assessment for Smart Stone, NMB 2005
- Botanical Assessment for Peninsular Farm (Port Alfred), Eastern Cape 2005
- Botanical Assessment for Mount Pleasant - Bathurst, Eastern Cape 2005
- Botanical Assessment and RoD amendments for Colchester Erven 1617 & 1618 (Riverside), NMB 2005
- Basic Botanical Assessment for Parsonsvlei 3/4, Eastern Cape 2005
- Botanical Assessment for Bridgemead – Malabar PE, NMB 2004

AGRICULTURAL PROJECTS

- Ecological Assessment for Vermaak Boerdery Hydro Turbine (Cookhouse)2020 2020
- Thornhill Eggland Specialist Ecological Assessment 2020
- Ecological Assessment for Citrus expansion on Hitgeheim Farm, Sunland, Eastern Cape 2015
- Ecological Assessment for Citrus expansion on farm 960, Patensie (AIN du Preez Boerdery) 2014
- Ecological Assessment for Doornkraal Pivot (Hankey), Eastern Cape 2014
- Ecological Assessment for Tzaneen Chicken Farm, Limpopo 2013
- Botanical Assessment and Open Space Management Plan for Kudukloof, NMB 2010
- Botanical Assessment and Open Space Management Plan for Landros Veeplaats, NMB 2010
- Botanical Assessment and Flora Relocation Plan for Wildemans Plaas, NMB 2006

GOLF ESTATE AND RESORT DEVELOPMENT PROJECTS

- Species List& Comments Report for Kidds Beach Golf Course, BCM, Eastern Cape 2009
- Botanical Assessment for Plettenberg Bay -Farm 288/03, Western Cape 2009
- Botanical Assessment for Rockcliff Golf Course, BCM, Eastern Cape 2008
- Botanical Assessment for Rockcliff Resort Development, BCM, Eastern Cape 2007
- Botanical Assessment, EMP and Rehabilitation Plan for Tiffendel Ski Resort, Eastern Cape 2006

MIXED USE DEVELOPMENT PROJECTS

- Ecological Assessment for South-End Precinct Mixed Use Development, Nelson Mandela Bay 2018
- Botanical Assessment, EMP and Open Space Management Plan for Bay West City, NMB 2010
- Botanical Assessment, GIS maps, Open Space and Rehab Plans for Fairview Erf 1082, NMB 2009
- Botanical Assessment and GIS maps for Utopia Estate PE, NMB 2008
- Botanical Assessment and GIS mapping for Madiba Bay Leisure Park, NMB 2007
- Botanical Assessment and GIS mapping for Madiba Bay Leisure Park, NMB 2007
- Botanical Basic Assessment for Cuyler Manor (Farm 320), Uitenhage, NMB 2007

BUSINESS AND INDUSTRIAL DEVELOPMENT PROJECTS

- Ecological Assessment for Parsonsvlei Erf 984 & 1134 Parsonsvlei, NMB 2020
- Mthatha Retails and Service Center 2020
- Ecological Assessment for Walmer Erf 11667 - Bidfood Warehousing Development, NMB 2020
- Ecological Assessment for Portion 87 of the Farm Little Chelsea No 10, NMB 2020
- Ecological Assessment for Bay West City ENGEN Service Station, NMB 2015
- Ecological Assessment for Green Star grading for SANRAL, NMB 2014
- Ecological Assessment for OTGC Tank Farm, NMB 2012
- Botanical Assessment and Open Space Management Plan for Petro SA Refinery, Coega IDZ, NMB 2010
- Botanical Assessment for Bluewater Bay Erf 805, NMB 2009
- Ecological Assessment for Bay West City, NMB 2007
- Botanical Assessment for Kenton Petrol Station, Eastern Cape 2005
- Botanical Assessment and RoD amendments for Colchester Petrol Station, NMB 2005

ECO-ESTATE DEVELOPMENT PROJECTS

- Botanical Re-Assessment of Swanlake Eco Estate, Aston Bay, Eastern Cape 2018
- Detailed Botanical Assessment and Open Space Management Plan for Olive Hills, Western Cape 2010
- Botanical Assessment and EMP for Zwartenbosch Road, Eastern Cape 2010
- Botanical Assessment - Poultry Farm for Coega Kammaskloof Farm 191, NMB 2008
- Botanical Assessment - Housing development for Coega Ridge, NMB 2008
- Botanical Assessment, Rehabilitation Plan, EMP and GIS maps for Amanzi Estate, NMB, 2008
- Botanical Assessment for Roydon Game farm, Queenstown, Eastern Cape 2007
- Botanical Assessment for Winterstrand Estate (Farm 1008), BCM, Eastern Cape 2007
- Botanical Assessment for Homeleigh Farm 820, BCM, Eastern Cape 2007
- Botanical Basic Assessment, Rehab Plan & Maps for Candlewood, Tsitsikamma, Western Cape 2007
- Botanical Assessment, EMP and Rehab Plan for Carpe Diem Eco development, Eastern Cape 2007
- Botanical Assessment, EMP and Rehabilitation Plan for Seaview Eco-estate, NMB 2006
- Botanical Assessment for Kidd's Beach portion 1076, BCM, Eastern Cape 2006
- Botanical Assessment for Palm Springs, Kidds Beach East London, BCM, Eastern Cape 2006
- Botanical Assessment for Nahoon Farm 29082, BCM, Eastern Cape 2006
- Botanical Assessment for Rosehill Farm, Eastern Cape 2005
- Botanical Assessment for Resolution Game Farm, Eastern Cape 2005
- Botanical Assessment for Gonubie Portion 809/11, BCM, Eastern Cape 2005
- Botanical Assessment for Kidd's Beach portion 1075, BCM, Eastern Cape 2005

FLORA AND FAUNA RELOCATION PLANS, PERMITS AND IMPLEMENTATION

- Flora Search and Rescue for Nelson Mandela University Phase 2 & 3 Residences, Eastern Cape 2020

- Flora Search and Rescue for Fairwest Housing Estate, Nelson Mandela Bay, Eastern Cape 2019
- Flora Search and Rescue for Utopia Estate, Nelson Mandela Bay, Eastern Cape 2019
- Flora Search and Rescue for Citrus expansion on Boschkraal Citrus Farm, Sunland, Eastern Cape 2018
- Flora Search and Rescue for Wanhoop pipeline, Willowmore, Eastern Cape 2018
- Flora Search and Rescue for Wilgekloof pipeline, Willowmore, Eastern Cape 2018
- Flora Search and Rescue for Citrus expansion on Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- Flora Search and Rescue for Steytlerville Bulk Water Supply, Eastern Cape (Phase 5) 2016
- Flora Search and Rescue for Citrus expansion on Farm 960, Patensie (AIN du Preez Boerdery) 2016
- Flora Search and Rescue for Steytlerville Bulk Water Supply & WTW, Eastern Cape (Phase 4) 2015
- Flora and Fauna Search and Rescue for Riversbend Citrus Farm, NMB 2014
- Flora and Fauna Search and Rescue for Mainstream Windfarm, Eastern Cape 2013
- Flora Search and Rescue for Steytlerville Bulk Water Supply, Eastern Cape (Phase 1, 2 & 3) 2013
- Flora and Fauna Search and Rescue for OTGC Tank Farm, Coega IDZ, NMB 2013
- Flora and Fauna Search and Rescue for Jeffreys Bay School, Eastern Cape 2013
- Flora Search and Rescue Plan for Red Cap Wind Farm, Eastern Cape 2012
- Flora Relocation for Disco Poultry Farm, NMB 2010
- Flora Relocation for Mainstream Windfarm, Eastern Cape 2010

ENVIRONMENTAL MANAGEMENT PLANS

- Final Environmental Management Programme (EMPr) and Maintenance Management Plan for South End Precinct Mixed Use Zone, Nelson Mandala Bay Municipality 2020
- Final Environmental Management Programme (EMPr) for Coega Land-Based Aquaculture Development Zone (ADZ), Coega Industrial Development Zone (IDZ), Nelson Mandela Bay Municipality 2019
- Basic Botanical Assessment for Kromensee EMP (Jeffries Bay), Eastern Cape 2010
- Wetland Management Plan for NMB Portnet, NMB 2010
- Baseline Botanical Study, Vegetation mapping and EMP for Local Nature Reserve for Plettenberg Bay Lookout LNA, Western Cape 2009
- Biodiversity & Ecological Processes for Bathurst-Commonage, Eastern Cape 2006
- EMP for Kromensee EMP (Jeffries Bay), Eastern Cape 2006
- Floral Survey for Mbotyi Conservation Assessment, Eastern Cape 2005
- Identifying and Assessment on Aquatic Weeds for Pumba Private Game Reserve, Eastern Cape 2005

BASIC ASSESSMENT APPLICATION PROJECTS (DEDEAT)

- Basic Assessment Application for Parsonsvlei Erf 984 & 1134 Parsonsvlei 2020
- Construction of Deviation and Rehabilitation of Bridge along DR02481 road 2020
- Basic Assessment Application for Vermaak Boerdery Hydro Turbine (Cookhouse) 2020
- Basic Assessment Application for Walmer Erf 11667 Bidfood Warehousing Development 2020
- Basic Assessment Application for Portion 87 of the Farm Little Chelsea No 10 2020
- Basic Assessment Application for Nelson Mandela University Access Road, NMB 2019
- Basic Assessment, WULA and Borrow Pit/Quarry Mining Application, Clarkebury Rd, Idutywa 2019

- Basic Assessment Application for Erf 599 Walmer Mixed Use Development, Nelson Mandela Bay 2019
- Basic Assessment Application for Cookhouse Bridge rehabilitation and temporary deviation 2019
- Basic Assessment Application for Erf 14 Kabega, NMBM 2017
- Basic Assessment Application for Hankey Housing, Kouga District Municipality 2017
- Basic Assessment Application for Fairwest Rental Housing, Nelson Mandela Bay 2017
- Basic Assessment Application for Citrus expansion on Hitgeheim Farm, Sunland, Eastern Cape 2015

- Basic Assessment Application for Hankey Housing, Kouga District Municipality 2015
- Basic Assessment Application for Citrus expansion on farm 960, Patensie (AIN du Preez Boerdery) 2014
- Basic Assessment Application for South-End Precinct Mixed Use Development, Nelson Mandela Bay 2018

MINING PERMIT/ENVIRONMENTAL MANAGEMENT PROGRAMME APPLICATIONS (DMR)

- Mining BAR/EMP's for Blue Crane Route & Camdeboo LM 12 Borrow Pits – (DoT) 2019
- Mining BAR/EMP's for Elundini LM 6 Borrow Pits (DoT)
- Mining BAR/EMP's for Baviaans LM 6 Borrow Pits (DoT)
- Mining BAR/EMP's for Kouga & Koukamma LM 12 Borrow Pits (DoT)
- Mining BAR/EMP's for Sakhisizwe & Engcobo LM 12 Borrow Pits (DoT)
- Mining BAR/EMP's for Senqu LM 12 Borrow Pits (DoT)
- Mining BAR/EMP's for 24 Borrow Pits in 6 districts within the Eastern Cape– (SANRAL) 2018
- Mining BAR/EMP's for Ingquza Hill LM Borrow Pits – (SANRAL) 2017
- Mining BAR/EMP's for Baviaans LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Senqu LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Kouga/Koukamma LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Inkwanca (Enoch Mgijima) LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Kouga/Koukamma LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Sakhisizwe/Engcobo LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Raymond Mahlaba LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Camdeboo LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Elundini LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Emalahleni/Intsika Yethu LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Nkonkobe LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Mbhashe LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Mbizana LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Senqu LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Elundini LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Emalahleni LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Emalahleni LM Borrow Pits – (DRPW) 2016
- Mining BAR/EMP's for Ikwezi/Baviaans LM Borrow Pits – (DRPW) 2016
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - MR00716 (Tarkastad) (DRPW) 2015
- Mining BAR/EMP's for Chris Hani DM Borrow Pits – Intsika Yethu and Emalahleni (DRPW) 2015
- Mining BAR/EMP's for Joe Gqabi DM Borrow Pits – Senqu (DRPW) 2015
- Mining BAR/EMP's for Makana/Ndlambe LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Amahlathi LM Borrow Pits – Amatole (DRPW) 2015
- Mining BAR/EMP's for Mbashe/Mqume LM Borrow Pits – Amatole (DRPW) 2015
- Mining BAR/EMP's for Sundays River Valley LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Kouga LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - MR00716 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR02581 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08041, DR08247, DR08248 & DR08504 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08599, DR08601 & DR08570 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08235, DR08551 & DR08038 (DRPW) 2014
- Mining BAR/EMP's for Alfred Nzo DM Borrow Pits - DR08092, DR08093 & DR08649 (DRPW) 2014
- Mining BAR/EMP's for Alfred Nzo DM Borrow Pits - DR08090, DR08412, DR08425, DR08129, DR08109, DR08106, DR08104 & DR08099 – Matatiele (DRPW) 2014

ENVIRONMENTAL COMPLIANCE AUDITING

- Environmental Compliance Audit (Habata Boerdery) 2021
- Environmental Compliance Audit (Sontule Farm) 2021

ENVIRONMENTAL MANAGEMENT, AUDITING, COMPLIANCE AND MONITORING PROJECTS

- Environmental Auditing Services Pre-construction and Construction (Rocky Coast Farm) 2021
- Environmental Auditing Services (Middledrift Breeder Facility) 2021
- Coega Aquaculture Development Zone Environmental Compliance and Monitoring for Construction (24 Months) 2020
- Construction of NMU West End Student Residences Phases 1 & 3 Environmental Control Office (30 Months) 2020
- Environmental Auditing and construction monitoring for construction of Phase 1 River Park (South End Precinct) 2020
- Waste Management License audit for Bedford Recycling project 2020
- Auditing for Construction of Fairwest Village Housing Project 2019
- Auditing for Construction of Utopia Estate monthly auditing 2019
- ECO for DRPW IRM Road Maintenance projects, Baviaans LM 2019
- ECO for DRPW IRM Road Maintenance projects, Senqu LM 2019
- ECO for DRPW IRM Road Maintenance projects, Kouga/Koukamma LM 2019
- ECO for DRPW IRM Road Maintenance projects, Sakhisizwe/Engcobo LM 2019
- ECO for DRPW IRM Road Maintenance projects, Elundini LM 2019
- ECO for DRPW IRM Road Maintenance projects, Emalahleni/Intsika Yethu LM 2019
- ECO for Construction of Fairwest Village Housing Project 2019
- ECO for Construction of Utopia Estate Mixed Use Project 2019
- ECO for Construction of NMU West End Student Residences Phases 1 & 3 2019
- ECO for Construction of Eco-Pullets pullet rearing facility, Paterson 2018
- ECO for DRPW IRM Road Maintenance projects, Raymond Mahlaba LM 2018
- ECO for DRPW IRM Road Maintenance projects, Inkwanca (Enoch Mgijima) LM 2018
- ECO for Citrus expansion on Farm 960, Patensie (AIN du Preez Boerdery) 2017
- ECO for Citrus expansion on Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- DEO for improvement of national route R67 section 5 from Whittlesea (km 0.00) to Swart Kei river (km 15.40) – Murray & Roberts 2017
- ECO for SANRAL RRP Road Maintenance projects, Mbizana LM 2017
- ECO and Botanical Specialist for the special maintenance of national route R61 Section 2 from Elinus Farm (km 42.2) to N10 (km 85.0) (SANRAL) 2016
- Environmental Control Officer (ECO): Construction of NSRI Slipway - Port Elizabeth Harbour 2016
- ECO for SANRAL RRP Road Maintenance projects, Mbashe LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Nkonkobe LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Mbizana LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Senqu LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Elundini LM 2016
- ECO and Environmental Management for closure of Bushmans River Landfill site 2016
- ECO for DRPW IRM Road Maintenance projects, Amahlathi Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Makana/Ndlambe Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Mbashe/Mqume Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Port St Johns, Mbizana, Ingquza Hill LM's 2015
- ECO for Riversbend Citrus Farm, NMB 2014
- ECO for Alfred Nzo DM Road resurfacing - DR08071, DR08649, DR08092, DR08418, DR08452, DR08015, DR08085, DR08639 & DR08073, Eastern Cape - MSBA 2014

- ECO Audits for Koukamma Flood Damage Road Repairs – Hatch Goba 2014
- EMP and ECO for Utopia Estate, NMB 2013
- Final EMPr submission for Seaview Garden Estate, NMB 2012
- ECO audits for NMB Road surfacing, NMB (multiple contacts) 2011
- EMPr submission and ECO for Seaview Garden Estate, NMB 2010
- ECO for Mainstream Windfarm wind monitoring mast installation, Eastern Cape 2010
- EMP and ECO for Sinati Golf Estate EMP, BCM, Eastern Cape 2009
- Flora Relocation Plan and Permit application for Wildemans Plaas, NMB 2006

ENVIRONMENTAL SCREENING PROJECTS

- Somerset East Stormwater Environmental Screening Report 2021
- Woodlands Diary Road Upgrade Environmental Screening Report, Kouga LM 2021
- Risk Assessment and Screening for proposed Heatherbank access road, NMB 2020
- Environmental Screening Report for Proposed Life Hospital parking expansion, NMB 2019
- Environmental Screening Report for Erf 984 & 1134 development, Parsonsvlei, NMB 2019
- Environmental Screening Report for proposed Khayalethu School, Buffalo City 2018
- Environmental Screening Report for Proposed Housing Development of Erf 8700, Kabega Park, NMB 2017
- Environmental Screening Report for Proposed Housing Development of Erf 14, Kabega Park, NMB 2017
- Environmental Screening Report for Proposed Fairwest Social Housing project, Fairview, NMB 2016
- Environmental Screening Report for Development of Little Chelsea No 25, NMB 2016
- Terrestrial Vegetation Risk Assessment for proposed Skietnek Citrus Farm development (Kirkwood) 2015
- Preliminary Environmental Risk Assessment: NSRI Slipway Port Elizabeth 2015
- Environmental Screening Report for Proposed Development of a Dwelling on Erf 899, Theescombe 2015
- Environmental Screening Report for Proposed Development on Erf 559, Walmer, Port Elizabeth 2015
- Environmental Screening Report for Proposed Housing Scheme Development of Erf 8709, Wells Estate 2015
- Environmental Screening Report for Development of Portion 10 of Little Chelsea No 87, NMB 2015

SECTION 24G APPLICATIONS

- 12 000 ML Dam constructed on farm 960, Patensie (MGM Trust) 2015
- Illegal clearing of 20 Ha of lands on Hitgeheim Farm, Sunland, Eastern Cape 2015

CONFERENCES AND PUBLICATIONS

- Pote, J., Shackleton, C.M., Cocks, M. & Lubke, R. 2006. *Fuelwood harvesting and selection in Valley Thicket*, South Africa. Journal of Arid Environments, 67: 270-287.
- Pote, J., Cocks, M., Dold, T., Lubke, R.A. and Shackleton, C. 2004. *The homegarden cultivation of indigenous medicinal plants in the Eastern Cape*. Indigenous Plant Use Forum, 5 - 8 July 2004, Augsburg Agricultural School, Clanwilliam, Western Cape.
- Pote, J. & Lubke, R.A. 2003. *The selection of indigenous species suitable for use as fuelwood and building materials as a replacement of invasive species that are currently used by the under-privileged in the Grahamstown commonage.* Working for Water Inaugural Research Symposium 19 - 21 August 2003, Kirstenbosch. Poster presentation.
- Pote, J. & Lubke, R.A. 2003. *The screening of indigenous pioneer species for use as a substitute cover crop for rehabilitation after removal of woody alien species by WfW in the grassy fynbos biome in the Eastern Cape*. Working for Water Inaugural Research Symposium 19 - 21 August 2003, Kirstenbosch, South Africa.

OTHER RESEARCH EXPERIENCE

- Resource assessment of bark stripped trees in indigenous forests in Weza/Kokstad area (June 2000; Dr C. Geldenhuis & Mr. M. Kaplin).
- Working for Water research project for indigenous trees for woodlots (December 2000/January 2001; Prof R.A. Lubke, Rhodes University).
- Project coordinator and leader of the REFYN project – A BP conservation gold award: Conservation and Restoration of Grassy-Fynbos. A multidisciplinary project focusing on management, restoration and public awareness/education (2001 – 2002).
- Conservation Project Management Training Workshops: Royal Geographical Society, London 2001 – Fieldwork Techniques, Habitat Assessment, Biological Surveys, Project Planning, Public Relations and Communications, Risk Assessment, Conservation Education
- Selection and availability of wood in Crossroads village, Eastern Cape, South Africa. Honours Research Project 2002. Supervisors: Prof. R.A. Lubke & Prof. C. Shackleton.
- Floral Morphology, Pollination and Reproduction in Cyphia (LOBELIACEAE). Honours Research Project 2002. Supervisor: Mr. P. Phillipson.
- Forestry resource assessment of bark-stripped species in Amatola District (December 2002; Prof R.A. Lubke).
- Homegarden Cultivation of Medicinal Plants in the Amathole area. Postgraduate Research Project (2003-2005; Prof R.A. Lubke, Prof C.M. Shackleton and Ms C.M., Cocks).

8.6 Appendix F: Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity

SCOPE

The protocol (*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* (GN 320, 20 March 2020)) provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation.

The protocol (*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 NEMA, gazetted on 30 October 2020*), provides the criteria for the assessment and reporting of impacts on plant and animal species for activities requiring environmental authorisation.

These protocols replace the requirements of Appendix 6 of the Environmental Impact Assessment Regulation[8].

The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (https://screening.environment.gov.za/screeningtool). The requirements for terrestrial biodiversity are for landscapes or sites which support various levels of biodiversity. The relevant terrestrial biodiversity data in the screening tool has been provided by the South African National Biodiversity Institute[9].

SITE SENSITIVITY VERIFICATION AND MINIMUM REPORT CONTENT REQUIREMENTS

Prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the screening tool must be confirmed by undertaking a site sensitivity verification.

2.1. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.

2.2. The site sensitivity verification must be undertaken through the use of:

(a) a desk top analysis, using satellite imagery,

(b) a preliminary on-site inspection; and

(c) any other available and relevant information.

2.3. The outcome of the site sensitivity verification must be recorded in the form of a report that:

(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;

(b) contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity; and

(c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

[8] The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act 107 of 1998).

[9] The biodiversity dataset has been provided by the South African National Biodiversity Institute (for details of the dataset, click on the options button to the right of the various biodiversity layers on ther screening tool).

TERRESTRIAL BIODIVERSITY SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
1	General Information	
1.1	An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being "very high sensitivity" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.	✓
1.2	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being 'low sensitivity' for terrestrial biodiversity, must submit a Terrestrial Biodiversity Compliance Statement.	✓
1.3	However, where the information gathered from the site sensitivity verification differs from the designation of 'very high' terrestrial biodiversity sensitivity on the screening tool and it is found to be of a 'low' sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.	✓
1.4	Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a 'low' terrestrial biodiversity sensitivity on the screening tool, a Terrestrial Biodiversity Specialist Assessment must be conducted.	✓
1.5	If any part of the proposed development footprint falls within an area of 'very high' sensitivity, the assessment and reporting requirements prescribed for the 'very high' sensitivity apply to the entire footprint, excluding linear activities for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any are that will be disturbed.	✓
	VERY HIGH SENSITIVITY RATING for terrestrial biodiversity features	
2	Terrestrial Biodiversity Specialist Assessment	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the blowing aspects:	
2.3.1	a description of the ecological drivers or processes of the system and how the proposed development with impact these;	
2.3.2	ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;	
2.3.3	the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	
2.3.4	the description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments);	
2.3.5	a description of terrestrial biodiversity and ecosystems on the preferred site, including:	
(a)	main vegetation types;	
(b)	threatened ecosystems, including fisted ecosystems as well as locally important habitat types identified;	

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
(c)	ecological connectivity, habitat fragmentation, ecological processes and fine- scale habitats; and	
(d)	species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	
2.3.6	the assessment must identify any alternative development footprints within the preferred site which would be of 'low' sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	
2.3.7	the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:	
2.3.7.1	terrestrial critical biodiversity areas (CBAs), including:	
(a)	the reasons why an area has been identified as a CBA;	
(b)	an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;	
(c)	the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to remaining extent of the ecosystem type(s);	
(d)	the impact on ecosystem threat status;	
(e)	the impact on explicit subtypes in the vegetation;	
(f)	the impact on overall species and ecosystem diversity of the site; and	
(g)	the impact on any changes to threat status of populations of species of conservation concern in the CBA;	
2.3.7.2	terrestrial ecological support areas (ESAs), including:	
(a)	the impact on the ecological processes that operate within or across the site;	
(b)	the extent the proposed development will impact on the functionality of the ESA; and	
(c)	loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration | and movement of flora and fauna;	
2.3.7.3	protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including	
(a)	an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;	
2.3.7.4	priority areas for protected area expansion, including-	
(a)	the way in which in which the proposed development will compromise or contribute to the expansion of the protected area I network;	
2.3.7.5	SWSAs (strategic water source areas) including:	
(a)	the impact(s) on the terrestrial habitat of SWSA; and	
(b)	the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses),	
2.3.7.6	FEPA sub catchments, including-	
(a)	the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;	
2.3.7.7	indigenous forests, including:	
(a)	impact on the ecological integrity of the forest and	

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
(b)	percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	
2.4	The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report	
3.	Terrestrial Biodiversity Specialist Assessment Report	
3.1	The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1	contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	
3.1.2	a signed statement of independence by the specialist;	
3.1.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment,	
3.1.4	description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modeling used, where relevant;	
3.1.5	a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	
3.1.6	a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	
3.1.7	additional environmental impacts expected from the proposed development;	
3.1.8	any direct, indirect and cumulative impacts of the proposed development;	
3.1.9	the degree to which impacts and risks can be mitigated;	
3.1.10	the degree to which the impacts and risks can be reversed;	
3.1.11	the degree to which the impacts and risks can cause toss of irreplaceable resources;	
3.1.12	proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr),	
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a 'low' terrestrial biodiversity sensitivity and that were not considered appropriate,	
3.1.14	a substantiated statement based on the findings of the specialist assessment, regarding the acceptability, or not. of the proposed development, if it should receive approval a not; and	
1.1.15	any conditions to which this statement is subjected.	
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	
	LOW SENSITIVITY RATING – for terrestrial biodiversity features	
4	Terrestrial Biodiversity Compliance Statement	⌄
4.1	The compliance statement must be prepared by a specialist registered with the SACNASP and having expertise in the field of ecological sciences.	✓
4.2	The compliance statement must:	⌄
4.2.1	be applicable to the preferred site and proposed development footprint;	✓
4.2.2	confirm that the site is of 'low' sensitivity for terrestrial biodiversity; and	✓

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
4.2.3	indicate whether or not the proposed development will have any impact on the biodiversity feature.	✓
4.3	The compliance statement must contain, as a minimum, the following information:	✓
4.3.1	the contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	✓
4.3.2	a signed statement of independence by the specialist;	✓
4.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
4.3.4	a baseline profile description of biodiversity and ecosystems of the site;	✓
4.3.5	the methodology used to verify the sensitivities of the terrestrial biodiversity features on the site, including equipment and modeling used, where relevant;	✓
4.3.6	in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures propped, the land can be returned to the current state within two years of completion of the construction phase;	✓
4.3.7	where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;	✓
4.3.8	a description of the assumptions made and any uncertainties or gaps in knowledge or data; and	✓
4.3.9	any conditions to which this statement is subjected.	EAP
4.4	A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	EAP

ANIMAL SPECIES SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
1	General Information	
1.1	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" or "high" sensitivity for terrestrial animal species must submit a Terrestrial Animal Species Specialist Assessment Report.	✓
1.2	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 animal species must submit either a Terrestrial Animal Species Specialist Assessment Report or a Terrestrial Animal Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.	✓
1.3	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 "low" sensitivity for terrestrial animal species must submit a Terrestrial Animal Species Compliance Statement.	✓
1.4	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "very high" or "high", for terrestrial animal species sensitivity and it is found to be of a "low" sensitivity, then a Terrestrial Animal Species Compliance Statement must be submitted.	✓
1.5	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" terrestrial animal species sensitivity and it is found to be of a "very high" or "high" terrestrial animal species sensitivity, a Terrestrial Animal Species Specialist Assessment must be conducted.	✓
1.6	If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high"	✓

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
	or "high" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol means, the area on which the proposed development will take place and includes the area that will be disturbed or impacted.	
1.7	The Terrestrial Animal Species Specialist Assessment and the Terrestrial Animal Species Compliance Statement must be undertaken within the study area.	✓
1.8	Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.	✓
1.9	Where the nature of the activity is expected to have an impact on SCC beyond the boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline10, and the study area must include the PAOI, as determined.	✓
	VERY HIGH AND HIGH SENSITIVITY RATING for terrestrial animal species	
2	Terrestrial Animal Species Specialist Assessment	
	VERY HIGH SENSITIVITY RATING Critical habitat for range-restricted species11 of conservation concern, that have a global range of less than 10 km2. SCC listed on the IUCN Red List of Threatened Species12 or on South Africa's National Red List website13 as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare. Species aggregations that represent ≥1% of the global population size of a species, over a season, and during one or more key stages of its life cycle. The number of mature individuals that ranks the site among the largest 10 aggregations known for the species. These areas are irreplaceable for SCC.	✓
4.6	Where SCC are found on site or have been confirmed to be likely present, a Terrestrial Animal Species Specialist Assessment must be submitted in accordance with the requirements specified for "very high" and "high" sensitivity in this protocol.	✓
4.7	Similarly, where no SCC are found on site during the site inspection or the presence is confirmed to be unlikely, a Terrestrial Animal Species Compliance Statement must be submitted.	✓
5	**LOW SENSITIVITY RATING – for terrestrial animal species**	
	Terrestrial Animal Species Compliance Statement Areas where no natural habitat remains. Natural areas where there is no suspected occurrence of SCC.	
5.1	The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Zoological Science or Ecological Science).	✓
5.2	The compliance statement must:	✓
5.2.1	be applicable to the study area;	✓
5.2.2	confirm that the study area, is of "low" sensitivity for terrestrial animal species; and	✓

10 Available at https://bgis.sanbi.org/
11 Species with a geographically restricted area of distribution.
12 https://www.iucnredlist.org/
13 This category includes the categories Extremely Rare, Critically Rare and Rare

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
5.2.3	indicate whether or not the proposed development will have any impact on SCC.	✓
5.3	The compliance statement14 must contain, as a minimum, the following information:	✓
5.3.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;	✓
5.3.2	a signed statement of independence by the specialist;	✓
5.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
5.3.4	a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;	✓
5.3.5	the mean density of observations/ number of samples sites per unit area15.	✓
5.3.6	where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;	✓
5.3.7	a description of the assumptions made and any uncertainties or gaps in knowledge or data; and	✓
5.3.8	any conditions to which the compliance statement is subjected.	✓
6.	A signed copy of the Terrestrial Animal Species Compliance Statement must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.	✓

PLANT SPECIES SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
1	**General Information**	
1.1	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*" or "*high*" sensitivity for terrestrial plant species must submit a **Terrestrial Plant Species Specialist Assessment Report**.	✓
1.2	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 undertaken in accordance with paragraph 4.	✓
1.3	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 "*low*" sensitivity for terrestrial plant species must submit a **Terrestrial Plant Species Compliance Statement.**	✓
1.4	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "*very high*" or "*high*", for terrestrial plant species sensitivity and it is found to be of a "*low*" sensitivity, then a **Terrestrial Plant Species Compliance Statement** must be submitted.	✓
1.5	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "*low*" terrestrial plant species sensitivity and it is found to be of a "*very high*" or "*high*" terrestrial plant species sensitivity, a **Terrestrial Plant Species Specialist Assessment** must be conducted.	✓
1.6	If any part of the development falls within an area of confirmed "*very high*" or "*high*" sensitivity, the assessment and reporting requirements prescribed for the "*very high*" or "*high*" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol means, the area on which the proposed development will take place and includes the area that will be disturbed or impacted.	✓
1.7	The **Terrestrial Plant Species Specialist Assessment** and the **Terrestrial Plant Species**	✓

14 An example of a what is contained in a Compliance Statement for Animal Species Impact Assessment can be found in the Species Environmental Impact Assessment Guideline

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
	Compliance Statement must be undertaken within the *study area*.	
1.8	Where the nature of the activity **is not** expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.	✓
1.9	Where the nature of the activity **is** expected to have an impact on SCC beyond the boundary of the preferred site, the *project areas of influence* (PAOI) must be determined by the specialist in accordance with *Species Environmental Assessment Guideline*[15], and the study area must include the PAOI, as determined.	✓
	VERY HIGH AND HIGH SENSITIVITY RATING for terrestrial plant species	
2	**Terrestrial Plant Species Specialist Assessment**	
	VERY HIGH SENSITIVITY RATING 1. Critical habitat for range-restricted species[16] of conservation concern, that have a global range of less than 10 km^2. 2. SCC listed on the IUCN Red List of Threatened Species[17] or on South Africa's National Red List website[18] as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare. 3. Species aggregations that represent ≥1% of the global population size of a species, over a season, and during one or more key stages of its life cycle. 4. The number of mature individuals that ranks the site among the largest 10 aggregations known for the species. These areas are irreplaceable for SCC. HIGH SENSITIVITY RATING 1. Confirmed habitat for SCC. 2. SCC, listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable, according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare. These areas are unsuitable for development due to a very likely impact on SCC.	✓
2.3.12	identify any alternative development footprints within the preferred site which would be of "*low*" or "*medium*" sensitivity as identified by the screening tool and verified through the site sensitivity verification.	✓
2.4	The findings of the assessment must be written up in a **Terrestrial Plant Species Specialist Assessment Report**.	✓
3	**Terrestrial Plant Species Specialist Assessment Report**	✓
3.1.13	a motivation must be provided if there were any development footprints identified as per paragraph 2.3.12 above that were identified as having "*low*" or "*medium*" terrestrial plant species sensitivity and were not considered appropriate.	✓
4	**MEDIUM SENSITIVITY SPECIES OF CONSERVATION CONCERN CONFIRMATION**	
	MEDIUM SENSITIVITY RATING – for terrestrial plant species:	
	1. Suspected habitat for SCC based either on there being records for this species collected in the past, prior to 2002, or being a natural area included in a habitat suitability model[19]. 2. SCC listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare.	✓

[15] Available at https://bgis.sanbi.org/
[16] Species with a geographically restricted area of distribution.
[17] https://www.iucnredlist.org/
[18] This category includes the categories Extremely Rare, Critically Rare and Rare
[19] The methodology by which habitat suitability models have been developed are explained within the Species Environmental Assessment Guideline.

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
4.6	Where SCC are found on site or have been confirmed to be likely present, a **Terrestrial Plant Species Specialist Assessment** must be submitted in accordance with the requirements specified for "*very high*" and "*high*" sensitivity in this protocol.	✓
4.7	Similarly, where no SCC are found on site during the site inspection or the presence is confirmed to be unlikely, a **Terrestrial Plant Species Compliance Statement** must be submitted.	✓
5	**LOW SENSITIVITY RATING – for terrestrial plant species**	
	Terrestrial Plant Species Compliance Statement 1. Areas where no natural habitat remains. 2. Natural areas where there is no suspected occurrence of SCC.	✓
5.1	The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Botanical Science or Ecological Science).	✓
5.2	The compliance statement must:	✓
5.2.1	be applicable to the study area;	✓
5.2.2	confirm that the study area, is of "*low*" sensitivity for terrestrial plant species; and	✓
5.2.3	indicate whether or not the proposed development will have any impact on SCC.	✓
5.3	The compliance statement[20] must contain, as a minimum, the following information:	✓
5.3.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;	✓
5.3.2	a signed statement of independence by the specialist;	✓
5.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
5.3.4	a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;	✓
5.3.5	where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;	✓
5.3.6	a description of the assumptions made and any uncertainties or gaps in knowledge or data;	✓
5.3.7	the mean density of observations/ number of samples sites per unit area[21]; and	✓
5.3.8	any conditions to which the compliance statement is subjected.	✓
6	A signed copy of the **Terrestrial Plant Species Compliance Statement** must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.	✓

[20] An example of a what is contained in a Compliance Statement for Plant Species Impact Assessment can be found in the Species Environmental Impact Assessment Guideline

[21] Refer to the Species Environmental Assessment Guideline

8.7 Site Sensitivity Verification Report

8.7.1 Background

Sharples Environmental Services cc (SES) has been appointed by Lyners Engineers on behalf of the George Municipality (applicant), to conduct the Environmental Impact Assessment process for the proposed upgrading of sewer infrastructure in Rosemoor, George, Western Cape (Figure 39). As part of this application, a Terrestrial Biodiversity, Plant & Animal Specialist Assessment is required.



Figure 39: Site locality.

8.7.2 Purpose of Report

The "*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 Act, when applying for Environmental Authorisation*", as published on 20 March, 2020 in National Gazette, No. 43110 in terms of NEMA (Act 107 of 1998) sections 24(5)(a), (h) and 44, lists protocols and minimum report requirements for environmental impacts on terrestrial biodiversity and provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation. The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the National web based Environmental Screening Tool. Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration, identified by the screening tool, must be confirmed by undertaking a **site sensitivity verification**, which must include the following.

4. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.
5. The site sensitivity verification must be undertaken through the use of:

a. a desk top analysis, using satellite imagery.
b. a preliminary on -site inspection; and
c. any other available and relevant information.

6. The outcome of the site sensitivity verification must be recorded in the form of a report that:
   a. confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool.
   b. contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity; and
   c. is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

The National Web Based Screening Tool was used to generate the potential environmental sensitivity of the site which has then been compared to various online and other databases and information sources in order to verify and confirm the validity of the screening tool findings. This was further supported with on-site observations and analysis of most recent aerial photography.

This terrestrial biodiversity site verification has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

8.7.3 Data sources and references

Data sources that were utilised for this report include the following:

- National (DFFE) Web Based Screening Tool – to generate the sites potential environmental sensitivity.
- National Vegetation Map 2018 (NVM, 2018), Mucina & Rutherford (2006) and National Biodiversity Assessment or Red Listed Ecosystems (NBA/RLE, 2022) – description of vegetation types, species (including endemic) and most recent vegetation unit conservation status.
- National and Regional Legislation including Provincial Nature Conservation Ordinance (P.N.C.O). NEM:BA Threatened or Protected Species (ToPS).
- Botanical Database of Southern Africa (BODATSA) and New Plants of Southern Africa (POSA) – lists of plant species and potential species of concern found in the general area (SANBI.)
- International Union for Conservation of Nature (IUCN) - Red List of Threatened Species.
- Animal Demography Unit Virtual Museum (VM) – potential faunal species.
- Global Biodiversity Information Facility (GBIF) – potential flora & faunal species.
- National Red Books and Lists - mammals, reptiles, frogs, dragonflies & butterflies.
- National Freshwater Ecosystem Priority Areas assessment (NFEPA, 2011) - important catchments.
- National Protected Areas Expansion Strategy (NPAES, 2018) and South Africa Protected Area database (2020) – protected area information.
- SANBI BGIS – All other biodiversity GIS datasets.
- Western Cape Biodiversity Spatial Plan (2023).
- Aerial Imagery – Google Earth, ESRI, Chief Surveyor General (http://csg.dla.gov.za).
- Cadastral and other topographical country data - Chief Surveyor General (http://csg.dla.gov.za).
- Other sources may include peer-reviewed journals, regional and local assessments, and studies in the general location of the project and its area of influence, landscape prioritization schemes (Key Biodiversity Areas), systematic conservation planning assessments and plans (as above), and any pertinent masters and doctoral theses, among others.

This terrestrial biodiversity assessment has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

8.7.4 Site visit

A site inspection was conducted on **04 December 2025**, during late spring/early summer and a follow up site visit (early autumn) for additional infrastructure. The site falls within a temperate climate with rainfall occurring throughout the year but is often higher in winter. For the purposes of this report, a single site visit is deemed to be adequate, specifically due to the disturbed nature of the site.

8.7.5 Assumptions, Uncertainties and Gaps in Knowledge

The findings and recommendations of this report may be susceptible to the following uncertainties and limitation:

- No assessment has been made of aquatic aspects relating to any wetlands, pans, and/or rivers/seep ecosystems outside of the scope of a terrestrial biodiversity report. Refer to separate reporting.
- Any botanical surveys based upon a limited sampling time-period, may not reflect the actual species composition of the site due to seasonal variations in flowering times. Additionally, the composition of fire adapted vegetation may vary depending on level of maturity or time since last burn. As far as possible, site collected data has been supplemented with desktop and database-centred distribution data.
- As far as possible, site collected data has been supplemented with desktop and database-centred distribution data as well as previous studies undertaken in the area.

8.7.6 National Environmental Screening Tool

The DFFE Screening Tool indicates the following, summarised in Table 1:

- Terrestrial Biodiversity is Very High (Figure 4).
- Plant species sensitivity is Low &Moderate (Figure 5).
- Animal Species sensitivity is Moderate & High (Figure 6).
- Aquatic Sensitivity is Very High (Figure 7).

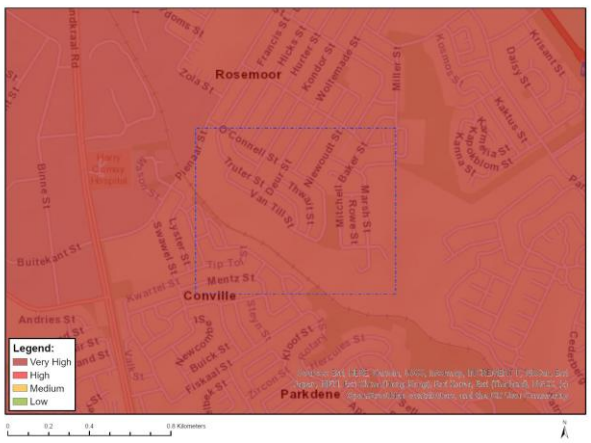


Figure 40: Terrestrial Biodiversity Sensitivity

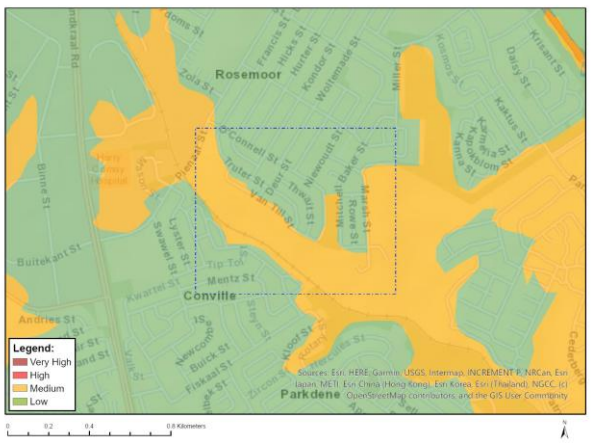


Figure 41: Plant Species Sensitivity

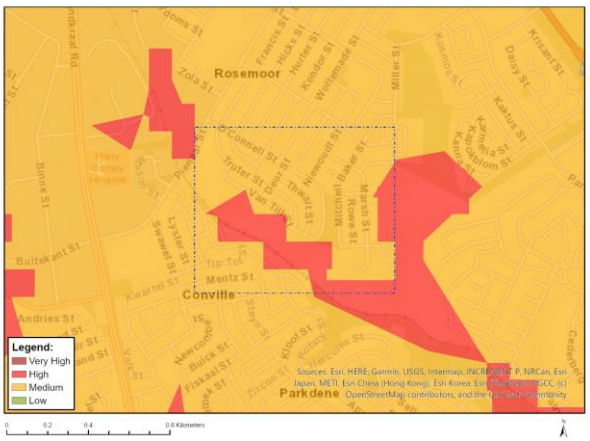


Figure 42: Animal Species Sensitivity

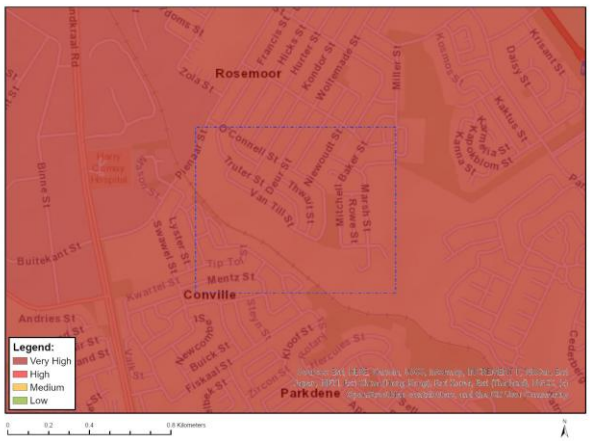


Figure 43: Aquatic Sensitivity

Table 9: Summary of Screening tool designations.

Terrestrial Sensitivity	**Feature(s) in proximity**
Very High	CBA: Terrestrial, CBA2: Terrestrial, SWSA (Outeniqua) & Garden Route Granite Fynbos (Critically Endangered)
High	None
Medium	None
Low	Present
Plant Sensitivity	
Very High	None
High	None
Medium	*Lampranthus pauciflorus, Leucospermum glabrum, Diosma passerinoides, Sensitive species 1024, 1032, 800 & 500.*
Low	Present
Animal Sensitivity	
Very High	None
High	*Circus ranivorus & Bradypterus sylvaticus* (Birds)
Medium	*Afrixalus knysnae* (Amphibian), *Chlorotalpa duthieae*, Sensitive species 8 (Mammal) & *Aneuryphymus montanus* (Insects)
Low	Present
Aquatic Sensitivity	
Very High	CBA: Wetland, SWSA (SW Outeniqua) & Wetlands (Unchanneled Valley-bottom)
High	None
Medium	None
Low	None

The site assessment will also physically screen for the presence of the listed, and other possible species and/or sensitivities that are not identified in the screening tool in addition to those that are flagged. Not all features are directly affected, but being in proximity, the risks associated with the activity will be investigated further and addressed in the report.

The following is deduced from the DFFE National Environmental Screening Tool:

- The terrestrial biodiversity theme is Very-High due to the proposed sewer infrastructure points being within or on the edge of designated CBA 1 & 2 areas. The Very High sensitivity designation is disputed as the entire site is situated on the edge of an urban area with little to no natural vegetation remaining. Vegetation cover is largely comprised of exotic species, and while it will serve limited ecological function, the specific proposed activity, if implemented responsibly and following the recommended mitigation and management actions, can be considered low risk.

- Several flora (plant) species regarded as being of concern are flagged as potentially being present (Medium sensitivity) and are assessed further in the report, however none were found to be present during the site visit and are furthermore due to the transformed nature of the site, it is not deemed to be suitable habitat for any functional species population. The Medium sensitivity designation is thus disputed as the site, which is situated on the edge of an urban area, is within a developed landscape and has hardened surfaces (roads and sidewalks) and/or landscaped gardens with little to no remnant natural vegetation, that will have limited ecological function.
- Several fauna (animal) species regarded as being of concern are flagged as potentially being present (High sensitivity) and are assessed further in the report. Due to the limited size of the site and transformed nature of the surrounding landscape, the site would not be deemed to be viable for any species population. The Medium/High sensitivity designation is thus disputed as the site, which is situated on the edge of an urban area, is within a developed landscape and has hardened surfaces (roads and sidewalks) with little to no remnant natural vegetation that have limited ecological function nor provide suitable habitat other than for temporarily transient fauna species (i.e. such as perching in a tree). The watercourses and riparian vegetation are likely highly polluted and thus not suited to the amphibian species.
- The aquatic sensitivity is Very High due to falling within designated CBA 1: Aquatic, SWSA (SW Outeniqua) & Wetlands - Eastern Fynbos-Renosterveld Bioregion (Valley-bottom). While the site does have a network of watercourses, these are largely modified, being within an urban context, subject to unmanaged stormwater discharge and sewer leaks and also having significantly modified (or exotic) vegetation cover, with some remaining riparian elements. The proposed sewer infrastructure is thus likely to improve aquatic functioning in the long-term.
- The impacts are assessed further in the relevant report sections in the accompanying report.

8.7.7 Findings, Outcomes and Recommendations

Terrestrial Biodiversity

Site verification of the Terrestrial Biodiversity sensitivities is summarised in Table 10 and depicted in *Figure 44*, where CBA is green and ESA is light blue/yellow. The CBA and ESA designation are primarily associated with feature adjacent to the site and/or outside of the proposed development/activity footprint.

Table 10: Terrestrial Biodiversity Features flagged in the National Environmental Screening Tool.

Feature		COMMENT
Critical Biodiversity Area 1	CBA 1	**Dispute** – the site is within an urban area and is vegetation cover is significantly altered where little to no natural vegetation remains, and since any vegetation restoration implies that vegetation would be in a secondary context and thus would strictly speaking not be CBA 1 but CBA 2.
Critical Biodiversity Area 2	CBA 2	**Partially Agree** – In principle it would be possible to restore indigenous vegetation, however the likelihood in the short term is not considered to be high, without significant cost. A part of this process would be to upgrade sewer infrastructure reduce unwanted sewerage discharge into the watercourses, so the proposed activity could indirectly improve overall localised ecological functioning.

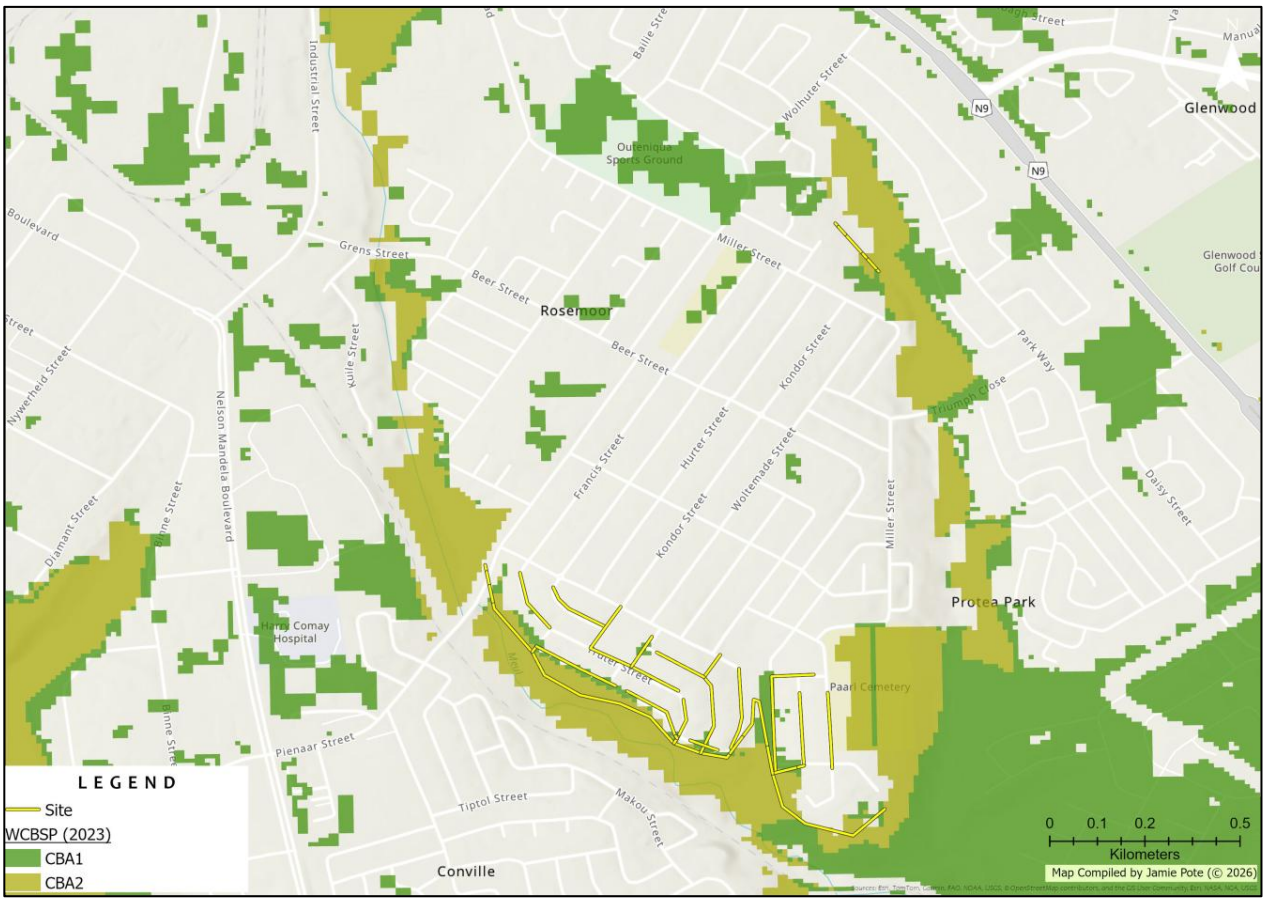


Figure 44: Western Cape Biodiversity Spatial Plan (2023). The site does overlap with some designated CBA 1, CBA 2 and ESA 2 areas.

A CBA 1 designation implies natural vegetation is present, whereas CBA 2 implies restoration is required. In light of the significant lack of indigenous species and high levels of disturbance and/or alien invasion, the correct CBA/ESA designations would need to be ESA 2 and/or CBA 2. It is questionable if the broader vegetated areas along the watercourses would ever achieve a state that would support conservation (i.e. CBA), without significant changes to municipal management and well as resident behaviour, well outside the scope if this assessment; however, they do serve a somewhat role in supporting local ecological processes and connectivity, and with some rehabilitation (which includes construction and improvement of sewer infrastructure), this is likely to improve.

NOTE: as per point 1.5 of the Terrestrial Biodiversity Specialist Assessment and Minimum Report Content Requirements:
'*If any part of the proposed development footprint falls within an area of 'very high' sensitivity, the assessment and reporting requirements prescribed for the 'very high' sensitivity apply to the entire footprint, excluding linear activities for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.'* The terrestrial biodiversity sensitivity for such features is thus deemed low.

Ecological processes should be considered within a landscape level and since the ecological areas are within a significantly modified and fragmented urban landscape, the minor impacts of the proposed sewer infrastructure will have a negligible impact.

The SSVR thus disputes the flagged flora high terrestrial biodiversity sensitivity designation.

Plant Species (Flora)

National Environmental Screening Tool flagged several flora species. Almost the entire site is situated within a significantly altered and degraded landscape, where little natural vegetation remains. No significant pockets of natural vegetation were found that might provide suitable habitat for these species and it is confirmed that no species of conservation concern having an elevated status and/or limited distribution range as flagged in the screening tool are present.

The SSVR thus disputes the flagged flora ('plant') species of conservation concern and medium plant species designations. The specialist designated a low plant species sensitivity.

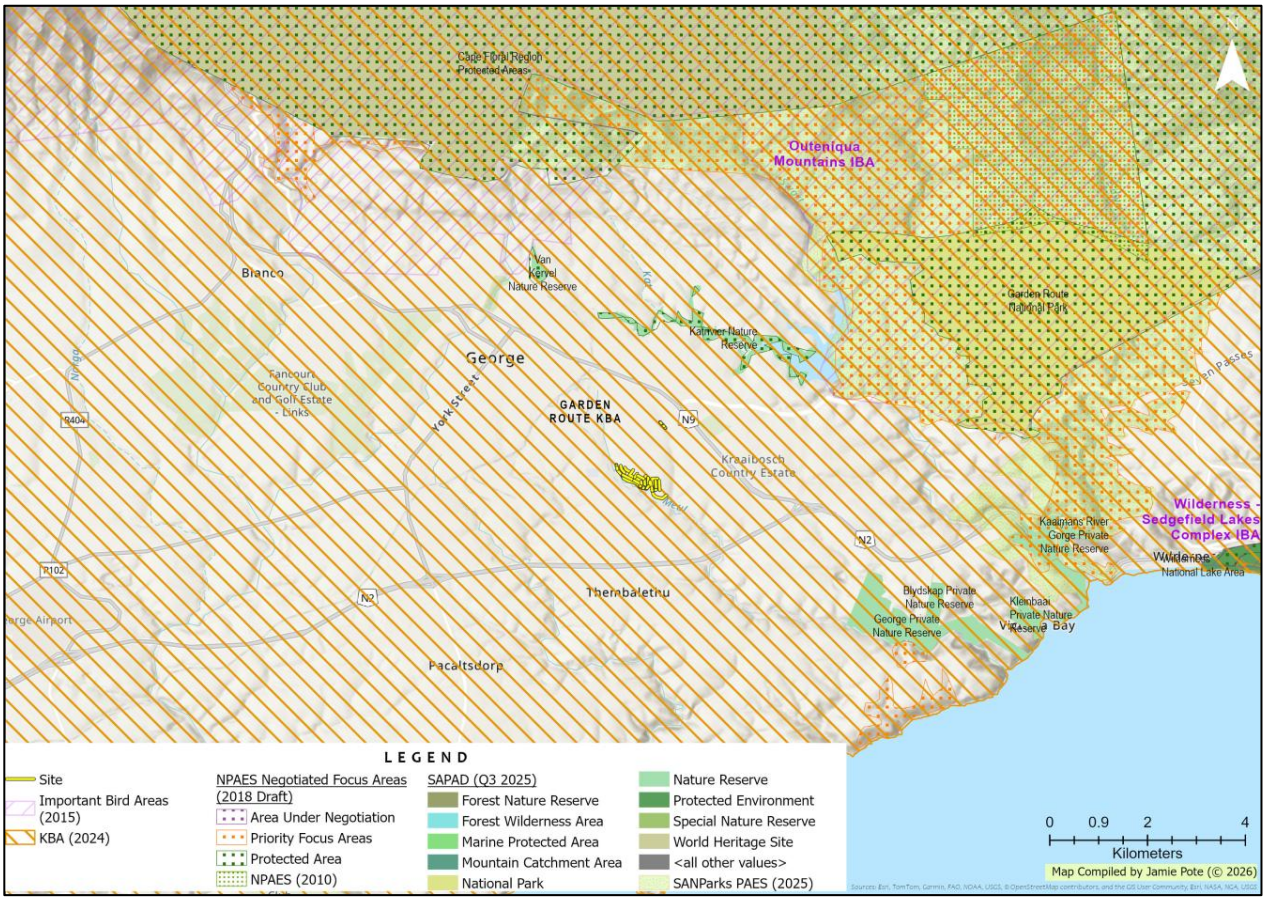


Figure 45: Protected Areas and NPAES in vicinity.

Animal Species (Fauna)

National Environmental Screening Tool flagged several fauna species. Almost the entire site is situated within a significantly altered and degraded landscape, where little natural vegetation remains. No significant pockets of natural vegetation were found that might provide suitable habitat for these species and it is confirmed that no species of conservation concern having an elevated status and/or limited distribution range as flagged in the screening tool are present.

The SSVR thus disputes the flagged fauna ('animal') species of conservation concern designations and High animal species designations. The specialist designated a low animal species sensitivity.

Aquatic

Wetland and River features are present in the broader area, including the watercourses within the urban area. Aquatic aspects are beyond the scope of this Terrestrial Biodiversity assessment but is given consideration in terms of terrestrial processes that may be influenced by the terrestrial vegetation. Based on the terrestrial vegetation composition, the watercourse would be deemed to be significantly modified, having little to no remnant natural vegetation and a high proliferation of weed and invasive alien species. The very high aquatic sensitivity it thus questionable, but outside the scope of this terrestrial assessment which does not include any water quality analysis.

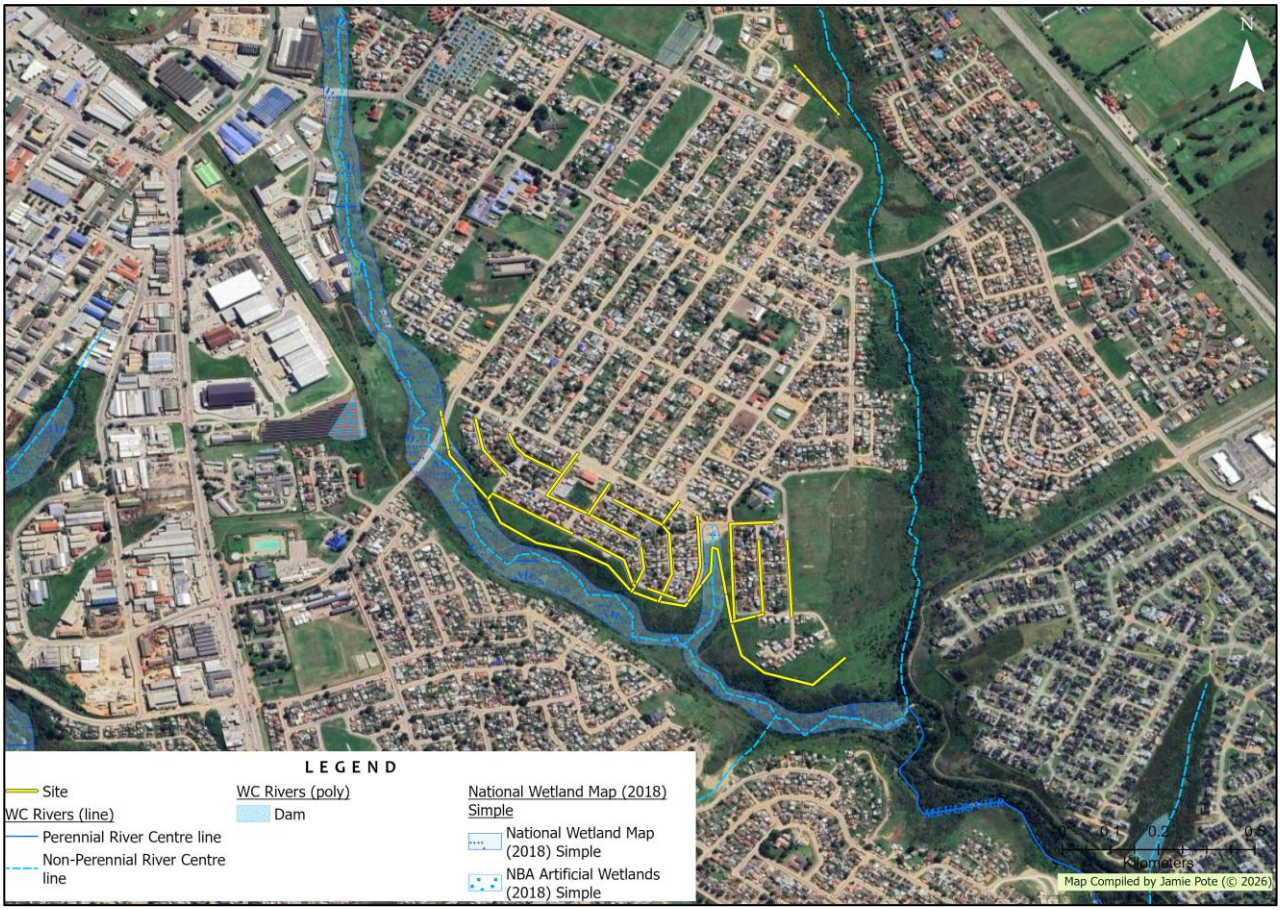


Figure 46: Rivers, FEPAs & SWSA's.

8.7.8 Conclusions

The site verification thus confirms that the site does not fall within a terrestrial biodiversity screening tool designated CBA area, as there is no evidence of any ecologically significant remaining naturel vegetation as the site is almost entirely transformed as the footprint is within a degraded, transformed urban landscape, which will have limited and modified ecological function. In principle, the proposed improvement of sewer infrastructure could result in an overall improvement to the ecological function of the area.

It further disputes that any of the screening tool flagged flora or fauna species of conservation concern are likely to be affected by the proposed activity within a degraded, modified and transformed landscape.

The SSVR thus disputes the flagged flora ('plant') species of conservation concern and medium plant species designation. The specialist designated a low plant species sensitivity.

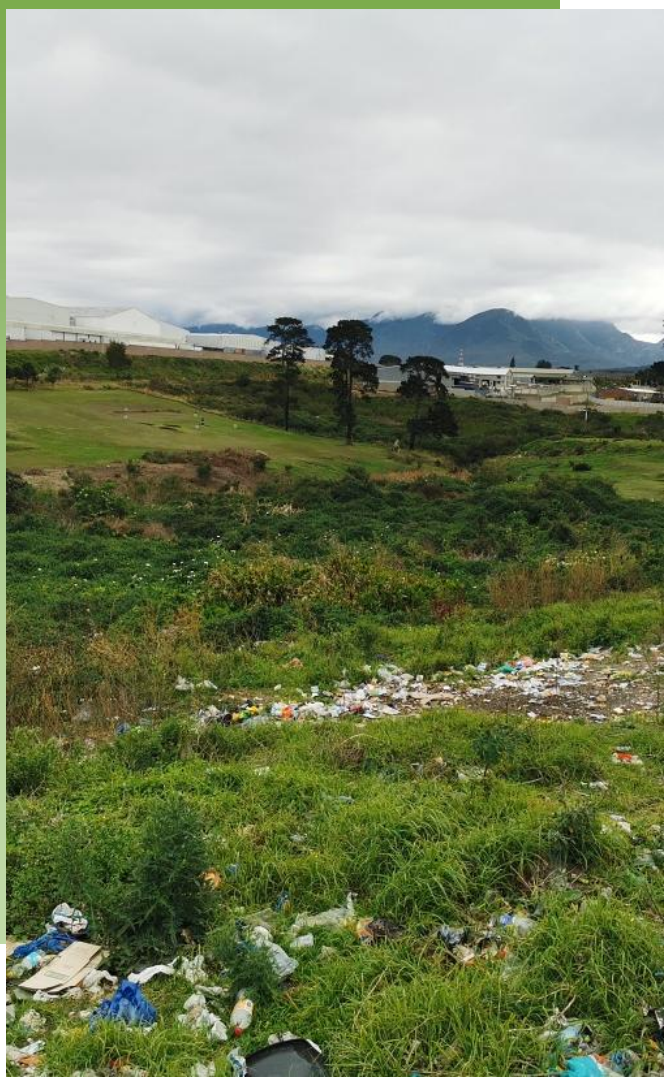
The SSVR thus disputes the flagged fauna ('plant') species of conservation concern and medium plant species designation. The specialist designated a low animal species sensitivity.

The SSVR thus disputes the flagged terrestrial biodiversity sensitivity designation. The specialist designated a low terrestrial biodiversity sensitivity.

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Appendix B2: Terrestrial Biodiversity Compliance Statement and Assessment - Stormwater



Terrestrial Biodiversity Assessment

Rosemoor Stormwater

Date: 23/03/2026
Version: Draft
Author: J. Pote

Terrestrial Biodiversity Assessment

Rosemoor Stormwater

Compiled by: **Jamie Pote** (Pr. Sci. Nat.)
Postnet Suite 57, Private Bag X13130, Humewood, Port Elizabeth, 6013, South Africa
jamiepote@live.co.za +27 (0)76 888 9890

Compiled for: **Sharples Environmental Services**

Date of report: **23/03/2026**

Draft Report

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Revisions

Report/Revision Version	Date:	Approved by:
First Draft	2026/03/23	Jamie Pote
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Final Version		

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1 Introduction & Background

1.1 Background

Sharples Environmental Services cc (SES) has been appointed by Lyners Engineers on behalf of the George Municipality (applicant), to conduct the Environmental Impact Assessment process for the proposed upgrading of stormwater infrastructure of Rosemoor, George, Western Cape (Figure 1). As part of this application, a Terrestrial Biodiversity, Plant & Animal Specialist Assessment is required. This report has been updated to include additional infrastructure added to the layout in 2026.



Figure 1: Site locality.

1.2 Purpose of Report

The "*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 Act, when applying for Environmental Authorisation*", as published on 20 March, 2020 in National Gazette, No. 43110 in terms of NEMA (Act 107 of 1998) sections 24(5)(a), (h) and 44, lists protocols and minimum report requirements for environmental impacts on terrestrial biodiversity and provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation. The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the National web based Environmental Screening Tool. Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration, identified by the screening tool, must be confirmed by undertaking a **site sensitivity verification**, which must include the following.

1. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.

2. The site sensitivity verification must be undertaken through the use of:
   a. a desk top analysis, using satellite imagery.
   b. a preliminary on -site inspection; and
   c. any other available and relevant information.
3. The outcome of the site sensitivity verification must be recorded in the form of a report that:
   a. confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool.
   b. contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity; and
   c. is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

The National Web Based Screening Tool was used to generate the potential environmental sensitivity of the site which has then been compared to various online and other databases and information sources in order to verify and confirm the validity of the screening tool findings. This was further supported with on-site observations and analysis of most recent aerial photography.
This terrestrial biodiversity site verification has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

1.3 Activity Description

The red polygons above (highlighted by red circles) show the areas where stormwater infrastructure outlets will be upgraded outside of the road reserve and in close proximity to watercourses (Figure 2). An additional pipeline was added to the layout in 2026 (Figure 4), and the report has been updated to reflect the additional section.

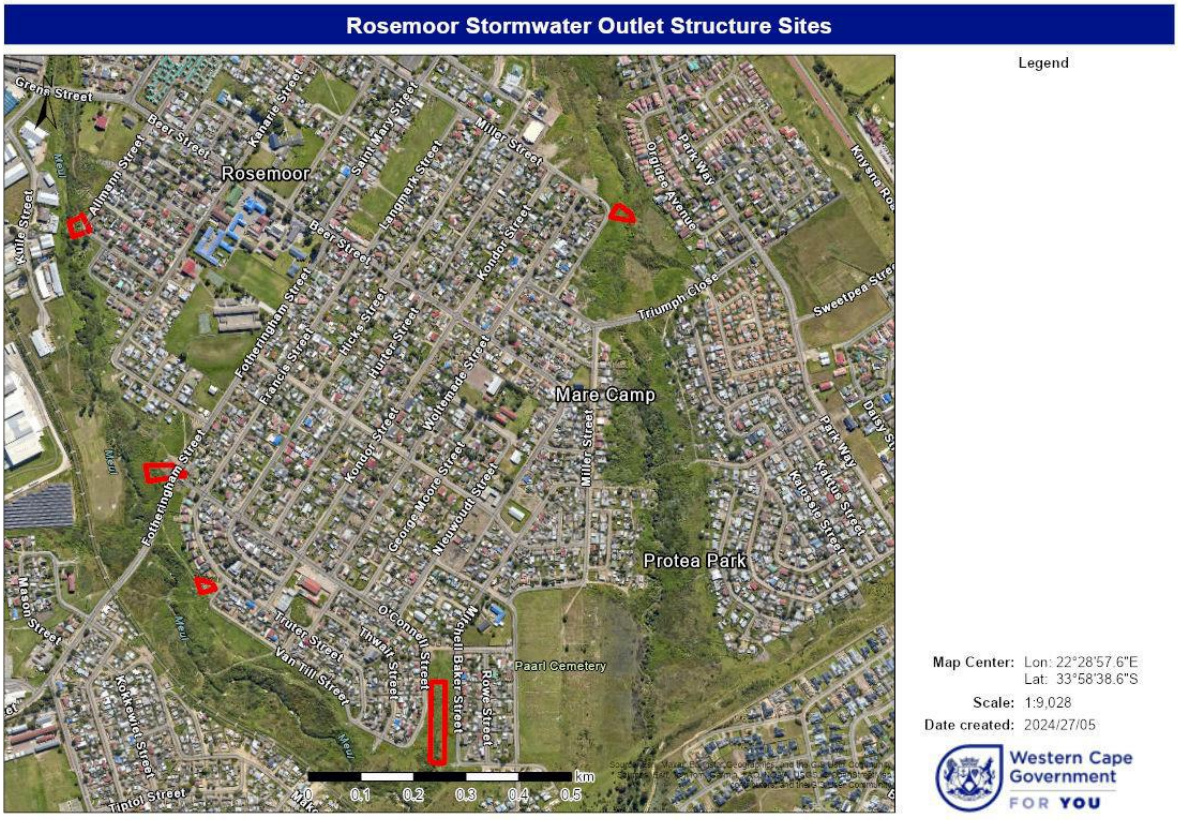


Figure 2: Rosemoor Stormwater Structure Sites.

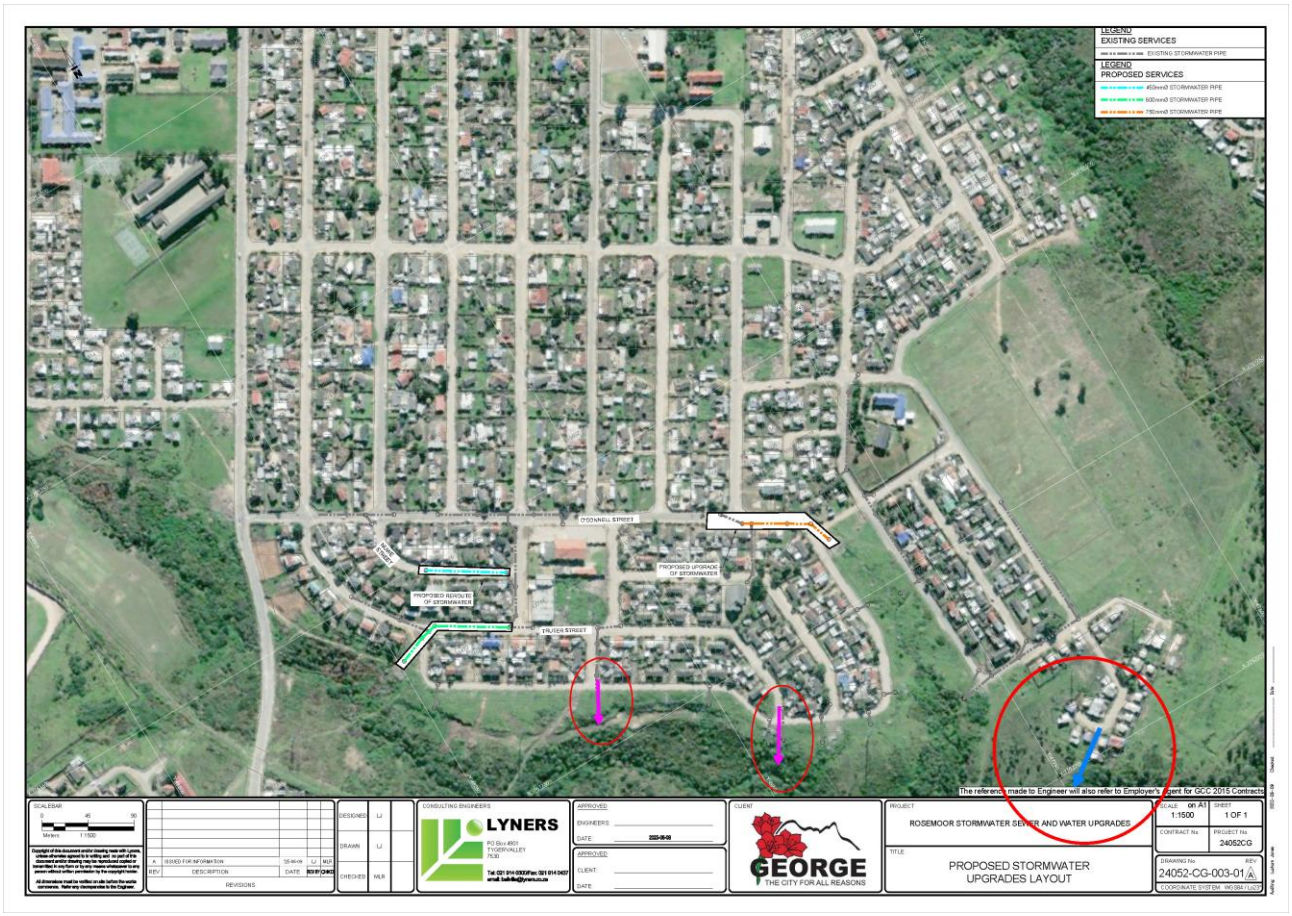


Figure 3: Rosemoor Stormwater Structure Sites.



Figure 4: Rosemoor Stormwater Structure Sites (additional).

1.4 Methodology and Approach

The proposed methodology and approach followed in this assessment are outlined below:

- Conduct a comprehensive desktop study and identify potential risks relating to vegetation and flora of the site and surrounding area, for a Terrestrial Biodiversity Assessment Report. This will include the relevant Regional Planning and legislated frameworks, which will also be represented in a series of associated maps.
- Conduct a detailed site visit to assess the following:
  - Detailed field survey of vegetation, flora and habitats present.
  - Comprehensive species list, highlighting species that are of special concern, threatened, Red Data species and species requiring permits for destruction/relocation in terms of NEMBA and the Provincial Nature Conservation Ordinance No. 19 of 1974.
  - Detailed mapping of the various habitat units and assessment of habitat integrity, ecological sensitivity, levels of degradation and transformation, alien invasion and Species of Conservation Concern, the outcome being a detailed sensitivity map ranked into high, medium or low classes.
- Reporting will be comprised of a preliminary summary, with identification of anticipated impacts and risks for any scoping phase report (where applicable), a draft detailed Assessment Report (for public review and comment) and a Final Assessment Report for submission. The draft and final detailed reports will include the following:
  - Indicate any assumptions made and gaps in available information. Assessment of all the vegetation types and habitat units within the relevant Regional Planning Frameworks.
  - A detailed species list highlighting the various Species of Conservation Concern categories (endemic, threatened, Red Data species and other protected species requiring permits for destruction/relocation and invasive/exotic weeds).
  - Description and assessment of the habitat units and site sensitivities ranked into high, medium or low classes based on sensitivity and conservation importance. A standard methodology has been developed based on other projects in the specific area.
  - Assessment of Impacts and Mitigation Measure, as well as specific measure that may be required for alternative development plans.
  - A comprehensive EMPr for inclusion in the reports and EMP with specific management actions for construction and Operation.
  - A habitat sensitivity map will be compiled, indicting the sensitivities as described above.
  - A map indicating buffers (if required) to accommodate Regional Planning and any other requirements.

This terrestrial biodiversity compliance statement has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

1.5 Data sources and references

Data sources that were utilised for this report include the following:

- National (DFFE) Web Based Screening Tool – to generate the sites potential environmental sensitivity.
- National Vegetation Map 2018 (NVM, 2018), Mucina & Rutherford (2006) and National Biodiversity Assessment or Red Listed Ecosystems (NBA/RLE, 2022) – description of vegetation types, species (including endemic) and most recent vegetation unit conservation status.
- National and Regional Legislation including Provincial Nature Conservation Ordinance (P.N.C.O). NEM:BA Threatened or Protected Species (ToPS).

- Botanical Database of Southern Africa (BODATSA) and New Plants of Southern Africa (POSA) – lists of plant species and potential species of concern found in the general area (SANBI.)
- International Union for Conservation of Nature (IUCN) - Red List of Threatened Species.
- Animal Demography Unit Virtual Museum (VM) – potential faunal species.
- Global Biodiversity Information Facility (GBIF) – potential flora & faunal species distributions.
- National Red Books and Lists - mammals, reptiles, frogs, dragonflies & butterflies.
- National Freshwater Ecosystem Priority Areas assessment (NFEPA, 2011) - important catchments.
- National Protected Areas Expansion Strategy (NPAES, 2018) and South Africa Protected Area database (2020) – protected area information.
- SANBI BGIS – All other biodiversity GIS datasets.
- Western Cape Biodiversity Spatial Plan (2017).
- Aerial Imagery – Google Earth, ESRI, Chief Surveyor General (http://csg.dla.gov.za).
- Cadastral and other topographical country data - Chief Surveyor General (http://csg.dla.gov.za).
- Other sources may include peer-reviewed journals, regional and local assessments, and studies in the general location of the project and its area of influence, landscape prioritization schemes (Key Biodiversity Areas), systematic conservation planning assessments and plans (as above), and any pertinent masters and doctoral theses, among others.

This terrestrial biodiversity assessment has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

1.5.1 Site visit

A site inspection was conducted on **24 July 2024**, during mid-winter and a follow up site visit (early autumn) for additional infrastructure. The site falls within a temperate climate with rainfall occurring throughout the year but is often higher in winter, hence for the purposes of this report, a single site visit is deemed to be adequate, specifically due to the disturbed nature of the site.

1.5.2 Assumptions, Uncertainties and Gaps in Knowledge

The findings and recommendations of this report may be susceptible to the following uncertainties and limitation:

- No assessment has been made of aquatic aspects relating to any wetlands, pans, and rivers/seeps and/or estuaries or marine ecosystems outside of the scope of a terrestrial biodiversity report. Refer to separate reporting.
- Any botanical surveys based upon a limited sampling time-period, may not reflect the actual species composition of the site due to seasonal variations in flowering times. Additionally, the composition of fire adapted vegetation may vary depending on level of maturity or time since last burn. As far as possible, site collected data has been supplemented with desktop and database-centred distribution data.
- As far as possible, site collected data has been supplemented with desktop and database-centred distribution data as well as previous studies undertaken in the area.

2 Policy

2.1 Legislation Framework

In terms of NEMA EIA Regulations (07 April 2014, as amended), the following is applicable[1]:

- In terms of section 52 of NEMBA *(Activity (a)(i))*, the vegetation unit Garden Route Granite Fynbos, has a **Critically Endangered** status as per National Biodiversity Assessment (2022).
- In terms of the Western Cape Biodiversity Spatial Plan (WCBSP, 2017), designated Critical Biodiversity Area 1 & 2 and Ecological Support Area 2 overlaps partially with the site.

Listing Notice 1:

Activity 12: The development of—
(xii) infrastructure or structures with a physical footprint of 100 square metres or more.
where such development occurs—
(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse: —
excluding—
(dd) where such development occurs within an urban area; or
(ee) where such development occurs within existing roads or road reserves.

The proposed activity is located within an urban area; hence the activity is not applicable.

Activity 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—
~~i. will occur behind a development setback.~~

The proposed activity will exceed the excavation of more than 10 cubic meters from within 32m of a watercourse, hence will be triggered.

Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—
(i) the undertaking of a linear activity; or
(ii) ~~maintenance purposes undertaken in accordance with a maintenance management plan.~~

The proposed activity will potentially exceed clearing of more than 1 Ha of indigenous vegetation resulting from construction of the discharge points.

Listing Notice 2:

None are applicable.

Listing Notice 3:

Activity 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 maintenance management plan.
(a) In Eastern Cape, Free State, Gauteng, Limpopo, North-West and Western Cape provinces:
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~~.
ii. Within critical biodiversity areas identified in bioregional plans.

1 *The listed activities itemized are only those with Biodiversity relevance to this report and is not a complete list.*

The proposed activity will potentially exceed clearing of more than 300m² of indigenous vegetation from within designated Critical Biodiversity Areas as well as designated Critically Endangered vegetation, resulting from construction of the discharge points.

Activity 14: The development of—
(ii) infrastructure or structures with a physical footprint of 10 m² or more, where such development occurs—
(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse
(f) In Western Cape:
i. Outside urban areas, in:
(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.

The proposed activity will include structures of more than 10m² within 32m of a watercourse within designated Critical Biodiversity Area and Ecological Support Areas, however, is situated within an urban area.

In terms of the EIA Listing Notices, listing notice 1 & 3, the activity is trigged as indicated above, thus requiring a Basic Assessment process. This Terrestrial Biodiversity Assessment will primarily deal with the activities triggering listed activities 12 (LN 1) and 14 (LN 3), depending on requirements for clearing of indigenous vegetation.

Other potentially relevant legislation, which will be evaluated as required, includes the following:

- Liability for any environmental damage, pollution, or ecological degradation: Arising from all -related activities occurring inside or outside the area to which the permission/right/permit relates is the responsibility of the rights holder. The National Water Act and NEMA both oblige any person to take all reasonable measures to prevent pollution or degradation from occurring, continuing, or reoccurring (polluter pays principle). Where a person/company fails to take such measures, a relevant authority may direct specific measures to be taken and, failing that, may carry out such measures and recover costs from the person responsible.
- Public participation: Public consultation and participation processes prior to granting licences or authorisations can be an effective way of ensuring that the range of ways in which the activities impact on the environment, social and economic conditions are addressed, and considered when the administrative discretion to grant or refuse the licence is made.
- Constitution of Republic of South Africa (1996): Section 24(a) of the Constitution states that everyone has the right *'to an environment that is not harmful to their health or well-being'*. Construction activities must comply with South African constitutional law by conducting their activities with due diligence and care for the rights of others.
- Western Cape Nature and Environmental Conservation Ordinance 19 of 1974: Lists Protected species, requiring permits for removal (Department of Economic Development, Environmental Affairs and Tourism).
- Water Use Authorisations: The National Water Act (No. 36 of 1998): Requires that provision is made both in terms of water quantity and quality for 'the reserve', namely, to meet the ecological requirements of freshwater systems and basic human needs of downstream communities. It is essential in preparing an EMP that any impacts on water resources be they surface water or groundwater resources, and/ or impacts on water quality or flow, are carefully assessed, and evaluated against both the reserve requirement and information on biodiversity priorities. This information will be required in applications for water use licenses or permits and/or in relation to waste disposal authorisations.
- Conservation of Agricultural Resources Act 43 of 1993: Lists Alien invasive species requiring removal.

2.2 Systematic Planning Frameworks

A screening of Systematic Planning Framework for the region has been undertaken (summarised in Table 1), that included the following features:

- National Environmental Screening Tool
- Critically Endangered, Endangered and Vulnerable Ecosystems
- Critical Biodiversity and Ecological Support Areas
- River and Wetland Freshwater Ecosystem Priority Areas (FEPAs) and buffers
- Protected Areas (and buffers) and National Protected Area Expansion Strategy areas (NPAES).
- Critical Habitat for listed endemic or protected species.

Table 1: Summary of Regional Planning Biodiversity features.

FEATURE[2]	DESCRIPTION	IMPLICATIONS/COMMENT
National Environmental Screening Tool (Terrestrial Biodiversity)	Very High Terrestrial Biodiversity Low, Medium & High Plant & Animal Species sensitivities Very High Aquatic sensitivity	CBA 1 & 2, ESA 2, Critically Endangered ecosystem, SWSA & SANParks Buffer Several Plant & Animal Species flagged by the screening tool. CBA 1, SWSA & Wetlands
National Vegetation Map (NVM, 2018)	Garden Route Granite Fynbos	Critically Endangered
Critically Endangered and Endangered Ecosystems (NBA 2018)	Garden Route Granite Fynbos	Assessment to determine risks.
Vulnerable Ecosystems (NBA)	None	N/A
Western Cape Biodiversity Spatial Plan (2017)	Critical Biodiversity Area 1 & 2, Ecological Support Area 1	Assessment to determine risks.
Protected Areas (SAPAD)	None	N/A
Protected Areas (WC BSP)	None	N/A
NPAES (Draft 2018)	None	N/A
NPAES (2010)	None	N/A
Strategic Water Source Areas (SWSA)	Outeniqua SWSA	Impacts to site may have risks to downstream water sources.
Freshwater Ecosystem Priority Areas (FEPA's)	None	N/A
Regional Hotspots & Regions of Endemism	Cape Floristic Region Hotspot	Specific activity and site unlikely to pose any risk to broader biodiversity hotspot.
Important Bird Areas (IBA's)	None	N/A
Key Biodiversity Areas (KBA's)	None	N/A
Marine/Coastal areas	None	N/A
RAMSAR sites	None	N/A
Within 32 m of Watercourse	Stormwater discharge points will be within 32m of watercourses	May have impacts to watercourses and/or associated flora and fauna.
Within 100 m of River	None.	N/A
Estuary	None	N/A

[2] Refer to Figure 9 to Figure 13.

FEATURE[2]	DESCRIPTION	IMPLICATIONS/COMMENT
Within 500 m of Wetland	Valley Bottom Wetlands are associated with the watercourses in the area.	May have impacts to watercourse and/or associated flora and fauna.
Forest	None	N/A
Surrounding Land Uses	Surrounding land primarily used for urban dwellings.	Site and surrounding area are transformed and/or with scattered secondary vegetation elements.
Critical Habitat for listed endemic/ protected species	No specific populations of threatened species were identified within the footprint and the affected footprint is largely disturbed or comprised of secondary vegetation. There are several red listed species in the surrounding area and vegetation units that are known to have limited distributions, however none were recorded within the footprint.	

2.2.1 National Environmental Screening Tool

The DEA Screening Tool indicates the following, summarised in Table 1:

- Terrestrial Biodiversity is Very High (Figure 5).
- Plant species sensitivity is Low &Moderate (Figure 6).
- Animal Species sensitivity is High (Figure 7).
- Aquatic Sensitivity is Very High (Figure 8).

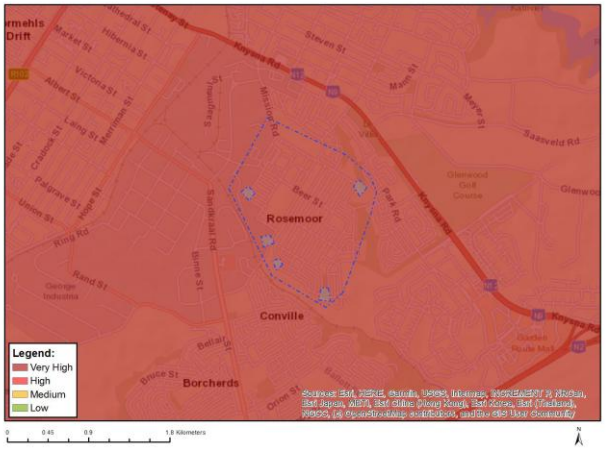


Figure 5: Terrestrial Biodiversity Sensitivity

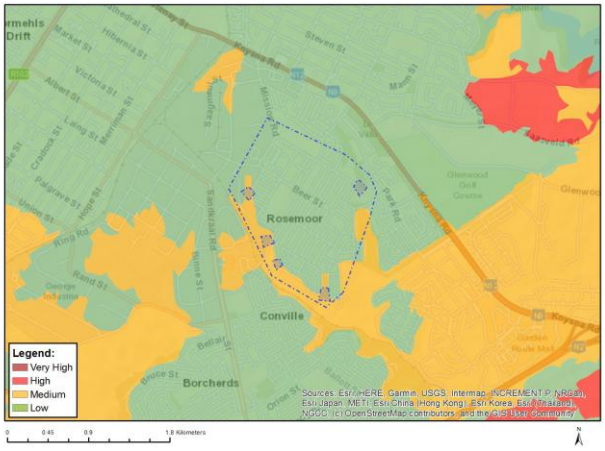


Figure 6: Plant Species Sensitivity

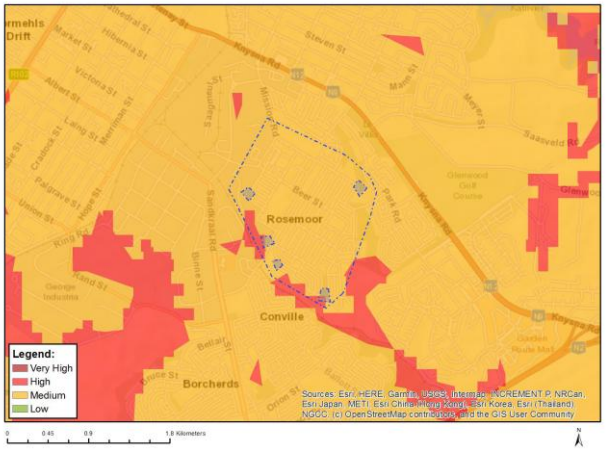


Figure 7: Animal Species Sensitivity

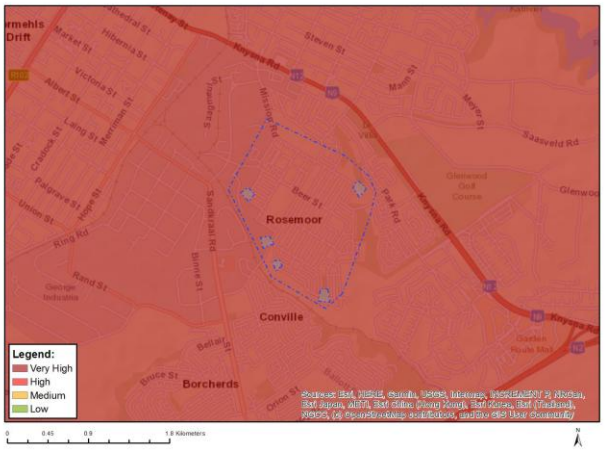


Figure 8: Aquatic Sensitivity

Table 2: Summary of Screening tool designations.

Terrestrial Sensitivity	**Feature(s) in proximity**
Very High	CBA 1: Terrestrial, CBA 2: Terrestrial, SWSA (SW Outeniqua) & Garden Route Granite Fynbos (Critically Endangered)
High	None
Medium	None
Low	Present
Plant Sensitivity	
Very High	None
High	None
Medium	*Lampranthus pauciflorus, Leucospermum glabrum, Diosma passerinoides, Sensitive species 1024, 1032, 800 & 500.*
Low	Present
Animal Sensitivity	
Very High	None
High	*Circus ranivorus* & *Bradypterus sylvaticus* (Birds)
Medium	*Afrixalus knysnae* (Amphibian), *Chlorotalpa duthieae*, Sensitive species 8 (Mammal) & *Aneuryphymus montanus* (Insects)
Low	Present
Aquatic Sensitivity	
Very High	CBA 1: Aquatic, SWSA (SW Outeniqua) & Wetlands - Eastern Fynbos-Renosterveld Bioregion (Valley-bottom wetlands)
High	None
Medium	None
Low	None

2.2.2 Vegetation of Southern Africa

The National Vegetation Type (NBA, 2018, Figure 9) indicated for the site and surrounding area are Garden Route Granite Fynbos, having a *Critically Endangered* status, as per National Biodiversity Red Listed Ecosystems Assessment (NBA/RLE, 2022).

Garden Route Granite Fynbos (FFg 5)

VT 46 Coastal Renosterbosveld (70%) (Acocks 1953). South Coast Renosterveld (22%) (Moll & Bossi 1983). LR 2 Afromontane Forest (67%) (Low & Rebelo 1996). BHU 100 Knysna Afromontane Forest (64%), BHU 28 Blanco Fynbos/Renosterveld Mosaic (36%) (Cowling et al. 1999b, Cowling & Heijnis 2001).

Distribution: Western Cape Province: Garden Route. Three main blocks south of the Outeniqua Mountains on the coastal plain from Botterberg west of Brandwaghoogte (south of Robinson Pass) to Groot Brak River; the largest block from Groot Brak River to Woodfield near the Wilderness (with a few strips along the coast from Bothastrand to the Wilderness); lastly, north of the lakes from Woodville to Hoogekraal Pass, west of Karatara.

Altitude: 0–300 m.

Vegetation & Landscape Features: Moderately undulating plains and undulating hills on the coastal forelands. Dense proteoid and ericoid shrubby grassland. Proteoid and graminoid fynbos are dominant with ericaceous fynbos in seeps. In the west, most remnants of this type are dominated by proteas. Eastwards graminoid and ericaceous fynbos are dominant on the flat plateaus, with proteas confined to the steep slopes.

Geology & Soils: George Batholith of the Cape Granite Suite. Deep, prismacutanic- and pedocutanic-dominated soils typical of Db land types (mainly).

Climate: MAP 350–880 mm (mean: 600 mm), with a slight low in early winter. Mean daily maximum and minimum temperatures 27.8°C and 6.8°C for January–February and July, respectively. Frost incidence 2 or 3 days per year.

Important Taxa: Tall Shrubs: *Passerina corymbosa* (d), *Cliffortia serpyllifolia*, *Protea coronata, P. lanceolata, P. neriifolia.* Low Shrubs: *Erica discolor variant 'speciosa'* (d), *E. peltata* (d), *Phylica confusa* (d), *Syncarpha paniculata* (d), *Agathosma ovata, Anthospermum prostratum, Aspalathus asparagoides, Cliffortia falcata, Cullumia bisulca, Erica canaliculata, E. diaphana, E. formosa, Eriocephalus africanus, Hermannia angularis, Leucadendron salignum, Lobelia tomentosa, Metalasia pungens, Mimetes cucullatus, Pelargonium fruticosum, Relhania calycina*. Succulent Shrub: *Lampranthus sociorum*. Semiparasitic Shrubs: *Osyris compressa, Thesium virgatum.* Semiparasitic Epiphytic Shrub: *Viscum capense*. Geophytic Herb: *Schizaea pectinata*. Graminoids: *Tetraria cuspidata* (d), *Brachiaria serrata, Eragrostis capensis, Ficinia nigrescens, Heteropogon contortus, Pentaschistis eriostoma, Restio triticeus, Themeda triandra*.

Conservation: Critically Endangered (2022). Target 23%. Only about 1% conserved in the proposed Garden Route National Park. About 70% has been transformed for, cultivation (56%), pine plantations (7%) and by urban development (6%). Remnants are largely confined to isolated pockets on steeper slopes.

Erosion: Moderate and High. Very few patches of this type remain in a pristine condition as most of it has been converted to pasture by liming, bush-cutting and frequent burning, and augmented with pasture grasses. Western remnants suggest that proteoid fynbos might have been dominant historically. It is easily converted to graminoid fynbos by regular fires and augmentation with pasture grasses.

References: Drews (1980b), Hoare et al. (2000).

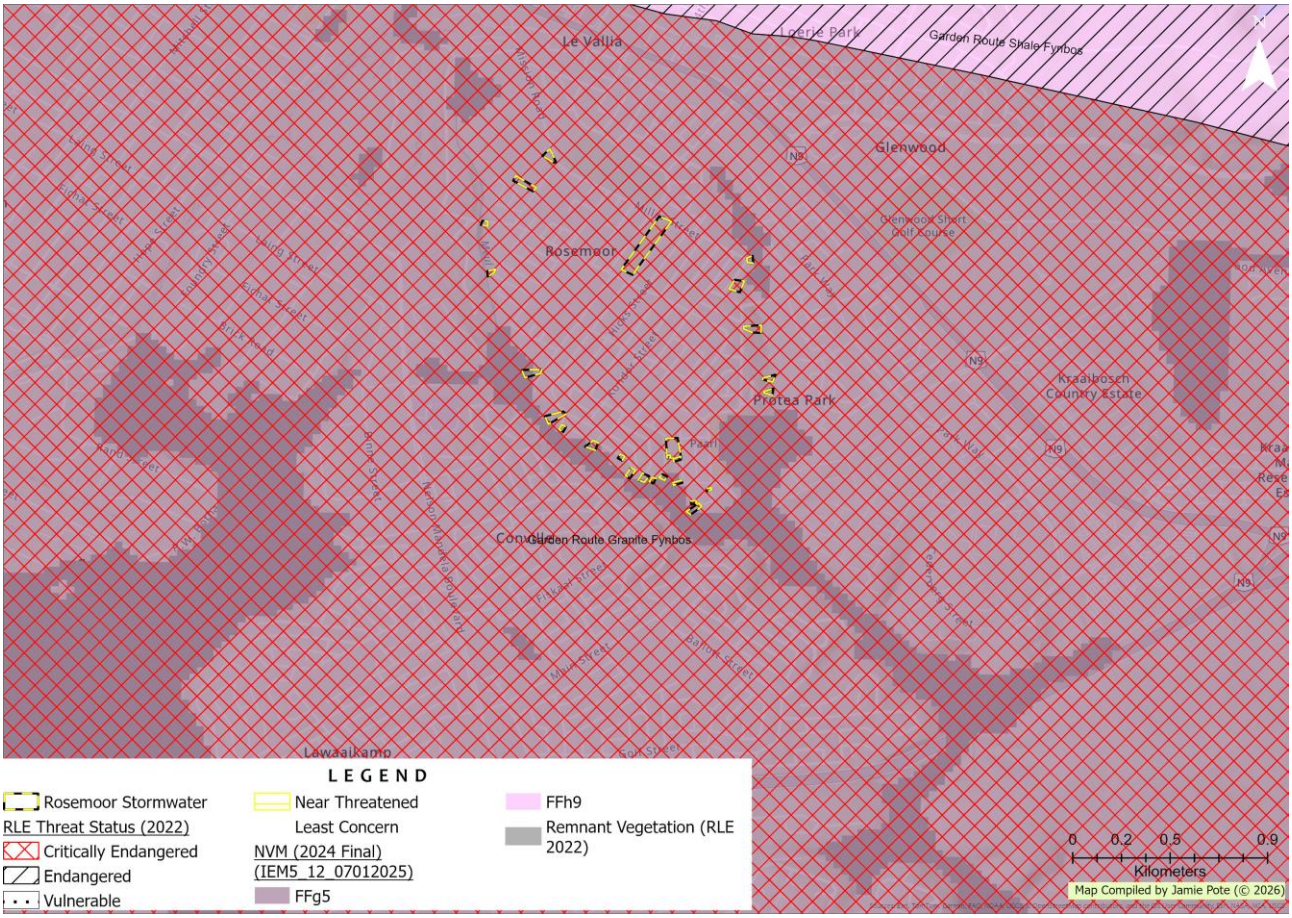


Figure 9: National Biodiversity Assessment Vegetation Type and Conservation Status (NBA, 2018). Darker shaded areas indicative of remnant vegetation.

2.2.3 Western Cape Biodiversity Spatial Plan (WCBSP, 2023) – Terrestrial

The Western Cape Biodiversity Spatial Plan (2017, Figure 10) indicates that most of the proposed stormwater structure footprints fall within transformed roads and road reserves, with predominantly the discharge points falling within areas designated CBA 1 & 2 and ESA 2, which are associated with the watercourses and surrounding vegetation that are undeveloped within the urban area.

The Biodiversity Spatial Plan indicates areas of land as well as aquatic features which must to be safeguarded in their natural state if biodiversity is to persist and ecosystems are to continue functioning. Land in this category is referred to as a Critical Biodiversity Area. CBAs incorporate:

I. areas that need to be safeguarded in order to meet national biodiversity thresholds.
II. areas required to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or
III. important locations for biodiversity features or rare species.

Ecological Support Areas (ESAs) are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may be an ecological process area that connects and therefore sustains Critical Biodiversity Areas or a terrestrial feature. None are present withi the site or immediate vicinity. Defining criteria and recommended activities are summarised in Table 3 below.

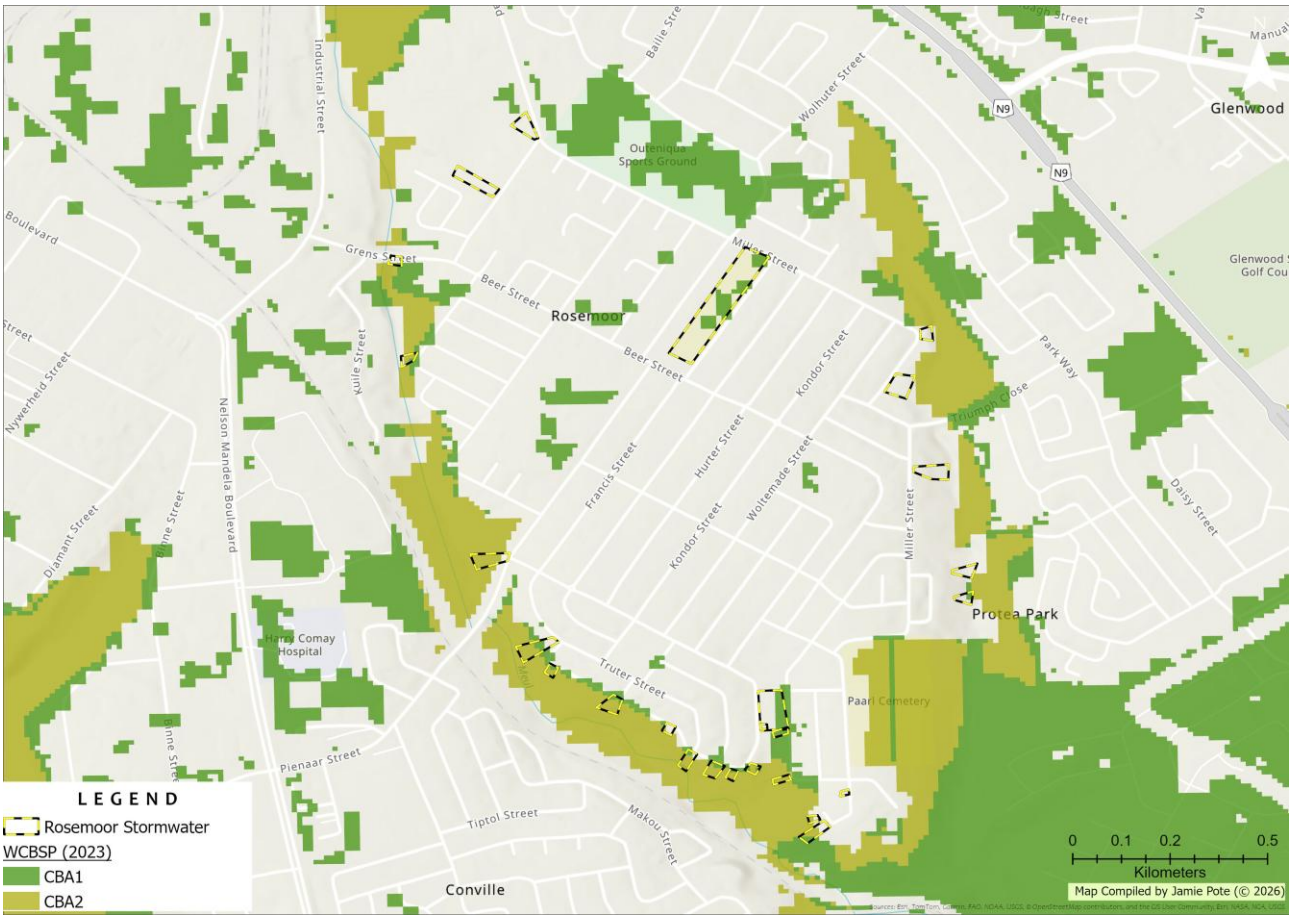


Figure 10:Western Cape Biodiversity Spatial Plan (WCBSP, 2023) –The site does overlap with some designated CBA 1 and CBA 2 areas.

Table 3: Criteria defining Critical Biodiversity Areas (Source: WC BSP, 2023)

CBA MAP CATEGORY:	DEFINING CRITERIA
Protected Areas (Not Present)	Areas that are proclaimed as protected areas under national or provincial legislation.

CBA MAP CATEGORY:	DEFINING CRITERIA
	Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity. A benchmark for biodiversity.
Critical Biodiversity Areas 1 (CBA) (Present)	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 habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
Critical Biodiversity Areas 1 (CBA 2) (Present)	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 functional, natural, or near-natural state, with no further loss of natural habitat. These areas should be rehabilitated.
Ecological Support Areas 1 (ESA 1) (Not Present)	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PA's or CBA's and are often vital for delivering ecosystem services. Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
Ecological Support Areas 2 (ESA 2) (Not Present)	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PA's or CBA's and are often vital for delivering ecosystem services. Restore and/or manage to minimise impact on ecological infrastructure functioning; especially soil and water-related services.
Other Natural Areas (ONA) (Present)	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem. Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high-impact land uses.
No Natural Area Remaining (NNAR) (Present)	Areas that have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets. These areas may still provide limited biodiversity and ecological infrastructure functions, even if they are never prioritised for conservation action. Manage in a biodiversity-sensitive manner, aiming to maximise ecological functionality. Offers the most flexibility regarding potential land uses, but some authorisation may still be required for high impact land uses.

2.2.4 Protected areas

The South Africa Protected Areas Database (SAPAD) database, a comprehensive database of various protected area categories, is updated on a quarterly basis, and provides a comprehensive source of all national and private nature reserves, world heritage sites and other formal legally protected conservation areas situated within South Africa (Figure 11).

When projects are located in legally protected and internationally recognized areas, clients should ensure that project activities are consistent with any national land use, resource use, and management criteria (including Protected Area Management Plans, National Biodiversity Strategy and Action Plans (NBSAP's), or similar documents).

The proposed site does not overlap with any SAPAD designated Protected Areas and is unlikely to have any impacts of significance to any species or processes associated with any nearby Protected Areas. Nearest Protected Areas within 10 km of the site include Blydskap Private Nature Reserve (4.6 km SE), Cape Floral Kingdom Protected Areas (4.6 km NW), Garden Route National Park (4.2 km NE), George Private Nature Reserve (3.8 km SE), Katrivier Nature Reserve (1.6 km N), Van Kervel Nature Reserve (2.6 km NW), Kwelanga Private Nature Reserve (6.4 km S), Kleinbaai Private Nature Reserve (6 km SE), Kaaimans River Gorge Private Nature Reserve (5.7 km NE). The watercourses associated with the proposed stormwater infrastructure are subsidiaries of the Meul River, which flows in a southerly direction and passes along the southern boundary of the George Private Nature Reserve.

The site is not within or in proximity to any designated NPAES areas, where any impacts may arise.

Activities that improve water quality discharge are likely to have a positive indirect impact in the downstream areas including protected areas.

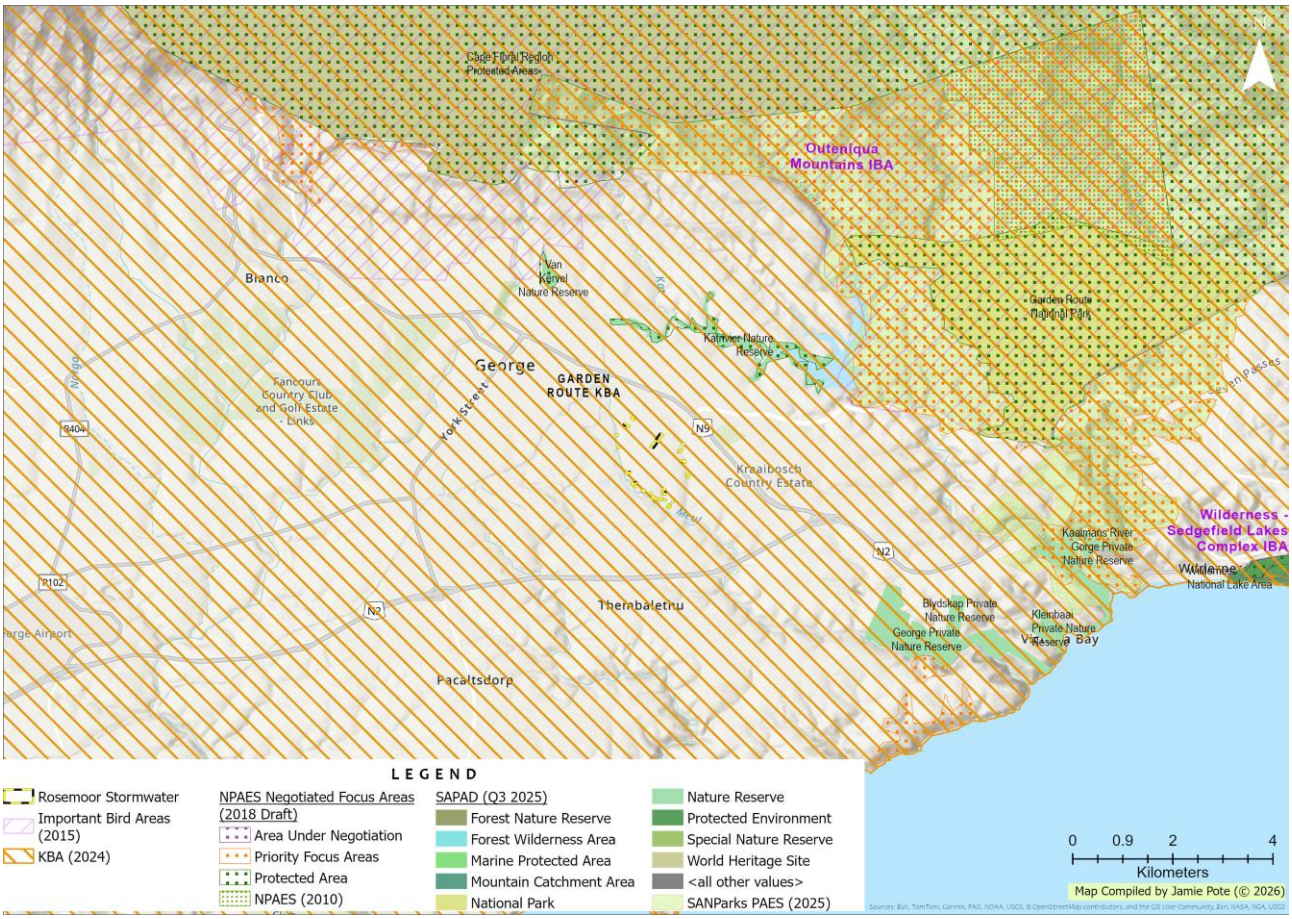


Figure 11: Protected Areas.

2.2.5 Key Biodiversity Areas

The site is situated within the Garden Route KBA, which covers and extensive area within eh eastern and western cape provinces. Subsequently, while 132 potential triggers (habitat and species) are flagged within the KBA, most are localised and thus only applicable to a small area within the boundary of the designated KBA area which includes terrestrial, marine, freshwater habitat and species. The specific triggers that are relevant to this site are addressed in the respective sections pertaining to the vegetation unit and species of conservation concern.

2.2.6 Important Bird Areas

The site is not situated within or near nay designated Important Bird Area (Figure 11). The nearest IBA is the Outeniqua mountains IBA situated just over 3 km to the north and east. While the surrounding area may have transient bird species visitors that are associated with the IBA, it is unlikely that the specific activity, within an urban and significantly transformed and degraded area is likely to have any impact of significance to such occurrences.

2.2.7 Garden Route Biodiversity Sector Plan (2010)

The Garden Route BSP (GRBSP, 2007, Figure 12) identified the vegetation as being Grassy Fynbos (associated with the slopes) and Rivers & Floodplain (associated with the watercourses). The Garden Route BSP further indicates that portions of the site partially intersect with designated Critical Biodiversity Area along the watercourses and possibly representing historically intact or remnant vegetation. The Garden Route BSP is largely integrated with and/or superseded by the Western Cape BSP and National Vegetation Map, which is also updated to represent changing land use, but indicates that the later plans are broadly aligned with the earlier GRBSP.



Figure 12: Garden Route Biodiversity Sector Plan (2007) vegetation designation and CBA/ESA status.

2.2.8 Rivers, Watercourses and Wetlands

The site is situated within along roads within an urban area, on slopes that drain into the adjacent slightly incised watercourses. The slopes directly adjacent to the watercourses are generally undeveloped and have vegetation cover. The condition and status of the vegetation cover, including riparian vegetation, is included in the vegetation description section below. The non-perennial watercourses associated with

the Rosemoor area drain in a southerly direction into the Meul River, which flows southwards to the coast.

Wetlands potentially comprise Valley bottom wetlands that are associated with the local watercourses. Aquatic assessment is outside the scope of this assessment but will consider aspects that relate to terrestrial processes and species.

Formalisation of stormwater infrastructure implemented correctly is likely to reduce erosion along riverbanks and ease localised flooding. Within the urban context, any wetlands in the vicinity of the discharge points are likely already significantly modified and/or affected by stormwater flows and are thus unlikely to be affected above baseline levels.

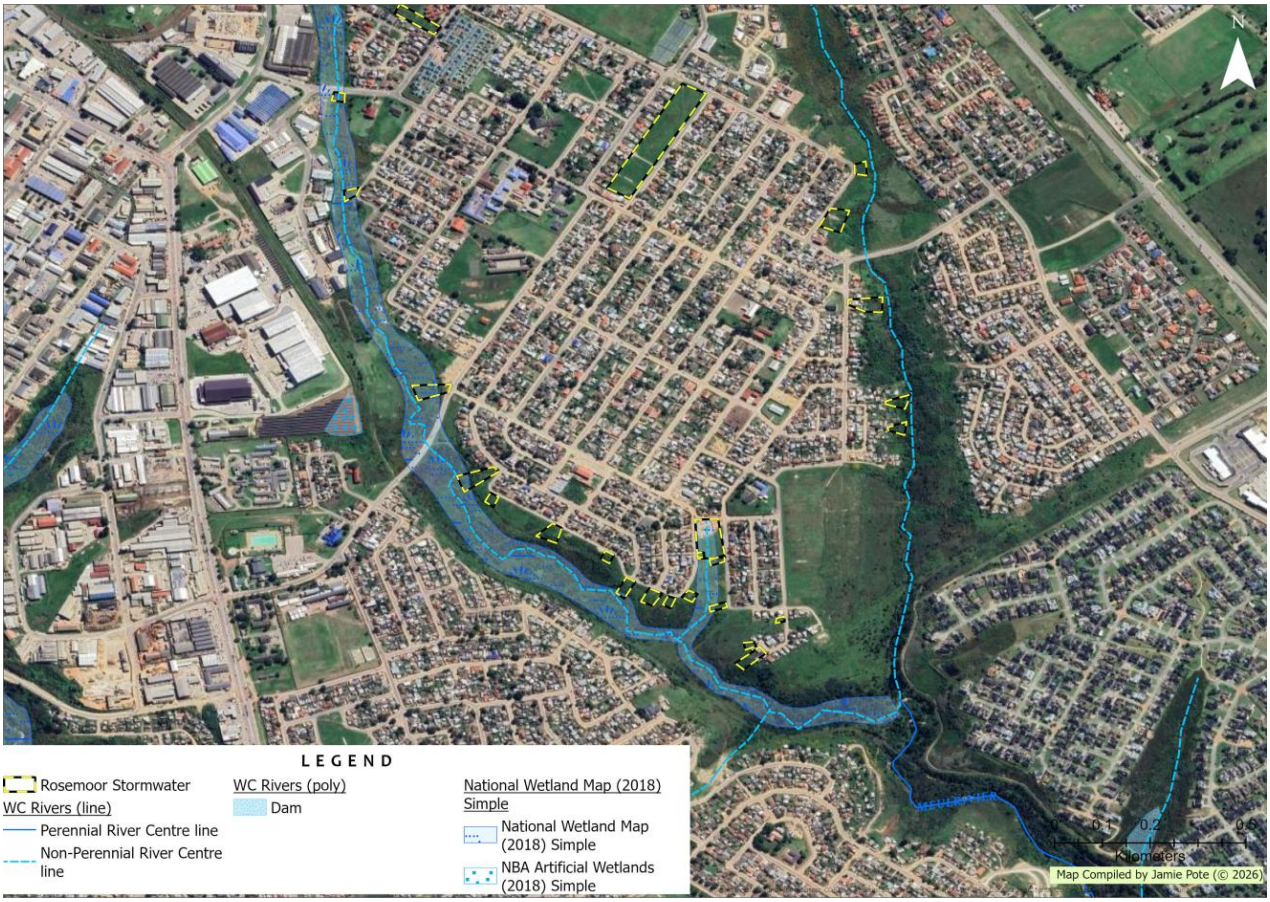


Figure 13: Rivers. Wetlands and Estuaries associated with the site.

3 Biodiversity Risk Identification and Assessment

3.1 Baseline Biodiversity Description

The site is located within a transformed developed urban area on slopes adjacent to somewhat incised watercourses, draining in a southerly direction. The only remaining vegetation cover is comprised of a narrow band of vegetation along eh banks of the watercourses, as well as some grassed and landscaped gardens within the suburbs (Figure 15 to Figure 42). .

The site is comprised predominantly of transformed areas which include the dwellings, surfaced roads, sidewalks, landscaped gardens ana few grassed open space areas (Figure 43). The areas having '*natural*'

vegetation cover are generally confined to the undeveloped areas surrounding the watercourses. The discharge points associated with the proposed stormwater infrastructure are generally located within these areas, typically discharging into the watercourses.

Three different main habitats can be differentiated within the vegetated area:

1. Transformed – Includes hardened surfaces such as paved roads, sidewalks, landscaped gardens and grassed areas including parks and road verges (*Figure* 15 to *Figure* 20).
2. Vegetated Areas– significantly degraded 'natural' vegetation composed predominantly of ruderal weeds, shrubs small trees and grasses (*Figure* 21 to *Figure* 30).
3. Watercourse – Watercourses are significantly degraded (*Figure* 31 to *Figure* 42).

Figure 15 to *Figure* 42 provide a general overview of the site.



Figure 14: Aerial photo of the site.

Transformed

Transformed areas (*Figure* 15 to *Figure* 20) are comprised of hardened surfaces such as paved roads, sidewalks, landscaped gardens and grassed areas including grassy parks and road verges. No indigenous terrestrial vegetation is present in these areas, other than planted trees on sidewalks and road verges that include predominantly exotic species.



Figure 15: Typical urban street.



Figure 16: Typical urban street.



Figure 17: Typical urban street.



Figure 18: Typical urban street.



Figure 19: Grassed open space area.



Figure 20: Grassed open space area.

Open areas are generally subject to mowing and vegetated with grasses including exotic Kikuyu grass (*Cenchrus clandestinus*, previously *Pennisetum clandestinum*) and Kweek (*Cynodon dactylon*) as well as several creeping ruderal weeds including *Arctotheca prostrata* (Prostrate Cape Milkweed).

Vegetated Areas

Vegetated areas (*Figure* 21 to *Figure* 30) along the slopes adjacent to watercourses are significantly disturbed and vegetation cover is comprised primarily of exotic Kikuyu grass (*Cenchrus clandestinus*, previously *Pennisetum clandestinum*) and *Senecio angulatus* (Cape Ivy) as groundcovers, with a range of ruderal and invasive weed species including herbs and shrubs *Ricinus communis* (Castor Oil plant), Bugweed (*Solanum mauritianum*), *Canna indica*, Inkberry (*Cestrum laevigatum*), *Lantana camara, Nidorella ivifolia, Amaranthus* spp. (Amaranth), *Verbena bonariensis*, *Iris pseudacorus*, *Cirsium vulgare* (Thistle), *Senna didymobotrya* (Peanut-Butter Cassia), *Phytolacca octandra* (Inkweed), *Urtica urens* (Nettle) and *Vinca major* (Periwinkle) and *Rubus* sp. (Bramble). Common trees include *Sambucus nigra* (European Black Elderberry) and *Acacia mearnsii* (Black Wattle), as well as *Leptospermum scoparium* (Broom tree), *Sesbania punicea* (Sesbania), *Acacia melanoxylon* (Blackwood), and *Melia azedarach* (Syringa). Clumps of *Cortaderia selloana* (Pampas Grass) is also common along the water courses. A wide range of garden escapees are also present, likely coming from dumped garden waste, mostly non-indigenous species.

Remnant elements include *Arctotheca prostrata* (Prostrate Cape Milkweed), *Carpobrotus deliciosus* (Sourfig), Wild Dagga (*Leonotis leonurus*), Arum lily (*Zantedeschia aethiopica*), *Senecio angulatus* and *Searsia rehmanniana*. While *Senecio angulatus* is an indigenous species, it can become invasive in disturbed areas and the creeping vine-like growth from allows it to effectively smother other vegetation.

The percentage of natural vegetation within this habitat is likely between 5 and 10 % comprising a few scratted elements. The vegetation present is not representative of the Critically Endangered



Figure 21: Typical vegetated watercourse bank (Kikuyu).



Figure 22: Typical vegetated watercourse bank (Kikuyu).



Figure 23: Typical vegetated watercourse bank (Kikuyu).



Figure 24: Typical vegetated watercourse bank (Kikuyu).



Figure 25: Typical vegetated area (Kikuyu).



Figure 26: Typical vegetated area (Kikuyu).



Figure 27: Typical vegetated area (Kikuyu).



Figure 28: Typical vegetated area (Cape Ivy).



Figure 29: Typical vegetated area (Kikuyu).


Figure 30: Typical vegetated area (Kikuyu).

Watercourses

Watercourses (*Figure* 31 to *Figure* 42) are significantly disturbed and/or modified with vegetation also comprised predominantly of exotic and invasive species. Cover is primarily also exotic Kikuyu grass (*Cenchrus clandestinus*, previously *Pennisetum clandestinum*) and *Senecio angulatus* (Cape Ivy), as well as *Cortaderia selloana* (Pampas Grass) and *Sambucus nigra* (European Black Elderberry) trees and the reed *Arundo donax* (Giant Reed). Riparian vegetation is not easily distinguished from surrounding vegetation due to the proliferation of weeds that are common to both habitats.

Remnant indigenous elements are occasional and include Arum lily (*Zantedeschia aethiopica*), clumps of *Typha capensis* (Bulrushes), occasional indigenous reeds (*Phragmites australis*) and occasional tufts of remnant sedges, including *Juncus effusus*, *Cyperus polystachyos and Cyperus textilis.*


Figure 31: Watercourse bridge crossing.


Figure 32: Discharge point at watercourse crossing.


Figure 33: Typical Watercourse.


Figure 34: Typical Watercourse.



Figure 35: Typical Watercourse.



Figure 36: Typical Watercourse.



Figure 37: Typical Watercourse.



Figure 38: Typical Watercourse.



Figure 39: Typical discharge point.



Figure 40: Eroded and polluted watercourse.



Figure 41: Eroded and polluted watercourse.



Figure 42: Eroded and polluted watercourse.

The proposed development is unlikely to have any significant impact on any 'intact' or natural indigenous vegetation of any significant ecological value. The respective vegetation or habitats coverages are indicated in Table 4 below

Table 4: Approximate footprint coverage areas of habitat in hectares.

HABITAT	SENSITIIVTY	AREA (HECTARES)
Watercourse	Moderate	~ 0.7
Vegetated Areas	Low	~ 1.0
Transformed/Hardened	Low	~ 1.8
TOTAL		**~ 3.5**



Figure 43: Mapped vegetation of the site (Overview).



Figure 44: Mapped vegetation of the site (North portion).



Figure 45: Mapped vegetation of the site (South portion).

3.1.1 Present Ecological State

In summary, the following general observations can be noted regarding the site:

- The area in and around the site is completely transformed and or degraded as a result of urban development and associated processes including dumping of refuse and garden waste and other pollution sources, with the occasional remnant scattered indigenous species. No elements of species typical to Garden Route Granite Fynbos were observed within vegetated areas along the watercourses
- Alien invasion is high to very high, comprising most of the vegetation along the watercourses and surrounding vegetated areas.
- Ecological processes are thus primarily significantly modified, as natural and indigenous vegetation elements are largely absent from within the site.
- Fauna species include mainly species typical of urbanised and transformed areas, perhaps having the occasional visit from less common species that typically occur in natural areas that are in transit through urban area or are acclimated to the urbanised environment.

3.1.2 Vegetation and Ecological Processes and Corridors

Landscapes corridors are a combination of Critical Biodiversity Areas (areas required to meet conservation targets) and Ecological Support Areas that link habitats, as well as linking inland mountains to the coastline (and therefore beyond municipal boundaries). Rivers and their associated riparian or riverbank habitats often provide the basis for many of these large-scale (landscape level) ecological processes.

Critical Biodiversity Areas (CBA) are generally regarded as being critical for meeting conservation objectives for vegetation units in an optimal manner. Where a vegetation unit is not under threat (i.e. Least Concern status), there is some flexibility, ito alternatives; however, as conservation status increases (a vegetation unit is under threat due to high levels of transformation), alternative options to meet conservation targets are significantly reduced. CBA 1 areas are generally natural or near natural, whereas CBA 2 are degraded and/or transformed areas where restoration would be required and/or recommended.

Ecological Support Areas (ESA) are supporting zones or areas which must be safeguarded as they are needed to prevent degradation of Critical Biodiversity Areas and formal Protected Areas. Although many ESA's consist of natural veld, there are areas of land - partially or wholly transformed or degraded -that have been classified as ESA even though they are no longer in a natural state. Although these areas are heavily degraded or transformed, they still play an important role in supporting ecological processes. This is particularly the case with riparian areas, some key catchment areas, and key pieces of corridors. ESA 1 areas are generally natural or near natural, whereas ESA 2 are degraded and/or transformed areas where restoration would be required and/or recommended. An ESA that is vegetated but not natural or near natural can still serve to retain some connectivity and support ecological processes, but in a significantly reduced manner. For example, trees in an apple orchard will provide perches for some birds and grassy groundcover will still allow for movement of some small animals such as rodents and reptiles. Certain species are significantly more at risk, as they may not be able to adapt to a modified environment, whereas others may not be affected.

While the site falls within a broader important ecologically connected area along the watercourses, the specific site is significantly transformed and surrounded by developed erven and paved roads. Remnant vegetation along watercourse is significantly degraded and transformed and thus provides limited

'natural' ecological value in its current state. It will serve limited connectivity support but does not and is not likely to support any substantial populations of at-risk species of conservation concern that are not adaptable to modified environments, nor provide ecological services and processes typically associated with the Critically Endangered Garden Route Granite Fynbos that occurs in the broader area. The watercourse corridors will however serve as broad level artificial habitat corridors for general movement faunal species around the broader area, but since no flora species typical of the unit are present, flora related ecological processes (such as pollination and seed dispersal) would be absent. The proposed activity, having a negligible footprint within significantly modified habitat, is thus unlikely to significantly impact or disturb these processes nor likely to alter current species composition from current baseline levels.

3.1.3 Flora & Fauna

No endemic and range restricted species were recorded to be present. Several species are known from the surrounding area, but unlikely to be affected by the proposed activity.

Red Listed, Endemic and Protected Flora

The site falls within the general distribution range of several endemic species and other species with a highly localised distribution, some of which are Critically Endangered, Endangered, Vulnerable or Rare. Some of these species are also only from a single or a few populations.

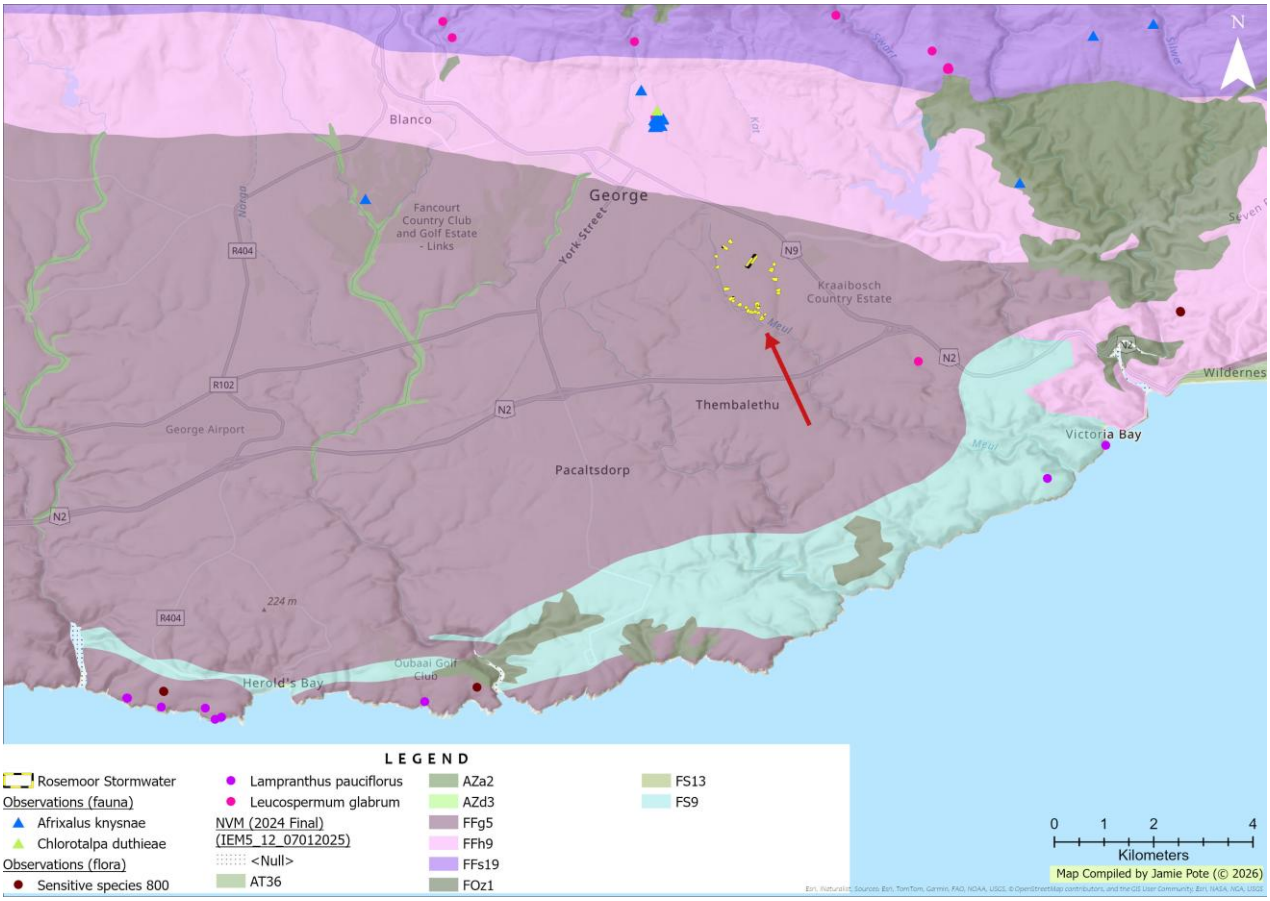


Figure 46: Distribution records of flora and fauna Species of Conservation Concern (GBIF, 26 July 2024) with known records in the vicinity of the site. NOTE some distribution records may have an offset for biosecurity purposes and/or accuracy errors but will non the less give an indication of general locality.

Table 5: Flora Species of Special Concern

SCIENTIFIC NAME	STATUS[3]	COMMENT/PRESENCE
Diosma passerinoides	NEST (M), Vu	Total population size estimated to be <5 000 mature individuals, based on records of 18 out of 25 subpopulations where species is indicated to be rare, uncommon, or only a few plants present, and with survey data of seven subpopulations indicating that the largest subpopulation consists of no more than 500 mature individuals. These populations are declining due to a number of different threats such as invasive alien plants, habit degradation in the form grazing and habitat loss due to protea cultivation. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Lampranthus pauciflorus	NEST (M), En	EOO 1270 km², four known locations remain after most of this species' habitat has been transformed for coastal development. Habitat loss continues, especially around Plettenberg Bay, Mossel Bay and Knysna. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Leucospermum glabrum	NEST (M), En	Somewhat widespread distribution including a population in the northern areas of George. A restricted endemic with an extent of occurrence (EOO) ranging between 1620 and 1642 km², and an area of occupancy (AOO) of between 152 and 156 km². This species occurs as scattered small subpopulations with the total population not exceeding 2500 mature individuals, and each subpopulation having fewer than 250 plants. The mountains where this species occurs have been extensively surveyed. Road verges and significantly disturbed watercourses do not provide suitable habitat for this species. Not recorded on site, which is not typical of preferred habitat.
Sensitive species 1024	NEST (M), En	A range-restricted and very rare species known from four small, severely fragmented subpopulations. It has an extent of occurrence (EOO) of 971 km². The population consists of 2 500 mature individuals, and the largest subpopulation has less than 200 plants. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Sensitive species 1032	NEST (M), Vu	Somewhat widespread distribution including a population in the northern areas of George. Not recorded on site but found in surrounding area. Road verges and significantly disturbed watercourses do not provide suitable habitat for this species.
Sensitive species 500	NEST (M), En	Somewhat widespread distribution. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.
Sensitive species 800	NEST (M), Vu	Formerly a very common species, now remaining mostly as small, isolated subpopulations on fragments of natural vegetation within its lowland distribution range. Not recorded on site and no known localities in close proximity that suggest high likelihood of a local occurrence.

As per Table 5, no Endangered or Critically Endangered flora species were confirmed to be present nor are known to be present in the affected area. Most likely species that do occur in the broader surrounding area include *Leucospermum glabrum* & Sensitive species 1032, however none were observed on the site. The species *Diosma passerinoides, Lampranthus pauciflorus, Sensitive species 1024, Sensitive species 500 & Sensitive species 800* have records in a much broader are and no records indicate a local presence.

Site observations also confirmed none being present, also confirmed to not be the typical habitat for several of the species, hence the footprint does not provide suitable habitat for these species.

3 **PNCO** - Provincial Nature Conservation Ordinance (1974); **NFA** - National Forests Act of (1998); ToPS – Threatened or Protected Species; **IUCN:** CR - Critically - Endangered, En - Endangered, Vu - Vulnerable; LC - Least Concern.

Red Listed and Protected Fauna

As per Table 6, no Endangered or Critically fauna species were found to be present nor are known to be present in close proximity to the affected area or are likely to be directly affected by the proposed activity. The site falls within the general distribution range of a single faunal SCC as indicated in Table 6 below, however none are confirmed to be present. Since the project footprint is relatively small, is situated directly adjacent to urban and disturbed areas and also surrounded by extensive outlying areas of natural habitat, any disturbance or displacement associated with increased activity or habitat destruction as a direct result of the activity is unlikely to pose a significant negative impact faunal species and in particular the species of special concern.

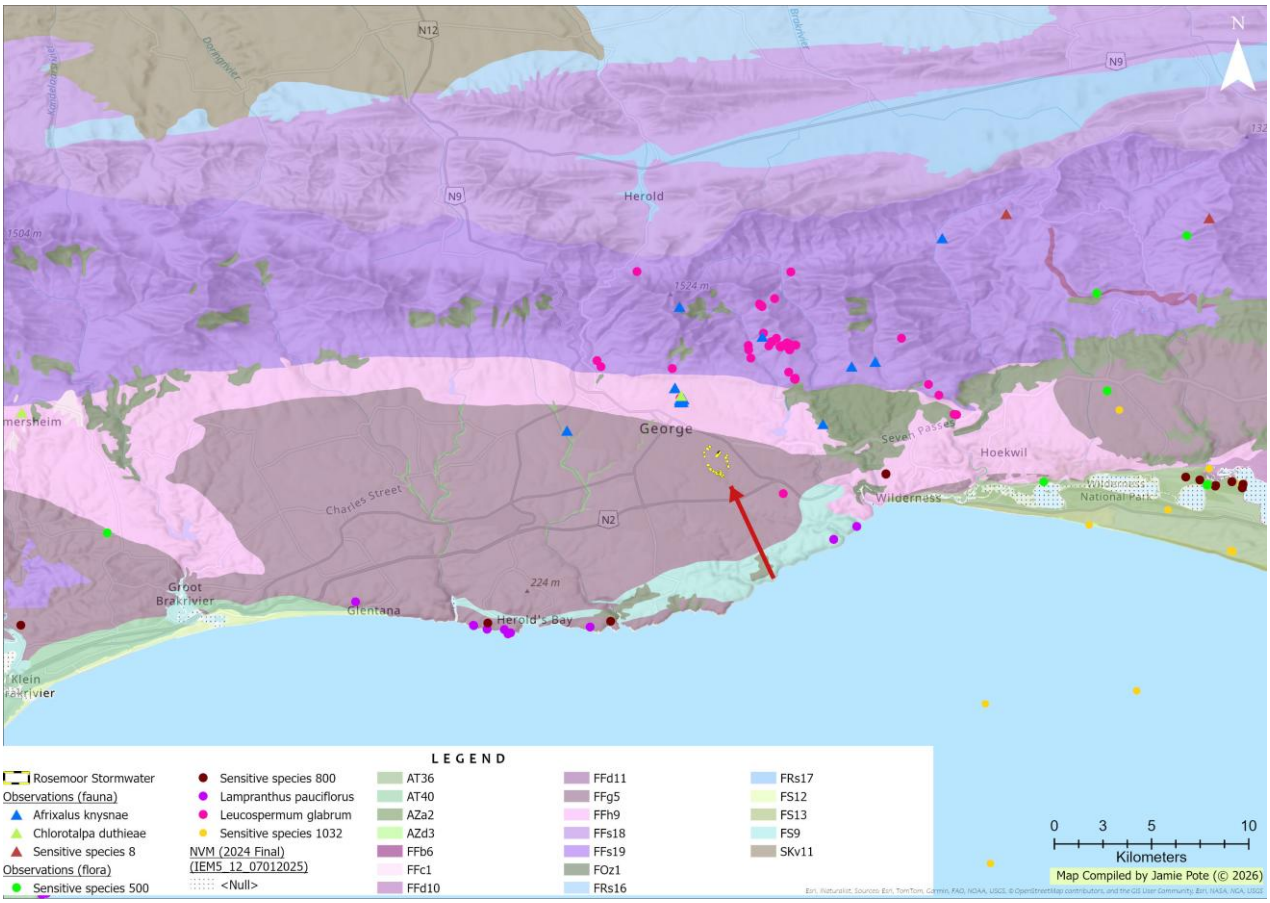


Figure 47: Distribution records of flora and fauna Species of Conservation Concern (GBIF, 26 July 2024) with known records from the broader area. NOTE some distribution records may have an offset for biosecurity purposes but will non the less give an indication of general locality (i.e. locality records in the sea).

Table 6: Fauna Species of Special Concern (SCC)

SCIENTIFIC NAME	COMMON NAME	STATUS[4]	COMMENT/PRESENCE
Mammals			
Chlorotalpa duthieae	Duthies Golden Mole	NEST (M), Vu	Known form the broader area, no evidence of any Golden Moles on site, which is primarily a landscaped garden and largely surrounded by compacted material.
Sensitive species 8		NEST (M), Vu	Not recorded on site but records indicate a presence in the surrounding area. May be a transient visitor in developed areas, but not likely to be affected above baseline levels due

4 **PNCO -** Provincial Nature Conservation Ordinance (1974); ToPS – Threatened or Protected Species, **IUCN:** Cr - Critically - Endangered, En - Endangered, Vu - Vulnerable; LC - Least Concern.

SCIENTIFIC NAME	COMMON NAME	STATUS[4]	COMMENT/PRESENCE
			to the proposed activity within a densely populated part of an urban area.
Birds			
Bradypterus sylvaticus	Knysna warbler	NEST (H)	Unlikely to be affected above baseline levels by the proposed activity in an already transformed footprint.
Circus ranivorus	African Marsh Harrier	NEST (H)	
Reptiles			
None			
Amphibians			
Afrixalus knysnae	*Knysna Spiny Reed Frog*	NEST (M), En	Unlikely to be present nor affected by the proposed temporary activity in a transformed footprint. While aquatic and other suitable habitat is in principle present, it is not deemed suitable due to the high levels of pollution in the watercourse and also the disturbed nature of the surrounding vegetation Not recorded.
Invertebrates			
Aneuryphymus montanus	Yellow-winged Agile Grasshopper	NEST (M), Vu	No records from vicinity and not recorded on site. Unlikely to be present nor affected by the proposed temporary activity in a transformed landscape. Not recorded.

Records indicate that the species *Chlorotalpa duthieae*, Sensitive species & *Afrixalus knysnae* have been recorded in the wider area, however none are likely to occur on the site. There is no evidence of any Golden Moles being present and while aquatic habitat is present, it is not deemed suitable due to the high levels of pollution in the watercourse and also the disturbed nature of the vegetation.

The birds *Bradypterus sylvaticus* & *Circus ranivorus*, as well as the insect *Aneuryphymus montanus*, while likely occurring in the surrounding area where natural vegetation is intact and more extensive, are unlikely to be affected by the proposed activity which will have a small and highly localised footprint. Improved stormwater management is also likely to improve overall aquatic health after construction.

Site observations also confirmed none being present, also confirmed to not be the typical habitat for several of the species, hence the footprint does not provide suitable habitat for these species.

No fauna PNCO permits are anticipated to be required but are recommended as a precaution as small species such as lizards, geckos and snakes may be present in the rocky landscaped areas.

Alien Invasive Species

On 18 September 2020, the Minister of Environmental Affairs published the Alien and Invasive Species Regulations ("the Regulations") which came into effect on the 18 October 2020 in a bid to curb the negative effects of IAPs. The Regulations call on landowners and sellers of land alike to assist the Department of Environmental Affairs to conserve our indigenous fauna and flora and to foster sustainable use of our land. Non-adherence to the Regulations by a landowner or a seller of land can result in a criminal offence punishable by a fine of up to R 5 million (R 10 million in case of a second offence) and/or a period of imprisonment of up to 10 years.

- Category 1a and 1b listed invasive species must be controlled and eradicated.
- Category 2 plants may only be grown if a permit is obtained, and the property owner ensures that the invasive species do not spread beyond his or her property.
- The growing of Category 3 species is subject to various exemptions and prohibitions.

Some invasive plants are categorised differently in different provinces. *For example*: the Spanish Broom plant is categorised as a category 1b (harmful) invasive plant in Eastern Cape and Western Cape, but it is a category 3 (less harmful) invasive plant in the other seven provinces.

Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Landowners are under legal obligation to control alien plants occurring on their properties. Alien Invasive Plants require removal according to the Conservation of Agricultural Resources Act 43 of 1983 (CARA) and the National Environmental Management: Biodiversity Act (10 of 2004; NEMBA): Alien and Invasive Species Lists (GN R598 and GN R599 of 2014). Alien control programs are long-term management projects and a clearing plan, which includes follow up actions for rehabilitation of the cleared area, is essential. This will save time, money, and significant effort. Collective management and planning with neighbours allow for more cost-effective clearing and maintenance considering aliens seeds as easily dispersed across boundaries by wind or water courses. All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing. A general rule of thumb is to first target lightly infested areas before tackling densely invaded areas and prioritize sensitive areas such as riverbanks and wetlands. Alien grasses are among the worst invaders in lowland ecosystems adjacent to farms but are often the most difficult to detect and control.

Several exotic invasive and other weed species were noted within the site and surrounding area. Proliferation of weedy and exotic species often indicate disturbance especially during or after construction. A list of species is included in Table 7. During construction it is highly likely that species currently not on site could be introduced through the construction process. A weed management programme is recommended after construction to counter the weed proliferation that would be expected after construction.

Table 7: Alien (exotic) invasive and other weed species and status.

SCIENTIFIC NAME	COMMON NAME	FAMILY	STATUS[5]	PRESENCE
Acacia mearnsii	Black Wattle	Fabaceae	CARA 1b	Present, common
Acacia melanoxylon	Blackwood	Fabaceae	CARA 2	Present, common
Canna indica	Indian shot	Cannaceae	CARA 1b[6]	Present, common
Cenchrus clandestinus	Kikuyu grass	Poaceae	CARA 1b	Present, common
Cestrum (Pennisetum) laevigatum	*Inkberry*	Solanaceae	CARA 1b	Present, dominant.
Cirsium vulgare	Scotch thistle	Asteraceae	CARA 1b	Present, common
Cortaderia selloana	Pampas grass	Poaceae	CARA 1b	Present, common
Iris pseudacorus	Yellow flag	Iridaceae	CARA 1a	Present, occasional
Lantana camara	Lantana	Verbenaceae	CARA 1b	Present, occasional
Leptospermum scoparium	Australian myrtle (Tea tree)	Asteraceae	CARA 1b	Present, common
Melia azedarach	Syringa	Meliaceae	CARA 1b	Present, common
Phragmites australis	*Spanish Reed*	Poaceae	CARA 1b	Present, common.
Phytolacca americana	Pokeweed	Phytolaccaceae	CARA 2	Present, occasional
Ricinus communis	Castor Oil Plant	Euphorbiaceae	CARA 2	Present, common
Rubus cuneifolius	Bramble	Rosaceae	CARA 1b	Present, common
Sambucus nigra	European elder	Adoxaceae	CARA 1b	Present, common
Senna didymobotrya	Peanut butter Cassia	Fabaceae	CARA 1b	Present, occasional
Sesbania punicea	Sesbania	Fabaceae	CARA 1b	Present, occasional
Solanum mauritianum	Bugweed	Solanaceae	CARA 1b	Present, common
Solanum sisymbriifolium	Wild tomato	Solanaceae	CARA 1b	Present, occasional
Urtica urens	Nettle	Urticaceae	Weed	Present, occasional
Verbena bonariensis	Wild verbena	Verbenaceae	CARA 1b	Present, occasional
Vinca major	Greater periwinkle	Apocynaceae	CARA 1b	Present, occasional

[5] CARA - Conservation of Agricultural Resources Act (1993); National List of Invasive Species in Terms Sections 70(1), 71(3) and 71A (2016); Weed – an exotic ruderal weed species, not indigenous but not a declared invasive species.
[6] 1b in protected areas and wetlands, not listed elsewhere.

Eradication protocol

The act required the removal of these species, being the responsibility of the landowner/contractor. Several other common weed species are also present which should also be managed as part of post construction management,

Specific eradication and management procedures must be stipulated in the EMP as to the methods to be implemented to remove and control the various alien invasive species as they tend to require species specific techniques. A management plan should be incorporated into the EMP, and a detailed action plan compiled and implemented by the ECO.

3.1.4 Aquatic Habitat

Aquatic systems do not function in isolation and in terms of ecological processes, the aquatic systems are intricately linked to the terrestrial system. In this case the riverine and riparian community that drains the surrounding urban landscape forms an integral link between upstream and downstream communities and as a corridor for various faunal especially avifaunal species. Based on the flora species composition, this is largely an artificial ecological landscape, and while it may support an associated faunal assemblage, the proposed activity is unlikely to significantly alter the associated composition and processes above current baseline levels.

3.1.5 Terrestrial Vegetation Sensitivity Assessment

An overall vulnerability assessment of proposed activity, incorporating key vegetation and ecological indicators was undertaken and includes the following key criteria:

- relative levels of *intactness* in terms of overall loss of indigenous vegetation cover.
- presence, diversity, and abundance of *species of special concern* (weighted in favour of local endemic species).
- extent of *invasion* (severity and overall ecological impact), as well as the degree to which successful rehabilitation could take place.
- overall degradation incorporating above factors.
- relative importance of the vegetation communities relative to regional conservation status - indicated as vulnerability of the area because of loss.

Intactness

Three basic classes are differentiated as follows:

- **Low**: > 75 % of original vegetation has been removed or lost; and/or no species of special concern present that are critically endangered, endangered, or endemic with highly localised distribution.
- **Moderate**: 25 - 75 % of original vegetation has been removed/lost; and or presence of species of special concern but not having high conservation status or high levels of endemicity or highly localised distributions.
- **High**: < 25 % of original vegetation has been removed or lost; and or presence of species with a highly endemicity and or high conservation status (endangered or critically endangered).

Intactness for the site is **Very Low**.

Alien Invasion

Three classes are differentiated as follows:

- **Low**: no or few scattered individuals.

- **Moderate:** individual clumps of invasives present but cover less than 50% or original area.
- **High:** dense, impenetrable stands of invasives present, or cover > 50 % of area with substantial loss functioning. Rehabilitation will most likely require specialised techniques over an extended period (> 5 years).

Alien invasion for the site is **Very High**.

Degradation

Overall Degradation is determined from the above alien invasion and intactness scores, according to the following matrix:

INTACTNESS	INVASION		
	LOW	MODERATE	HIGH
High	Pristine	Near Pristine	Moderately Degraded
Moderate	Near Pristine	Moderately Degraded	**Severely Degraded**
Low	Moderately Degraded	Severely Degraded	**Transformed**

Degradation for the site is **Very High** (Transformed and/or Severely Degraded)

Overall Sensitivity score

Overall vulnerability (or Sensitivity) of the vegetation within the site is calculated according to the following matrix which combines degradation and overall conservation status of the vegetation units of the site.

DEGRADATION	CONSERVATION STATUS			
	LEAST CONCERN	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED
Severely degraded/ Transformed	Very Low/Low	Low	Moderate	Moderate - High
Moderately degraded	Low	Moderate	High	High
Ecologically Pristine or near Pristine (no such areas identified)	Moderate	Moderate - High	High	Very High (No-Go area)

Table 8: Summary of discharge point habitat.

STREET	DISCHARGE POINT	COMMENT
Mission Rd/Miller St	Mission Rd/Miller St	Low sensitivity. Discharge point should terminate on edge of watercourse and measures implemented for erosion management. No issues.
Attakwa St	Attakwa St	Low sensitivity. Discharge point should terminate on edge of watercourse and measures implemented for erosion management. No issues.
Grens St	Grens St	Low sensitivity/Proposed stormwater will flow along an existing but significantly modified and eroded watercourse. Measures should be implemented to manage water flow and also recreate natural habitat where possible.
Allman St	Allmann/Widom St	Low sensitivity. Discharge point should terminate on edge of watercourse and measures implemented for erosion management. No issues.
Pienaar St/Fotheringham St	Pienaar St/Fotheringham St	Low sensitivity. Discharge point should terminate on edge of watercourse and measures implemented for erosion management. No issues.
Truter St	Truter/Van Till St	Low sensitivity. Discharge point should terminate on edge of watercourse and measures implemented for erosion management. No issues.

STREET	DISCHARGE POINT	COMMENT
Van Till St/Aansluit St	Van Till St	Low sensitivity. Within transformed/Secondary Vegetation.
Van Till St/Thwaite St	Van Till St	Low sensitivity. Within transformed/Secondary Vegetation.
O'Connell ST/Mitchell Baker St	O'Connell ST/Mitchell Baker St	Low sensitivity/Proposed stormwater will flow along an existing but significantly modified and eroded watercourse. Measures should be implemented to manage water flow and also recreate natural habitat where possible.
Spandiel Cir (N)	Spandiel Cir (N)	Low sensitivity. Within transformed/Secondary Vegetation.
Spandiel Cir (S)	Spandiel Cir (S)	Low sensitivity. Within transformed/Secondary Vegetation.
Miller St/Mcgregor St	Miller St	Low sensitivity. Within transformed/Secondary Vegetation.
Miller St	Miller St	Low sensitivity. Within transformed/Secondary Vegetation.
Miller St	Miller St	Low sensitivity. Within transformed/Secondary Vegetation.
Site Camp (Langmark St)	Site Camp (Langmark St)	Low sensitivity. Within transformed/Secondary Vegetation.

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Habitat Sensitivity

- Almost the entire vegetated and transformed area (i.e. the roads) are designated a LOW sensitivity, where exotic and invasive species comprise most of the vegetation cover, the remainder being hardened surfaces (i.e. roads and sidewalks).
- MODERATE sensitivity portions are designated where Watercourses and riparian vegetation, although primarily exotic species) is present, due to underlying ecological importance of watercourses. However, as a caveat, it should be noted that the watercourses are significantly modified. Since the primary objective is to better manage stormwater discharge in tot e watercourses, the overall impact of the stormwater discharge features is not significantly negative within the broader context of the site and surrounds.
- No VERY HIGH sensitivity areas are identified but limited to the terrestrial environment and excludes aquatic processes, which is outside of the scope of this terrestrial assessment.

3.1.6 No-Go Areas

No-go areas are not identified within the site. Caution to be exercised in proximity to planted Cycads.

3.1.7 Potential Development Footprints

The remainder of the site outside of the identified no-go areas above is considered to be developable.



Figure 48: Vegetation Sensitivity of proposed site (Overview).



Figure 49: Vegetation Sensitivity of proposed site (North portion).



Figure 50: Vegetation Sensitivity of proposed site (South portion).

3.2 Risks and Potential Impacts to Biodiversity

3.2.1 Summary of actions, activities, or processes that require mitigation.

The main impacts associated with the unauthorised activity include the following and are described in Table 9:

1. Permanent or temporary loss of indigenous vegetation cover.
2. Loss of flora Species of Conservation Concern.
3. Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species.
4. Susceptibility of some areas to wind and water erosion associated with uncontrolled stormwater runoff.
5. Disturbances to ecological processes.
6. Aquatic and Riparian processes.
7. Loss of faunal Species of Conservation Concern.
8. Loss of Faunal Habitat and processes.

3.2.2 Potential Terrestrial Biodiversity Impacts (Indirect)

No significant indirect impacts are anticipated.

3.2.3 Potential Terrestrial Biodiversity Impacts (Direct)

Overall impacts to terrestrial biodiversity are likely to be nominal, with loss resulting from removal of small footprints within the vegetated areas. As indicated in Figure 48 to Figure 50, the proposed activity will require clearing of some vegetation along the watercourses in order to construct the stormwater discharge points.

Table 9: Potential Impacts to Terrestrial Biodiversity.

IMPACT	Nature of Impact
Vegetation	Permanent or temporary loss of indigenous vegetation cover because of site clearing. Site clearing before construction will result in the blanket clearing of vegetation within the affected footprint.
Flora Species[7]	Loss of flora Species of Conservation Concern during pre-construction site clearing activities. Several special of concern are known from surrounding areas, which could be destroyed during site preparation, none of which were confirmed to be present.
Alien Invasive Species	Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species and removal of exotic and alien invasive species during construction. Post construction disturbed areas having no vegetation cover are often susceptible to invasion by weedy and alien species, which can not only become invasive but also prevent natural flora from becoming established.
Erosion	Susceptibility of some areas to erosion because of construction related disturbances. Removal of vegetation cover and soil disturbance may result in some areas being susceptible to soil erosion after completion of the activity.
Ecological Processes	Disturbances to ecological processes: Activity may result in disturbances to ecological processes.

[7] Subject to findings of follow-up species survey.

IMPACT	Nature of Impact
Aquatic and Riparian processes	Aquatic and Riparian processes: None present/affected
Faunal Species	Loss of faunal SCC due to construction activities: Activities associated with bush clearing, killing of perceived dangerous fauna, may lead to increased mortalities among faunal species.
Faunal Habitat	Loss of Faunal Habitat: Activity may result in the loss of habitat for faunal species, which could result in disturbance and displacement of faunal species.
Faunal Processes	Impacts to faunal processes because of the activity

3.3 Assessment of Risks and Impacts to Biodiversity

3.3.1 Criteria of assigning significance to potential impacts

The following methodology is to be applied in the specialist studies for the assessment of potential impacts.

CRITERIA	EXPLANATION
Nature of impact	Review the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"
Extent	Indicate whether the impact will be: • *(S) local* and limited to the immediate area of development (the site). • (L) limited to within 5 km of the development: or • (R) whether the impact may be realized regionally, nationally or even internationally.
Duration	Review the lifetime of the impact, as being: • (V) very short term (0 - 1 years), • *(S) short term* (1 - 5 years), • (M) medium (5 - 15 years), • *(L) long term* (>15 years but where the impacts will cease after the operation of the site), or • (P) permanent.
Intensity	Establish whether the impact is destructive or innocuous and should be described as either: • *(L) low* (where no environmental functions and processes are affected) • *(M) medium* (where the environment continues to function but in a modified manner) or • *(H) high* (where environmental functions and processes are altered such that they temporarily or permanently cease), including loss of critical endangered ecosystem and or critically endangered species (population).
Probability	Consider the likelihood of the impact occurring and should be described as: • *(I) improbable* (low likelihood) • *(P) probable* (distinct possibility) • (H) highly probable (most likely) or • *(D) definite* (impact will occur regardless of prevention measures).
Status of the impact	Description as to whether the impact will be positive (a benefit), negative (a cost), or neutral.
Degree of confidence	The degree of confidence in the predictions, based on the availability of information and specialist knowledge. This should be assessed as high, medium, or low.
Significance	• (*VL*) *Very Low:* Considered to be negligible.

CRITERIA	EXPLANATION
	• *(L) Low:* Where the impact will not have an influence on the decision or require to be significantly accommodated in the project design • *(M) Medium*: Where it could have an influence on the environment which will require modification of the project design or alternative mitigation. • *(H) High*: Where it could have a 'no-go' implication for the project unless mitigation or re-design is practically achievable. • *(VH) Very High*: Confirmed No-Go area, no mitigation feasible, redesign and avoidance are required, where activity will have a significant permanent and irreversible impact on a critically endangered ecosystem or species population.

3.3.2 Significance Rating

INTENSITY		DURATION: PERMANENT	LONG TERM	MEDIUM TERM	SHORT TERM	VERY SHORT TERM
HIGH INTENSITY						
EXTENT	National	Very High	Very High	High	High	Medium
	Regional	Very High[8]	High	High	High	Medium
	Local	High	High	Medium	Medium	Medium
	Site specific	Medium	Medium	Medium	Medium	Medium
MEDIUM INTENSITY						
EXTENT	National	High	High	High	Medium	Medium
	Regional	High	High	High	Medium	Medium
	Local	Medium	Medium	Medium	Medium	Medium
	Site specific	Medium	Medium	Medium	Medium	Low
LOW INTENSITY						
EXTENT	National	Medium	Medium	Medium	Medium	Medium
	Regional	Medium	Medium	Medium	Medium	Low
	Local	Medium	Medium	Medium	Low	Very Low
	Site specific	Low	Low	Low	Very Low	Very Low

3.3.3 Assessment of Terrestrial Biodiversity Impacts

Operations can result in a range of negative impacts on terrestrial, marine and other aquatic ecosystems if not effectively managed. Table 9 describes impacts that may potentially occur in the site (as per DEDEAT guidelines) as well indicating the relevant EMP section. The predicted significance of these during the construction phase are summarised in Table 10 and during the operational phase are summarised in Table 11.

Table 10 : Construction Phase Assessment (Refer to Sections 3.3.1 & 3.3.2 for methodology).

Nature of impact	Extent	Duration	Intensity	Probability	Status of the impact	Degree of confidence	Significance (before)	Significance (after)
Vegetation	S	S	L	D	-ve	H	L	VL
Flora Species	S	S	L	P	-ve	M	L	VL
Alien Invasive Species	S	M	L	H	-ve	H	L	VL

[8] Considered a regional impact if activity will result in significant permanent and irreversible loss to a critically endangered species population or ecosystem (vegetation type)

Nature of impact	Extent	Duration	Intensity	Probability	Status of the impact	Degree of confidence	Significance (before)	Significance (after)
Erosion	S	M	L	P	-ve	M	L	VL
Ecological Processes	S	S	L	P	-ve	H	L	VL
Aquatic & Riparian Processes	S	V	L	P	-ve	M	M	L
Faunal Species	S	V	L	P	-ve	M	L	VL
Faunal Habitat	S	V	L	D	-ve	H	L	VL
Faunal Processes	S	V	L	P	-ve	H	L	VL

Table 11: Operational Phase Assessment (Refer to Sections 3.3.1 & 3.3.2 for methodology).

Nature of impact	Extent	Duration	Intensity	Probability	Status of the impact	Degree of confidence	Significance (before)	Significance (after)
Vegetation	S	S	L	D	-ve	H	L	VL
Flora Species	S	S	L	P	-ve	M	L	VL
Alien Invasive Species	S	M	L	H	-ve	H	L	VL
Erosion	S	M	L	P	-ve	M	L	VL
Ecological Processes	S	S	L	P	-ve	H	L	VL
Aquatic & Riparian Processes	S	V	L	P	-ve	M	L	VL
Faunal Species	S	V	L	P	-ve	M	L	VL
Faunal Habitat	S	V	L	D	-ve	H	L	VL
Faunal Processes	S	V	L	P	-ve	H	L	VL

Impacts to Aquatic & Riparian Processes are expected to be medium before mitigation and Low after mitigation. All other impacts are assessed to be of low significance before mitigation and can be reduced to very low (or insignificant) with the implementation of the mitigation measures.

3.3.4 Potential Terrestrial Biodiversity Impacts (Cumulative)

No cumulative impacts are expected because of the development of the site providing recommendation and mitigation measures are adhered to, due to the limited disturbance area.

3.3.5 Terrestrial Biodiversity Impact Reversibility

In general, most impacts will have a high reversibility in the affected habitat, as well as transformed or degraded areas, except where hardening of surfaces or removal of topsoil may occur.

3.3.6 Impacts and Risks to Irreplaceable Biodiversity Resources

Risks to Irreplaceable Biodiversity Resources is low to very low.

3.3.7 Residual Risks and Uncertainties

No residual risks or uncertainties are anticipated.

3.4 Findings, Outcomes and Recommendations

3.4.1 Summary of Findings

- The vegetation on site is generally highly modified, degraded, transformed and/or comprising vegetation cover with little evidence of remnant natural vegetation (Garden Route Granite Fynbos).
- No Sensitive plant or Animal species identified as per the National Environmental Screening Tool were found to be present or likely to be present. The general vegetation cover along the remnant watercourses is primarily comprised of kikuyu grass (non-indigenous) and a wide range of invasive and weed herbaceous, shrub and tree species.
- Although areas are designated CBA 1, CBA 2 and ESA 2, these designations do not have remnant Garden Route Granite Fynbos vegetation. In terms of species composition. While the vegetated areas may provide habitat for faunal species, these are mostly species that are adapted to an urbanised environment.
- Almost the entire vegetated and transformed area (i.e. the roads) are designated a LOW sensitivity, where exotic and invasive species comprise most of the vegetation cover, the remainder being hardened surfaces (i.e. roads and sidewalks).
- MODERATE sensitivity portions are designated where Watercourses and riparian vegetation, although primarily exotic species) is present, due to underlying ecological importance of watercourses. However, as a caveat, it should be noted that the watercourses are significantly modified. Since the primary objective is to better manage stormwater discharge in tot e watercourses, the overall impact of the stormwater discharge features is not significantly negative within the broader context of the site and surrounds.
- No VERY HIGH sensitivity areas are identified but limited to the terrestrial environment and excludes aquatic processes, which is outside of the scope of this terrestrial assessment.
- No No-go areas are identified within the site footprint.
- No significant direct, indirect or cumulative impacts are anticipated.

3.4.2 Recommendations & Mitigation Measures

- The proposed activity is unlikely to pose any significant risk to natural ecological processes, vegetarian or plant and animal species of conservation concern due to the limited footprint and significantly degraded and/or transformed nature of the site(s).
- No PNCO protected species were recorded within any of the proposed Stormwater outlet footprints. PNCO (Provincial Nature Conservation Ordinance) permits are not likely to be required for any naturally occurring indigenous species.

Table 12 lists specific mitigation measures that must be implemented and adhered to. These must be considered to be conditions of authorisation.

Table 12: Specific Mitigation Measures and Recommendations

IMPACT	MITIGATION MEASURES
Vegetation	• No clearing outside of development footprint to take place. • Areas surrounding the footprints should be revegetated on completion of construction.
Flora Species	• A flora search and rescue is unlikely to be required and no protected flora were found to be present within a natural context.
Alien Invasive Species	• A suitable weed management strategy to be implemented in and around the site post construction, which is likely to result in proliferation of weeds in disturbed areas on completion.

IMPACT	MITIGATION MEASURES
Erosion	• Suitable measures must be implemented at all discharge points to protected against erosion. • Areas must be rehabilitated, and a suitable indigenous grass seed mix planted where natural vegetation re-establishment does not occur.
Aquatic and Riparian processes	• Adequate measures to be implemented for erosion and stormwater management and/or dispersion at stormwater discharge points. • Where possible, design of discharge points should accommodate measures to trap and reduce discharge of solid waste into watercourses (paper, plastic, etc), that would allow for easier ongoing cleanup.
Faunal Processes	• The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint above current baseline levels would be of low significance if mitigation measures are adhered to.
Faunal Species	• Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • A faunal search and rescue is unlikely to be required and no protected species are likely to be affected but is recommended as a precautionary measure. • No animals are to be harmed, trapped or killed during the course of operations other than where rescue is required and only undertaken by an expert. .

3.5 Site Preparation and Vegetation Clearing Plan

No flora relocation is likely to be required before commencement, and flora permits are unlikely to be required.

No fauna relocation is likely to be required before commencement, and permits were unlikely to be required for any species of conservation concern, but recommended as a precautionary measure for any small rodents and reptiles may occur, and since fauna are mobile, they may be transient to the area.

3.6 Open Space Management/Conservation Plan

None are applicable for this project.

3.7 Maintenance Management Plan

Ongoing maintenance is likely to be required in the long-term, which could include ongoing repairs to stormwater discharge points. All measures of this report, including the EMPr should be adhered for any maintenance requirements. Any excavated areas must be stabilised and rehabilitated as per the measures indicated in this report.

4 Organizational Capacity and Competency

Successful Implementation will be in part be dependent on the organisational capacity and competency of the applicant and any implementing agents. The following aspects are likely to pose risk to the successful mitigation of the project:

- Budget constraints – budget allocated for environmental management tends to be inadequate for construction projects.
- Organisational Structure – implementing agents may or may not have adequate capacity and competency to ensure appropriate and adequate environmental management.

5 Emergency Preparedness and Response

Emergency Preparedness Plan must be included in the EMPr and should address specific measures relating to the following emergency risks:

- Fire management and response.
- Spill management and incident response.
- Waste management and incident response.
- Response to emergency site shutdown, including labour and protest actions.

6 Stakeholder Engagement

Possible Stakeholders relating to Biodiversity could include the following key groups:

- Neighbouring Property Owners
- Local Regional and National Conservation Authorities

No Stakeholder Engagement was conducted specifically by the Specialist. Stakeholder Engagement will be undertaken by the EAP as part of the environment application public participatory process. Any comments raised relating to Biodiversity will be addressed by the specialist in the final report.

7 Monitoring and Review

Key monitoring activities should include the following:

1. Pre-construction
   a) Ensure flora permits are in place timeously (PNCO only) – allow at least 1 or 2 months before commencement.
   b) Environmental Awareness and training (EAT) – Ensure all labour are informed and plant operators are aware of risks, issues, do's and don'ts and no-go areas.
2. Bush clearing
   a) Ensure working plant has no oil or hydraulic leaks
   b) Check delineated footprints area not exceeded.
3. Construction
   a) Regular checks on trenches for trapped animals and possible drowning risks
   b) Regular checks of fences for snares
4. Rehabilitation
   a) Check quality of topsoil and weed free.
   b) Check for weed regrowth and manage timeously (before seed is set)
5. Operation monitoring
   a) Weed management on ongoing basis.
   b) Erosion to be addressed on ongoing basis

8 Appendices

8.1 Appendix A: References

General Reference Sources

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- South African Bird Atlas Project: http://sabap2.birdmap.africa
- United Nations Environment Programme (UNEP), *A to Z Areas of Biodiversity Importance:* http://www.biodiversitya-z.org
- United Nations Environment Programme (UNEP), *World Database on Protected Areas*, Protected Planet: http://www.protectedplanet.net
- World Resources Institute (WRI): https://www.wri.org

8.2 Appendix B: Abbreviations & Glossary

8.2.1 Abbreviations

CARA	Conservation of Agricultural Resources Act, Act 43 of 1983
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs (*now DFFE, see below*)
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism
DFFE	The Department of Environmental Affairs was renamed the Department of Forestry, Fisheries & the Environment (DFFE) in April 2021, incorporating the forestry and fisheries functions from the previous Department of Agriculture, Forestry and Fisheries.
DEMC	Desired Ecological Management Class
DWS	Department of Water Affairs and Sanitation
DWAF	Department of Water Affairs and Forestry (former department name)
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMC	Ecological Management Class
EMP	Environmental Management Plan
EMPr	Environmental Management Programme report
ER	Environmental Representative
ESS	Ecosystem Services
IAP's	Interested and Affected Parties
IEM	Integrated Environmental Management
LM	Local Municipality
masl	meters above sea level
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, Act 107 of 1998
NFA	National Forests Act
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NFA	National Forest Act, Act 84 of 1998
PEMC	Present Ecological Management Class
PES	Present Ecological State
PNCO	Provincial Nature and Environment Conservation Ordinance (No. 19 of 1974).
RDL	Red Data List
RHS	Right Hand Side
RoD	Record of Decision
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SoER	State of the Environment Report
SSC	Species of Special Concern
ToPS	Threatened of Protected Species
ToR	Terms of Reference
+ve	Positive
-ve	Negative

8.2.2 Glossary

Alien Invasive Species (AIS)	An alien species whose introduction and/or spread threaten biological diversity (Convention on Biological Diversity). Note: "*Alien invasive species*" is considered to be equivalent to "*invasive alien species*". An alien species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity (*IUCN*).
Best Environmental Practice	The application of the most appropriate combination of environmental control measures and strategies (Stockholm Convention).
Best Management Practice	Established techniques or methodologies that, through experience and research, have proven to lead to a desired result (BBOP).
Biodiversity	Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.
Biodiversity Offset	Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure and ecosystem function and people's use and cultural values associated with biodiversity (BBOP).
Bioremediation	The use of organisms such as plants or microorganisms to aid in removing hazardous substances from an area. Any process that uses microorganisms, fungi, green plants, or their enzymes to return the natural environment altered by contaminants to its original condition.
Boundary	Landscape patches have a boundary between them which can be defined or fuzzy (Sanderson and Harris, 2000). The zone composed of the edges of adjacent ecosystems is the boundary.
Catchment	In relation to a watercourse or watercourses or part of a watercourse, means the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points.
Connectivity	The measure of how connected or spatially continuous a corridor, network, or matrix is. For example, a forested landscape (the matrix) with fewer gaps in forest cover (open patches) will have higher connectivity.
Corridors	Have important functions as strips of a landscape differing from adjacent land on both sides. Habitat, ecosystems or undeveloped areas that physically connect habitat patches. Smaller, intervening patches of surviving habitat can also serve as "steppingstones" that link fragmented ecosystems by ensuring that certain ecological processes are maintained within and between groups of habitat fragments.
Critically Endangered (CR)	A category on the IUCN Red List of Threatened Species which indicates a taxon is considered to be facing an extremely high risk of extinction in the wild (*IUCN*).
Cultural Ecosystem Services	The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including, e.g. knowledge systems, social relations, and aesthetic values (Millennium Ecosystem Assessment).
Cumulative Impacts	The total impact arising from the project (under the control of the developer), other activities (that may be under the control of others, including other developers, local communities, government) and other background pressures

	and trends which may be unregulated. The project's impact is therefore one part of the total cumulative impact on the environment. The analysis of a project's incremental impacts combined with the effects of other projects can often give a more accurate understanding of the likely results of the project's presence than just considering its impacts in isolation (BBOP).
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat(*IUCN*).
Degraded Habitat/Land	Land that has been impacted upon by human activities (including introduction of invasive alien plants, light to moderate overgrazing, accelerated soil erosion, dumping of waste), but still retains a degree of its original structure and species composition (although some species loss would have occurred) and where ecological processes still occur (albeit in an altered way). Degraded land is capable of being restored to a near-natural state with appropriate ecological management.
Disturbance	An event that significantly alters the pattern of variation in the structure or function of a system, while fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. Disturbance is generally considered a natural process.
Ecological Function	How each of the elements in the landscape interacts based on its life cycle events [Producers, Consumers, Decomposers Transformers]. Includes the capacity of natural processes and components to provide goods and services that satisfy human needs, either directly or indirectly.
Ecological Pattern	The contents and internal order of the landscape, or its spatial (and temporal) components. May be homogenous or heterogenous. Result from the ecological processes that produce them.
Ecological Process	Includes *Physical processes* [Climate (precipitation, insolation), hydrology, geomorphology]; *Biological processes* [Photosynthesis, respiration, reproduction]; *Ecological processes* [Competition, predator-prey interactions, environmental gradients, life histories]
Ecological Processes	Ecological processes typically only function well where natural vegetation remains, and where the remaining vegetation is well-connected with other nearby patches of natural vegetation. Loss and fragmentation of natural habitat severely threatens the integrity of ecological processes. Where basic processes are intact, ecosystems are likely to recover more easily from disturbances or inappropriate actions if the actions themselves are not permanent. Conversely, the more interference there has been with basic processes, the greater the severity (and longevity) of effects. Natural processes are complex and interdependent, and it is not possible to predict all the consequences of loss of biodiversity or ecosystem integrity. When a region's natural or historic level of diversity and integrity is maintained, higher levels of system productivity are supported in the long run and the overall effects of disturbances may be dampened.
Ecological Structure	The composition, or configuration, and the proportion of different patches across the landscape. Relates to species diversity, the greater the diversity, the more complex the structure. A description of the organisms and physical features of environment including nutrients and climatic conditions.
Ecosystem	All the organisms of a habitat, such as a lake or forest, together with the physical environment in which they live. A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Ecosystem Services	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Supporting Ecosystem services are those that are necessary for the maintenance of all other ecosystem services. Some examples include biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat.
Ecosystem Status	Ecosystem status of terrestrial ecosystems is based on the degree of habitat loss that has occurred in each ecosystem, relative to two thresholds: one for maintaining healthy ecosystem functioning, and one for conserving the majority of species associated with the ecosystem. As natural habitat is lost in an ecosystem, its functioning is increasingly compromised, leading eventually to the collapse of the ecosystem and to loss of species associated with that ecosystem (Millennium Ecosystem Assessment).
Ecotone	The transitional zone between two communities. Ecotones can arise naturally, such as a lakeshore, or can be human created, such as a cleared agricultural field from a forest. The ecotonal community retains characteristics of each bordering community and often contains species not found in the adjacent communities. Classic examples of ecotones include fencerows; forest to marshlands transitions; forest to grassland transitions; or land-water interfaces such as riparian zones in forests. Characteristics of ecotones include vegetational sharpness, physiognomic change, and occurrence of a spatial community mosaic, many exotic species, ecotonal species, spatial mass effect, and species richness higher or lower than either side of the ecotone.
Edge	The portion of an ecosystem near its perimeter, where influences of the adjacent patches can cause an environmental difference between the interior of the patch and its edge. This edge effect includes a distinctive species composition or abundance in the outer part of the landscape patch. For example, when a landscape is a mosaic of perceptibly different types, such as a forest adjacent to a grassland, the edge is the location where the two types adjoin. In a continuous landscape, such as a forest giving way to open woodland, the exact edge location is fuzzy and is sometimes determined by a local gradient exceeding a threshold, as an example, the point where the tree cover falls below thirty-five percent.
Emergent Tree	Trees that grow above the top of the canopy
Endangered (En)	Endangered terrestrial ecosystems have lost significant amounts (more than 60 % lost) of their original natural habitat, so their functioning is compromised. A taxon (species) is Endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild (*IUCN*).
Endemic	A plant or animal species, or a vegetation type, which is naturally restricted to a defined region or limited geographical area. Many endemic species have widespread distributions and are common and thus are not considered to be under any threat. They are however noted to be unique to a region, which can include South Africa, a specific province or a bioregion, vegetation type, or a localised area. In cases where it is highly localised or known only from a few or a few localities, and is under threat, it may be red listed either in terms of the South Africa Threatened Species Programme, NEMBA Threatened or Protected Species (ToPS) or the IUCN Red List of Threated Species.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Estuary	a partially or fully enclosed body of water - (a) which is open to the sea permanently or periodically; and

	(b) within which the sea water can be diluted, to an extent that is measurable, with fresh water drained from land.
Evolutionary Processes	The process by which genetic changes have taken place and continue to take place in populations of plants and animals over successive generations in response to environmental changes. Evolutionary Processes includes the mechanisms that produce the biodiversity of life and include Mutation and Migration (Gene Flow), Genetic Drift, Natural Selection, Common Descent, Speciation, Sexual Selection, and Biogeography. Disruptions to evolutionary processes can prevent ecosystems and species from adapting to environmental change over time. Significant fragmentation is considered to be an important disrupter of evolutionary processes. Series of actions which enable new species to evolve in response to changing Biodiversity is maintained by ecological processes at the micro-scale (such as in pollination and nutrient cycling via microbial action) through to the mega-scale (natural events e.g. fire, flood; migration of species along river valleys or coastal areas, quality and quantity of water feeding rivers and estuaries; marine sand movement and the seasonal mountain-to-coast migration of birds that pollinate plants).
Exotic	Non-indigenous; introduced from elsewhere, may also be a *weed* or alien *invasive* species. Exotic species may be invasive or non-invasive.
Fragmentation (Habitat Fragmentation)	The 'breaking apart' of continuous habitat into distinct pieces. Causes land transformation, an important current process in landscapes as more and more development occurs.
Habitat	The home of a plant or animal species. Generally, those features of an area inhabited by animal or plant which are essential to its survival.
Habitat Banking	A market where credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage. Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time (IEEP).
IFC PS6	International Finance Corporation Performance Standard 6 – A standard guiding biodiversity conservation and sustainable management of living natural resources for projects financed by the International Finance Corporation (IFC)
Indicator	Information based on measured data used to represent an attribute, characteristic, or property of a system.
Indicator species	A species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem. They reflect the quality and changes in environmental conditions as well as aspects of community composition.
Indigenous	Native; occurring naturally in a defined area.
Indigenous Species (Native species)	A species that has been observed in the form of a naturally occurring and self-sustaining population in historical times (*Bern Convention 1979*). A species or lower taxon living within its natural range (past or present) including the area which it can reach and occupy using its natural dispersal systems (*modified after the Convention on Biological Diversity*)
Indirect Impact	Impacts triggered in response to the presence of a project, rather than being directly caused by the project's own operations (BBOP)
Instream habitat	Includes the physical structure of a watercourse and the associated vegetation in relation to the bed of the watercourse;
Intact Habitat / Vegetation	Land that has not been significantly impacted upon by man's activities. These are ecosystems that are in a near-pristine condition in terms of structure, species composition and functioning of ecological processes.
Intrinsic Value	The inherent worth of something, independent of its value to anyone or anything else.

Keystone Species	Species whose influence on ecosystem function and diversity are disproportionate to their numerical abundance. Although all species interact, the interactions of some species are more profound and far-reaching than others, such that their elimination from an ecosystem often triggers cascades of direct and indirect changes on more than a single trophic level, leading eventually to losses of habitats and extirpation of other species in the food web.
Landscape	An area of land that contains a mosaic of ecosystems, including human-dominated ecosystems (Millennium Ecosystem Assessment).
Landscape Approach	Dealing with large-scale processes in an integrated and multidisciplinary manner, combining natural resources management with environmental and livelihood considerations (FAO).
Landscape connectivity	The degree to which the landscape facilitates or impedes movement among resource patches.
Least threatened / Least Concern (LC)	These ecosystems have lost only a small proportion (more than 80 % remains) of their original natural habitat and are largely intact (although they may be degraded to varying degrees, for example by invasive alien species, overgrazing, or overharvesting from the wild). A taxon (species) is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category (*IUCN*).
Matrix	The "*background ecological system*" of a landscape with a high degree of connectivity.
Natural Forest (Indigenous Forest)	The definition of "*natural forest*" in the National Forests Act of 1998 (NFA) Section 2(1)(xx) is as follows: 'A natural forest means a group of indigenous trees. • whose crowns are largely contiguous. • or which have been declared by the Minister to be a natural forest under section 7(2)? This definition should be read in conjunction with Section 2(1)(x) which states that 'Forest' includes: • A natural forest, a woodland, and a plantation • The forest-produce in it; and • The ecosystems which it makes up. The legal definition must be supported by a technical definition, as demonstrated by a court case in the Umzimkulu magisterial district, relating to the illegal felling of Yellowwood (Podocarpus latifolius) and other species in the Gonqogonqo forest. From scientific definitions (also see Appendix B) we can define natural forest as: • A generally multi-layered vegetation unit • Dominated by trees that are largely evergreen or semi-deciduous. • The combined tree strata have overlapping crowns, and crown cover is >75% • Grasses in the herbaceous stratum (if present) are generally rare. • Fire does not normally play a major role in forest function and dynamics except at the fringes. • The species of all plant growth forms must be typical of natural forest (check for indicator species) • The forest must be one of the national forest types
Near Threatened (NT)	A taxon (species) is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable

	now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (*IUCN*).
Patch	A term fundamental to landscape ecology, is defined as a relatively homogeneous area that differs from its surroundings. Patches are the basic unit of the landscape that change and fluctuate, a process called patch dynamics. Patches have a definite shape and spatial configuration and can be described compositionally by internal variables such as number of trees, number of tree species, height of trees, or other similar measurements.
Protected Area	A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.
Range restricted species	Species with a geographically restricted area of distribution. Note: Within the IFC PS6, restricted range refers to a limited extent of occurrence (EOO): • For terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 square kilometres (km2).
Refugia	A location which supports an isolated or relict population of a once more widespread species. This isolation can be due to climatic changes, geography, or human activities such as deforestation and overhunting.
Rehabilitation	Measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised. Rehabilitation emphasizes the reparation of ecosystem processes, productivity and services, whereas the goals of restoration also include the re-establishment of the pre-existing biotic integrity in terms of species composition and community structure (BBOP).
Resilience	The capacity of a natural system to recover from disturbance (OECD).
Restoration	The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. An ecosystem has recovered when it contains sufficient biotic and abiotic resources to continue its development without further assistance or subsidy. It would sustain itself structurally and functionally, demonstrate resilience to normal ranges of environmental stress and disturbance, and interact with contiguous ecosystems in terms of biotic and abiotic flows and cultural interactions (IFC).
Riparian	Pertaining to, situated on or associated with the banks of a watercourse, usually a river or stream.
Riparian Habitat	Includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.
River Corridors	River corridors perform several ecological functions such as modulating stream flow, storing water, removing harmful materials from water, and providing habitat for aquatic and terrestrial plants and animals. These corridors also have vegetation and soil characteristics distinctly different from surrounding uplands and support higher levels of species diversity, species densities, and rates of biological productivity than most other landscape elements. Rivers provide for migration and exchange between inland and coastal biotas.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED).
Terrestrial	Occurring on, or inhabiting, land.
Threatened Species	Umbrella term for any species categorised as Critically Endangered, Endangered or Vulnerable by the IUCN Red List of Threatened Species (*IUCN*). Any species that

	is likely to become extinct within the foreseeable future throughout all or part of its range and whose survival is unlikely if the factors causing numerical decline or habitat degradation continue to operate (EU).
Traditional Ecological Knowledge	Knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, and forestry (CBD).
Transformation	In ecology, transformation refers to adverse changes to biodiversity, typically habitats or ecosystems, through processes such as cultivation, forestry, drainage of wetlands, urban development or invasion by alien plants or animals. Transformation results in habitat fragmentation – the breaking up of a continuous habitat, ecosystem, or land-use type into smaller fragments.
Transformed Habitat/Land	Land that has been significantly impacted upon as a result of human interferences/disturbances (such as cultivation, urban development, mining, landscaping, severe overgrazing), and where the original structure, species composition and functioning of ecological processes have been irreversibly altered. Transformed habitats are not capable of being restored to their original states.
Tributary	A small stream or river flowing into a larger one.
Untransformed Habitat/Land	Land that has not been significantly impacted upon by man's activities. These are ecosystems that are in a near-pristine condition in terms of structure, species composition and functioning of ecological processes.
Vulnerable (Vu)	Vulnerable terrestrial ecosystems have lost some (more than 60 % remains) of their original natural habitat and their functioning will be compromised if they continue to lose natural habitat. A taxon (species) is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild (*IUCN*).
Watercourse	Natural or man-made channel through or along which water may flow. 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 a reference to a watercourse includes, where relevant, its bed and banks;
Weed	An indigenous or non-indigenous plant that grows and reproduces aggressively, usually a ruderal pioneer of disturbed areas. Weeds may be unwanted because they are unsightly, or they limit the growth of other plants by blocking light or using up nutrients from the soil. They can also harbour and spread plant pathogens. Weeds are generally known to proliferate through the production of large quantities of seed.
Wetlands	A collective term used to describe lands that are sometimes or always covered by shallow water or have saturated soils, and where plants adapted for life in wet conditions usually grow.

8.3 Appendix C: Biodiversity Environmental Management Plan

Specific measures relating to management of Biodiversity Impacts that must be included in the project Environmental Management Programme (EMPr). This Environmental Management Plan (EMP) contains guidelines, operating procedures and rehabilitation control requirements, which will be binding on the holder of the environmental authorisation after approval of the EMP. The impacts identified and listed in Section 3.3 will be managed / controlled as set out under mitigating measures and as detailed in this section, which provides general management guidelines, which may or may not be appropriate, depending on the specific circumstances.

8.3.1 Protection of Flora and Fauna

The following actions must be implemented at construction phase, where deemed necessary.

- Search and rescue operations for Species of Conservation Concern *must* be undertaken before the commencement of site clearing activities.
- Indigenous vegetation encountered on the sites that are to be conserved and left intact.
- It is important that clearing activities are kept to the minimum and take place in a phased manner. This allows animal species to move into safe areas and prevents wind and water erosion of the cleared areas.
- Stripped vegetation *should* be temporarily stored during operations and to be used later to stabilise slopes. This excludes exotic invasive species.
- No animals are to be harmed or killed during the course of operations.
- Workers are NOT allowed to collect any flora or snare any faunal species. All flora and fauna remain the property of the landowner and *must* not be disturbed, upset or used without their expressed consent.
- It is the responsibility of the Contractor to provide sufficient fuel for cooking and heated as needed by the staff.
- No domestic animals are permitted on the sites.
- Trees and shrubs that are directly affected by the operations may be felled or cleared but only by the expressed written permission of the ECO.
- Rehabilitation of vegetation of the site *must* be done as described in the Rehabilitation Plans.

Flora Search and Rescue

The following flora relocation plan is recommended, where deemed necessary:

- Once the final layout has been determined the botanist will be consulted in order to finalise the plant relocation and vegetation clearing plan.
- Respective permits to be obtained.
- Flora search and rescue is to be conducted before vegetation clearing takes place.
- Areas should only be stripped of vegetation as and when required and once species of special concern have been relocated for that area.
- Once site clearing is to commence, the area to be cleared of vegetation will be surveyed by the vegetation and plant search and rescue team clearing under the supervision of the botanist to identify and remove species suitable for rescue and commence removal of plants.
- These species are to be replanted immediately in a suitable area of similar vegetation, where future development is unlikely to occur, or within a nearby protected area.

Fauna Search and Rescue

The following fauna relocation plan is recommended for inclusion in the EMP and Fauna removal permit applications, where deemed necessary:

- An on-foot search, conducted by a professional reptile handler/team, is to be carried out to search for reptiles within every possible habitat.

- Once caught, each reptile will be placed into transport containers suited for that individual reptile.
- The transport containers must be kept cool to decrease stress for the reptiles.
- The reptiles will be relocated as soon as possible after they have been caught.
- Professional equipment will be used to ensure limited harm to the reptiles and to prevent the team members from being bitten by venomous snakes.
- Nooses should not be used as they cause injury to lizards.
- Safety procedures will be in place for the release of the reptiles.
- Amphibians should be caught by hand and net.
- Amphibians must be placed into transport containers with damp substrates to avoid dehydration.
- Tadpoles may be collected, placed into water containers and released as soon as possible, where required.
- During release, the tadpoles will be allowed to acclimatize to the new water in terms of temperature, pH etc.
- Small mammals will be caught with nets and by hand. They will then be transported in carry cages and released as soon as possible.
- No immobilizers or tranquilizers will be used on the mammals.

8.3.2 Alien and Invasive Plan Management Plan

The following mitigation measures have been identified in order to ensure that the introduction and spread of alien invasive vegetation is minimised, where deemed necessary:

- Alien species must be removed from the site as per the National Environmental Management: Biodiversity Act (No. 10 of 2004) requirements.
- A suitable weed management strategy must be implemented in the construction phase and carried through the operational phase.
- Weeds and alien species *must* be cleared by hand before the rehabilitation phase of the areas. Removal of alien plants are to be done according to the Working for Water Guidelines.
- The Contractor is responsible for the removal of alien species within all areas disturbed during construction activities. Disturbed areas include (but are not limited to) access roads, construction camps, site areas and temporary storage areas.
- In consultation with relevant authorities, the Engineer may order the removal of alien plants (when necessary). Areas within the confines of the site are to be included.
- All alien plant material (including brushwood and seeds) should be removed from site and disposed of at a registered waste disposal site. Should brushwood be utilised for soil stabilization or mulching, it must be seed free.
- After clearing is completed, an appropriate cover crop may be required, should natural re-establishment of grasses not take place in a timely manner.

8.3.3 Fires

The following mitigation measures have been identified in order to minimise fire risks, where deemed necessary:

- The Contractor must ensure that an emergency preparedness plan is in place in order to fight accidental fires or veld fires, should they occur. The adjacent landowners/users/managers *should* also be informed or otherwise involved.
- Enclosed areas for food preparation should be provided and the Contractor *must* strictly prohibit the use of open fires for cooking and heating purposes.
- The use of branches of trees and shrubs for fire-making *must* be strictly prohibited.
- The Contractor *should* take all reasonable and active steps to avoid increasing the risk of fire through their activities on-site. No fires may be lit except at places approved by the ECO.

- The Contractor *must* ensure that the basic fire-fighting equipment is to the satisfaction of the Local Emergency Services.
- The Contractor *must* supply all living quarters, site offices, kitchen areas, workshop areas, materials, stores and any other relevant areas with tested and approved fire-fighting equipment.
- Fires and "hot work" *must* be restricted to demarcated areas.
- A braai facility may be considered at the discretion of the Contractor and in consultation with the ECO. The area *must* be away from flammable stores. All events must be under management's supervision and a fire extinguisher *will* be immediately available. "Low-smoke" fuels must be used (e.g. charcoal) and smoke control regulations, if applicable, must be considered.
- The Contractor *must* take precautions when working with welding or grinding equipment near potential sources of combustion. Such precautions include having a suitable, tested and approved fire extinguisher immediately at hand and the use of welding curtains.

8.3.4 Soil Aspects

The following mitigation measures have been identified in order to minimise soil loss, where deemed necessary:

- Sufficient topsoil must be stored for later use during decommissioning, particularly from outcrop areas.
- Topsoil shall be removed from all areas where physical disturbance of the surface will occur.
- All available topsoil shall be removed after consultation with the botanist and horticulturalist prior to commencement of any operations.
- The removed topsoil shall be stored on high ground within the site footprint outside the 1:50 flood level within demarcated areas.
- Topsoil shall be kept separate from overburden and shall not be used for building or maintenance of roads.
- The stockpiled topsoil shall be protected from being blown away or being eroded. The application of a suitable grass seed/runner mix will facilitate this and reduce the minimise weeds.

8.3.5 Dust

The following mitigation measures have been identified in order to minimise dust, where deemed necessary:

- To manage complaints relation to impacts on the nearby communities, a dust register *will* be developed.
- If required, water spray vehicles *will* be used to control wind cause by strong winds during activities on the works.
- No over-watering of the site or road surfaces.
- Wind screens *should* be used to reduce wind and dust in open areas.

8.3.6 Infrastructural Requirements

The following mitigation measures have been identified in order to minimise impacts of infrastructure requirements, where deemed necessary:

Topsoil

- Topsoil shall be removed from all areas where physical disturbance of the surface will occur.
- All available topsoil shall be removed after consultation with the Regional Manager prior to commencement of any operations.

- The removed topsoil shall be stored on high ground within the footprint outside the 1:50 flood level within demarcated areas (Appendix 1)
- Topsoil shall be kept separate from overburden and shall not be used for building or maintenance of roads.
- The stockpiled topsoil shall be protected from being blown away or being eroded. The use of a suitable grass seed/runner mix will facilitate soil protection and minimise weeds/weed growth.

Stormwater and Erosion Control

- Stormwater Management Plans *must* be developed for the site and should include the following:
  - The management of stormwater during construction.
  - The installation of stormwater and erosion control infrastructure.
  - The management of infrastructure after completion of construction.
- Temporary drainage works may be required to prevent stormwater to prevent silt laden surface water from draining into river systems in proximity to the site. Stormwater *must* be prevented from entering or running off site.
- To ensure that site is not subjected to excessive erosion and capable of drainage runoff with minimum risk of scour, their slopes *should* be profiled at a maximum 1:3 gradient.
- Diversion channels *should* be constructed ahead of the open cuts, and above emplacement areas and stockpiles to intercept clean runoff and divert it around disturbed areas into the natural drainage system downstream of the site.
- Rehabilitation is necessary to control erosion and sedimentation of all eroded areas (where works will take place).
- Existing vegetation *must* be retained as far as possible to minimise erosion problems.
- It is importation that the rehabilitation of site is planned and completed in such a way that the runoff water will not cause erosion.
- Visual inspections *will* be done on a regular basis with regard to the stability of water control structure, erosion and siltation.
- Sediment-laden runoff from cleared areas *must* be prevented from entering rivers and streams.
- No river or surface water may be affected by silt emanating from the site.

Site Office / Camp Sites

- No site offices or camp sites will be constructed on the site under current operating conditions, existing structures will be used.

Operating Procedures in the Site

- Construction shall only take place within the approved demarcated site.
- Construction may be limited to the areas indicated by the Regional Manager on assessment of the application.
- The holder of the environmental authorisation shall ensure that operations take place only in the demarcated areas as described in this report.
- Watering to minimise the effect of dust generation should be carried out as frequently as necessary. Noise should also be kept within reason.
- No workers will be allowed to damage or collect any indigenous plant or snare any animal.
- Grass and vegetation of the immediate environment or adapted grass / vegetation will be re-established on completion of construction activities, where applicable.
- No firewood to be collected on site and the lighting of fires must be prohibited.
- Cognisance is to be taken of the potential for endangered species occurring in the area. It is considered unlikely, however, that these species will be affected by the proposed activity, or the access road.

Excavations

Whenever any excavation is undertaken, the following procedures shall be adhered to:

- Topsoil shall be handled as described in this EMP.
- Excavations shall take place only within the approved demarcated site.
- Excavations must follow the contour lines where possible.
- The construction site will not be left in any way to deteriorate into an unacceptable state.
- The excavated area must serve as a final depositing area for waste rock and overburden during the rehabilitation process.
- Once excavations have been filled with overburden, rocks and coarse natural materials and profiled with acceptable contours (including erosion control measures), the previous stored topsoil shall be returned to its original depth over the area.
- The area shall be fertilised, if necessary, to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix in order to propagate the locally occurring flora.

Rehabilitation of Processing and Excavation Areas

- On completion of construction, the surface of the processing areas especially if compacted due to hauling and dumping operations shall be scarified to a depth of at least 200 mm and graded to an even surface condition and the previously stored topsoil will be returned to its original depth over the area.
- The area shall be fertilised, if necessary, to allow vegetation to establish rapidly. The site shall be seeded with suitable grasses and local indigenous seed mix.
- Excavations may be used for the dumping of construction wastes. This *shall* be done in such a way as to aid rehabilitation.
- Waste (non-biodegradable refuse) will not be permitted to be deposited in the excavations.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the activity, be corrected and the area be seeded with a vegetation seed mix to his or her satisfaction. This *must* be done in conjunction with the ECO.
- Final rehabilitation *must* comply with the requirements mention in the Rehabilitation Plan.

8.3.7 Rehabilitation Plan

The following mitigation measures have been identified in order to maximise rehabilitation success, where deemed necessary.

Rehabilitation Objective

The overall objective of the rehabilitation plan is to minimize adverse environmental impacts associated with the activity whilst maximizing the future utilization of the property. Significant aspects to be borne in mind in this regard is, revegetation of undeveloped footprint and stability and environmental risk. The depression and immediate area of the working must also be free of alien vegetation. Additional broad rehabilitation strategies / objectives include the following:

- Rehabilitating the worked-out areas to take place concurrently within prescribed framework established in the EMP.
- All infrastructure, equipment, plant and other items used during the construction period will be removed from the site.
- Waste material of any description, including scrap, rubble and tyres, will be removed entirely from the site and disposed of at a recognised landfill facility. It will not be permitted to be buried or burned on site.
- Final rehabilitation shall be completed within a period specified by the Regional Manager.

Topsoil and Subsoil Replacement

Topsoil and subsoil will be stripped and stockpiled separately and only used in rehabilitation work towards the end of the operation. This is in contract to the gravel activity where rehabilitation and topsoil replacement was earmarked at the completion of each phase.
Stripped overburden will be backfilled into the worked-out areas where needed. Stripped topsoil will be spread over the re-profiled areas to an adequate depth to encourage plant regrowth. The vegetative cover will be stripped with the thin topsoil layer to provide organic matter to the relayed material and to ensure that the seed store contained in the topsoil is not diminished. Reseeding may be required should the stockpiles stand for too long and be considered barren from a seed bank point of view. Stockpiles should ideally be stored for no longer than a year.
The topsoil and overburden will be keyed into the reprofiled surfaces to ensure that they are not eroded or washed away. The topsoiled surface will be left fairly rough to enhance seedling establishment, reduce water runoff and increase infiltration.

Revegetation

All prepared surfaces will be seeded with suitable grass species to provide an initial ground cover and stabilize the soil surface. The following grass seed that is commonly available and suitable.

Botanical name	Common name	Approx seed mixture /Ha
Cynodon dactylon	Kweek	12 kg/ Ha
Eragrostis curvula	Weeping Love Grass	6 kg/ Ha
Eragrostis tef	Teff	2 kg/ Ha
Digitaria eriantha	Smuts Grass	4 kg/ Ha
Other indigenous veld grasses can be added to the seed mix		± 4 kg/Ha

The overall revegetation plan will, therefore, be as follows:

- Ameliorate the aesthetic impact of the site.
- Stabilise disturbed soil and rock faces.
- Minimize surface erosion and consequent siltation of natural water course located on site.
- Control wind-blown dust problems.
- Enhance the physical properties of the soil.
- Re-establish nutrient cycling.
- Re-establish a stable ecological system.

Every effort must be made to avoid unnecessary disturbance of the natural vegetation during operations.

Drainage and Erosion Control

To control the drainage and erosion at site the following procedures will be adopted:

- Areas where construction is completed should be rehabilitated immediately.
- Areas to be disturbed in future activities will be kept as small as possible (i.e. conducting the operations in phases), thereby limiting the scale of erosion.
- Slopes will be profiled to ensure that they are not subjected to excessive erosion but capable of drainage runoff with minimum risk of scour (maximum 1:3 gradient).
- All existing disturbed areas will be re-vegetated to control erosion and sedimentation.
- Existing vegetation will be retained as far as possible to minimize erosion problems.

Visual Impacts Amelioration

The overall visual impact of the proposed activities will be minimised by the following mitigating measures:

- Confining the footprint to an area as small as possible
- Re-topsoiling and vegetating all disturbed areas.

8.3.8 Monitoring and Reporting

Adequate management, maintenance and monitoring will be carried out annually by the applicant to ensure successful rehabilitation of the property until a closure certificate is obtained.
To minimise adverse environmental impacts associated with operations it is intended to adopt a progressive rehabilitation programme, which will entail carrying out the proposed rehabilitation procedures concurrently with activity.

8.3.9 Closure objectives and extent of alignment to pre-construction environment

Closure Objectives

The closure of the site will involve removal of all debris and rehabilitation of areas disturbed during the construction phase of the project. This will comprise the scarification of compacted areas, reshaping of areas, topsoiling and rehabilitating all prepared surfaces.

8.4 Appendix D: General Impact Rating Scale

To ensure a direct comparison between various specialist studies, six standard rating scales are defined and used to assess and quantify the identified impacts. This is necessary since impacts have several parameters that need to be assessed.
These scales are:

1. The Severity/ Benefit Scale, which assesses the importance of the impact from a purely technical perspective.
2. The Spatial Impact Scale, which assesses the extent or magnitude of the impact (the area that will be affected by the impact).
3. The Temporal Impact Scale, which assesses how long the impact will be felt. Some impacts are of a short duration, whereas others are permanent.
4. The Degree of Certainty Scale, which provides a measure of how confident the author feels about their prediction.
5. The Likelihood Scale, which provides an indication of the risk or chance of an impact taking place.
6. The Environmental Significance Scale, which assesses the importance of the impact in the overall context of the affected system or party.

To ensure integration of social and ecological impacts, to facilitate specialist assessment of impact significance, and to reduce reliance on value judgments, the severity of the impact within the scientific field in which it takes place (e.g. vegetation, fauna etc.) was assessed first. Thereafter, each impact was assessed within the context of time and space, and the probability of the impact occurring was quantified using the degree of certainty scale.
The impact was then assessed in the context of the whole environment to establish the "environmental significance" of the impact to the flora and vegetation.
The scales are described in detail below.

8.4.1 The Severity/ Beneficial Scale

The *severity scale* was used to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on an affected system (for ecological impacts) or an affected party. This methodology attempts to remove any value judgments from the assessment, although it relies on the professional judgment of the specialist.

NEGATIVE IMPACT	POSITIVE IMPACT
Very severe An irreversible and permanent change to the affected system(s)) which cannot be mitigated. For example, change in topography resulting from a quarry.	Very Beneficiary A permanent and very substantial benefit to the affected system(s) with no alternative to achieve this benefit.
Severe Long-term impacts on the affected system(s) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial A long-term impact and substantial benefit to the affected system(s). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
Moderately severe Medium- to long-term impact on the affected system(s) that could be mitigated.	Moderately beneficial A medium- to long-term impact of real benefit to the affected system(s) Other ways of optimising are equally difficult, expensive and time

NEGATIVE IMPACT	POSITIVE IMPACT
	consuming (or a combination of these), as achieving them in this way.
Slight Medium- to short term impacts on the affected system(s) Mitigation is very easy, cheap, less time consuming or not necessary.	Slightly beneficial A short- to medium-term impact and negligible benefit to the affected system(s) Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.
No effect The system(s) is not affected by the proposed development.	Do not know/Cannot know In certain cases, it may not be possible to determine the severity of the impact.

The severity of impacts can be evaluated with and without mitigation order to demonstrate how serious the impact is when nothing is done about it. For beneficial impacts, optimisation means anything that can enhance the benefits. However, mitigation or optimisation must be practical, technically feasible and economically viable.

8.4.2 Spatial and Temporal Scales

Two additional factors were considered when assessing the impacts, namely the relationship of the impact to Spatial and Temporal Scales.
The *spatial scale* (shown in italics) defines the impact at the following scales.

SPATIAL SCALE	EXPLANATION
Localised	at a localised scale (i.e. few hectares in extent). The specific area to which this scale refers is defined for the impact to which it refers.
Study Area	the site, some effects to surrounding area (*~10 km*)
District	the site, some effects to wider surrounding area (*~100 km*)
Regional	the site, some effects to surrounding area (*+250 km*)
National	Impacts will affect at a country level
International	Impacts extend beyond country boundary

The *temporal scale* (shown in italics) defines the impact at the following scales.

TEMPORAL SCALE	EXPLANATION
Short Term	Less than 5 years. Many construction phase impacts will be of a short duration
Medium Term	Between 5 and 20 years
Long Term	Between 20 and 40 years, and from a human perspective essentially permanent.
Permanent	Over 40 years and resulting in a permanent and lasting change.

8.4.3 The Degree of Certainty and the Likelihood Scale

It is also for each specialist to state the degree of certainty, or the confidence attached to their prediction of significance. For this reason, a 'degree of certainty' scale (shown in bold) must be used.

DEGREE	DESCRIPTION
Definite:	More than 90% sure of fact. To use this one will need to substantial supportive data.
Probable:	Between 70% and 90% sure of fact.
Possible:	Between 40% and 70% sure of fact.
Unsure:	Less than 40% sure of fact.

The risk or likelihood (shown in normal font) of impacts being manifested differs. There is no doubt that some impacts would occur, but certain other (usually secondary data) impacts are not as likely and may or may not result. Although these impacts maybe severe, the likelihood of them occurring may affect their overall significance and must therefore be considered. It is therefore necessary for the author to state his estimate of the likelihood of an impact occurring, using the following likelihood scale:

DEGREE	DESCRIPTION
Very unlikely	The chance of these impacts occurring is extremely slim, e.g. natural forces destroying a dam wall.
Unlikely	The risk of these impacts occurring is slight.
May occur	The risk of these impacts is more likely, although it is not definite.
Very Likely	Slight chance that this impact will not occur.
Definite	There is no chance that this impact will not occur.

8.4.4 The Environmental Significance Scale

The environmental significance scale is an attempt to evaluate the significance of an impact, the severity or benefit of which has already been assessed. This evaluation needs to be assessed in the relevant context, as an impact can either be ecological or social, or both. Since the severity of impacts with and without mitigation will already have been assessed, significance was only evaluated after mitigation. In many cases, this mitigation will take place, as it has been incorporated into project design. A six-point significance scale is applied as follows:

SIGNIFICANCE	DESCRIPTION
Very High (6)	Impacts considered to have a major and permanent change to natural environment and are rate as VERY HIGH, usually resulting to severe or very severe/ beneficial to highly beneficial effects.
High (5)	Long term change and are rated as HIGH resulting to severe or moderately severe effects/ beneficial to moderately beneficial.
Moderate (4)	Medium to long-term effects. Impacts are rated as MODERATE with moderately severe or moderately beneficial effects.
Low (3)	Medium to short term effects. Impacts are rated as MODERATE resulting in moderately severe or moderately beneficial effects.
Insignificant (2)	Short term effects are present. Impacts are rated as SLIGHT resulting in SLIGHTLY BENEFICIAL effects. Residual effects are present but are of no consequence.
No Significance (1)	No primary or secondary effects, resulting in NO SIGNIFICANT impact.
Do not Know (0)	Not possible to determine the significance of impacts

8.4.5 Absence of Data

In certain instances, an assessment must be produced in the absence of all the relevant and necessary data, due to paucity or lack of scientific information on the study area. It is more important to identify all the likely environmental impacts than to precisely evaluate the more obvious impacts. It is important to be on the conservative side in reporting likely environmental impacts. Because assessing impacts with a lack of data is more dependent on scientific judgment, the rating on the certainty scale cannot be too high. It is for these reasons that a degree of certainty scale has been provided, as well as the categories DON'T KNOW or CAN'T KNOW.

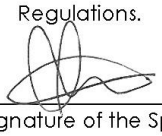
8.5 Appendix E: Declaration, Specialist Profile and Registration

DECLARATION OF THE SPECIALIST

Note: Duplicate this section where there is more than one specialist.

I Mr Jamie Pote....., as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that:

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



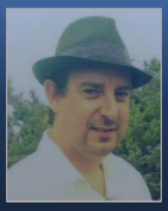
2025/04/05

Signature of the Specialist: Date:

N/A

Name of company (if applicable):

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Jamie Pote

SENIOR ECOLOGIST AND ENVIRONMENTAL SCIENTIST

CONTACT

(+27) 76 888 9890
jamiepote@live.co.za
Port Elizabeth, South Africa
Linkedin.com
Jamiepote
Bluesky-SA

EDUCATION

Bachelor of Science
Rhodes University
2001 (Botany & Environmental Science)

Bachelor of Science (Honours)
Rhodes University
2002 (Botany)

Professional Natural Scientist
SACNASP
2016

SERVICES

Terrestrial Biodiversity/Ecological Assessments
Environmental & Ecological Risk-Assessments
Bioremediation, Restoration & Rehabilitation Plans
Environmental Management Plans & Programmes
GIS Mapping & Analysis & Web maps
Alien Invasive Management (Terrestrial)
Environmental Auditing & Monitoring (ECO)
Flora Search & Rescue & Relocation
Independent Environmental & Ecological review
Permit and License applications
Environmental & Mining Applications

ABOUT ME

16 years broad professional experience in Biodiversity, Ecological and Vegetation Assessments on over 220 projects in southern, western and central Africa. Senior Environmental Consultant and EAP on over 50 projects in the mining, infrastructure, housing and agricultural sectors. Environmental monitoring and auditing on over 50 civil infrastructure and construction projects. Have managed all aspects of projects from inception through to implementation. GIS mapping and analytics.

EXPERIENCE AND CLIENTS

Key Sectors

- *Wind, Solar Energy Facilities*
- *Infrastructure and Housing*
- *Agriculture and Forestry*
- *Mining and Industrial*

Key Projects

- *Over 220 independent Biodiversity/Ecological Assessments throughout southern, western and central Africa.*
- *Mining applications and construction auditing on over 40 projects and more than 300 gravel borrow pits for the Eastern Cape Department of Roads and Public Works, Department of Transport and the South African National Roads Agency (SANRAL) throughout the Eastern Cape.*
- *South-End Precinct Mixed Use Development for Mandela Bay Development Agency - Environmental application, Ecological assessments and Construction monitoring.*
- *Coega Development Corporation IDZ projects – Ecological assessments, Flora search & rescue and Construction monitoring.*
- *Environmental applications, construction monitoring and auditing for a wide range of projects, including infrastructure and housing for various clients including the Department of Transport and SANRAL.*
- *Various agricultural expansion and infrastructure projects.*
- *Various wind and solar energy and associated infrastructure projects.*
- *Numerous infrastructure projects including electrical, water and roads.*
- Various Environmental Management and Rehabilitation Plans.

SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Jamie Robert Claude Pote

Registration Number: 115233

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice (Schedule 1 of the Act)

Ecological Science (Professional Natural Scientist)

Effective **20 July 2016** Expires **31 March 2026**

Chairperson

Chief Executive Officer

To verify this certificate scan this code

Mr Jamie Pote (BSc (Hons) PR. Sci. Nat.

PROJECT EXPERIENCE

PERFORMANCE STANDARD BIODIVERSITY AND CRITICAL HABITAT ASSESSMENTS (IFC PS6)

- DBSA Environmental & Social Safeguards Standards 9: Biodiversity Conservation and Sustainable Management Assessment: The Ilitha Fibre Project, Ethekwini 2021
- Critical Habitat & Biodiversity Assessment - Roggeveld Wind Energy Project 2020
- Biodiversity Assessment for Kalukundi Copper/Cobalt Mine, Democratic Republic of Congo 2008

TERRESTRIAL BIODIVERSITY ASSESSMENTS AND COMPLIANCE STATEMENTS

- Terrestrial Biodiversity Assessment (Addo BSD Offices) 2021
- Terrestrial Biodiversity Assessment (Blaauwater Farms) 2021
- Terrestrial Biodiversity Assessment (Buffelshoek Farm, Loerie) 2021
- Terrestrial Biodiversity & Aquatic Assessment & Review (Falcon Ridge Dam) 2021
- Terrestrial Biodiversity Assessment (Gubenxa Valley Deciduous Fruit) 2021
- Terrestrial Biodiversity Assessment (Little Chelsea Mixed-use) 2021
- Terrestrial Biodiversity Compliance Statement (Maidenhead Farm) 2021
- Terrestrial Biodiversity Review, Mulilo Total Hydra Storage Project Grid Interconnection 2021
- Terrestrial Biodiversity Compliance Statement (Lahlangubo River Bridge) 2021
- Terrestrial Biodiversity Assessment (Mbashe access roads - 3 sites) 2021
- Terrestrial Biodiversity Assessment (Burlington Farm Citrus Development, Cookhouse) 2020
- Terrestrial Biodiversity Compliance Statement: CHDM Cluster 9 Phase 3D Pipeline 2020
- Terrestrial Biodiversity Review, Mulilo Total Hydra Storage Project BESS 2020
- Terrestrial Biodiversity Assessment (Mbashe housing projects, Dutywa & Willowvale) 2020
- Terrestrial Biodiversity Assessment (Helpmekaar Dam, Tarkastad) 2020
- Terrestrial Biodiversity Assessment (Herbertsdale pipeline, Mossel Bay) 2020
- Terrestrial Biodiversity Assessment (Keurbooms Erf 155, Keurboomstrand) 2020
- Terrestrial Biodiversity Assessment (Lowmar Hydroelectric Project, Cradock) 2020
- Terrestrial Biodiversity Assessment (Mossel Bay Gas Power Plant) 2020
- Terrestrial Biodiversity Assessment (Erf 1820, Mthatha) 2020
- Terrestrial Biodiversity Assessment (Newlyn Manganese Terminal, Coega SEZ) 2020
- Terrestrial Biodiversity Assessment Thornhill Phase 2 Sanitation Link 2020

ENERGY PROJECTS (WIND FARM AND PHOTOVOLTAIC INFRASTRUCTURE)

- Preliminary Biodiversity Screening for Chrisdelina Ranch Agricultural Project, Kizenga District 2020
- Preliminary Biodiversity Screening and GIS mapping for Balekani Photovoltaic Solar Project 2020
- Preliminary Biodiversity Screening and GIS mapping for Sihhoye Photovoltaic Solar Project 2020
- Preliminary Biodiversity Screening and GIS mapping Mpaka Photovoltaic Solar Project 2020
- Preliminary Biodiversity Screening and GIS mapping for Chiwelwa Hydroelectric project 2020
- Ecological Assessment for Vermaak Boerdery Hydro Turbine (Cookhouse), Eastern Cape 2020
- Ecological Assessment for Windcurrent Wind Farm, Eastern Cape 2012
- Ecological Assessment for Universal Windfarm, NMB 2011
- Ecological Assessment for Inca Energy Windfarm, Northern Cape 2011
- Ecological Assessment for Broadlands Photovoltaic Farm, Eastern Cape 2011
- Botanical Assessment for Electrawinds Windfarm Coega, NMB 2010
- Botanical Assessment and Open Space Management Plan for Mainstream WEF Phase 2, Eastern Cape 2010

SPECIALISED ECOLOGICAL REPORTS AND REVIEWS

- Rebels Vlei Riparian delineation 2021

- Buck Kraal Dam Rehabilitation Plan Review 2020
- Rehabilitation Plan for Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- Green Star Rating Ecological Assessment for SANRAL office, Bay West City, NMBM 2015
- Section 24G Assessment and Rehabilitation Plan for Bingo Farm, Eastern Cape 2014
- Mapping and Ecological services for Congo Agriculture, Republic of Congo 2013
- Rehabilitation Plan for Nieu Bethesda, Eastern Cape 2011
- Mapping of pipeline for Kenton Water Board, Eastern Cape 2010
- Rehabilitation Plan for N2 Upgrade - Coega to Colchester, NMB 2010
- Representative for landowner group for Seaview burial Park, NMB 2010
- Botanical Sensitivity Analysis for LSDF, Greenbushes-Hunters Retreat, NMB 2008
- Forestry Rehabilitation Assessment Report for Amahlathi Forest Rehabilitation, Eastern Cape 2007
- Botanical & Riparian Assessment for Orange River Weirs-Boegoeberg, Douglas Dam and Sendelingsdrif, Northern Cape 2006
- Botanical Assessment for State of the Environment Report for Chris Hani District Municipality SoER, Eastern Cape 2003

ROAD AND RAILWAY INFRASTRUCTURE PROJECTS

- Ecological Assessment for CDC IDZ Mn Terminal, conveyor and railway line, NMB 2013
- Ecological Assessment Review for Penhoek Road widening, Eastern Cape 2012
- Ecological Assessment for R61 road widening, Eastern Cape 2012
- Botanical Assessment for Chelsea RD - Walker Drive Ext., NMB 2010
- Botanical Assessment for Motherwell - Blue Water Bay Road, NMB 2010
- Ecological Assessment for Port St John Road, Eastern Cape 2010
- Botanical Basic Assessment for Bholani Village Rd, Port St Johns, Eastern Cape 2009
- Botanical Report, EMP and Rehab Plan for Coega-Colchester N2 Upgrade, NMB 2009
- Botanical Assessment for Manganese Conveyor Screening Report, NMB 2008
- Ecological Assessment for Road Layout for Whiskey Creek- Kenton, Eastern Cape 2006

MINING PROJECTS

- Ecological Assessment for Bochum Borrow Pits, Limpopo 2013
- Ecological Assessment and Mining and Rehabilitation Plan for Greater Soutpansberg Mining Project, Limpopo (3 proposed Mines) 2013
- Ecological Assessment for Thulwe Road Borrow Pits, Limpopo 2013
- Ecological Assessment and Mining and Rehabilitation Plan for Baghana Mining, Ghana 2010
- Botanical Assessment for Zwartenbosch Quarry, Eastern Cape 2008
- Botanical description & map production for Quarry - Rudman Quarry, Eastern Cape 2008
- Botanical Basic Assessment, Rehab Plan & Maps for Borrow Pit - Rocklands/Patensie, Eastern Cape 2008
- Botanical Assessment & Maps for Sandman Sand Gravel Mine, Eastern Cape 2008
- Botanical Assessment & GIS maps for Shamwari Borrow Pit, Eastern Cape 2008
- Detailed Botanical Assessment, EMP and Rehab Plan for Kalukundi Copper/Cobalt Mine, Democratic Republic of Congo 2008
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit Humansdorp/Oyster Bay, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Cala, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Camdeboo, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Somerset East, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Nkonkobe, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Ndlambe, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Blue Crane Route, Eastern Cape 2008

- Botanical Assessment, EMP and Rehabilitation Plan for AWRM - Cathcart, Eastern Cape 2008
- Botanical Assessment, GIS maps and Rehab Plan for Mthatha Prospecting, Eastern Cape 2008
- Regional Botanical Map for mining prospecting permit, Welkom 2008
- Botanical Assessment for Scoping Report and Detailed Botanical Assessment and Rehab Plan for Elitheni Coal Mine, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Oyster Bay, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Bathurst/GHT, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit – Jeffreys Bay, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Storms River/Kareedouw, Eastern Cape 2007
- Biophysical Assessment for Humansdorp Quarry, Eastern Cape 2006
- Botanical Assessment, Rehab Plan & Maps for Quarry-Cathcart & Somerset East, Eastern Cape 2006
- Botanical Assessment, Rehab Plan & Maps for Quarry - Despatch Quarry, NMB 2006
- GIS Mapping & Botanical Assessment and Rehab Plan for Quarry - JBay Crushers, Eastern Cape 2006
- Botanical Assessment, EMP and Rehabilitation Plan for Polokwane Silicon Smelter, Limpopo 2006
- Application for Mining Permit for Bruce Howarth Quarry, Eastern Cape 2006

POWERLINE INFRASTRUCTURE PROJECTS

- Ecological Assessment: Dieprivier-Karreedouw 132kV Powerline realignment, Kouga LM 2016
- Eskom Ecological Walkdown: Dieprivier-Karreedouw 132 kV Powerline, Kouga LM 2016
- Eskom Solar one Ecological Walkdown: Nieuwehoop 400 kV powerline 2015
- Rehabilitation Plan and Auditing for Grassridge-Poseidon Powerline Rehab, Eastern Cape 2013
- Ecological Assessment for Dieprivier Karreedouw 132kV Powerline, Eastern Cape 2012
- Flora and Fauna search and Rescue plan for Van Stadens Windfarm Powerline, NMB 2012
- Botanical Assessment for Dedisa-Grassridge Powerline, Eastern Cape 2010
- Ecological Assessment for Grahamstown-Kowie Powerline, Eastern Cape 2010
- Species of Special Concern Mapping Transmission Line for San Souci to Nivens Drift 132kV powerline, NMB 2009
- Botanical Assessment for Eskom Powerline - Albany-Kowie, Eastern Cape 2009
- Botanical Assessment for Eskom 132 kV Dedisa Grassridge Power line-Coega, NMB 2006
- Botanical Assessment for Eskom Power line – Tyalara-Wilo, Eastern Cape 2006
- Botanical Assessment for Steynsburg - Teebus 132 kV powerline, Eastern Cape 2004

PIPELINE INFRASTRUCTURE PROJECTS

- Terrestrial Biodiversity Assessment for Thornhill Phase 2 Sanitation Link, Ndlambe, Eastern Cape 2020
- Botanical Assessment for Ngqamakhwe Regional Water Supply Scheme (Phase 3) 2018
- Ecological Assessment for Butterworth Emergency Bulk Water Supply Scheme 2017
- Ecological Assessment for Karringmelkspruit Emergency Bulk Water Supply (Lady Grey) 2017
- Ecological Assessment for Wanhoop-Willowmore Bulk Water Supply, Eastern Cape 2016
- Ecological Assessment for Steytlerville Bulk Water Supply, Eastern Cape (Phase 4) 2013
- Ecological Assessment for Steytlerville Bulk Water Supply, Eastern Cape (Phase 5) 2013
- Detailed Ecological Assessment for Suikerbos Pipeline, Gauteng 2012
- Basic Botanical Assessment for Wanhoop farm pipeline, Eastern Cape 2010
- Basic Botanical Assessment for Chatty Sewer, NMB 2010
- Species of Special Concern Mapping for Seaview Pipeline, NMB 2009
- Species of Special Concern Mapping for Chelsea Bulk Water Pipeline, NMB 2009
- Map Production for Russell Rd Stormwater, NMB 2008
- Basic Botanical Assessment for Albany Pipeline, Eastern Cape 2008
- Environmental Risk Assessment for Elands River pipeline, Eastern Cape 2007

- Detailed Botanical Assessment for Motherwell Pipeline, NMB 2007
- Detailed Botanical Assessment, GIS maps for Erasmuskloof Pipeline, Eastern Cape 2007
- Botanical & Floristic Report for Hankey pipeline, Eastern Cape 2006
- Detailed Botanical Assessment for Port Alfred water pipeline, Eastern Cape 2004

GENERAL INFRASTRUCTURE DEVELOPMENT PROJECTS

- Ecological Assessment for Amalinda crossing, BCM, Eastern Cape 2019
- Ecological Assessment for Cookhouse Bridge rehabilitation and temporary deviation, Eastern Cape 2019
- Ecological Assessment for Nelson Mandela University Access Road, NMB 2019
- Botanical Assessment for Zachtevlei Dam (Lady Grey), Eastern Cape 2017
- Botanical Assessment for Gcebula River bridge (Peddie), Eastern Cape 2017
- Botanical Assessment for Kouga Dam wall upgrade, Eastern Cape 2012
- Botanical Assessment for Jansenville Cemetery, Eastern Cape 2009
- Botanical Assessment for Radar Mast construction for South African Weather Service – BCM & NMB 2008
- Botanical Assessment and GIS mapping for golf course realignment for East London Golf Course, BCM, Eastern Cape 2007
- Botanical Assessment for PE Airport Extention, NMB 2006
- Botanical Assessment for Kidd's Beach Desalination Plant, BCM, Eastern Cape 2006

HOUSING DEVELOPMENT PROJECTS

- Terrestrial Biodiversity Assessment for Erf 1820 Mthatha, KSDM, Eastern Cape 2020
- Ecological Assessment for Erf 599 Walmer Mixed Use Development, Nelson Mandela Bay 2019
- Ecological Assessment Portion 21-23 and 41 of Farm 807, Gonubie, Buffalo City 2019
- Ecological Assessment for Emerald Sky Housing Project, BCMM 2019
- Ecological Assessment for Erf 14, Kabega, Port Elizabeth 2017
- Ecological Assessment for Fairwest Rental Housing, Port Elizabeth 2017
- Ecological Assessment for Hankey Housing, Kouga District Municipality 2015
- Ecological Assessment for Lebowakgoma Housing, Limpopo 2013
- Ecological Assessment for Giyani Development, Limpopo 2013
- Ecological Assessment for Palmietfontein Development, Limpopo 2013
- Ecological Assessment for Seshego Development, Limpopo 2013
- Botanical Assessment for Sheerness Road, BCM, Eastern Cape 2013
- Ecological Assessment for Ethembeni Housing, NMB 2012
- Ecological Assessment for Pelana Housing, Limpopo 2012
- Flora Search and Rescue Plan for Kwanobuhle Housing, Western Cape 2011
- Botanical Assessment for The Crags 288/03, Western Cape 2010
- Ecological Assessment Revision Report for Fairview Housing, NMB 2010
- Botanical Assessment, EMP and Open Space Management Plan for Hornlee Housing Development, Western Cape 2010
- Botanical Assessment for Little Ladywood, Western Cape 2010
- Botanical Assessment and Open Space Management Plan for Motherwell NU31, NMB 2010
- Botanical Assessment and Open Space Management Plan for Plett 443/07, Western Cape 2010
- Botanical Assessment for Willow Tree Farm, NMB 2010
- Botanical Assessment for Kouga RDP Housing, Eastern Cape 2009
- Botanical Assessment for Fairview Erf 1226 (Wonderwonings), NMB 2009
- Species List Compilation for Zeekoerivier Humansdorp, Eastern Cape 2009
- Botanical Assessment for Woodlands Golf Estate (Farm 858), BCM, Eastern Cape 2009

- Botanical Assessment for Plettenberg Bay - 438/4, Western Cape 2009
- Vegetation Assessment for Kwanokuthula RDP housing project, Western Cape 2008
- Site screening assessment for Greenbushes Site screening, NMB 2008
- Botanical Assessment for Fairfax development, Eastern Cape 2008
- Botanical Assessment for Plettenberg Bay Brakkloof 50&51, Western Cape 2008
- Botanical Assessment, GIS mapping for Theescombe Erf 325, NMB 2008
- Site Screening for Mount Road, NMB 2008
- Botanical Assessment for Greenbushes Farm 40 Swinburne 404, NMB 2008
- Botanical Assessment for Greenbushes 130, NMB 2008
- Botanical Assessment for Greenbushes Kuyga no. 10, NMB 2008
- Botanical Assessment for Plettenberg Bay - 438/24, Western Cape 2007
- Botanical Assessment for Plettenberg Bay - Olive Hills 438/7, Western Cape 2007
- Botanical Assessment for Gonubie Portion 809/9, BCM, Eastern Cape 2006
- Botanical Assessment for Glengariff Farm 723, BCM, Eastern Cape 2006
- Botanical Assessment for Gonubie Portion 809/10, BCM, Eastern Cape 2006
- Botanical Assessment for Gonubie Portion 809/4 & 5, BCM, Eastern Cape 2006
- Botanical Assessment for Plettenberg bay - Ladywood 438/1&3, Western Cape 2006
- Botanical Assessment and Rehab Plan for Winterstrand Desalination Plant, BCM 2006
- Botanical Assessment for Bosch Hoogte, NMB 2006
- Botanical Assessment for Plettenberg bay Farm 444/38, Western Cape 2006
- Botanical Assessment for Plettenberg Bay - 444/27, Western Cape 2006
- Botanical Assessment for Leisure Homes, BCM, Eastern Cape 2006
- Botanical Basic Assessment for Trailees Wetland Assessment, Eastern Cape 2005
- Botanical Assessment and Rehab Plan for Arlington Racecourse - PE, NMB 2005
- Botanical Assessment for Smart Stone, NMB 2005
- Botanical Assessment for Peninsular Farm (Port Alfred), Eastern Cape 2005
- Botanical Assessment for Mount Pleasant - Bathurst, Eastern Cape 2005
- Botanical Assessment and RoD amendments for Colchester Erven 1617 & 1618 (Riverside), NMB 2005
- Basic Botanical Assessment for Parsonsvlei 3/4, Eastern Cape 2005
- Botanical Assessment for Bridgemead – Malabar PE, NMB 2004

AGRICULTURAL PROJECTS

- Ecological Assessment for Vermaak Boerdery Hydro Turbine (Cookhouse)2020 2020
- Thornhill Eggland Specialist Ecological Assessment 2020
- Ecological Assessment for Citrus expansion on Hitgeheim Farm, Sunland, Eastern Cape 2015
- Ecological Assessment for Citrus expansion on farm 960, Patensie (AIN du Preez Boerdery) 2014
- Ecological Assessment for Doornkraal Pivot (Hankey), Eastern Cape 2014
- Ecological Assessment for Tzaneen Chicken Farm, Limpopo 2013
- Botanical Assessment and Open Space Management Plan for Kudukloof, NMB 2010
- Botanical Assessment and Open Space Management Plan for Landros Veeplaats, NMB 2010
- Botanical Assessment and Flora Relocation Plan for Wildemans Plaas, NMB 2006

GOLF ESTATE AND RESORT DEVELOPMENT PROJECTS

- Species List& Comments Report for Kidds Beach Golf Course, BCM, Eastern Cape 2009
- Botanical Assessment for Plettenberg Bay -Farm 288/03, Western Cape 2009
- Botanical Assessment for Rockcliff Golf Course, BCM, Eastern Cape 2008
- Botanical Assessment for Rockcliff Resort Development, BCM, Eastern Cape 2007
- Botanical Assessment, EMP and Rehabilitation Plan for Tiffendel Ski Resort, Eastern Cape 2006

MIXED USE DEVELOPMENT PROJECTS

- Ecological Assessment for South-End Precinct Mixed Use Development, Nelson Mandela Bay 2018
- Botanical Assessment, EMP and Open Space Management Plan for Bay West City, NMB 2010
- Botanical Assessment, GIS maps, Open Space and Rehab Plans for Fairview Erf 1082, NMB 2009
- Botanical Assessment and GIS maps for Utopia Estate PE, NMB 2008
- Botanical Assessment and GIS mapping for Madiba Bay Leisure Park, NMB 2007
- Botanical Assessment and GIS mapping for Madiba Bay Leisure Park, NMB 2007
- Botanical Basic Assessment for Cuyler Manor (Farm 320), Uitenhage, NMB 2007

BUSINESS AND INDUSTRIAL DEVELOPMENT PROJECTS

- Ecological Assessment for Parsonsvlei Erf 984 & 1134 Parsonsvlei, NMB 2020
- Mthatha Retails and Service Center 2020
- Ecological Assessment for Walmer Erf 11667 - Bidfood Warehousing Development, NMB 2020
- Ecological Assessment for Portion 87 of the Farm Little Chelsea No 10, NMB 2020
- Ecological Assessment for Bay West City ENGEN Service Station, NMB 2015
- Ecological Assessment for Green Star grading for SANRAL, NMB 2014
- Ecological Assessment for OTGC Tank Farm, NMB 2012
- Botanical Assessment and Open Space Management Plan for Petro SA Refinery, Coega IDZ, NMB 2010
- Botanical Assessment for Bluewater Bay Erf 805, NMB 2009
- Ecological Assessment for Bay West City, NMB 2007
- Botanical Assessment for Kenton Petrol Station, Eastern Cape 2005
- Botanical Assessment and RoD amendments for Colchester Petrol Station, NMB 2005

ECO-ESTATE DEVELOPMENT PROJECTS

- Botanical Re-Assessment of Swanlake Eco Estate, Aston Bay, Eastern Cape 2018
- Detailed Botanical Assessment and Open Space Management Plan for Olive Hills, Western Cape 2010
- Botanical Assessment and EMP for Zwartenbosch Road, Eastern Cape 2010
- Botanical Assessment - Poultry Farm for Coega Kammaskloof Farm 191, NMB 2008
- Botanical Assessment - Housing development for Coega Ridge, NMB 2008
- Botanical Assessment, Rehabilitation Plan, EMP and GIS maps for Amanzi Estate, NMB, 2008
- Botanical Assessment for Roydon Game farm, Queenstown, Eastern Cape 2007
- Botanical Assessment for Winterstrand Estate (Farm 1008), BCM, Eastern Cape 2007
- Botanical Assessment for Homeleigh Farm 820, BCM, Eastern Cape 2007
- Botanical Basic Assessment, Rehab Plan & Maps for Candlewood, Tsitsikamma, Western Cape 2007
- Botanical Assessment, EMP and Rehab Plan for Carpe Diem Eco development, Eastern Cape 2007
- Botanical Assessment, EMP and Rehabilitation Plan for Seaview Eco-estate, NMB 2006
- Botanical Assessment for Kidd's Beach portion 1076, BCM, Eastern Cape 2006
- Botanical Assessment for Palm Springs, Kidds Beach East London, BCM, Eastern Cape 2006
- Botanical Assessment for Nahoon Farm 29082, BCM, Eastern Cape 2006
- Botanical Assessment for Rosehill Farm, Eastern Cape 2005
- Botanical Assessment for Resolution Game Farm, Eastern Cape 2005
- Botanical Assessment for Gonubie Portion 809/11, BCM, Eastern Cape 2005
- Botanical Assessment for Kidd's Beach portion 1075, BCM, Eastern Cape 2005

FLORA AND FAUNA RELOCATION PLANS, PERMITS AND IMPLEMENTATION

- Flora Search and Rescue for Nelson Mandela University Phase 2 & 3 Residences, Eastern Cape 2020

- Flora Search and Rescue for Fairwest Housing Estate, Nelson Mandela Bay, Eastern Cape 2019
- Flora Search and Rescue for Utopia Estate, Nelson Mandela Bay, Eastern Cape 2019
- Flora Search and Rescue for Citrus expansion on Boschkraal Citrus Farm, Sunland, Eastern Cape 2018
- Flora Search and Rescue for Wanhoop pipeline, Willowmore, Eastern Cape 2018
- Flora Search and Rescue for Wilgekloof pipeline, Willowmore, Eastern Cape 2018
- Flora Search and Rescue for Citrus expansion on Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- Flora Search and Rescue for Steytlerville Bulk Water Supply, Eastern Cape (Phase 5) 2016
- Flora Search and Rescue for Citrus expansion on Farm 960, Patensie (AIN du Preez Boerdery) 2016
- Flora Search and Rescue for Steytlerville Bulk Water Supply & WTW, Eastern Cape (Phase 4) 2015
- Flora and Fauna Search and Rescue for Riversbend Citrus Farm, NMB 2014
- Flora and Fauna Search and Rescue for Mainstream Windfarm, Eastern Cape 2013
- Flora Search and Rescue for Steytlerville Bulk Water Supply, Eastern Cape (Phase 1, 2 & 3) 2013
- Flora and Fauna Search and Rescue for OTGC Tank Farm, Coega IDZ, NMB 2013
- Flora and Fauna Search and Rescue for Jeffreys Bay School, Eastern Cape 2013
- Flora Search and Rescue Plan for Red Cap Wind Farm, Eastern Cape 2012
- Flora Relocation for Disco Poultry Farm, NMB 2010
- Flora Relocation for Mainstream Windfarm, Eastern Cape 2010

ENVIRONMENTAL MANAGEMENT PLANS

- Final Environmental Management Programme (EMPr) and Maintenance Management Plan for South End Precinct Mixed Use Zone, Nelson Mandala Bay Municipality 2020
- Final Environmental Management Programme (EMPr) for Coega Land-Based Aquaculture Development Zone (ADZ), Coega Industrial Development Zone (IDZ), Nelson Mandela Bay Municipality 2019
- Basic Botanical Assessment for Kromensee EMP (Jeffries Bay), Eastern Cape 2010
- Wetland Management Plan for NMB Portnet, NMB 2010
- Baseline Botanical Study, Vegetation mapping and EMP for Local Nature Reserve for Plettenberg Bay Lookout LNA, Western Cape 2009
- Biodiversity & Ecological Processes for Bathurst-Commonage, Eastern Cape 2006
- EMP for Kromensee EMP (Jeffries Bay), Eastern Cape 2006
- Floral Survey for Mbotyi Conservation Assessment, Eastern Cape 2005
- Identifying and Assessment on Aquatic Weeds for Pumba Private Game Reserve, Eastern Cape 2005

BASIC ASSESSMENT APPLICATION PROJECTS (DEDEAT)

- Basic Assessment Application for Parsonsvlei Erf 984 & 1134 Parsonsvlei 2020
- Construction of Deviation and Rehabilitation of Bridge along DR02481 road 2020
- Basic Assessment Application for Vermaak Boerdery Hydro Turbine (Cookhouse) 2020
- Basic Assessment Application for Walmer Erf 11667 Bidfood Warehousing Development 2020
- Basic Assessment Application for Portion 87 of the Farm Little Chelsea No 10 2020
- Basic Assessment Application for Nelson Mandela University Access Road, NMB 2019
- Basic Assessment, WULA and Borrow Pit/Quarry Mining Application, Clarkebury Rd, Idutywa 2019

- Basic Assessment Application for Erf 599 Walmer Mixed Use Development, Nelson Mandela Bay 2019
- Basic Assessment Application for Cookhouse Bridge rehabilitation and temporary deviation 2019
- Basic Assessment Application for Erf 14 Kabega, NMBM 2017
- Basic Assessment Application for Hankey Housing, Kouga District Municipality 2017
- Basic Assessment Application for Fairwest Rental Housing, Nelson Mandela Bay 2017
- Basic Assessment Application for Citrus expansion on Hitgeheim Farm, Sunland, Eastern Cape 2015

- Basic Assessment Application for Hankey Housing, Kouga District Municipality 2015
- Basic Assessment Application for Citrus expansion on farm 960, Patensie (AIN du Preez Boerdery) 2014
- Basic Assessment Application for South-End Precinct Mixed Use Development, Nelson Mandela Bay 2018

MINING PERMIT/ENVIRONMENTAL MANAGEMENT PROGRAMME APPLICATIONS (DMR)

- Mining BAR/EMP's for Blue Crane Route & Camdeboo LM 12 Borrow Pits – (DoT) 2019
- Mining BAR/EMP's for Elundini LM 6 Borrow Pits (DoT)
- Mining BAR/EMP's for Baviaans LM 6 Borrow Pits (DoT)
- Mining BAR/EMP's for Kouga & Koukamma LM 12 Borrow Pits (DoT)
- Mining BAR/EMP's for Sakhisizwe & Engcobo LM 12 Borrow Pits (DoT)
- Mining BAR/EMP's for Senqu LM 12 Borrow Pits (DoT)
- Mining BAR/EMP's for 24 Borrow Pits in 6 districts within the Eastern Cape– (SANRAL) 2018
- Mining BAR/EMP's for Ingquza Hill LM Borrow Pits – (SANRAL) 2017
- Mining BAR/EMP's for Baviaans LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Senqu LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Kouga/Koukamma LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Inkwanca (Enoch Mgijima) LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Kouga/Koukamma LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Sakhisizwe/Engcobo LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Raymond Mahlaba LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Camdeboo LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Elundini LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Emalahleni/Intsika Yethu LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Nkonkobe LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Mbhashe LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Mbizana LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Senqu LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Elundini LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Emalahleni LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Emalahleni LM Borrow Pits – (DRPW) 2016
- Mining BAR/EMP's for Ikwezi/Baviaans LM Borrow Pits – (DRPW) 2016
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - MR00716 (Tarkastad) (DRPW) 2015
- Mining BAR/EMP's for Chris Hani DM Borrow Pits – Intsika Yethu and Emalahleni (DRPW) 2015
- Mining BAR/EMP's for Joe Gqabi DM Borrow Pits – Senqu (DRPW) 2015
- Mining BAR/EMP's for Makana/Ndlambe LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Amahlathi LM Borrow Pits – Amatole (DRPW) 2015
- Mining BAR/EMP's for Mbashe/Mqume LM Borrow Pits – Amatole (DRPW) 2015
- Mining BAR/EMP's for Sundays River Valley LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Kouga LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - MR00716 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR02581 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08041, DR08247, DR08248 & DR08504 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08599, DR08601 & DR08570 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08235, DR08551 & DR08038 (DRPW) 2014
- Mining BAR/EMP's for Alfred Nzo DM Borrow Pits - DR08092, DR08093 & DR08649 (DRPW) 2014
- Mining BAR/EMP's for Alfred Nzo DM Borrow Pits - DR08090, DR08412, DR08425, DR08129, DR08109, DR08106, DR08104 & DR08099 – Matatiele (DRPW) 2014

ENVIRONMENTAL COMPLIANCE AUDITING

- Environmental Compliance Audit (Habata Boerdery) 2021
- Environmental Compliance Audit (Sontule Farm) 2021

ENVIRONMENTAL MANAGEMENT, AUDITING, COMPLIANCE AND MONITORING PROJECTS

- Environmental Auditing Services Pre-construction and Construction (Rocky Coast Farm) 2021
- Environmental Auditing Services (Middledrift Breeder Facility) 2021
- Coega Aquaculture Development Zone Environmental Compliance and Monitoring for Construction (24 Months) 2020
- Construction of NMU West End Student Residences Phases 1 & 3 Environmental Control Office (30 Months) 2020
- Environmental Auditing and construction monitoring for construction of Phase 1 River Park (South End Precinct) 2020
- Waste Management License audit for Bedford Recycling project 2020
- Auditing for Construction of Fairwest Village Housing Project 2019
- Auditing for Construction of Utopia Estate monthly auditing 2019
- ECO for DRPW IRM Road Maintenance projects, Baviaans LM 2019
- ECO for DRPW IRM Road Maintenance projects, Senqu LM 2019
- ECO for DRPW IRM Road Maintenance projects, Kouga/Koukamma LM 2019
- ECO for DRPW IRM Road Maintenance projects, Sakhisizwe/Engcobo LM 2019
- ECO for DRPW IRM Road Maintenance projects, Elundini LM 2019
- ECO for DRPW IRM Road Maintenance projects, Emalahleni/Intsika Yethu LM 2019
- ECO for Construction of Fairwest Village Housing Project 2019
- ECO for Construction of Utopia Estate Mixed Use Project 2019
- ECO for Construction of NMU West End Student Residences Phases 1 & 3 2019
- ECO for Construction of Eco-Pullets pullet rearing facility, Paterson 2018
- ECO for DRPW IRM Road Maintenance projects, Raymond Mahlaba LM 2018
- ECO for DRPW IRM Road Maintenance projects, Inkwanca (Enoch Mgijima) LM 2018
- ECO for Citrus expansion on Farm 960, Patensie (AIN du Preez Boerdery) 2017
- ECO for Citrus expansion on Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- DEO for improvement of national route R67 section 5 from Whittlesea (km 0.00) to Swart Kei river (km 15.40) – Murray & Roberts 2017
- ECO for SANRAL RRP Road Maintenance projects, Mbizana LM 2017
- ECO and Botanical Specialist for the special maintenance of national route R61 Section 2 from Elinus Farm (km 42.2) to N10 (km 85.0) (SANRAL) 2016
- Environmental Control Officer (ECO): Construction of NSRI Slipway - Port Elizabeth Harbour 2016
- ECO for SANRAL RRP Road Maintenance projects, Mbashe LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Nkonkobe LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Mbizana LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Senqu LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Elundini LM 2016
- ECO and Environmental Management for closure of Bushmans River Landfill site 2016
- ECO for DRPW IRM Road Maintenance projects, Amahlathi Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Makana/Ndlambe Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Mbashe/Mqume Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Port St Johns, Mbizana, Ingquza Hill LM's 2015
- ECO for Riversbend Citrus Farm, NMB 2014
- ECO for Alfred Nzo DM Road resurfacing - DR08071, DR08649, DR08092, DR08418, DR08452, DR08015, DR08085, DR08639 & DR08073, Eastern Cape - MSBA 2014

- ECO Audits for Koukamma Flood Damage Road Repairs – Hatch Goba 2014
- EMP and ECO for Utopia Estate, NMB 2013
- Final EMPr submission for Seaview Garden Estate, NMB 2012
- ECO audits for NMB Road surfacing, NMB (multiple contacts) 2011
- EMPr submission and ECO for Seaview Garden Estate, NMB 2010
- ECO for Mainstream Windfarm wind monitoring mast installation, Eastern Cape 2010
- EMP and ECO for Sinati Golf Estate EMP, BCM, Eastern Cape 2009
- Flora Relocation Plan and Permit application for Wildemans Plaas, NMB 2006

ENVIRONMENTAL SCREENING PROJECTS

- Somerset East Stormwater Environmental Screening Report 2021
- Woodlands Diary Road Upgrade Environmental Screening Report, Kouga LM 2021
- Risk Assessment and Screening for proposed Heatherbank access road, NMB 2020
- Environmental Screening Report for Proposed Life Hospital parking expansion, NMB 2019
- Environmental Screening Report for Erf 984 & 1134 development, Parsonsvlei, NMB 2019
- Environmental Screening Report for proposed Khayalethu School, Buffalo City 2018
- Environmental Screening Report for Proposed Housing Development of Erf 8700, Kabega Park, NMB 2017
- Environmental Screening Report for Proposed Housing Development of Erf 14, Kabega Park, NMB 2017
- Environmental Screening Report for Proposed Fairwest Social Housing project, Fairview, NMB 2016
- Environmental Screening Report for Development of Little Chelsea No 25, NMB 2016
- Terrestrial Vegetation Risk Assessment for proposed Skietnek Citrus Farm development (Kirkwood) 2015
- Preliminary Environmental Risk Assessment: NSRI Slipway Port Elizabeth 2015
- Environmental Screening Report for Proposed Development of a Dwelling on Erf 899, Theescombe 2015
- Environmental Screening Report for Proposed Development on Erf 559, Walmer, Port Elizabeth 2015
- Environmental Screening Report for Proposed Housing Scheme Development of Erf 8709, Wells Estate 2015
- Environmental Screening Report for Development of Portion 10 of Little Chelsea No 87, NMB 2015

SECTION 24G APPLICATIONS

- 12 000 ML Dam constructed on farm 960, Patensie (MGM Trust) 2015
- Illegal clearing of 20 Ha of lands on Hitgeheim Farm, Sunland, Eastern Cape 2015

CONFERENCES AND PUBLICATIONS

- Pote, J., Shackleton, C.M., Cocks, M. & Lubke, R. 2006. *Fuelwood harvesting and selection in Valley Thicket*, South Africa. Journal of Arid Environments, 67: 270-287.
- Pote, J., Cocks, M., Dold, T., Lubke, R.A. and Shackleton, C. 2004. *The homegarden cultivation of indigenous medicinal plants in the Eastern Cape*. Indigenous Plant Use Forum, 5 - 8 July 2004, Augsburg Agricultural School, Clanwilliam, Western Cape.
- Pote, J. & Lubke, R.A. 2003. *The selection of indigenous species suitable for use as fuelwood and building materials as a replacement of invasive species that are currently used by the under-privileged in the Grahamstown commonage.* Working for Water Inaugural Research Symposium 19 - 21 August 2003, Kirstenbosch. Poster presentation.
- Pote, J. & Lubke, R.A. 2003. *The screening of indigenous pioneer species for use as a substitute cover crop for rehabilitation after removal of woody alien species by WfW in the grassy fynbos biome in the Eastern Cape*. Working for Water Inaugural Research Symposium 19 - 21 August 2003, Kirstenbosch, South Africa.

OTHER RESEARCH EXPERIENCE

- Resource assessment of bark stripped trees in indigenous forests in Weza/Kokstad area (June 2000; Dr C. Geldenhuis & Mr. M. Kaplin).
- Working for Water research project for indigenous trees for woodlots (December 2000/January 2001; Prof R.A. Lubke, Rhodes University).
- Project coordinator and leader of the REFYN project – A BP conservation gold award: Conservation and Restoration of Grassy-Fynbos. A multidisciplinary project focusing on management, restoration and public awareness/education (2001 – 2002).
- Conservation Project Management Training Workshops: Royal Geographical Society, London 2001 – Fieldwork Techniques, Habitat Assessment, Biological Surveys, Project Planning, Public Relations and Communications, Risk Assessment, Conservation Education
- Selection and availability of wood in Crossroads village, Eastern Cape, South Africa. Honours Research Project 2002. Supervisors: Prof. R.A. Lubke & Prof. C. Shackleton.
- Floral Morphology, Pollination and Reproduction in Cyphia (LOBELIACEAE). Honours Research Project 2002. Supervisor: Mr. P. Phillipson.
- Forestry resource assessment of bark-stripped species in Amatola District (December 2002; Prof R.A. Lubke).
- Homegarden Cultivation of Medicinal Plants in the Amathole area. Postgraduate Research Project (2003-2005; Prof R.A. Lubke, Prof C.M. Shackleton and Ms C.M., Cocks).

8.6 Appendix F: Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity

SCOPE

The protocol (*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* (GN 320, 20 March 2020)) provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation.

The protocol (*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 NEMA, gazetted on 30 October 2020*), provides the criteria for the assessment and reporting of impacts on plant and animal species for activities requiring environmental authorisation.

These protocols replace the requirements of Appendix 6 of the Environmental Impact Assessment Regulation[9].

The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (https://screening.environment.gov.za/screeningtool). The requirements for terrestrial biodiversity are for landscapes or sites which support various levels of biodiversity. The relevant terrestrial biodiversity data in the screening tool has been provided by the South African National Biodiversity Institute[10].

SITE SENSITIVITY VERIFICATION AND MINIMUM REPORT CONTENT REQUIREMENTS

Prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the screening tool must be confirmed by undertaking a site sensitivity verification.

2.1. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.

2.2. The site sensitivity verification must be undertaken through the use of:

(a) a desk top analysis, using satellite imagery,

(b) a preliminary on-site inspection; and

(c) any other available and relevant information.

2.3. The outcome of the site sensitivity verification must be recorded in the form of a report that:

(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;

(b) contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity; and

(c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

[9] The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act 107 of 1998).

[10] The biodiversity dataset has been provided by the South African National Biodiversity Institute (for details of the dataset, click on the options button to the right of the various biodiversity layers on ther screening tool).

TERRESTRIAL BIODIVERSITY SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
1	General Information	
1.1	An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being "very high sensitivity" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.	✓
1.2	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being 'low sensitivity' for terrestrial biodiversity, must submit a Terrestrial Biodiversity Compliance Statement.	✓
1.3	However, where the information gathered from the site sensitivity verification differs from the designation of 'very high' terrestrial biodiversity sensitivity on the screening tool and it is found to be of a 'low' sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.	✓
1.4	Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a 'low' terrestrial biodiversity sensitivity on the screening tool, a Terrestrial Biodiversity Specialist Assessment must be conducted.	✓
1.5	If any part of the proposed development footprint falls within an area of 'very high' sensitivity, the assessment and reporting requirements prescribed for the 'very high' sensitivity apply to the entire footprint, excluding linear activities for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any are that will be disturbed.	✓
	VERY HIGH SENSITIVITY RATING for terrestrial biodiversity features	
2	Terrestrial Biodiversity Specialist Assessment	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the blowing aspects:	
2.3.1	a description of the ecological drivers or processes of the system and how the proposed development with impact these;	
2.3.2	ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;	
2.3.3	the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	
2.3.4	the description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments);	
2.3.5	a description of terrestrial biodiversity and ecosystems on the preferred site, including:	
(a)	main vegetation types;	
(b)	threatened ecosystems, including fisted ecosystems as well as locally important habitat types identified;	

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
(c)	ecological connectivity, habitat fragmentation, ecological processes and fine- scale habitats; and	
(d)	species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	
2.3.6	the assessment must identify any alternative development footprints within the preferred site which would be of 'low' sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	
2.3.7	the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:	
2.3.7.1	terrestrial critical biodiversity areas (CBAs), including:	
(a)	the reasons why an area has been identified as a CBA;	
(b)	an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;	
(c)	the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to remaining extent of the ecosystem type(s);	
(d)	the impact on ecosystem threat status;	
(e)	the impact on explicit subtypes in the vegetation;	
(f)	the impact on overall species and ecosystem diversity of the site; and	
(g)	the impact on any changes to threat status of populations of species of conservation concern in the CBA;	
2.3.7.2	terrestrial ecological support areas (ESAs), including:	
(a)	the impact on the ecological processes that operate within or across the site;	
(b)	the extent the proposed development will impact on the functionality of the ESA; and	
(c)	loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration | and movement of flora and fauna;	
2.3.7.3	protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including	
(a)	an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;	
2.3.7.4	priority areas for protected area expansion, including-	
(a)	the way in which in which the proposed development will compromise or contribute to the expansion of the protected area I network;	
2.3.7.5	SWSAs (strategic water source areas) including:	
(a)	the impact(s) on the terrestrial habitat of SWSA; and	
(b)	the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses),	
2.3.7.6	FEPA sub catchments, including-	
(a)	the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;	
2.3.7.7	indigenous forests, including:	
(a)	impact on the ecological integrity of the forest and	

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
(b)	percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	
2.4	The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report	
3.	Terrestrial Biodiversity Specialist Assessment Report	
3.1	The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1	contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	
3.1.2	a signed statement of independence by the specialist;	
3.1.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment,	
3.1.4	description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modeling used, where relevant;	
3.1.5	a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	
3.1.6	a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	
3.1.7	additional environmental impacts expected from the proposed development;	
3.1.8	any direct, indirect and cumulative impacts of the proposed development;	
3.1.9	the degree to which impacts and risks can be mitigated;	
3.1.10	the degree to which the impacts and risks can be reversed;	
3.1.11	the degree to which the impacts and risks can cause toss of irreplaceable resources;	
3.1.12	proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr),	
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a 'low' terrestrial biodiversity sensitivity and that were not considered appropriate,	
3.1.14	a substantiated statement based on the findings of the specialist assessment, regarding the acceptability, or not. of the proposed development, if it should receive approval a not; and	
1.1.15	any conditions to which this statement is subjected.	
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	
	LOW SENSITIVITY RATING – for terrestrial biodiversity features	
4	Terrestrial Biodiversity Compliance Statement	⌄
4.1	The compliance statement must be prepared by a specialist registered with the SACNASP and having expertise in the field of ecological sciences.	✓
4.2	The compliance statement must:	⌄
4.2.1	be applicable to the preferred site and proposed development footprint;	✓
4.2.2	confirm that the site is of 'low' sensitivity for terrestrial biodiversity; and	✓

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
4.2.3	indicate whether or not the proposed development will have any impact on the biodiversity feature.	✓
4.3	The compliance statement must contain, as a minimum, the following information:	✓
4.3.1	the contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	✓
4.3.2	a signed statement of independence by the specialist;	✓
4.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
4.3.4	a baseline profile description of biodiversity and ecosystems of the site;	✓
4.3.5	the methodology used to verify the sensitivities of the terrestrial biodiversity features on the site, including equipment and modeling used, where relevant;	✓
4.3.6	in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures propped, the land can be returned to the current state within two years of completion of the construction phase;	✓
4.3.7	where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;	✓
4.3.8	a description of the assumptions made and any uncertainties or gaps in knowledge or data; and	✓
4.3.9	any conditions to which this statement is subjected.	EAP
4.4	A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	EAP

ANIMAL SPECIES SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
1	General Information	
1.1	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" or "high" sensitivity for terrestrial animal species must submit a Terrestrial Animal Species Specialist Assessment Report.	✓
1.2	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 animal species must submit either a Terrestrial Animal Species Specialist Assessment Report or a Terrestrial Animal Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.	✓
1.3	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 "low" sensitivity for terrestrial animal species must submit a Terrestrial Animal Species Compliance Statement.	✓
1.4	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "very high" or "high", for terrestrial animal species sensitivity and it is found to be of a "low" sensitivity, then a Terrestrial Animal Species Compliance Statement must be submitted.	✓
1.5	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" terrestrial animal species sensitivity and it is found to be of a "very high" or "high" terrestrial animal species sensitivity, a Terrestrial Animal Species Specialist Assessment must be conducted.	✓
1.6	If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high"	✓

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
	or "high" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol means, the area on which the proposed development will take place and includes the area that will be disturbed or impacted.	
1.7	The Terrestrial Animal Species Specialist Assessment and the Terrestrial Animal Species Compliance Statement must be undertaken within the study area.	✓
1.8	Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.	✓
1.9	Where the nature of the activity is expected to have an impact on SCC beyond the boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline11, and the study area must include the PAOI, as determined.	✓
	VERY HIGH AND HIGH SENSITIVITY RATING for terrestrial animal species	
2	Terrestrial Animal Species Specialist Assessment	
	VERY HIGH SENSITIVITY RATING Critical habitat for range-restricted species12 of conservation concern, that have a global range of less than 10 km2. SCC listed on the IUCN Red List of Threatened Species13 or on South Africa's National Red List website14 as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare. Species aggregations that represent ≥1% of the global population size of a species, over a season, and during one or more key stages of its life cycle. The number of mature individuals that ranks the site among the largest 10 aggregations known for the species. These areas are irreplaceable for SCC.	✓
4.6	Where SCC are found on site or have been confirmed to be likely present, a Terrestrial Animal Species Specialist Assessment must be submitted in accordance with the requirements specified for "very high" and "high" sensitivity in this protocol.	✓
4.7	Similarly, where no SCC are found on site during the site inspection or the presence is confirmed to be unlikely, a Terrestrial Animal Species Compliance Statement must be submitted.	✓
5	**LOW SENSITIVITY RATING – for terrestrial animal species**	
	Terrestrial Animal Species Compliance Statement Areas where no natural habitat remains. Natural areas where there is no suspected occurrence of SCC.	
5.1	The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Zoological Science or Ecological Science).	✓
5.2	The compliance statement must:	✓
5.2.1	be applicable to the study area;	✓
5.2.2	confirm that the study area, is of "low" sensitivity for terrestrial animal species; and	✓

11 Available at https://bgis.sanbi.org/
12 Species with a geographically restricted area of distribution.
13 https://www.iucnredlist.org/
14 This category includes the categories Extremely Rare, Critically Rare and Rare

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
5.2.3	indicate whether or not the proposed development will have any impact on SCC.	✓
5.3	The compliance statement15 must contain, as a minimum, the following information:	✓
5.3.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;	✓
5.3.2	a signed statement of independence by the specialist;	✓
5.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
5.3.4	a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;	✓
5.3.5	the mean density of observations/ number of samples sites per unit area15.	✓
5.3.6	where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;	✓
5.3.7	a description of the assumptions made and any uncertainties or gaps in knowledge or data; and	✓
5.3.8	any conditions to which the compliance statement is subjected.	✓
6.	A signed copy of the Terrestrial Animal Species Compliance Statement must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.	✓

PLANT SPECIES SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
1	**General Information**	
1.1	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*" or "*high*" sensitivity for terrestrial plant species must submit a **Terrestrial Plant Species Specialist Assessment Report**.	✓
1.2	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 undertaken in accordance with paragraph 4.	✓
1.3	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 "*low*" sensitivity for terrestrial plant species must submit a **Terrestrial Plant Species Compliance Statement.**	✓
1.4	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "*very high*" or "*high*", for terrestrial plant species sensitivity and it is found to be of a "*low*" sensitivity, then a **Terrestrial Plant Species Compliance Statement** must be submitted.	✓
1.5	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "*low*" terrestrial plant species sensitivity and it is found to be of a "*very high*" or "*high*" terrestrial plant species sensitivity, a **Terrestrial Plant Species Specialist Assessment** must be conducted.	✓
1.6	If any part of the development falls within an area of confirmed "*very high*" or "*high*" sensitivity, the assessment and reporting requirements prescribed for the "*very high*" or "*high*" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol means, the area on which the proposed development will take place and includes the area that will be disturbed or impacted.	✓
1.7	The **Terrestrial Plant Species Specialist Assessment** and the **Terrestrial Plant Species**	✓

15 An example of a what is contained in a Compliance Statement for Animal Species Impact Assessment can be found in the Species Environmental Impact Assessment Guideline

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
	Compliance Statement must be undertaken within the *study area*.	
1.8	Where the nature of the activity **is not** expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.	✓
1.9	Where the nature of the activity **is** expected to have an impact on SCC beyond the boundary of the preferred site, the *project areas of influence* (PAOI) must be determined by the specialist in accordance with *Species Environmental Assessment Guideline*[16], and the study area must include the PAOI, as determined.	✓
	VERY HIGH AND HIGH SENSITIVITY RATING for terrestrial plant species	
2	**Terrestrial Plant Species Specialist Assessment**	
	VERY HIGH SENSITIVITY RATING 1. Critical habitat for range-restricted species[17] of conservation concern, that have a global range of less than 10 km^2. 2. SCC listed on the IUCN Red List of Threatened Species[18] or on South Africa's National Red List website[19] as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare. 3. Species aggregations that represent ≥1% of the global population size of a species, over a season, and during one or more key stages of its life cycle. 4. The number of mature individuals that ranks the site among the largest 10 aggregations known for the species. These areas are irreplaceable for SCC. HIGH SENSITIVITY RATING 1. Confirmed habitat for SCC. 2. SCC, listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable, according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare. These areas are unsuitable for development due to a very likely impact on SCC.	✓
2.3.12	identify any alternative development footprints within the preferred site which would be of "*low*" or "*medium*" sensitivity as identified by the screening tool and verified through the site sensitivity verification.	✓
2.4	The findings of the assessment must be written up in a **Terrestrial Plant Species Specialist Assessment Report**.	✓
3	**Terrestrial Plant Species Specialist Assessment Report**	✓
3.1.13	a motivation must be provided if there were any development footprints identified as per paragraph 2.3.12 above that were identified as having "*low*" or "*medium*" terrestrial plant species sensitivity and were not considered appropriate.	✓
4	**MEDIUM SENSITIVITY SPECIES OF CONSERVATION CONCERN CONFIRMATION**	
	MEDIUM SENSITIVITY RATING – for terrestrial plant species:	
	1. Suspected habitat for SCC based either on there being records for this species collected in the past, prior to 2002, or being a natural area included in a habitat suitability model[20]. 2. SCC listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare.	✓

[16] Available at https://bgis.sanbi.org/
[17] Species with a geographically restricted area of distribution.
[18] https://www.iucnredlist.org/
[19] This category includes the categories Extremely Rare, Critically Rare and Rare
[20] The methodology by which habitat suitability models have been developed are explained within the Species Environmental Assessment Guideline.

	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	
4.6	Where SCC are found on site or have been confirmed to be likely present, a **Terrestrial Plant Species Specialist Assessment** must be submitted in accordance with the requirements specified for "*very high*" and "*high*" sensitivity in this protocol.	✓
4.7	Similarly, where no SCC are found on site during the site inspection or the presence is confirmed to be unlikely, a **Terrestrial Plant Species Compliance Statement** must be submitted.	✓
5	**LOW SENSITIVITY RATING – for terrestrial plant species**	
	Terrestrial Plant Species Compliance Statement 1. Areas where no natural habitat remains. 2. Natural areas where there is no suspected occurrence of SCC.	✓
5.1	The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Botanical Science or Ecological Science).	✓
5.2	The compliance statement must:	✓
5.2.1	be applicable to the study area;	✓
5.2.2	confirm that the study area, is of "*low*" sensitivity for terrestrial plant species; and	✓
5.2.3	indicate whether or not the proposed development will have any impact on SCC.	✓
5.3	The compliance statement[21] must contain, as a minimum, the following information:	✓
5.3.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;	✓
5.3.2	a signed statement of independence by the specialist;	✓
5.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
5.3.4	a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;	✓
5.3.5	where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;	✓
5.3.6	a description of the assumptions made and any uncertainties or gaps in knowledge or data;	✓
5.3.7	the mean density of observations/ number of samples sites per unit area[22]; and	✓
5.3.8	any conditions to which the compliance statement is subjected.	✓
6	A signed copy of the **Terrestrial Plant Species Compliance Statement** must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.	✓

[21] An example of a what is contained in a Compliance Statement for Plant Species Impact Assessment can be found in the Species Environmental Impact Assessment Guideline

[22] Refer to the Species Environmental Assessment Guideline

8.7 Site Sensitivity Verification Report

8.7.1 Background

Sharples Environmental Services cc (SES) has been appointed by Lyners Engineers on behalf of the George Municipality (applicant), to conduct the Environmental Impact Assessment process for the proposed upgrading of stormwater infrastructure of Rosemoor, George, Western Cape (Figure 51). As part of this application, a Terrestrial Biodiversity, Plant & Animal Specialist Assessment is required. assessment is required to support the necessary environmental applications.



Figure 51: Site locality.

8.7.2 Activity Location and Description

The site is situated within a transformed developed suburb, that is drained by a network of vegetated watercourses. The development proposal construction of stormwater discharge points within the vegetated areas adjacent to the watercourses in order to facilitate improved and controlled stormwater discharge.

8.7.3 Purpose of Report

The "*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 Act, when applying for Environmental Authorisation*", as published on 20 March, 2020 in National Gazette, No. 43110 in terms of NEMA (Act 107 of 1998) sections 24(5)(a), (h) and 44, lists protocols and minimum report requirements for environmental impacts on terrestrial biodiversity and provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation. The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the National web based Environmental Screening Tool. Prior to

commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration, identified by the screening tool, must be confirmed by undertaking a **site sensitivity verification**, which must include the following.

4. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.
5. The site sensitivity verification must be undertaken through the use of:
    a. a desk top analysis, using satellite imagery.
    b. a preliminary on -site inspection; and
    c. any other available and relevant information.
6. The outcome of the site sensitivity verification must be recorded in the form of a report that:
    a. confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool.
    b. contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity; and
    c. is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

The National Web Based Screening Tool was used to generate the potential environmental sensitivity of the site which has then been compared to various online and other databases and information sources in order to verify and confirm the validity of the screening tool findings. This was further supported with on-site observations and analysis of most recent aerial photography.

This terrestrial biodiversity site verification has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

8.7.4 Data sources and references

Data sources that were utilised for this report include the following:

- National (DFFE) Web Based Screening Tool – to generate the sites potential environmental sensitivity.
- National Vegetation Map 2018 (NVM, 2018), Mucina & Rutherford (2006) and National Biodiversity Assessment or Red Listed Ecosystems (NBA/RLE, 2022) – description of vegetation types, species (including endemic) and most recent vegetation unit conservation status.
- National and Regional Legislation including Provincial Nature Conservation Ordinance (P.N.C.O). NEM:BA Threatened or Protected Species (ToPS).
- Botanical Database of Southern Africa (BODATSA) and New Plants of Southern Africa (POSA) – lists of plant species and potential species of concern found in the general area (SANBI.)
- International Union for Conservation of Nature (IUCN) - Red List of Threatened Species.
- Animal Demography Unit Virtual Museum (VM) – potential faunal species.
- Global Biodiversity Information Facility (GBIF) – potential flora & faunal species.
- National Red Books and Lists - mammals, reptiles, frogs, dragonflies & butterflies.
- National Freshwater Ecosystem Priority Areas assessment (NFEPA, 2011) - important catchments.
- National Protected Areas Expansion Strategy (NPAES, 2018) and South Africa Protected Area database (2020) – protected area information.
- SANBI BGIS – All other biodiversity GIS datasets.
- Western Cape Biodiversity Spatial Plan (2017).
- Aerial Imagery – Google Earth, ESRI, Chief Surveyor General (http://csg.dla.gov.za).
- Cadastral and other topographical country data - Chief Surveyor General (http://csg.dla.gov.za).

- Other sources may include peer-reviewed journals, regional and local assessments, and studies in the general location of the project and its area of influence, landscape prioritization schemes (Key Biodiversity Areas), systematic conservation planning assessments and plans (as above), and any pertinent masters and doctoral theses, among others.

This terrestrial biodiversity assessment has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

8.7.5 Site visit

A site inspection was conducted on **23 July 2024**, during mid-winter and a follow up site visit (early autumn) for additional infrastructure. The site falls within a temperate climate with rainfall occurring throughout the year but is often higher in winter, hence for the purposes of this report, a single site visit is deemed to be adequate, specifically due to the disturbed nature of the site.

8.7.6 Assumptions, Uncertainties and Gaps in Knowledge

The findings and recommendations of this report may be susceptible to the following uncertainties and limitation:

- No assessment has been made of aquatic aspects relating to any wetlands, pans, and/or rivers/seep ecosystems outside of the scope of a terrestrial biodiversity report. Refer to separate reporting.
- Any botanical surveys based upon a limited sampling time-period, may not reflect the actual species composition of the site due to seasonal variations in flowering times. Additionally, the composition of fire adapted vegetation may vary depending on level of maturity or time since last burn. As far as possible, site collected data has been supplemented with desktop and database-centred distribution data.
- As far as possible, site collected data has been supplemented with desktop and database-centred distribution data as well as previous studies undertaken in the area.

8.7.7 National Environmental Screening Tool

The DEA Screening Tool indicates the following, summarised in Table 1:

- Terrestrial Biodiversity is Very High (Figure 52).
- Plant species sensitivity is Low & Moderate (Figure 53).
- Animal Species sensitivity is High (Figure 54).
- Aquatic Sensitivity is Very High (Figure 55).

Table 13: Summary of Screening tool designations.

Terrestrial Sensitivity	**Feature(s) in proximity**
Very High	CBA 1: Terrestrial, CBA 2: Terrestrial, SWSA (SW Outeniqua) & Garden Route Granite Fynbos (Critically Endangered)
High	None
Medium	None
Low	Present
Plant Sensitivity	
Very High	None
High	None
Medium	*Lampranthus pauciflorus, Leucospermum glabrum, Diosma passerinoides, Sensitive species 1024, 1032, 800 & 500.*

Low	Present
Animal Sensitivity	
Very High	None
High	*Circus ranivorus* & *Bradypterus sylvaticus* (Birds)
Medium	*Afrixalus knysnae* (Amphibian), *Chlorotalpa duthieae*, Sensitive species 8 (Mammal) & *Aneuryphymus montanus* (Insects)
Low	Present
Aquatic Sensitivity	
Very High	CBA 1: Aquatic, SWSA (SW Outeniqua) & Wetlands - Eastern Fynbos-Renosterveld Bioregion (Valley-bottom)
High	None
Medium	None
Low	None

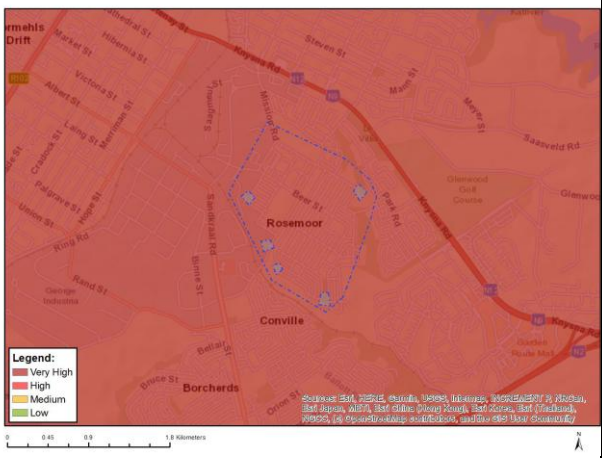


Figure 52: Terrestrial Biodiversity Sensitivity

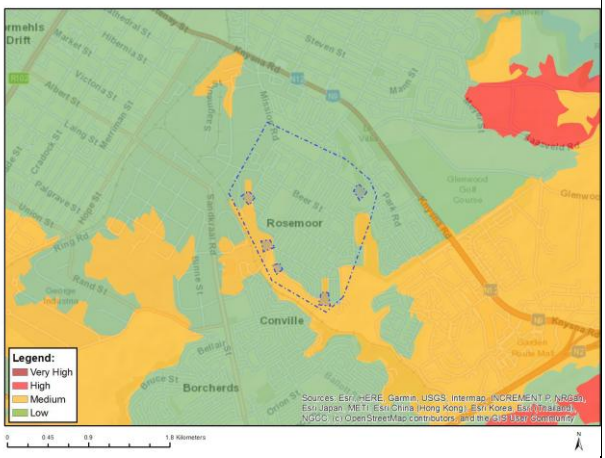


Figure 53: Plant Species Sensitivity

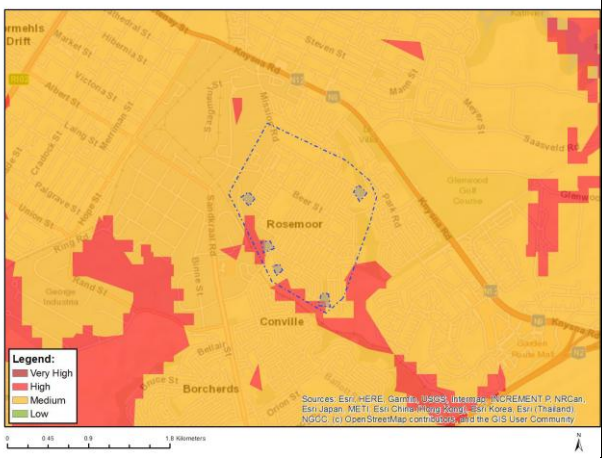


Figure 54: Animal Species Sensitivity

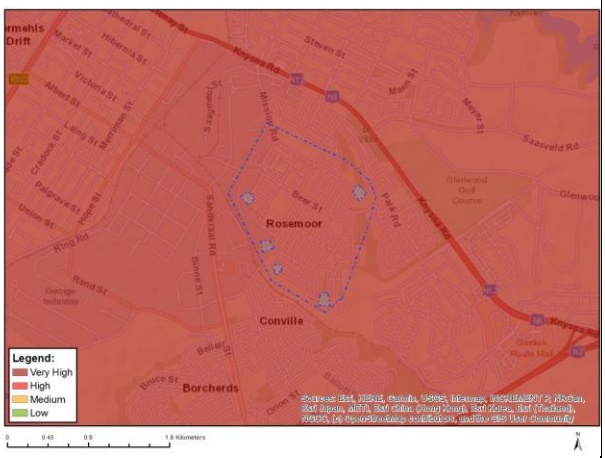


Figure 55: Aquatic Sensitivity

The site assessment will also physically screen for the presence of the listed, and other possible species and/or sensitivities that are not identified in the screening tool in addition to those that are flagged. Not all features are directly affected, but being in proximity, the risks associated with the activity will be investigated further and addressed in the report.

The following is deduced from the DFFE National Environmental Screening Tool:

- The terrestrial biodiversity theme is Very-High due to the proposed stormwater discharge points being within or on the edge of designated CBA 1, 2 & ESA areas. The Very High sensitivity designation

is disputed as the entire site is situated on the edge of an urban area with little to no natural vegetation remaining. Vegetation cover is largely comprised of exotic species, and while it will serve limited ecological function, the specific proposed activity, if implemented responsibly and following the recommended mitigation and management actions, can be considered low risk.

- Several flora (plant) species regarded as being of concern are flagged as potentially being present (Medium sensitivity) and are assessed further in the report, however none were found to be present during the site visit and are furthermore due to the transformed nature of the site, it is not deemed to be suitable habitat for any functional species population. The Medium sensitivity designation is thus disputed as the site, which is situated on the edge of an urban area, is within a developed landscape and has hardened surfaces (roads and sidewalks) and/or landscaped gardens with little to no remnant natural vegetation, that will have limited ecological function.
- Several fauna (animal) species regarded as being of concern are flagged as potentially being present (High sensitivity) and are assessed further in the report. Due to the limited size of the site and transformed nature of the surrounding landscape, the site would not be deemed to be viable for any species population. The Medium/High sensitivity designation is thus disputed as the site, which is situated on the edge of an urban area, is within a developed landscape and has hardened surfaces (roads and sidewalks) with little to no remnant natural vegetation that have limited ecological function nor provide suitable habitat other than for temporarily transient fauna species (i.e. such as perching in a tree). The watercourses and riparian vegetation are likely highly polluted and thus not suited to the amphibian species.
- The aquatic sensitivity is Very High due to falling within designated CBA 1: Aquatic, SWSA (SW Outeniqua) & Wetlands - Eastern Fynbos-Renosterveld Bioregion (Valley-bottom). While the site does have a network of watercourses, these are largely modified, being within an urban context, subject to unmanaged stormwater discharge and also having significantly modified (or exotic) vegetation cover. The proposed stormwater infrastructure is thus likely to improve aquatic functioning in the long-term.
- The impacts are assessed further in the relevant report sections in the accompanying report.

8.7.8 Findings, Outcomes and Recommendations

Terrestrial Biodiversity

Site verification of the Terrestrial Biodiversity sensitivities is summarised in Table 14 and depicted in *Figure 56*, where CBA is green and ESA is light blue/yellow. The CBA and ESA designation are primarily associated with feature adjacent to the site and/or outside of the proposed development/activity footprint.

Table 14: Terrestrial Biodiversity Features flagged in the National Environmental Screening Tool.

Feature		COMMENT
Critical Biodiversity Area 1	CBA 1	**Dispute** – the site is within an urban area and is vegetation cover is significantly altered where little to no natural vegetation remains, and since any vegetation restoration implies that vegetation would be in a secondary context and thus would strictly speaking not be CBA 1 but CBA 2.
Critical Biodiversity Area 2	CBA 2	**Partially Agree** – In principle it would be possible to restore indigenous vegetation, however the likelihood in the short term is not considered to be high, without significant cost. A part of this process would be to formalise and improve stormwater

Feature		COMMENT
		runoff and discharge into the watercourses, so the proposed activity could indirectly improve overall localised ecological functioning.
Ecological Support Areas	ESA 2	**Partially Agree** – the site does provide some ecological connectivity and supports ecological processes, be-it in a significantly altered or modified form. In light of the modified nature, the proposed activity is not seen to exceed current baseline disturbance levels.

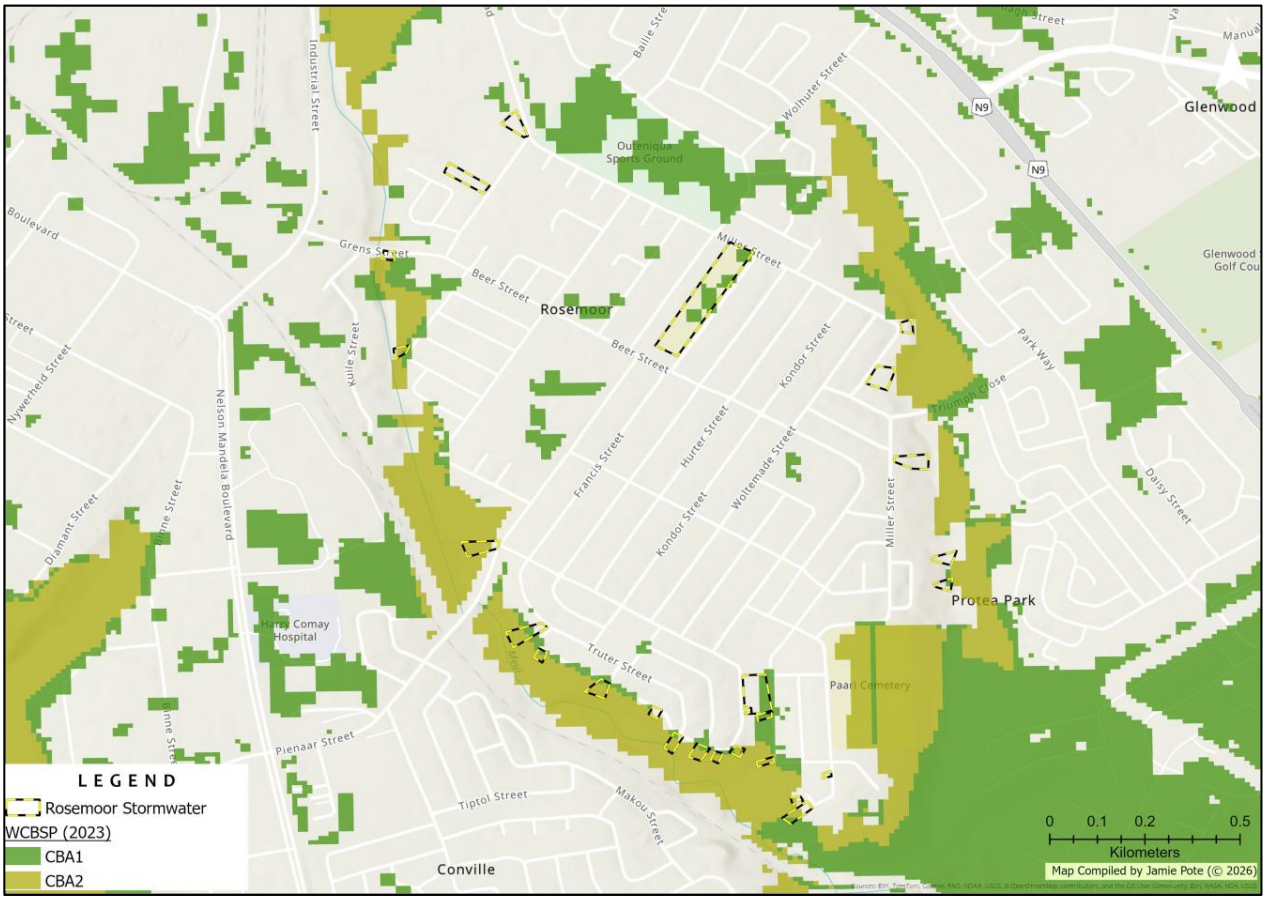


Figure 56: Western Cape Biodiversity Spatial Plan (2017). The site does overlap with some designated CBA 1, CBA 2 and ESA 2 areas.

A CBA 1 designation implies natural vegetation is present, whereas CBA 2 implies restoration is required. In light of the significant lack of indigenous species and high levels of disturbance and/or alien invasion, the correct CBA/ESA designations would need ot be ESA 2 and possibly CBA 2. It is questionable if the broader vegetated areas along the watercourses would ever achieve a state that would support conservation (i.e. CBA), without significant changes to municipal management and well as resident behaviour, well outside the scope if this assessment; however, they do serve a somewhat role in supporting local ecological processes and connectivity, and with some rehabilitation (which includes construction and improvement of stormwater discharge), this is likely to improve.

Ecological processes should be considered within a landscape level and since the ecological areas are within a significantly modified and fragmented urban landscape, the minor impacts of the proposed stormwater infrastructure discharge points will have a negligible impact.

Plant Species (Flora)

National Environmental Screening Tool flagged several flora species. Almost the entire site is situated within a significantly altered and degraded landscape, where little natural vegetation remains. No significant pockets of natural vegetation were found that might provide suitable habitat for these species and it is confirmed that no species of conservation concern having an elevated status and/or limited distribution range as flagged in the screening tool are present.

The SSVR thus disputes the flagged flora ('plant') species of conservation concern and medium plant species designations.

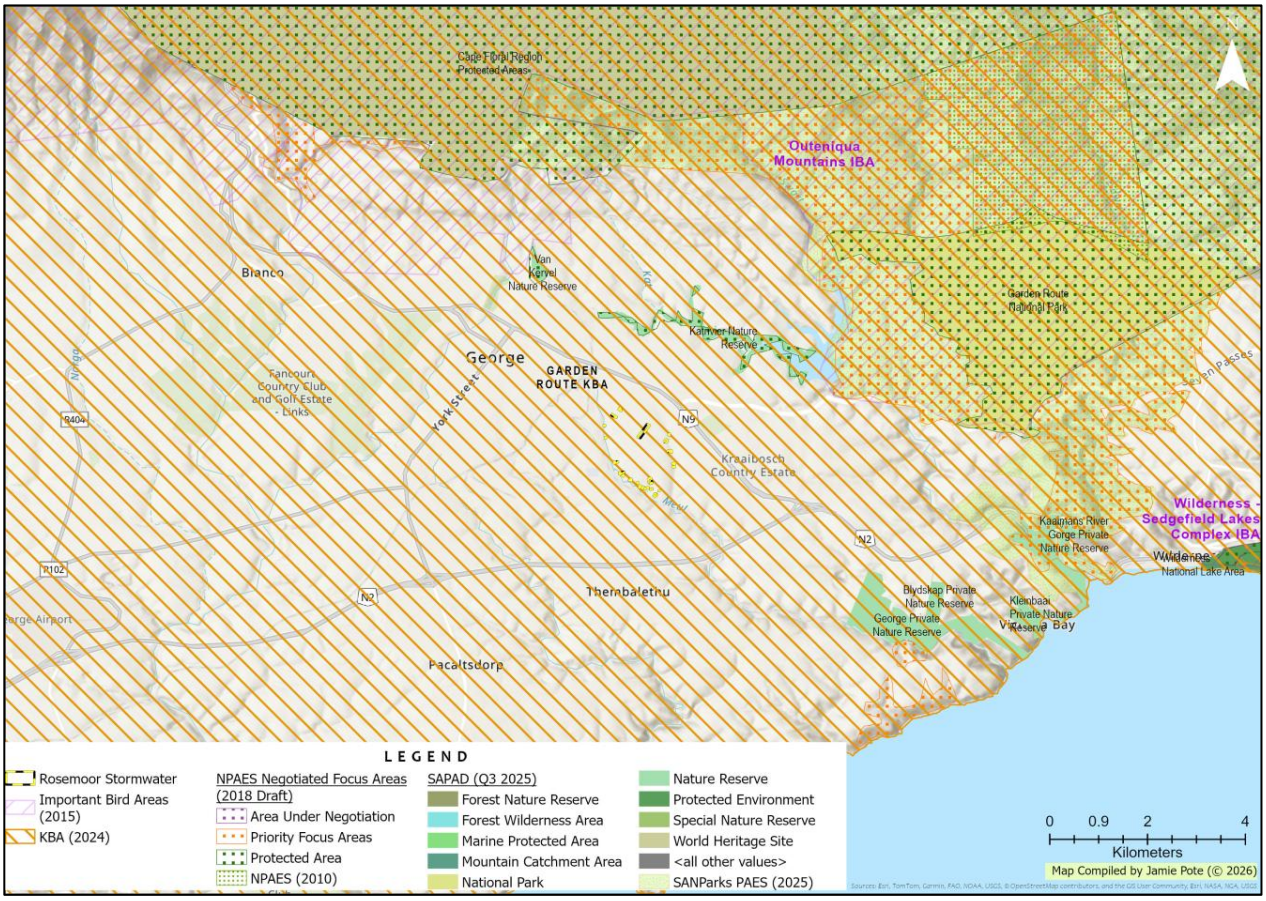


Figure 57: Protected Areas and NPAES in vicinity.

Animal Species (Fauna)

National Environmental Screening Tool flagged several fauna species. Almost the entire site is situated within a significantly altered and degraded landscape, where little natural vegetation remains. No significant pockets of natural vegetation were found that might provide suitable habitat for these species and it is confirmed that no species of conservation concern having an elevated status and/or limited distribution range as flagged in the screening tool are present.

The SSVR thus disputes the flagged fauna ('animal') species of conservation concern designations and High animal species designations.

Aquatic

Wetland and River features are present in the broader area, including the watercourses within the urban area. Aquatic aspects are beyond the scope of this Terrestrial Biodiversity assessment but is given consideration in terms of terrestrial processes that may be influenced by the terrestrial vegetation. Based on the terrestrial vegetation composition, the watercourse would be deemed to be significantly modified, having little to no remnant natural vegetation and a high proliferation of weed and invasive alien species. The very high aquatic sensitivity it thus questionable, but outside the scope of this terrestrial assessment which does not include any water quality analysis.

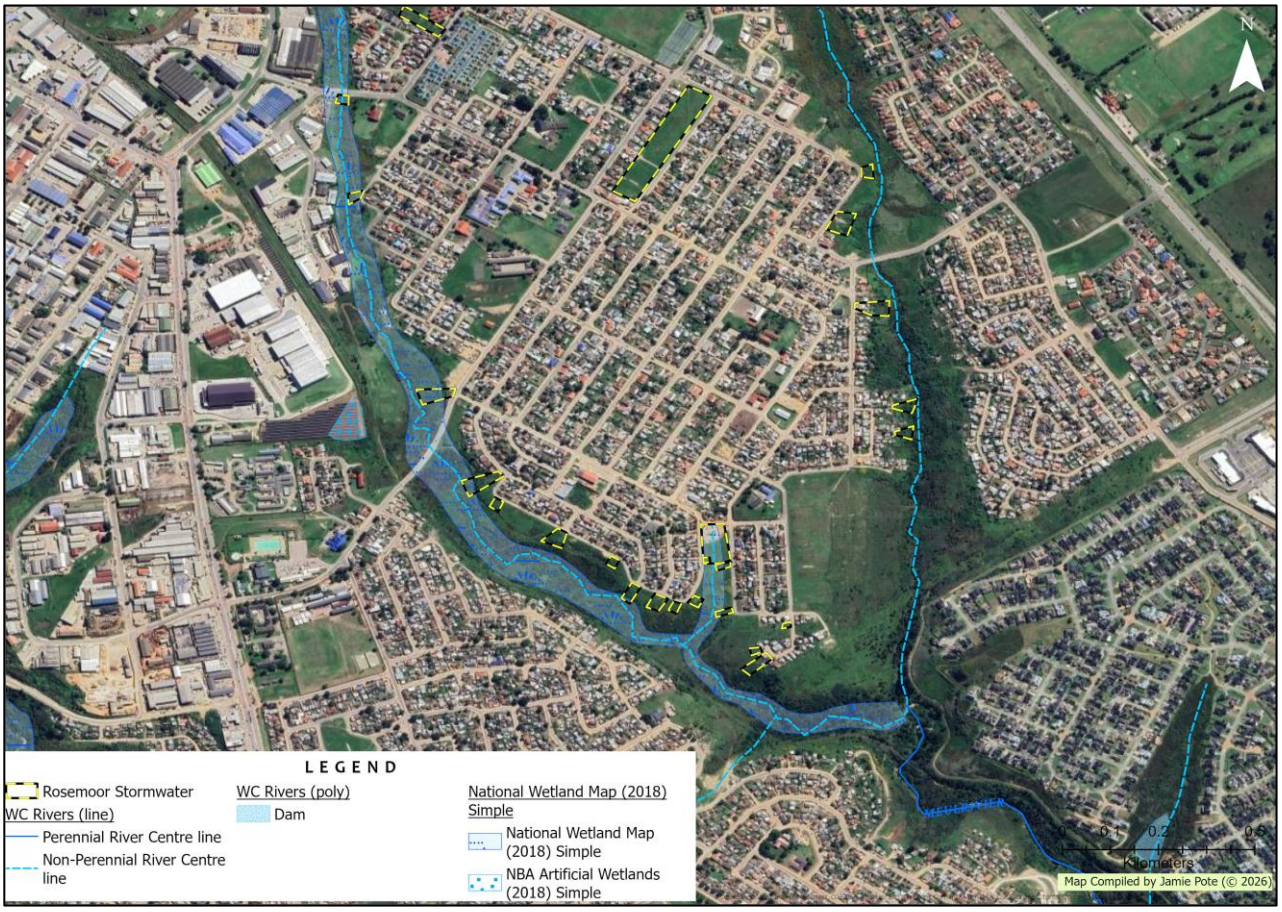


Figure 58: Rivers, FEPAs & SWSA's.

8.7.9 Conclusions

The site verification thus confirms that the site does not fall within a terrestrial biodiversity screening tool designated CBA area, as there is no evidence of any ecologically significant remaining naturel vegetation as the site is almost entirely transformed as the footprint is within a degraded, transformed urban landscape, which will have limited and modified ecological function. In principle, the proposed improvement of stormwater discharge infrastructure could result in an overall improvement to the ecological function of the area.

It further disputes that any of the screening tool flagged flora or fauna species of conservation concern are likely to be affected by the proposed activity within a degraded, modified and transformed landscape.

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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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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. 28

11.2 Label recommendations regarding suitable application conditions must be followed. 28

11.3 The following conditions must be taken into consideration, depending on the method of application. 28

11.4 Conditions of target plants. 29

MIXING PESTICIDES 29

12.1 Mixing must take place according to label instructions. 29

12.2 Suitable protective clothing must be worn when handling pesticide concentrates[8,14]. 29

12.3 Liquid pesticide concentrates should be added to the half full tank of water which is then topped up with water. 29

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

12.5 Do not mix pesticide concentrates together before adding them to the tank. Consult product labels. 29

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. 29

12.7 Spray mixtures should be agitated continuously as recommended. This is essential after they have been standing for a while. 29

CALIBRATION 29

13.1 Application equipment must be correctly calibrated to obtain optimum results and prevent wastage through over-application. 29

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DOCUMENT CONTROL PAGE

Document Control Page	
Document Title	Environmental Programmes Pesticide Policy
Creation Date	June 2012
Revision Date	June 2021
Effective Date	
Pesticide Policy Owner	Chief Directorate: NRM
Distribution	NRM, Finance, Internal Audit Risk & Ethics, Corporate & Legal Services, Strategic Services, Supply Chain management, EP branch (internal Stakeholders) and National treasury, Auditor-General (external stakeholders)

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

	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

	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

	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* 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 Astra	Eye irritant, skin irritant Don't use in aquatic environments		2- acute toxicity to mammals and birds GHS 07 WARNING  5 – Developmental and reproductive toxicity GHS08 DANGER  8 – Persistence in soil/water and soil absorption potential& biomagnification & bioaccumulation GHS09 WARNING 
Fluroxypyr 200g/L	Starane Tomahawk Voloxypyr	Exclusion period	Limited species on Starane and Voloxypyr Flammable	8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
Picloram 80g/L + Fluroxypyr 80g/L	Plenum	Don't use in aquatic environments Eye and skin irritant	Toxic to aquatic invertebrates	2- acute toxicity to mammals and birds GHS 07 WARNING 

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				3 - Carcinogenicity GHS07 WARNING  6 – Endocrine Disrupting Chemicals (EDC) GHS08 DANGER  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
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 GHS 07 WARNING  3 - Carcinogenicity GHS07 WARNING 

Active ingredients	**Trade names**	**Restrictions**	**Comments**	**Hazard criteria**
				5 – Developmental and reproductive toxicity GHS08 DANGER  6 – Endocrine Disrupting Chemicals (EDC) GHS08 DANGER  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
2-4D (as dimethyl amine salt) 480g/L	2,4D 2,4D Amine	Limited registrations, herbaceous species	Weedy species such as *D. ferox*	2- acute toxicity to mammals and birds GHS 07 WARNING  3 - Carcinogenicity GHS07 WARNING

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				 5 – Developmental and reproductive toxicity GHS08 DANGER  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
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 GHS 07 WARNING 
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 GHS 07 WARNING 
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 GHS 07 WARNING 

Active ingredients	**Trade names**	**Restrictions**	**Comments**	**Hazard criteria**
Glyphosate (as sodium salt) 700g/L	Kilo max	Registered for aquatic weeds Polyethoxylated tallow amine free Aerial spray exclusion zones	Eye irritant	2- acute toxicity to mammals and birds GHS 07 WARNING 
Imazapyr 100 g/L	Chopper Hatchet	Hatchet, limited registrations	Poisonous if swallowed	2- acute toxicity to mammals and birds GHS 07 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
Imazapyr 250g/L	Format	Consult the technical unit for minor use registrations		2- acute toxicity to mammals and birds GHS 07 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 

Active ingredients	**Trade names**	**Restrictions**	**Comments**	**Hazard criteria**
Chlorimuron ethyl 500g/L	Extreme Nicanor	Bush encroachment only	Consult technical unit for assistance	2- acute toxicity to mammals and birds GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING 
Metsulfurion methyl 600g/L	Brushoff Climax	28 days withholding period	Eyes, nose skin irritant	2- acute toxicity to mammals and birds GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING 
Picloram (as potassium salt) 240g/L	Access Browser	Not to be used as foliar applications		2- acute toxicity to mammals and birds GHS 07 WARNING  3 - Carcinogenicity GHS07 WARNING  6 – Endocrine Disrupting Chemicals (EDC)

Active ingredients	**Trade names**	**Restrictions**	**Comments**	**Hazard criteria**
				GHS08 DANGER  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
Tebuthiuron 200g/kg	Molopo	Bush encroachment only Consult the technical unit PRIOR to application	Extremely residual in soil, acutely toxic	2- acute toxicity to mammals and birds GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING

Active ingredients	**Trade names**	**Restrictions**	**Comments**	**Hazard criteria**
				
Tebuthiuron 500g/L	Molopo	Bush encroachment only Consult the technical unit PRIOR to application	Extremely residual in soil, acutely toxic	2- acute toxicity to mammals and birds GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
Tebuthiuron 800g/kg	Molopo Limpopo	Bush encroachment only Consult the technical unit PRIOR to application	Extremely residual in soil, acutely toxic	2- acute toxicity to mammals and birds GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				potential& bio magnification & bioaccumulation GHS09 WARNING 
Triclopyr (as butoxy ethyl ester) 240g/L	Ranger	Eye irritant Volatile over 25 degrees	Toxic to fish and animals Skin and eye irritant	2- acute toxicity to mammals and birds GHS 07 WARNING  5 – Developmental and reproductive toxicity GHS08 DANGER  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
Triclopyr (as butoxy ethyl ester) 480g/L	Garlon Triclon Viroaxe	Volatile over 25 degrees Do not use in riparian and aquatic environments Diesel mix not allowed	Toxic to fish and animals Skin and eye irritant Poisonous if swallowed	2- acute toxicity to mammals and birds GHS 07 WARNING  5 – Developmental and reproductive toxicity GHS08 DANGER

Active ingredients	**Trade names**	**Restrictions**	**Comments**	**Hazard criteria**
				 8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
Triclopyr (as pyridyloxy compound) 360 g/L	Lumberjack Timbrel	Adjuvant as indicated on the label	Skin, eye irritant, burns Flammable Possible weed resistant	2- acute toxicity to mammals and birds GHS 07 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
Triclopyr (as butoxy ethyl ester) 240g/L + Aminopyralid 30g/L	Garlon max	Volatile over 25 degrees Do not use in riparian and aquatic environments Diesel mix not allowed	Toxic to fish and animals Skin and eye irritant Poisonous if swallowed	2- acute toxicity to mammals and birds GHS 07 WARNING  5 – Developmental and reproductive toxicity GHS08 DANGER 

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
Triclopyr (as thiethyl ammonium) 120g/L + Aminopyralid (as triisopropanol) 12g/L	Confront super	Eye irritant, skin irritant Don't use in aquatic environments	Limited registrations	2- acute toxicity to mammals and birds GHS 07 WARNING  5 – Developmental and reproductive toxicity GHS08 DANGER  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				magnification & bioaccumulation GHS09 WARNING 
Bromacil 250g/L + Tebuthioron 250g/L	Bundu	Bush encroachers only		2- acute toxicity to mammals and birds GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
Wetter/Adjuvant	H&R crop oil BP crop oil 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 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 Anti-coagulant	2- acute toxicity to mammals and birds GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
2,2,2-trichloroethyylidene	Alphachloralose	To not use near water bodies. Toxic if swallowed. Inhalation risk CNS depressant	Used as a sedative in invasive bird control such as Mallard control programmes	2- acute toxicity to mammals and birds GHS06 – DANGER  GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
3-chloro-p-toluidine hydrochloride	DRC-1336/Starlicide	Toxic if swallowed Toxic in contact with skin Skin irritation, eye irritation Inhalation risk Toxic to aquatic environments 4	Avicide powder to mix into bait to control corvids	2- acute toxicity to mammals and birds GHS06 – DANGER  GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				absorption potential& bio magnification & bioaccumulation GHS09 WARNING 
1,2,12,12a-tetrahydrochromeno[3,4-b]furo[2,3-h]chromen-6(6aH)-one	Rotenone	Toxic if swallowed Causes skin and eye irritation 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 GHS06 – DANGER  GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 

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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>** **GHS07** **WARNING**  H319 (causes serious eye irritation) H335 (Respiratory irritant) H315 (causes skin irritation)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 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 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 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. 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	

				8	**<u>Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation</u>** **GHS09** **WARNING**  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 GHS09 WARNING  H400 (Very toxic to aquatic life)								
				2	Acute toxicity to mammals and birds GHS07 WARNING  H315 (causes skin irritation) H335 (Respiratory tract irritant) H319 (Causes serious eye irritation)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  	  	EN 374:2016 EN 14605:2005 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. 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	

						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 ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 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  H302 (harmful if swallowed) H312 (harmful in contact with skin) H319 (Causes serious eye irritation) H332 (harmful if inhaled)	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 year. 3. All workers need to be tested once they leave they programme	

						5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts	 	EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100					
				3	Carcinogenicity GHS07 WARNING  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. 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		

				6	Endocrine Disrupting Chemicals (EDC) GHS08 DANGER  H370 (causes damage to organs – lungs)	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 8. Long-sleeved shirts	     	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		

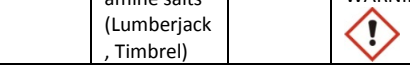
				7	Acute toxicity to aquatic organisms GHS09 WARNING  H400 (Very toxic to aquatic life)								
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects) H412 (harmful to aquatic life with long lasting effects)								
	Phenoxy acids	Group 4: Synthetic auxins	Alkylchloro phenoxy (2,4D)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) H317 (May cause an allergic reaction)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing 	 	EN 374:2016 EN 14605:2005 EN 345: 1993		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 year.	

					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 ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100				3. All workers need to be tested once they leave they programme	
				3	Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators		EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 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. 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		

						6.Particulate air filters for respirators 7.Apron/ Knapjack	 	EN 140, EN149, EN 143:200 R95, R99, R100			once they leave the programme	
				5	Developmental & Reproductive toxicity GHS08 DANGER  H361 (Suspected of damaging fertility or the unborn child)	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	     	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		

						filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts							
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  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 GHS07 WARNING  H302 (Harmful if swallowed) H317 (May cause an allergic reaction)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing 	  	EN 374:2016 EN 14605:2005 EN 345: 1993		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	

					H319 (causes serious eye irritation) H373 (May cause damage to organs – heart, liver, kidneys)	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 EN 140, EN149, EN 143:200 R95, R99, R100				tested once they leave they programme	
				5	Developmental and Reproductive toxicity GHS08 DANGER  H360 (May damage fertility or the unborn child)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  Type 5 protective clothing  3.Safety boots	   	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 5 years.. 3. All workers need to be tested once they		

						4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts	 				leave the programme		
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  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 GHS07 WARNING 	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4		EN 374:2016 EN 14605:2005		5cc fresh urine sample refrigerated. Tested using		1.All workers need to be tested before they start working. 2.If the worker sprays	

					H302 (Harmful if swallowed) H317 (May cause an allergic reaction) H318 (Causes serious eye damage) H315 (Causes skin irritation) H335 (may cause respiratory irritation) H336 (may cause drowsiness or dizziness) H360 (may damage fertility or the unborn child)	protective clothing  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		ELIZA dipstick test		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	
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H411 (Toxic to aquatic life with								

					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 GHS09 WARNING  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 GHS07 WARNING  H315 (Causes skin irritation H318 (causes serious eye damage) H319 (Causes serious eye irritation) H335 (may cause respiratory irritation)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air	    	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 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. 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	

						filters for respirators 7.Apron/ Knapjack		R95, R99, R100					
				7	Acute toxicity to aquatic organisms GHS09 WARNING  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)								
	Combinations	Group 4: Synthetic auxins	Quinoline carboxylic acid such as Picloram + Pyridine compound such as Fluroxypyr (	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (harmful if swallowed)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing	 	EN 374:2016 EN 14605:2005		5cc fresh urine sample refrigerated. Tested using ELIZA		1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days	

			Plenum, Gladiator)		H312 (harmful in contact with skin) H319 (Causes serious eye irritation) H332 (harmful if inhaled)	 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		dipstick test		per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme	
				3	Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation)	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	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		

						4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	  	EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100			every 2 years.. 3. All workers need to be tested once they leave the programme		
				6	Endocrine Disrupting Chemicals (EDC) GHS08 DANGER  H370 (causes damage to organs – lungs)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  Type 5 protective clothing  3.Safety boots 4.Face & Eye protection	   	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		

						5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts	 				programme		
				7	Acute toxicity to aquatic organisms GHS09 WARNING  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)								

					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 GHS07 WARNING  H302 (Harmful if swallowed) H317 (May cause an allergic reaction) H319 (causes serious eye irritation) H373 (May cause damage to organs – heart, liver, kidneys)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 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 shirt	     	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100		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	

				5	Developmental and Reproductive toxicity GHS08 DANGER  H360 (May damage fertility or the unborn child)	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 8. Long-sleeved shirts	     	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 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 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 GHS07 WARNING  H302 (harmful if swallowed) H312 (harmful in contact with skin) H315 (causes skin irritation) H317(May cause allergic skin reaction) H319 (Causes serious eye irritation) H332 (harmful if inhaled) H335 (May cause respiratory irritation)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air	    	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200					

					H336 (may cause drowsiness or dizziness)	filters for respirators 7.Apron/ Knapjack		R95, R99, R100					
				3	Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	     	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 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		

				5	Developmental and Reproductive toxicity GHS08 DANGER  H360 (May damage fertility or the unborn child)	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 8. Long-sleeved shirts	     	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 5 years.. 3. All workers need to be tested once they leave the programme		

				6	Endocrine Disrupting Chemicals (EDC) GHS08 DANGER  H370 (causes damage to organs – lungs)	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 8. Long-sleeved shirts	     	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		

				7	Acute toxicity to aquatic organisms GHS09 WARNING  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) H411 (Toxic to aquatic life with long lasting effects) 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 GHS07 WARNING 	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4		EN 374:2016 EN 14605:2005		5cc fresh urine sample refrigerated. Tested using ELIZA		1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per	

			Clopyralid (Confront, Astra)		H302 (Harmful if swallowed) H315 (Causes skin irritation) H317 (May cause an allergic reaction) H318 (causes serious eye damage) H319 (causes serious eye irritation) H335 (May cause respiratory irritation) H373 (May cause damage to organs – heart, liver, kidneys)	protective clothing  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		dipstick test		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	
				5	Developmental and Reproductive toxicity GHS08 DANGER  H360 (May damage fertility or the unborn child)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  Type 5 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 test needs		

						 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								

					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 GHS07 WARNING  H317 (May cause an allergic skin reaction) H318 (Causes serious eye damage) H319 (Causes serious eye irritation) H315 (Causes skin irritation) H335 (may cause respiratory irritation) H336 (may cause drowsiness or dizziness)	1.Chemically resistant nitrile gloves  2.Type 3 and Type 4 protective clothing 3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	     	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100		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	
				5	Developmental and Reproductive toxicity GHS08 DANGER	1.Chemically resistant nitrile gloves		EN ISO 20345	20cc fresh blood sample. AChE tests		1.All workers need to be tested before		

					 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								

					 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	

					H319 (causes serious eye irritation) H335 (may cause respiratory irritation) H336 (may cause drowsiness or dizziness) H373 (May cause damage to organs – heart, liver, kidneys)	5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	 	EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100					
				5	Developmental and Reproductive toxicity GHS08 DANGER  H360 (May damage fertility or the unborn child)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  Type 5 protective clothing  3.Safety boots 4.Face & Eye protection	    	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 5 years.. 3. All workers need to be tested once they leave the programme		

						5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts							
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  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 GHS07 WARNING  H302 (Harmful if swallowed)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing	 	EN 374:2016 EN 14605:2005		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	

					H315 (Causes skin irritation) H319 (Causes serious eye irritation) H335 (may cause respiratory irritation)	 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	
				7	Acute toxicity to aquatic organisms GHS09 WARNING  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)								
	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 2.Type 3 and Type 4 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	     	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100		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	

				7	Acute toxicity to aquatic organisms GHS09 WARNING  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)								
	Combinations	Group 5 (Uracil) + Group 7 (urea)	Bromacil + Tebuthiuron (Bundu)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) 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 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	

						5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	 	EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100					
				7	Acute toxicity to aquatic organisms GHS09 WARNING  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)								

	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 2.Type 3 and Type 4 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particula te air filters for respirators 7.Apron/ Knapjack	     	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 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. 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	
	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 2.Type 3 and Type 4 protective clothing	 	EN 374:2016 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. 2.If the worker sprays 8 hours per day for 5 days per week, an	

					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	

						4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	  	EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100				they programme	
				3	Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation) H336 (may cause drowsiness or dizziness) H315 (Causes skin irritation) H319 (causes serious eye irritation)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air	    	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 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. 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		

						filters for respirators 7.Apron/ Knapjack		R95, R99, R100			programme		
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H411 (Toxic to aquatic life with long lasting effects)								
	Organoarsenicals	Group 17: Unknown	Monosodium methylarsonate (MSMA)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) H315 (causes skin irritation) H319 (Causes serious eye irritation) H332 (Harmful if inhaled)	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	

						4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	  	EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100				they programme	
				3	Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation) H336 (May cause drowsiness or dizziness)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing   3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air	    	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 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. 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		

						filters for respirators 7.Apron/ Knapjack		R95, R99, R100					
				6	Endocrine Disrupting Chemicals (EDC) GHS08 DANGER  H371 (may cause damage to organs (kidneys and liver) H372 (causes damage to organs through prolonged effect (liver and kidneys)	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	     	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		

						7.Apron/ Knapjack 8. Long-sleeved shirts							
	Bipyridyliums	Group 22: Cell membrane disruptors	Diquat dibromide (Scuba, Midstream) & Paraquat (Gramoxone)	2	Acute toxicity to mammals and birds GHS06 DANGER  H301(Toxic if swallowed) H311(Toxic in contact with skin) H330(Fatal if inhaled) GHS07 WARNING  H315(Causes skin irritation) H319(causes serious eye irritation) H335(May cause respiratory irritation) H372(Causes damage to organs)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack		EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100		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	

				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		

					H300 (Fatal if swallowed) H310 (Fatal in contact with skin) GHS07 WARNING  H373 (Causes damage to organs through prolonged or repeated exposure – blood)	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	    	EN140 EN 149 EN 143:2000 R95, R99, R100	done with Test-Mate model 400 device		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		
				5	Developmental and Reproductive toxicity GHS08 DANGER 	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4		EN ISO 20345 EN 166:2001	20cc fresh blood sample. AChE tests done		1.All workers need to be tested before they start working.		

					H360D (May damage the unborn child)	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	    	EN140 EN 149 EN 143:2000 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.. 3. All workers need to be tested once they leave the programme		
				6	Endocrine Disrupting Chemicals (EDC) GHS08 DANGER  H372 (Causes damage to organs through	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing		EN ISO 20345 EN 166:2001	20cc fresh blood sample. AChE tests done with Test-		1.All workers need to be tested before they start working. 2.If the worker		

					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

					potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects)								complied with such as ESRA protocols
			Cholecalciferol	2	Acute Toxicity to mammals and birds GHS06 DANGER  H301 (Toxic is swallowed) H311 (Toxic in contact with skin) H330 (fatal if inhaled)	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		

						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 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		

						8. Long-sleeved shirts							
2	Avicides	Sedative powder	alphachloralose	2	Acute Toxicity to mammals and birds GHS06 DANGER  H301 (Toxic if swallowed) GHS07 WARNING  H332 (Harmful if inhaled) H336 (may cause drowsiness or dizziness)	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		

						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		

					 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

					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		

						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