



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: 14.7.8.2.4.144

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

1. I refer to the following:
 - 1.1. Invasive Species Monitoring, Control and Eradication Plan of Proposed Upgrading Of The Bulk Sewerage Line From Amy Searle Street / Greenhaven To The Cricket Field Sewerage Pumpstation, On Erven 4808, 4809, 4807, 770, 733, 83, Remainder Of Farm 4812, Street Parcel Re/131 And Street Parcel Re/4893, Groot Brakrivier, Mossel Bay Municipality, Western Cape Province. submitted to the Department of Forestry, Fisheries and the Environment (DFFE) on 19 February 2026 compiled by Michael Jon Bennett. The plan was prepared for Mossel Bay 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.



Batho pele – putting people first

Departement van Bosbou, Visserie en die Omgewing • Department of Forestry, Fisheries and the Environment • UmNyango wezamaHlathi, zokuThiya neBhoduluko • iSebe lezamaHlathi, ezokuLoba noKusingqongileyo • Umnyango WezamaHlathi, Ezokudoba Nezemvelo • Kgoro ya Dithokgwa, Boreahlapi le Tikologo • Lefapha la Meru, Botshwasi ba dithapi le Tikoloho • Lefapha la Dikgwa, Dithapi le Tikologo • Litiko Letemahlatsi, Tihlanti Netendzawo • Muhasho wa zwa Vhusima-magaka, Vhureakhovhe na Mupo • Ndzawulo ya Swihlahla, Vunjoeri na Mbango. 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.

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

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:14/2/8/2/4/144. Enquiries may be directed to the contact person highlighted at the top of this correspondence.

Yours sincerely



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: 17/03/2026

**GEORGE****TEL:** +27 (0) 44 873 4923 **FAX:** +27 (0) 44 874 5953**EMAIL:** info@sescs.net **WEBSITE:** www.sescs.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@sescs.net **WEBSITE:** www.sescs.net**ADDRESS:** Tableview, Cape Town, 7441**PO BOX:** 443, Milnerton, 7435

SITE SPECIFIC ALIEN AND INVASIVE SPECIES MANAGEMENT PROGRAMME

FOR THE

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

Produced as part of a Basic Assessment EIA Application for Environmental Authorisation in terms of the National Environmental Management Act (Act 107 of 1998) and the amended (April 2017) Environmental Impact Assessment Regulations, 2014

SUBMITTED TO STIAAN KOTZE (skotze@dffe.gov.za) FOR APPROVAL

PREPARED FOR: Mossel Bay Municipality
Private Bag X29
Mossel Bay
6500

DATE: 16 February 2026

SES REF NO: AMP/ASGC /MB/02/26
DEA&DP REF.NO.: 16/3/3/6/7/1/D6/17/0356/25

-
- Environmental Impact Assessments • Basic Assessments • Environmental Management Planning
 - Environmental Control & Monitoring • Water Use License Applications • Aquatic Assessments



Table of Contents:

1.PROJECT DETAILS.....	3
2. PURPOSE OF THIS ALIEN AND INVASIVE SPECIES MANAGEMENT PLAN	4
3. LEGISLATIVE CONTEXT	4
4. SITE DESCRIPTION	6
5. ALIEN SPECIES IDENTIFIED ON SITE	16
6. MANAGEMENT OBJECTIVES	17
7. CLEARING METHODOLOGY	19
8. IMPLEMENTATION PROGRAMME	21
9. MONITORING AND REPORTING	21
10. RESPONSIBILITIES	22

Appendices:

Appendix A1: C.V of Author

Appendix A2: EAPASA Registration of Author

Appendix B: Plant Species Site Verification and Compliance Statement Report

Appendix C: DFFE Pesticide Policy

Section	PROJECT DETAILS	
1		
PROJECT DETAILS:		
Project Name:	The proposed upgrading of the bulk sewerage line from Amy Searle Street / Greenhaven to the cricket field sewerage pumpstation, on Erven 4808, 4809, 4807, 770, 733, 83, Remainder of Farm 4812, Street Parcel RE/131 and Street Parcel RE/4893, Groot Brakrivier, Mossel Bay Municipality, Western Cape Province.	
DEADP Reference Number:	16/3/3/6/7/1/D6/17/0356/25	
Erf Name and Portion Number:	- Erf 4808; - Erf 4809; - Erf 4807; - RE/4812; - Erf 770; - Erf 733; - Erf 83; - Street Parcel RE/131; - Street Parcel RE/4893	
SG Codes:	Erf 4808	C05100030000480800000
	Erf 4809	C05100030000480900000
	Erf 4807	C05100030000480700000
	RE/4812	C05100030000481200000
	Erf 770	C05100030000077000000
	Erf 733	C05100030000073300000
	Erf 83	C05100030000008300000
	Street Parcel RE/131	C05100000000013100000
	Street Parcel RE/4893	C05100030000489300000
GPS Co-ordinates of Pipeline Route:	Starting point co-ordinates	34 ° 3' 4.01" S 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
Municipality:	Mossel Bay Municipality	
Province:	Western Cape	
Applicant:	Mossel Bay Municipality	
EAP:	Sharples Environmental Services cc EAP: Michael Jon Bennett (EAPASA: 2021/3163) Candidate EAP: Christiaan Smit (EAPASA: 2024/8297)	
Date:	16 February 2026	
Conditions of Use:	This report is the intellectual property of Environmental Services cc (SES), who may make allowance to publish it, in whole provided that: a) Approval for copy is obtained from SES. b) SES is acknowledged in the publication. c) SES is indemnified against and claim for damages that may result from publication of specifications, recommendations or statements that is not administered or controlled by SES. d) That approval is obtained from SES if this report is to be used for the purposes of sale, publicity or advertisement. SES accepts no responsibility for failure to follow the recommended program.	

Section**2****PURPOSE OF THIS ALIEN AND INVASIVE SPECIES MANAGEMENT PLAN**

This Alien and Invasive Species Management Plan has been prepared for the Mossel Bay Municipality, for the construction and post construction rehabilitation activities associated with the proposed upgrading of the bulk sewerage line from Amy Searle Street / Greenhaven to the cricket field sewerage pumpstation, on Erven 4808, 4809, 4807, 770, 733, 83, Remainder of Farm 4812, Street Parcel RE/131 and Street Parcel RE/4893, Groot Brakrivier, Mossel Bay Municipality, Western Cape Province.

This 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 minimises their ecological and socio-economic impacts.

Control measures must be appropriate to the species concerned and may include mechanical, chemical or biological methods, implemented in accordance with best environmental practice and applicable permit conditions. Ongoing monitoring and follow-up clearing are required to ensure that regrowth is addressed and long-term control is achieved.

The implementation of this Management Plan ensures compliance with the control obligations prescribed under Regulation 7.

Section	
4	SITE DESCRIPTION

Locality and Project Description:

The proposed development entails the installation of a sewage pipeline from the pump station south east of Long Street to the connection point located towards the north along Amy Searl Street. Please see the figures below for the proposed pipeline route and Site Development Plan (SDP). The pipe to be installed has a diameter of 300mm and the pipeline route will be approximately 1100m. Please refer to the Figure below for the locality of the pipeline route and construction footprint. The pipeline has an internal diameter of 300mm and the proposed route is approximately 1100m long, therefore the development footprint will equal 330m².



Figure 1: Locality of pipeline route and construction footprint.

Vegetation on Site:

JA van der Walt from Advanced Environmental Corporation was appointed to compile a Site Verification and Compliance Statement Report for the project as part of the Basic Assessment Report process being undertaken by Sharples Environmental Services cc. The specialist has determined the following regarding the vegetation present on site:

- **Vegetation:**

The natural vegetation (Groot Brak Dune Strandveld) has been historically transformed for urban development across most of the proposed development footprint. The range of photos and maps covers the proposed development footprint from north to south and is displayed in Figures 2 to 18. The yellow shaded area in the maps indicates the area visible in the adjoining photograph. There are small sections that retain elements of the original vegetation, but more than 75% of the area is fully transformed. Large sections are maintained as lawns and sidewalks that are either paved or tarred. No visible natural plant communities are still intact.

Figure 2:



Figure 3:



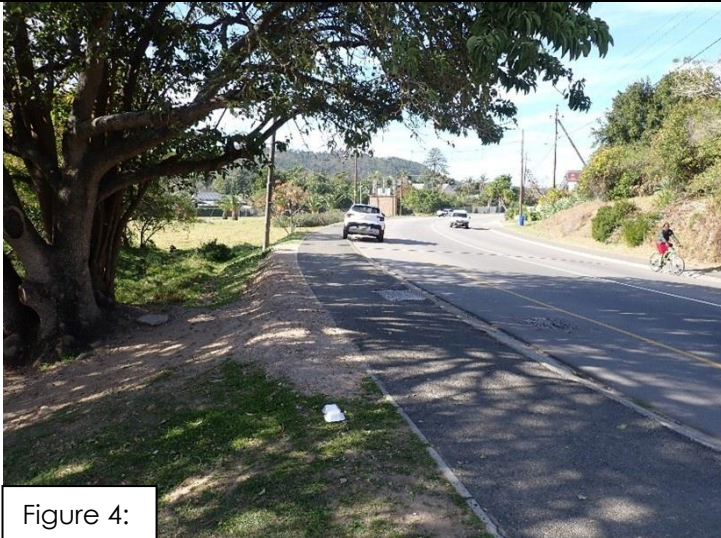


Figure 4:



Figure 5:



Figure 6:





Figure 7:



Figure 8:



Figure 9:



Figure 10:



Figure 11:



Figure 12:



Figure 13:



Figure 14:



Figure 15:

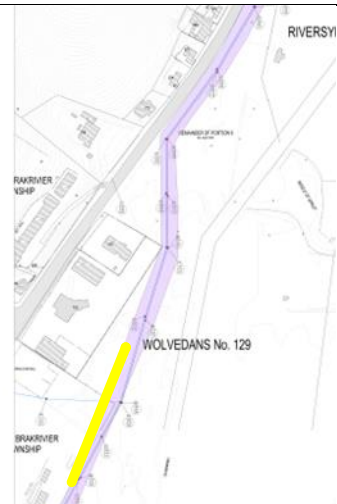
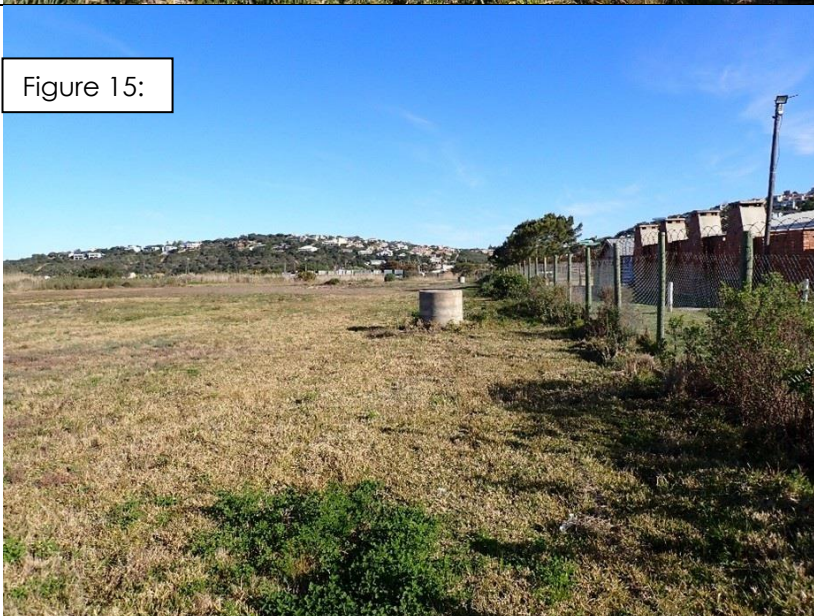




Figure 16:



Figure 17:

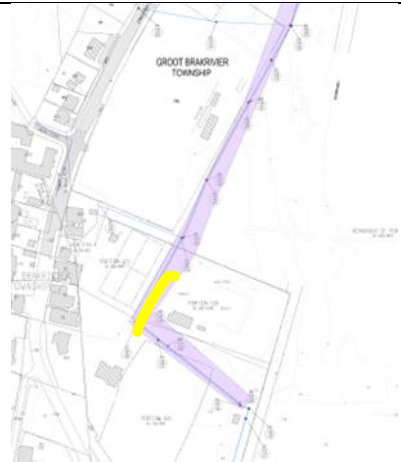


Figure 18:



- **Plant Species:**

The specialist identified 43 plant species from 27 families during a two-day survey of the proposed development site (**Table 1**). Due to prior transformation, overall species diversity was low as anticipated.

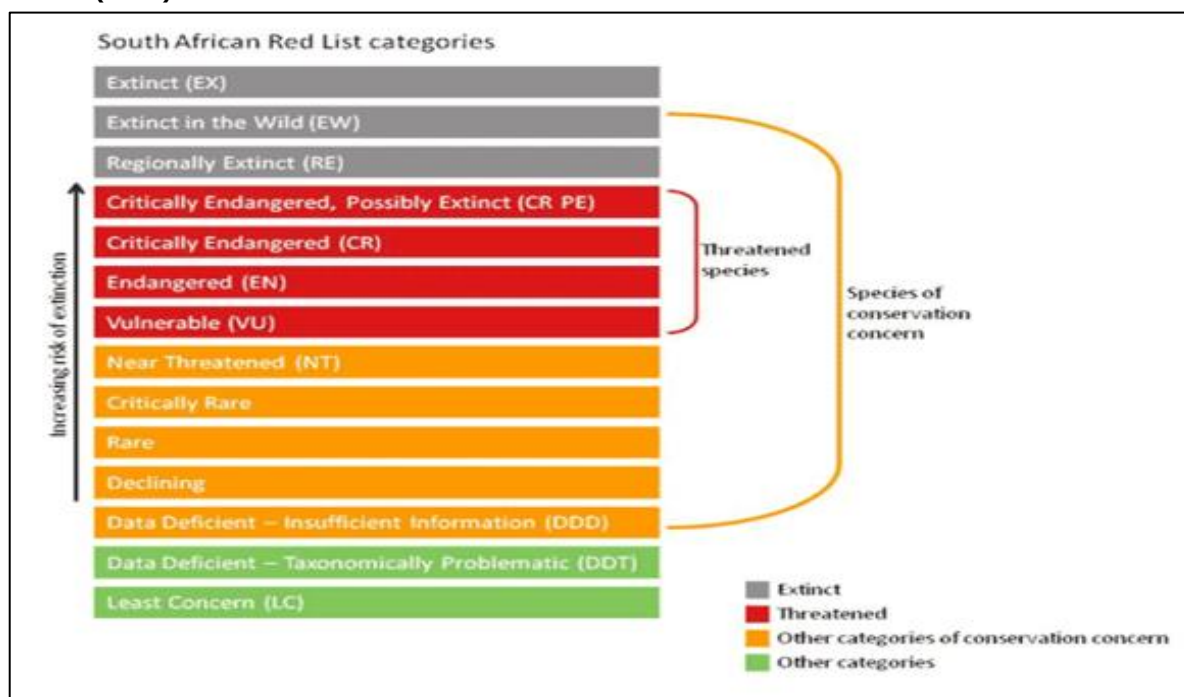
No threatened plant species were recorded within the proposed development footprint. None of the 15 threatened and sensitive plant species listed in the Environmental Screening Tool Report was recorded within the proposed development footprint. The conservation status of the plants is also presented in **Table 1**, and the various categories of conservation status are listed in **Table 2**.

Table 1: Plant species recorded during the field survey on 19 and 20 July 2025

FAMILY	SPECIES	COMMON NAME	SANBI Red List status
AIZOACEAE	<i>Carpobrotus edulis</i>	Common Sourfig	LC
AIZOACEAE	<i>Carpobrotus deliciosus</i>	Delicious Sourfig	LC
AIZOACEAE	<i>Disphyma crassifolium</i>	Purple Dewplant	LC
AMARANTHACEAE	<i>Salicornia decumbens</i>	Dense Glasswort	LC
ANACARDIACEAE	<i>Searsia lucida</i>	Glossy Curranthrus	LC
ANACARDIACEAE	<i>Schinus terebinthifolia</i>	Brazilian pepper	alien (Category 1b)
APOCYNACEAE	<i>Gomphocarpus physocarpus</i>	Balloonplant	LC
ARACEAE	<i>Zantedeschia aethiopica</i>	Arum Lily	LC
ASPARAGACEAE	<i>Agave attenuata</i>	Foxtail agave	LC
ASTERACEAE	<i>Arctotheca prostrata</i>	Prostrate Capeweed	LC
ASTERACEAE	<i>Helichrysum cymosum</i>	Fume Everlasting	LC
ASTERACEAE	<i>Helminthotheca echioides</i>	Bristly oxtongue	Alien (Category 1b)
ASTERACEAE	<i>Metalsia acuta</i>	Pointy Blombush	LC
ASTERACEAE	<i>Nidorella ivifolia</i>	Ovenbush	LC
ASTERACEAE	<i>Oedera pungens</i>	Perdekaroos	LC
ASTERACEAE	<i>Osteospermum moniliferum</i>	Bitou	LC
ASTERACEAE	<i>Senecio inaequidens</i>	Ragwort	LC
ASTERACEAE	<i>Taraxacum officinale</i>	Common dandelion	alien
BASELLACEAE	<i>Anredera cordifolia</i>	Mignonette vine	alien (Category 1b)
BIGONIACEAE	<i>Tecomaria capensis</i>	Cape honeysuckle	LC
CASUARINACEAE	<i>Casuarina cunninghamiana</i>	Beefwood	alien (Category 1b)
COMMELINACEAE	<i>Commelina africana</i>	Yellow Dayflower	LC
CONVOLVULACEAE	<i>Falkia repens</i>	Pink Ear	LC
CYPERACEAE	<i>Cyperus albostratus</i>	Dwarf striped sedge	LC
CYPERACEAE	<i>Cyperus textilis</i>	Mat Sedge	LC
EBENACEAE	<i>Diospyros dichrophylla</i>	Poison Starapple	LC
FABACEAE	<i>Acacia mearnsii</i>	Black Wattle	alien (Category 1b)
FABACEAE	<i>Acacia cyclops</i>	Rooikrans	alien (Category 1b)
GERANIACEAE	<i>Pelargonium capitatum</i>	fleshy-stalk pelargonium	LC
GERANIACEAE	<i>Pelargonium zonale</i>	Zonal Storkbill	LC
HYPOXIDACEAE	<i>Hypoxis setosa</i>	Stargrasses	LC
IRADACEAE	<i>Bobartia robusta</i>	Giant Rushiris	LC
JUNCACEAE	<i>Juncus acutus</i>	Spiny rush	LC
JUNCACEAE	<i>Juncus effusus</i>	Common rush	LC

JUNCAGINACEAE	<i>Triglochin maritima</i>	Common arrow-grass	LC
MAVACEAE	<i>Hermannia flammea</i>	Flaming dollsrose	LC
OXALIDACEAE	<i>Oxalis pes-caprae</i>	klawersuring	LC
POACEAE	<i>Stenotaphrum secundatum</i>	Buffalo grass	LC
RUTACEAE	<i>Calodendrum capense</i>	Cape-Chestnut	LC
SCROPHULARIACEAE	<i>Myoporum laetum</i>	Myoporum	alien (Category 1b)
TYPHACEAE	<i>Typha capensis</i>	Cape bulrush	LC
VERBENIACEAE	<i>Verbena bonariensis</i>	Purple top	alien (Category 1b)
VISCACEAE	<i>Viscum capense</i>	Voëlent	LC

Table 2: South African Red List categories as prescribed by the International Union for Conservation of Nature (IUCN)



Critical Biodiversity Areas and Ecological Support Areas on Site:

Critical Biodiversity Areas (CBAs) are areas that must be safeguarded in their natural or near-natural state because they are essential for conserving biodiversity and maintaining ecosystem functioning. The spatial planning map for Groot Brakrivier (Figure 19) indicates that the proposed development footprint does not cross over any terrestrial CBA. The footprint does intersect with CBA Wetland and CBA Estuary near Lang Street. Figure 20 provides a zoomed-in version of Figure 19 to show more detail on the CBA Wetland demarcation. No Ecological Support Areas (ESAs) are mapped near the proposed development footprint. ESAs that are not essential for meeting biodiversity targets but play an important role in supporting the functioning of protected areas or critical biodiversity areas are often vital for delivering ecosystem services. The 2023 Western Cape Biodiversity Spatial Plan (WC BSP) was formally adopted into law on the 13th of December 2024 (Gazette Extraordinary 9017) in alignment with the Western Cape Biodiversity Act (No. 6 of 2021). This marks the replacement of the 2017 WC BSP with the 2023 WC BSP.

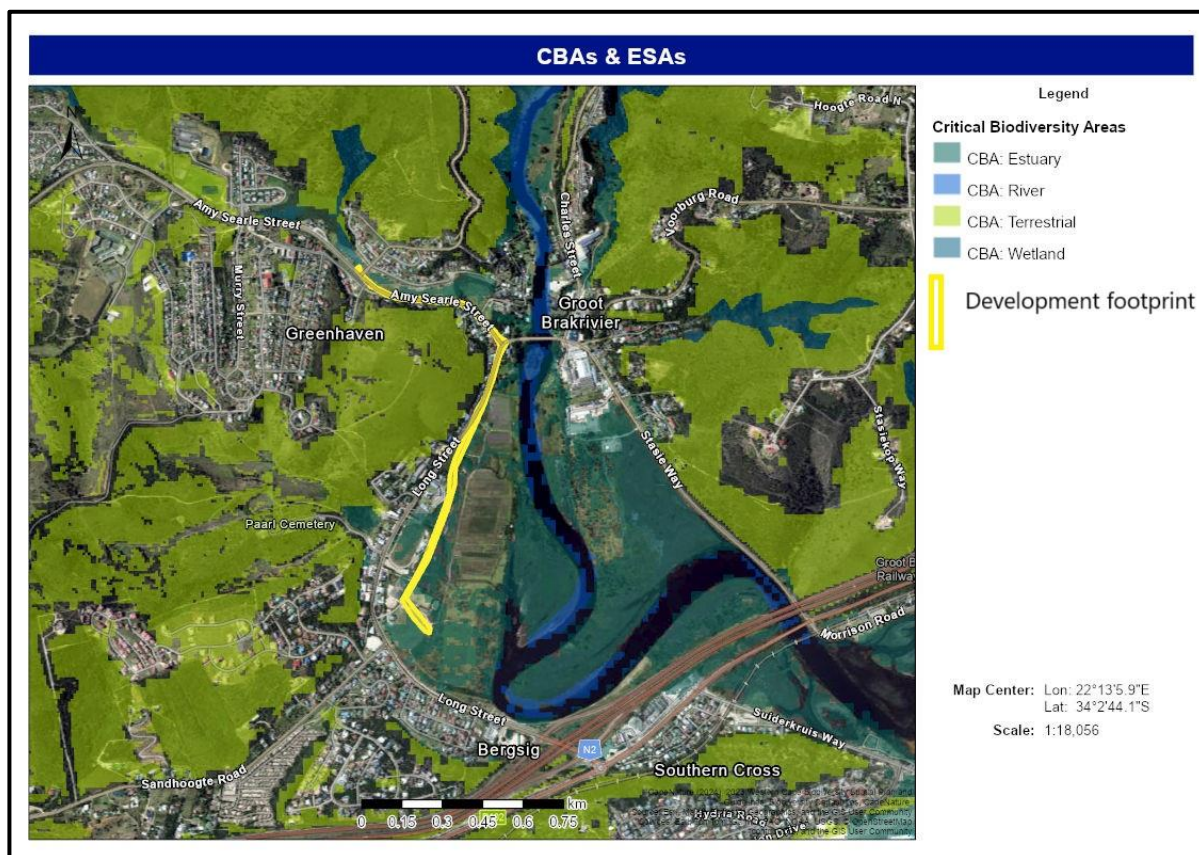


Figure 19: Spatial Planning Map for Grootbrak River.



Figure 20: Spatial Planning Map for the southern section of the proposed development footprint.

Reasons for CBA status

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

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

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

Section	
5	ALIEN SPECIES IDENTIFIED ON SITE

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

Alien Species	Category
<i>Schinus terebinthifolia</i> (Brazilian pepper)	Category 1b
<i>Helminthotheca echioides</i> (Bristly ox-tongue)	Category 1b
<i>Taraxacum officinale</i> (Common dandelion)	not subject to compulsory control
<i>Anredera cordifolia</i> (Mignonette vine)	Category 1b
<i>Casuarina cunninghamiana</i> (Beefwood)	Category 1b
<i>Acacia mearnsii</i> (Black Wattle)	Category 1b
<i>Acacia cyclops</i> (Rooikrans)	Category 1b
<i>Myoporum laetum</i> (Myoporum)	Category 1b
<i>Verbena bonariensis</i> (Purple top)	Category 1b

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 EMP and must comply with DFFE requirements.	
Management Actions:	
1. Integration into EMP:	- This Alien Management Plan forms part of the approved EMP. - 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: ◦ NEMBA (Act 10 of 2004) ◦ Alien & Invasive Species Regulations ◦ 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.

- Identification and treatment of regrowth;
- Monitoring of seed bank emergence;
- Verification of rehabilitation success;
- Ensuring no new infestations establish on site.

Where regrowth is identified, follow-up clearing shall be undertaken promptly to ensure long-term control and compliance with Section 73 of the National Environmental Management: Biodiversity Act.

Section	
10	RESPONSIBILITIES

Applicant – Mossel Bay Municipality

Mossel Bay Municipality, as the Applicant and landowner (or authority responsible for the project), shall:

- Ensure implementation of this Alien and Invasive Species Management Plan;
- Allocate adequate financial and human resources for clearing and follow-up activities;
- Appoint a suitably qualified contractor to undertake alien clearing;
- Appoint an independent Environmental Control Officer (ECO) to monitor compliance;
- Ensure that clearing operations comply with the approved EMP, 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 EMP;
- 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@sescs.net WEBSITE: www.sescs.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@sescs.net WEBSITE: www.sescs.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 Plattekleof 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 Municipality
- 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 Clinkscapes 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 Environmental 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 Clinkscapes 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 filling 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 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** Knysna 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 Rheeboek

- 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** Knysna 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** Knysna 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 Quantity Surveyers

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

2016 Plettenberg Bay Bitou Municipality

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

2014 - 2016 Mossel Bay The South Cape College

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

2016 George SMEC

- Environmental Control Officer for the resurfacing of York Street

2014 - 2015 Mossel bay The Muller Murray Trust

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

2015 Swellendam Casidra SOC Ltd

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

2015 George Element Consulting Engineers

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

- 2014 - 2015** George Department of Transport & Public Works
- Environmental Control Officer for the flood damage repair projects in the George and Knysna local municipal areas
- 2015** George BDE Consulting Engineers (Pty) Ltd
- Environmental Control Officer for the photovoltaic solar plant for the ACSA George Airport
- 2015** Heidelberg Bergstan South Africa
- Environmental Control Officer for the Duiwenhoks River stabilization works: Sites B31, B38 and B39
- 2015** Krakeel Element Consulting Engineers
- Environmental Control Officer for the construction of filling station at SSK Tuinrote Agri on portion 5 of the farm no. 320
- 2014 - 2015** Herbertsdale SMEC
- Environmental Control Officer for the flood damage repairs to structures in the Eden region: Herbertsdale area
- 2014 - 2015** George Department of Transport & Public Works
- Environmental Control Officer for the flood damage repair projects in the George and Knysna local municipal areas
- 2015** George SMEC
- Environmental Control Officer for the improvements to the Pacaltsdorp interchange and new pedestrian bridge
- 2014 - 2015** Still Bay De Villiers & Moore Consulting Engineers
- Environmental Control Officer for the Still Bay 66kV substation and overhead powerline
- 2014** Beaufort West Worley Parsons Consulting Engineers
- Environmental Control Officer for the Nelspoort bulk water supply scheme northeast of Nelspoort

Appendix A2: EAPASA REGISTRATION OF AUTHOR:

**Environmental Assessment
Practitioners Association
of South Africa**



Registration No. 2021/3163

Herewith certifies that

MICHAEL BENNETT

is registered as an

Environmental Assessment Practitioner

**Registered in accordance with the prescribed criteria of Regulation 15. (1)
of the Section 24H Registration Authority Regulations
(Regulation No. 849, Gazette No. 40154 of 22 July 2016, of the
National Environmental Management Act (NEMA), Act No. 107 of 1998, as amended).**

Effective: 01 March 2025

Expires: 31 March 2026

Chairperson

Registrar



Appendix B: Plant Species Site Verification and Compliance Statement Report:

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

Plant species



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



EXECUTIVE SUMMARY

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

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

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

- I act as the independent environmental specialist in this report;
- I will perform the work relating to the report objectively, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental impact assessments and specialist reports, including knowledge of the Act, Regulations, and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations, and all other applicable legislation;
- I do not have and will not have any vested interest (either business, financial, personal, or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations

ENVIRONMENTAL SPECIALIST:

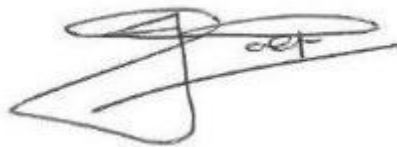
Johannes Adriaan van der Walt

Tel: +27 (82) 305 8945

Email: admin@aecorp.co.za

Signature

Date: 17 August 2025

A handwritten signature in black ink, appearing to read 'J. van der Walt', with a large, stylized initial 'J'.

Abridged Curriculum Vitae – Johannes Adriaan van der Walt

PROFESSIONAL REGISTRATION

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

QUALIFICATIONS

MTech Nature Conservation
(cum laude) 2014, CPUT

BTech Nature Conservation
(cum laude) 2012, CPUT

NDip Nature Conservation
(cum laude) 1994, CPUT

LANGUAGES

English – fluent
Afrikaans – fluent

EXPERIENCE

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

EMPLOYMENT

1988 – 2006 CapeNature

2007 – 2010 Botanical Insight
cc

2010 - 2017 CapeNature

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

BOTANICAL, ANIMAL, AND BIODIVERSITY EXPERTISE WAS GAINED THROUGH:

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

PUBLICATIONS:

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

CONTENT

Executive summary.....	2
Declaration of Independence.....	3
Abridged curriculum vitae: Johannes Adriaan van der Walt.....	4
1. INTRODUCTION	6
2. TERMS OF REFERENCE.....	7
3. LIMITATIONS AND ASSUMPTIONS.....	9
4. STUDY AREA.....	10
5. METHODOLOGY.....	11
6. RESULTS: DESKTOP ASSESSMENT.....	13
6.1 Climate.....	13
6.2 Topography, geology, and soils.....	13
6.3 Vegetation.....	14
6.4 Spatial planning.....	17
7. RESULTS: FIELD ASSESSMENT.....	20
7.1 Vegetation.....	20
7.2 Plant Species.....	26
7.3 Alien plant species.....	27
8. CONCLUSIONS.....	28
9. PROPOSED IMPACT MANAGEMENT OUTCOMES.....	28
REFERENCES.....	28

1. INTRODUCTION

1.1 Background

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

1.2 Environmental Screening Tool Report

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

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

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

2. TERMS OF REFERENCE

2.1 Site verification

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

-The assessment must identify the following:

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

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

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

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

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

2.2 Compliance statement

The compliance statement must:

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

Minimum Requirements Include:

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

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

2.3. Legal requirements applicable to the specialists conducting assessments

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

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

(a) be independent;

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

(c) ensure compliance with these Regulations;

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

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

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

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

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

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

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

2.4 Report Content Requirements

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

2.4.1 Guidelines documents

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

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

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

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

2.4.2 Legal documents

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

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

3. LIMITATIONS AND ASSUMPTIONS

The field surveys for this report were conducted on July 19 and 20, 2025. These surveys took place during the optimal period for botanical assessments (June to September). The findings from this specialist assessment are based on a two-day site visit, which means some plant species might not have been recorded. However, the proposed development footprint was highly altered, reducing the likelihood that species were missed. Confidence in the findings is high. It is unlikely that a full botanical assessment would reveal additional findings that would significantly impact the outcome.

4. STUDY AREA

4.1 Location

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

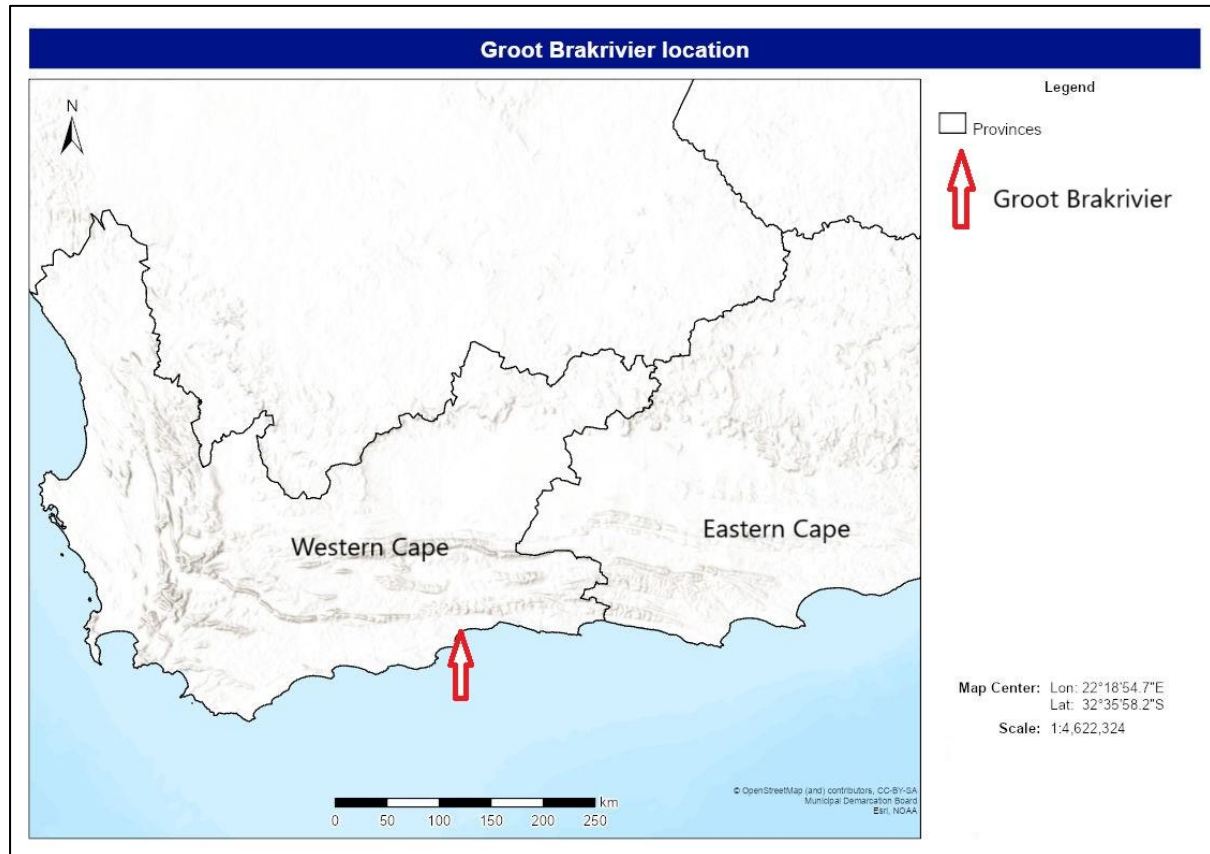


Figure A. Map showing the location of Groot Brakrivier

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

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

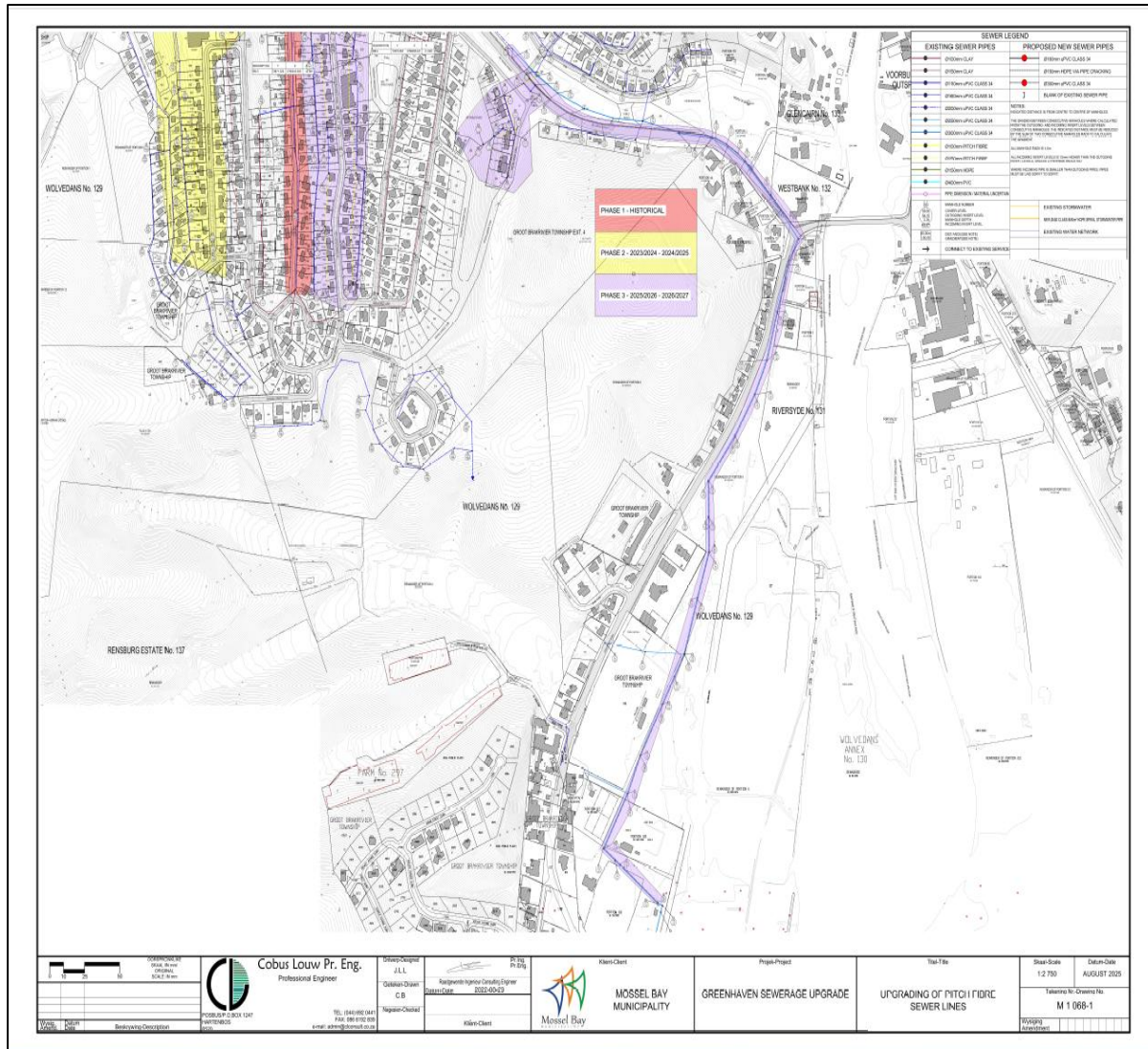


Figure B: The route of the proposed sewage pipeline upgrade is indicated with a purple polygon

5. METHODOLOGY

5.1 Desktop assessment

The specialist used various sources of information to assess the sensitivity of the vegetation and plant species within the proposed development footprint.

5.1.1 The Environmental Screening Tool Report: The environmental screening tool report indicates the sensitivity of the plant theme across the proposed development and lists threatened and sensitive plant species that could potentially occur within or near the proposed development footprint.

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

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

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

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

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

5.2 Field assessment

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

6. RESULTS: DESKTOP ASSESSMENT

6.1 Climate

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

6.2 Topography, geology, and soils

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

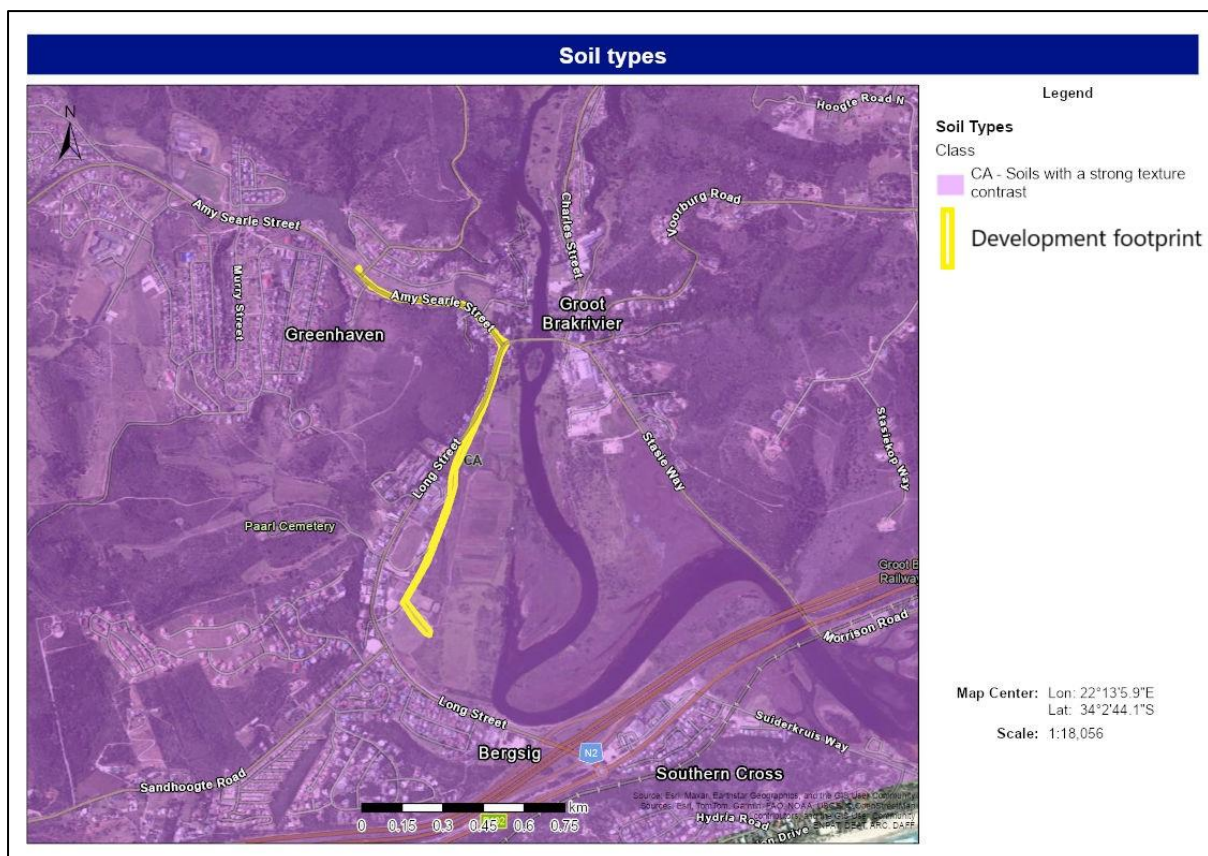


Figure C: Map indicating the different soil types on and near the proposed development footprint

6.3.3 Plant species

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

Environmental Screening Tool results

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

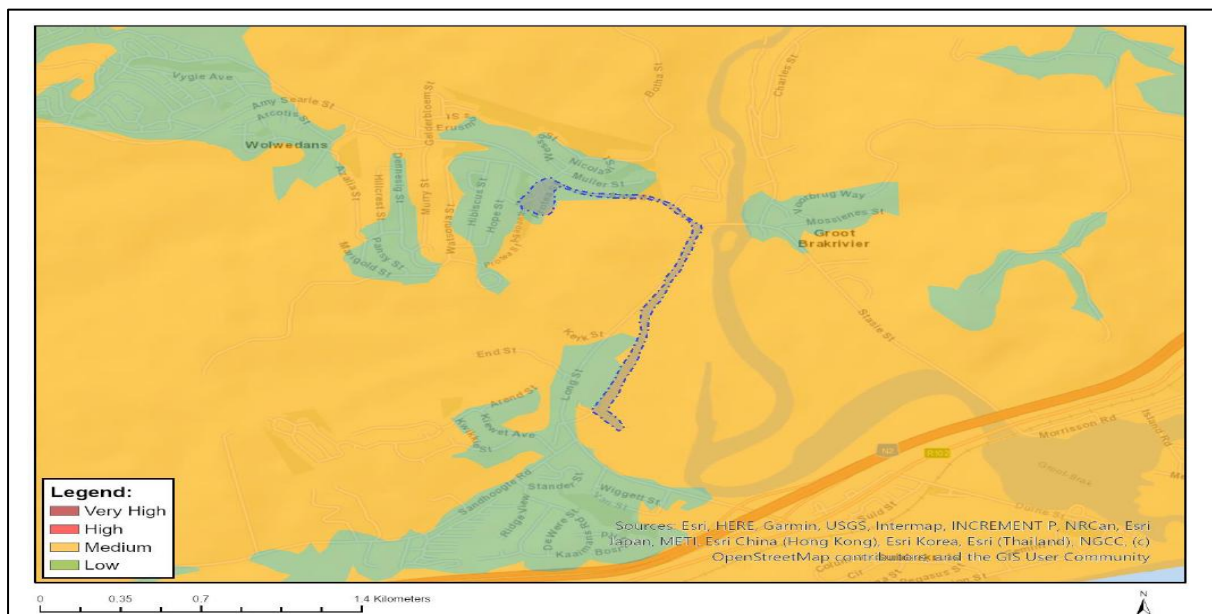


Figure E: Map indicating the relative plant theme sensitivity rating for the proposed development footprint and surrounding areas.

The Environmental Screening Tool report also lists threatened and sensitive species that could potentially occur at or near the proposed development footprint. These species are listed in **Table 1** below, and the table also indicates the SANBI Red List status of the species. The specialist also included a column that indicates the natural distribution of the species. The names of the sensitive species listed in the environmental screening tool report may not be displayed in this report, as this report will be available in the public domain. Sensitive species are targeted by collectors and/or illegal harvesting.

Table 1: Threatened and sensitive species listed for the proposed development footprint (CR Critically Endangered, EN Endangered, VU Vulnerable)

Species	SANBI Red List status	Distribution
<i>Lampranthus pauciflorus</i>	EN	Cape Infanta to Plettenberg Bay
<i>Lebeckia gracilis</i>	EN	Agulhas to Gqeberha
<i>Erica unicolor subsp. mutica</i>	EN	Herbertsdale to George
<i>Erica glandulosa subsp. fourcadei</i>	VU	Mossel Bay to Cape St Francis.
<i>Hermannia lavandulifolia</i>	VU	Worcester to Plettenberg Bay
<i>Sensitive species 633</i>	CR	Groot Brak but not in Strandveld
<i>Sensitive species 268</i>	EN	Herbertsdale to Groot Brak (Renosterveld)
<i>Sensitive species 1024</i>	EN	Riversdale to Knysna (not in Strandveld)
<i>Cotula myriophylloides</i>	CR	Cape Peninsula, Bredasdorp, Plettenberg Bay
<i>Euchaetis albertiniana</i>	EN	Albertinia
<i>Sensitive species 516</i>	EN	Herbertsdale to Mossel Bay
<i>Sensitive species 800</i>	VU	Cape Peninsula to Knysna
<i>Sensitive species 500</i>	VU	Cape Flats to Gqeberha
<i>Diosma passerinoides</i>	VU	Caledon to Baviaanskloof
<i>Agathosma microcarpa</i>	VU	Potberg to Mossel Bay

iNaturalist

There were seven research-grade iNaturalist plant sightings within or very near to the proposed development footprint. The low number of iNaturalist sightings is an indication that the proposed development footprint has been transformed.

Table 2: Research grade observations from iNaturalist within or very near to the proposed development footprint.

Family	Species	Common name	Red List status
ASTERACEAE	<i>Osteospermum moniliferum</i>	Bitou	LC
CONVOLVULACEAE	<i>Falkia repens</i>	Pink Ear	LC
ERICACEAE	<i>Erica afra</i>	heath	LC
IRADACEAE	<i>Gladiolus tristis</i>	Marsh Afrikaner	LC

OXALIDACEAE	<i>Oxalis pes-caprae</i>	Sorrel	LC
POACEAE	<i>Cenchrus clandestinus</i>	Kikuyu Grass	ALIEN
RUTACEAE	<i>Calodendrum capense</i>	Cape-Chestnut	LC

6.4 Spatial Planning

6.4.1 Critical Biodiversity Areas and Ecological Support Areas

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

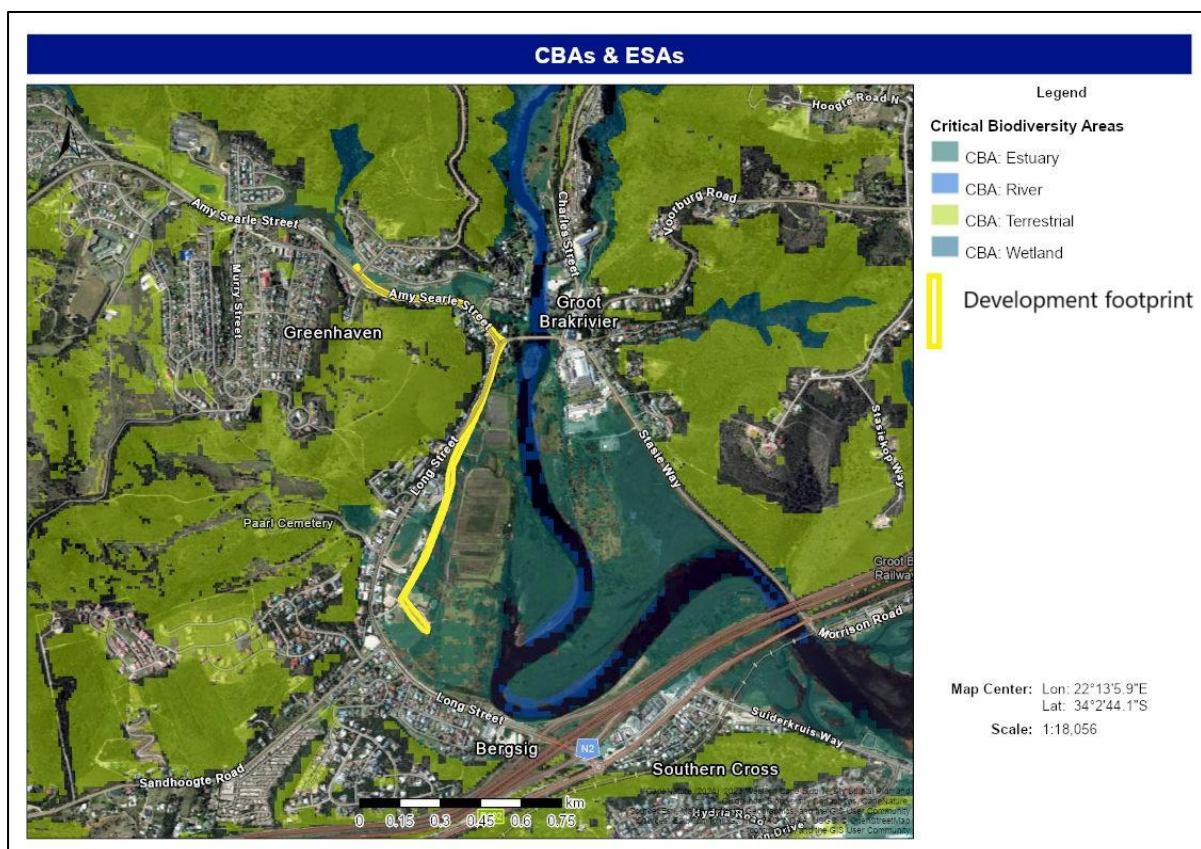


Figure F: Spatial planning map for Groot Brakrivier.**Figure G:** Spatial planning map for the southern section of the proposed development footprint

6.4.2 Reasons for CBA status

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

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

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

6.4.3 Special Habitats, Indigenous Forest, Connectivity, and Corridors

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

6.4.4 Protected Areas

There are no formally protected areas near the proposed development footprint. Groot Brakrivier does fall in the domain of the Gouritz Cluster Biosphere Reserve as indicated in **Figure H**.

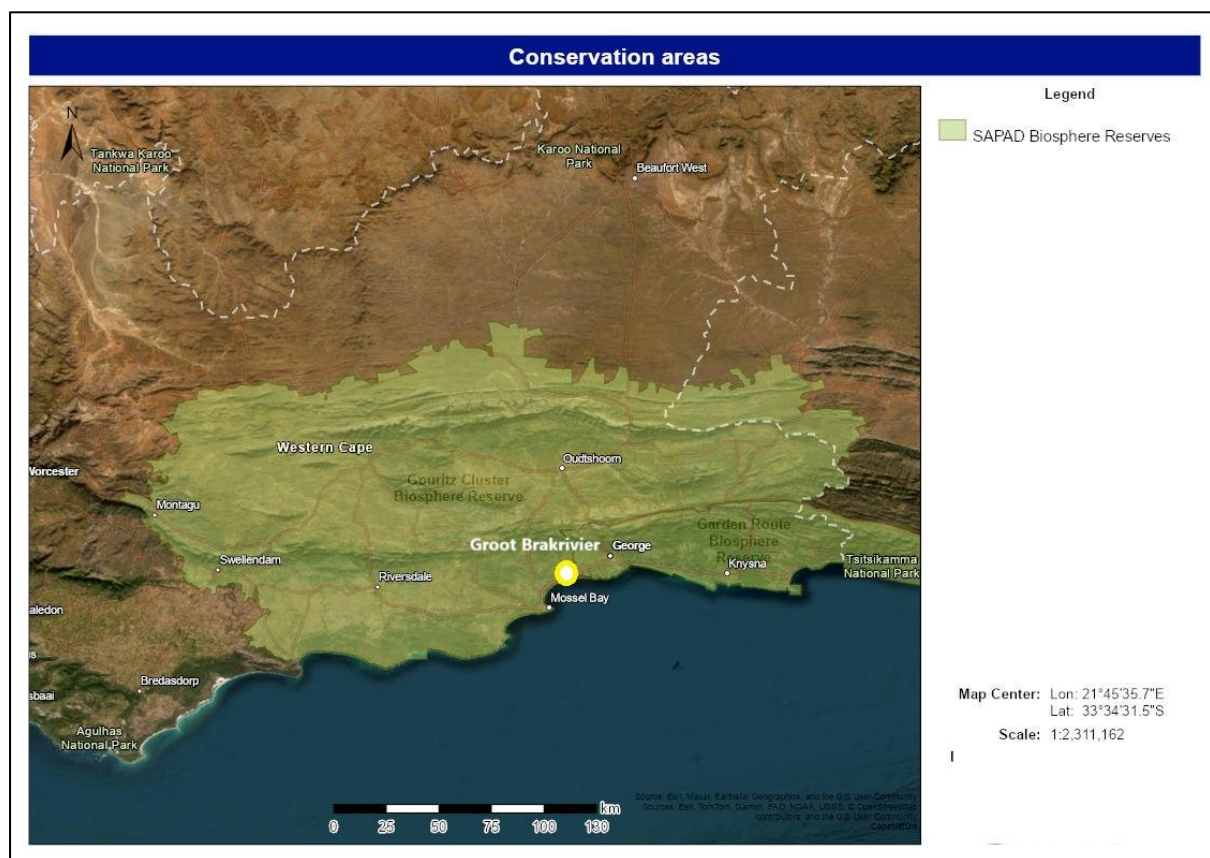


Figure H: Protected areas map for the area that includes Groot Brakrivier

The proposed development footprint is also not part of an area earmarked for protected area expansion, as it is located within an urban environment. The CBA status of sections of the footprint will protect further expansion of urban development.

7. RESULTS: FIELD ASSESSMENT

7.1 Vegetation

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













7.2 Plant species

The specialist identified 43 plant species from 27 families during a two-day survey of the proposed development site (**Table 4**). Due to prior transformation, overall species diversity was low as anticipated.

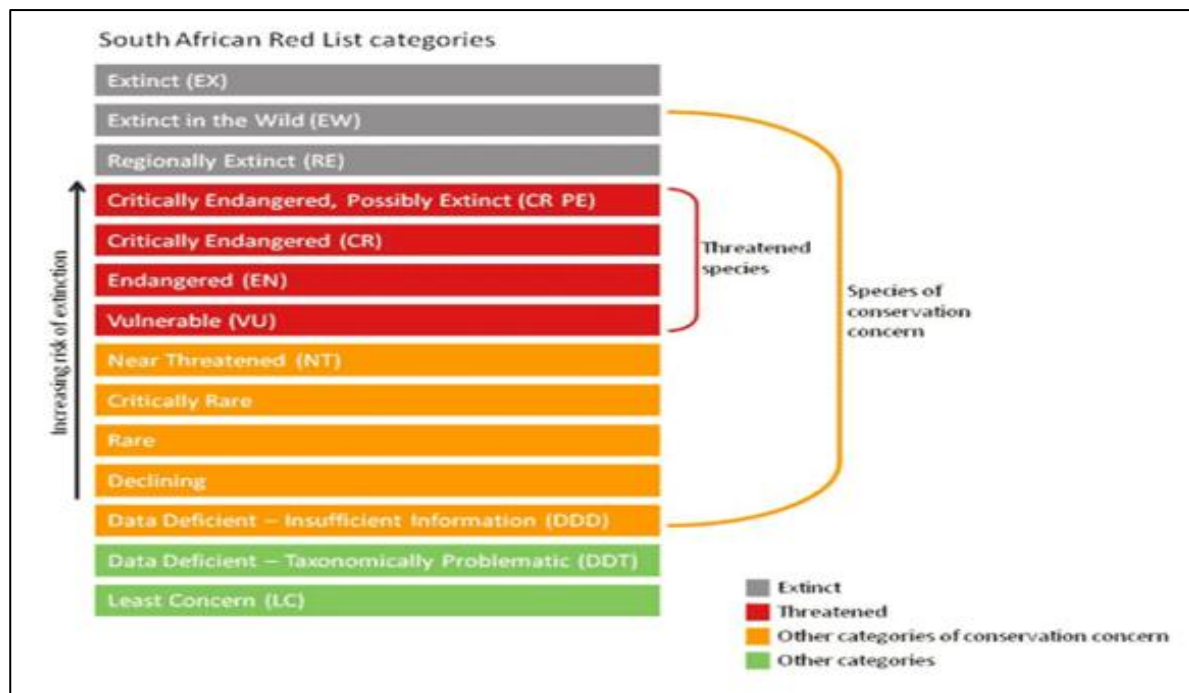
No threatened plant species were recorded within the proposed development footprint. None of the 15 threatened and sensitive plant species listed in the Environmental Screening Tool Report was recorded within the proposed development footprint. The conservation status of the plants is also presented in **Table 4**, and the various categories of conservation status are listed in **Table 5**.

Table 4: Plant species recorded during the field survey on 19 and 20 July 2025

FAMILY	SPECIES	COMMON NAME	SANBI Red List status
AIZOACEAE	<i>Carpobrotus edulis</i>	Common Sourfig	LC
AIZOACEAE	<i>Carpobrotus deliciosus</i>	Delicious Sourfig	LC
AIZOACEAE	<i>Disphyma crassifolium</i>	Purple Dewplant	LC
AMARANTHACEAE	<i>Salicornia decumbens</i>	Dense Glasswort	LC
ANACARDIACEAE	<i>Searsia lucida</i>	Glossy Currantrhus	LC
ANACARDIACEAE	<i>Schinus terebinthifolia</i>	Brazilian pepper	alien
APOCYNACEAE	<i>Gomphocarpus physocarpus</i>	Balloonplant	LC
ARACEAE	<i>Zantedeschia aethiopica</i>	Arum Lily	LC
ASPARAGACEAE	<i>Agave attenuata</i>	Foxtail agave	LC
ASTERACEAE	<i>Arctotheca prostrata</i>	Prostrate Capeweed	LC
ASTERACEAE	<i>Helichrysum cymosum</i>	Fume Everlasting	LC
ASTERACEAE	<i>Helminthotheca echioides</i>	Bristly oxtongue	alien
ASTERACEAE	<i>Metalasia acuta</i>	Pointy Blombush	LC
ASTERACEAE	<i>Nidorella ivifolia</i>	Ovenbush	LC
ASTERACEAE	<i>Oedera pungens</i>	Perdekaroos	LC
ASTERACEAE	<i>Osteospermum moniliferum</i>	Bitou	LC
ASTERACEAE	<i>Senecio inaequidens</i>	Ragwort	LC
ASTERACEAE	<i>Taraxacum officinale</i>	Common dandelion	alien
BASELLACEAE	<i>Anredera cordifolia</i>	Mignonette vine	alien
BIGONIACEAE	<i>Tecomaria capensis</i>	Cape honeysuckle	LC
CASUARINACEAE	<i>Casuarina cunninghamiana</i>	Beefwood	alien
COMMELINACEAE	<i>Commelina africana</i>	Yellow Dayflower	LC
CONVOLVULACEAE	<i>Falkia repens</i>	Pink Ear	LC
CYPERACEAE	<i>Cyperus albostratus</i>	Dwarf striped sedge	LC
CYPERACEAE	<i>Cyperus textilis</i>	Mat Sedge	LC
EBENACEAE	<i>Diospyros dichrophylla</i>	Poison Starapple	LC
FABACEAE	<i>Acacia mearnsii</i>	Black Wattle	alien
FABACEAE	<i>Acacia cyclops</i>	Rooikrans	alien
GERANIACEAE	<i>Pelargonium capitatum</i>	fleshy-stalk pelargonium	LC
GERANIACEAE	<i>Pelargonium zonale</i>	Zonal Storkbill	LC

HYPOXIDACEAE	<i>Hypoxis setosa</i>	Stargrasses	LC
IRADACEAE	<i>Bobartia robusta</i>	Giant Rushiris	LC
JUNCACEAE	<i>Juncus acutus</i>	Spiny rush	LC
JUNCACEAE	<i>Juncus effusus</i>	Common rush	LC
JUNCAGINACEAE	<i>Triglochin maritima</i>	Common arrow-grass	LC
MAVACEAE	<i>Hermannia flammea</i>	Flaming dollsrose	LC
OXALIDACEAE	<i>Oxalis pes-caprae</i>	klawersuring	LC
POACEAE	<i>Stenotaphrum secundatum</i>	Buffalo grass	LC
RUTACEAE	<i>Calodendrum capense</i>	Cape-Chestnut	LC
SCROPHULARIACEAE	<i>Myoporum laetum</i>	Myoporum	alien
TYPHACEAE	<i>Typha capensis</i>	Cape bulrush	LC
VERBENIACEAE	<i>Verbena bonariensis</i>	Purple top	alien
VISCACEAE	<i>Viscum capense</i>	Voëlent	LC

Table 5: South African Red List categories as prescribed by the International Union for Conservation of Nature (IUCN)



7.3 Alien plant species present

Alien species were dominant in certain sections of the proposed development footprint. The alien species is listed in **Table 4** above.

8. CONCLUSIONS

The site sensitivity is verified to be **Low** from a plant species perspective and not Medium as rated in the Environmental Screening Tool. This finding is based on:

- No plant species of conservation concern is located within the proposed development footprint.
- The severe state of transformation of the proposed development footprint.
- The high percentage of alien vegetation located within the proposed development footprint.

The specialist therefore recommends that the development proceed as planned from a plant species perspective if the mitigation measures in **Section 9** are captured in the Environmental Management Program.

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

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

REFERENCES

- Brownlie, S. 2006. Guideline for involving biodiversity specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 C. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.
- Cadman, M. (ed.) 2016. Ecosystem Guidelines for Environmental Assessment in the Western Cape, Edition 2. Fynbos Forum, Cape Town.
- DEA 2022. Revised National List of Ecosystems that are threatened and in need of protection. Government Gazette No. 47526. Government Printer, Pretoria.
- Manning, J. and Goldblatt, P. 2000. Cape Plants. A conspectus of the Cape Flora of South Africa, *Strelitzia* 9. South African National Biodiversity Institute, Pretoria.
- Pence, G. 2017. Western Cape Spatial Biodiversity Plan. CapeNature, Cape Town, South Africa.
- Pool-Stanvliet, R., Duffell-Canham, A., Pence, G. & Smart, R. 2017. The Western Cape Biodiversity Spatial Plan Handbook. Stellenbosch: CapeNature.
- Rutherford, M.C. and Mucina, L. 2006. Introduction. In: Mucina, L. & Rutherford, M.C. (eds), The vegetation of South Africa, Lesotho, and Swaziland: 3-10. SANBI, Pretoria.
- SANBI 2018, Vegetation Map of South Africa, Lesotho, and Swaziland [vector geospatial dataset] 2018. website <http://bgis.sanbi.org/>
- SANBI. 2018. Using CBA Maps to support land-use planning and decision-making. SANBI Factsheet Series. South African National Biodiversity Institute, Pretoria.
- SANBI 2021 South Africa's Terrestrial Red List of Ecosystems (RLE): Technical report on the revision of the "List of terrestrial ecosystems that are threatened and in need of protection". Report 7639. South African National Biodiversity Institute, Pretoria, South Africa. <http://hdl.handle.net/20.500.12143/7639>.
- Turner, A.A. (ed) 2017. Western Cape Province State of Biodiversity 2017. CapeNature Scientific Services, Stellenbosch.

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:				

Table of Contents

DOCUMENT CONTROL PAGE	5
TERMINOLOGY	6
LIST OF RELEVANT LEGISLATION	9
PURPOSE:	10
APPLICATION:	10
INTRODUCTION:	10
OBJECTIVES FOR THE USE OF PESTICIDES FOR INVASIVE ALIEN SPECIES CONTROL	11
METHODS OF CONTROL	12
A. Invasive Alien Plants	12
1. Selection of appropriate methods of control shall be based on the following criteria:.....	12
1.1 Species to be controlled.....	12
1.2 Size of plants.....	12
1.3 Density of stands.....	14
1.4 Accessibility of terrain.....	14
1.5 Environmental considerations.....	14
1.6 Desirable vegetation.....	14
1.7 Disposal of vegetation.....	15
B. Non Plant Invasives	15
LONG TERM CONTROL PROGRAMMES	17
2.1 Considerations	17
SELECTION OF PESTICIDES	18
3.1 Pesticides	18
3.2 Operator safety.....	18
3.3 Environmental safety.....	19
3.4 Availability.....	19
TRAINING	20
4.1 Supervisors.....	20
4.2 Operators.....	21
COSTING OPERATIONS OR PROGRAMMES	21
5.2 Follow-up treatments.....	21
5.3 Biomonitoring.....	21
PROVISION OF EQUIPMENT	22
6.1 Application equipment.....	22

6.2	Equipment brands.....	22
6.3	Tools.....	22
6.4	Replacements.....	22
6.5	Handheld sprayers	22
6.6	Measuring equipment.....	22
6.7	Containers.....	22
STORAGE, HANDLING AND TRANSPORTATION.....		22
7.1	Storage.....	22
7.2	Isolation.....	22
7.3	Accessibility.....	23
7.4	Construction.....	23
7.5	Equipment.....	24
7.6	Handling.....	24
7.7	In field observations.....	25
7.8	Transportation ^{5,7}	25
7.9	Disposal ^{11,12,13,15}	25
PUBLIC SAFETY.....		26
8.1	Due regard must be paid at all times to the health and safety of the public.....	26
8.2	Public should be kept out of operational areas where any hazards exist. Warning notices should be displayed to this effect where necessary.....	26
8.3	Pesticides must only be applied strictly according to label recommendations.....	26
8.4	Product and spray mixtures should be stored so that they are inaccessible to the public..	26
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.	26
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.....	26
ENVIRONMENTAL SAFETY.....		26
9.1	Area contamination must be minimised by careful accurate application with a minimum amount of pesticide to achieve good control.....	26
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.	26
9.3	Equipment should be washed where there is no danger of contaminating water sources and washings used in the next spray mix.	26
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.....	27

APPLICATION	27
10.1 Equipment.....	27
10.2 Rates of Application.	27
10.3 Precautions.	27
10.4 Adjuvants.	28
10.5 Water Sources.....	28
WEATHER CONDITIONS.....	28
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
13.2 Calibration should be carried out in the area to be treated.	29
13.3 Calibration should be checked frequently during application. The following should be checked:	29
ESTIMATED VOLUMES OF PRODUCT PER HECTARE.....	30
HERBICIDE DOSAGE AND LITRES PER HECTARE SUMMARY	30
ANNEXURE 1: CHEMICAL GROUPS AND HAZARD GROUPS OF PESTICIDES.....	48

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 of 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 Lifecycle 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 handling or storage of 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 such risks posed by said 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)

Occupational 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 Practice for the Safe Handling of Pesticides)

SANS 10228:2010 (The Code of Practice 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 convention¹, Rotterdam convention², Basel convention³ and Bamako⁴ 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 Management⁵ 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 of this

policy, the life cycle includes procurement, distribution, storage, transport, use and final disposal or the pesticide product and/or its container⁵.

The Service Provider is responsible for the procuring pesticides and may make use of the RT12 (Transversal Contract by national Treasury) to procure pesticides at 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 protocols⁶ for pesticides in hazard groups 1-6 and 9 & 10 (Annexure 1), Regulations for Hazardous Chemicals Agents⁷ and Guidelines for Personal Protection when handling and Applying Pesticides⁸.
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 8⁶ (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 protection⁶. 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 volatilizing pesticides due to human health inhalation risk being too high to mitigate⁹, 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 contamination⁵⁻⁹.

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 to⁶, as well and the PPE guidelines¹⁴.
 - 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.

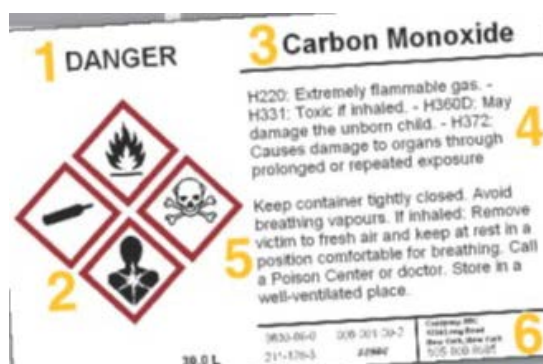
3.2.1 All measures must be taken to ensure the safety of the operators^{6,8} and where choices exist preference should be given to the safest product. Check the label colour band.

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 Hazard¹⁰:

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 follows⁹:

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 legislation⁶⁻¹⁰.

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 Programme¹¹.
- 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. Hygiene⁵⁻⁹.
- 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 requirements⁶⁻¹⁰.
- 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 Africa¹¹, Regulations for Hazardous Chemical Agents 2021⁷, Occupational Health and Safety Act 85 of 1993, FAO Pesticide Storage and Stock Control Manual¹² 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 Countries¹³. 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 stored¹². 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 in¹². Another option is smooth screeded concrete, however sealed, steel container floors are also acceptable. The doorway should be banded 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 band 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 cleaning¹². 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 fire 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 if 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 volatilise) and barred or burglar bars installed to prevent unauthorised entry¹².

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 fittings¹². 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 is 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 cause 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 vapours¹².

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 1m³sump /10m²floor 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 out¹².

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 nozzles¹².

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 contaminated⁶⁻⁹.

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 DENSITY 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
<i>Cylindrobasidium leave*</i>	Stumpout	None	Only registered for <i>A. Cyclops</i> , <i>A. mearnsii</i> , <i>A. dealbata</i> , <i>A. decurrans</i> , <i>A. melanoxydon</i> , <i>A. pycnantha</i>	None
<i>Colletotrichum acutatum*</i>	Hakea gummosis	Grahamstown hakea resistant to pathogen	Only used on <i>Hakea sericea</i> , <i>H. drupacea</i> and <i>H. sericifolia</i> Effective on all growth stages	None
<i>Puccinia eupatori*</i>	Leaf pathogen		Only for <i>C. macrocephalum</i>	None
<i>Uromycladium tepperianum*</i>	Rust fungus		Only for <i>A. saligna</i>	None
<i>Cercospora rodmannii*</i>			Only for <i>E. crassipes</i>	None
<i>Mycovellociella lantanae*</i>	Leaf pathogen		Only for <i>L. camara</i>	None
<i>Pasalora agaritinae*</i>	Leaf pathogen		Only for <i>A. adenopora</i>	None
<i>Entyloma ageratinae*</i>	Leaf pathogen		Only for <i>A. riparia</i>	None
<i>Puccinia abrupt*</i>	Leaf pathogen		Only for <i>P. hysterophorus</i>	None
<i>Puccinia xanthii*</i>	Leaf pathogen		Only for <i>P. hysterophorus</i>	None

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
<i>Prospodium transformans</i> *	Leaf pathogen		Only for <i>T. sans</i>	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 Voloxypr	Exclusion period	Limited species on Starane and Voloxypr 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 <i>D. ferox</i>	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 isopropylamine 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 
Metsulfuron 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 + Tebuthion 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-trichloroethylidene	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 permanganate 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 

References:

1. UNEP, 2019. Stockholm Convention on Persistent organic Pollutants (POPs). United Nations Environment Programme, Secretariat of the Stockholm Convention, September 2020. Available from <https://www.chm.pops.int>
2. UNEP, 2020. Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. United Nations Environment Programme and Food and Agriculture Organization, Secretariat of the Rotterdam Convention, August 2020.

3. UNEP, 2019. Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and their Disposal. United Nations Environment Programme, Secretariat of the Basel Convention, April, 2020.
4. UNEP, 1991. Bamako Convention on the Ban of the Import into Africa and the Control of Trans boundary Movement and management of Hazardous Wastes within Africa. United Nations Environment Programme, Secretariat of the Bamako Convention, April 1991.
5. FAO & WHO, 2014. The International Code of Conduct on Pesticide Management. Food and Agriculture Organization of the United Nations & World Health Organization, Rome, 2014. Available from www.fao.org/publications
6. Muir.D & Taliep.M, 2021. EP Biomonitoring protocols for pesticide management. Internal document available from D. Muir.
7. DOEL, 2021. Regulations for Hazardous Chemical Agents. Occupational health and Safety Act, 1993. Notice No. 44348, published Government Gazette, 29 March 2021. Available from: <https://www.pgwonline.co.za>
8. FAO & WHO, 2020. International Code of Conduct on Pesticide Management: Guidelines for Personal Protection when Handling and Applying Pesticides. Food and Agriculture Organization of the United Nations & World Health Organization, Rome, 2020. Available from: <https://www.fao.org/publications>
9. UN, 2011. Globally Harmonised System of Classification and Labelling of Chemicals (GHS). 4th Revised Edition. United Nations, New York and Geneva, 2011. Available from: http://www.unece.org/trans/danger/publi/ghs/implementation_e.html
10. WHO, 2009. The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification. International Programme on Chemical safety (IPCS). Inter-Organization Programme for Sound Management of Chemicals (IOMC), World Health Organization, Stuttgart, 2010. Available from: http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html.
11. Croplife SA, 2018. Waste Management Programme: Guidelines for the Responsible Disposal of the Triple Rinsed Empty Plastic Pesticide Containers. December 2018 Edition. Available from Croplife SA.
12. FAO, 1996. Pesticide storage and stock control manual. FAO Pesticide Disposal Series 3. Food and Agriculture Organization of the United Nations, Rome, 1996. Available from: <https://www.fao.org/publications/>
13. FAO, 1988. Guidelines for Retail Distribution of Pesticides with Particular reference to Storage and Handling at the Point of Supply to Users in Developing Countries. Food and Agriculture Organization of the United Nations, Rome. October 1988. Available from: <https://www.fao.org/publications/>
14. Muir, D. & Taliep, M. 2020. EP Job category PPE Spreadsheet 2020. Internal document. Available from: D. Muir
15. FAO & WHO, 2008. International Code of Conduct on the Distribution and Use of Pesticides: Guidelines on Management Options for Empty Pesticide Containers. Food and Agriculture Organization of the United Nations & World Health Organization. Rome, May 2008. Available from: <https://www.fao.org/publications/>

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	Acute toxicity to mammals and birds 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 the programme		

				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation 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	

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						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.			

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					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 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		EN 140, EN149, EN 143:200			once they leave the programme		
						7.Apron/ Knapjack		R95, R99, R100					
				5	Developmental & Reproductive toxicity GHS08 DANGER  H361 (Suspected of damaging fertility or the unborn child)	1.Chemically resistant nitrile gloves		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.Type 3 and Type 4 protective clothing		EN 166:2001			2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..		
						 Type 5 protective clothing		EN140 EN 149			3. All workers need to be tested once they leave the programme		
						3.Safety boots		EN 143:2000					
						4.Face & Eye protection		R95, R99, R100					
						5.Half-face respirators							
						6.Particulate air							

						filters for respirators							
						7.Apron/ Knapjack							
						8. Long-sleeved shirts							
					Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H412 (Harmful to aquatic life with long lasting effects)								
				8									
			Pyridine compounds as butoxy ethyl esters (Garlon 4, Garlon max, Nuvogon, Triclon, Viroaxe, Tricloxmax, Turbador)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) H317 (May cause an allergic reaction)	1.Chemical ly 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	

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					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									

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					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	

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

			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.Particula te 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.Chemical ly 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		

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						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)								

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					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.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.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				

[illegible]

				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		

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

			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									

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					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 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)							
	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 the 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)								

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						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 the programme	
	Glycines	Group 9: Inhibitors of EPSP synthesis.	Phosphonoglycines such as Glyphosate isopropylamine salts (Seismic, tumbled weed) POE-T free	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	 	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	

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					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 the 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						they programme	
						5.Half-face respirators		EN 166:2001 EN 140, EN149, EN 143:200					
						6.Particulate air filters for respirators							
						7.Apron/ Knapjack		R95, R99, R100					
						1.Chemically resistant nitrile gloves		EN 374:2016	20cc fresh blood sample. AChE tests done with Test-Mate model 400 device				
						2.Type 3 and Type 4 protective clothing		EN 14605:2005					
						3.Safety boots		EN 345: 1993					
						4.Face & Eye protection		EN ISO 20345					
						5.Half-face respirators		EN 166:2001 EN 140, EN149, EN 143:200					
						6.Particulate air							

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						filters for respirators					programme		
						7.Apron/ Knapjack		R95, R99, R100					
				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 methylarsenate (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						they programme	
						5.Half-face respirators		EN 166:2001 EN 140, EN149, EN 143:200					
						6.Particulate air filters for respirators							
						7.Apron/ Knapjack		R95, R99, R100					
				3	Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation) H336 (May cause drowsiness or dizziness)	1.Chemically resistant nitrile gloves		EN 374:2016	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		
						2.Type 3 and Type 4 protective clothing		EN 14605:2005					
								EN 345: 1993					
						3.Safety boots		EN ISO 20345					
						4.Face & Eye protection							
						5.Half-face respirators		EN 166:2001 EN 140, EN149, EN 143:200					
						6.Particulate air							

						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.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	

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

				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		Environmental monitoring
	Chemical group	MOA	Examples	Hazard Group	Hazard Criterion	Type	Pictogram	Classification	Blood	Urine	Blood	Urine	
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		

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					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		

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					prolonged or repeated exposure – blood)	 Type 5 protective clothing	 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

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					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				

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						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		

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						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		

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					 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			

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						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