BERGRIVIER MUNICIPALITY

INVASIVE SPECIES MONITORING, CONTROL AND ERADICATION PLAN

JUNE 2020

FINAL

BERGRIVIER MUNICIPALITY

Infinity Environmental

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REPORT DETAILS

Report title:	**Invasive Species Monitoring, Control and Eradication Plan: Bergrivier Local Municipality**
Date:	11 June 2020
Prepared for:	Bergrivier Local Municipality Voortrekker Road Velddrif
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Purpose:	This invasive species monitoring, control and eradication plan is prepared to ensure compliance with the requirements of section 76 of the National Environmental Management: Biodiversity Act for a municipality to prepare a plan for property under its control.
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Cover image: invasive Prickly pear cactus (Opuntia ficus-indica) in Velddrif

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EXECUTIVE SUMMARY

Invasive alien species are plants and animals that have been introduced and spread outside of their natural distribution range. Biological invasions are a large and growing environmental problem, globally and in South Africa. They often have direct negative impacts on both people and ecosystems. It has been estimated (SANBI & CIB, 2018) that alien invasive species cost the South African economy about R 6.5 billion per year, and threaten the survival of more than 1 200 indigenous species. Invasive species are particularly problematic in the Western Cape, where they threaten areas of exceptionally high natural biodiversity.

The Bergrivier Municipality (BM) is a Category B (Local) Municipality located in the Western Cape Province. The BM, as an organ of state, is obliged in terms of section 76 of the National Environmental Management: Biodiversity Act (Act 10 of 2004, NEMBA) and the Alien and Invasive Species Regulations, 2014 (GNR 598 of 2014, AIS Regulations) to prepare an **invasive species monitoring, control and eradication plan** for land under its control.

The BM appointed Infinity Environmental as a service provider to prepare this plan, the purpose of which is to respond to the BM's legal obligations and to coordinate the BM's efforts to control and eradicate alien and invasive species in areas it owns and manages. It is based on a set of core principles, including

- a focus on prioritising key assets and priority areas, given the constraints of municipal budgets and staffing;
- minimisation of harm to the natural environment; and
- maximisation of socio-economic benefits.

The municipality has under its control a total of 134 cadastral properties, located primarily within the urban areas of Piketberg, Porterville, Laaiplek, Velddrif, Eendekuil, Dwarskersbos and Aurora, and including areas of agricultural commonage adjacent to these towns. The sites have a combined total area of approximately 267 hectares. They were surveyed in November 2019 for alien invasive species. Surveys confirmed the presence of **41** listed alien invasive plant species and identified habitats likely to be utilised by a further **4** alien invasive animal species. Distributions and densities were mapped in a geographic information system.

The properties have been consolidated into **18 management units**, at an appropriate size and structure to allow for coherent management interventions to be implemented within each unit. At the management unit scale, control methods for each species have been determined based on best practice and norms and standards, adapted to the urban context. Workload assessments for both the initial clearing and the longer-term follow up have been carried out, allowing the determination of a budget for each management unit.

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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

AIS	Alien and invasive species
Biological control	Using one species for the purpose of controlling another species
CARA	Conservation of Agricultural Resources Act, 43 of 1983
Extirpation	Total eradication from a particular area
GIS	Geographic Information System
BM	Bergrivier Local Municipality
IAP	Invasive Alien Plant
MU	Management Unit: A section of a property or a group of smaller properties that should be managed as a single unit.
NEMBA AIS Regulations	Alien and Invasive Species Regulations, 2014 in terms of NEMBA
NEMBA	National Environmental Management: Biodiversity Act, 10 of 2004
PPE	Personal Protective Equipment

INTRODUCTION

Aurora

1 INTRODUCTION

1.1 Background

The Bergrivier Municipality (BM) is a Category B (Local) Municipality located in the Western Cape Province. It includes the urban areas of Piketberg, Porterville, Eendekuil, Aurora, Velddrif, Laaiplek, and Dwarskersbos. The BM is bordered to the north by the Cederberg Local Municipality, to the south by the Saldanha Bay and Swartland municipalities, and to the east by the Witzenberg municipality. It is approximately 4 400 square kilometres in extent.

The BM, as an organ of state, is obliged in terms of section 76 of the National Environmental Management: Biodiversity Act (Act 10 of 2004, NEMBA) and the Alien and Invasive Species Regulations, 2014 (GNR 598 of 2014, AIS Regulations) to prepare an invasive species monitoring, control and eradication plan for land under its control. Such a plan must include:

(a) A detailed list and description of any listed invasive species occurring on the relevant land;
(b) a description of the parts of that land that are infested with such listed invasive species;
(c) an assessment of the extent of such infestation;
(d) a status report on the efficacy of previous control and eradication measures;
(e) the current measures to monitor, control and eradicate such invasive species; and
(f) measurable indicators of progress and success, and indications of when the control plan is to be completed.

The Act further provides that the invasive species monitoring, control and eradication plans of municipalities must be part of their integrated development plans. The purpose of this document is to respond to this obligation and to coordinate the BM's efforts to control and eradicate alien and invasive species in areas it owns and manages. The structure and content of this plan is based on the Guidelines for Monitoring, Control and Eradication Plans published by the Department of Environmental Affairs in 2015 in terms of Regulation 8 of the AIS Regulations.[1]

The BM has under its control 120 properties, which for the purposes of this Invasive Species Monitoring, Control and Eradication Plan have been divided into a total of 18 management units. A list of the sites, their cadastral delineations, and locations is included in section 3.

Map 1. Bergrivier Municipality

[1] Department of Environmental Affairs. 2015. *Guidelines for species listed as invasive in terms of section 70 of National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) (NEMBA) and as required by section 76 of this act*.

1.2 Importance and context

Biological invasion is the translocation of organisms through human activity (intentionally or accidentally) to areas outside their natural range, and their establishment, reproduction, and proliferation in invaded areas. Biological invasions are a large and growing environmental problem, globally and in South Africa.[2] They often have direct negative impacts on both people and ecosystems, as well as reducing the ability of natural systems to deliver vital services.

An alien invasive species is defined in South African law as

> ***a species which has established and spread outside of its natural distribution range, and threatens ecosystems, habitats or other species, or results in economic or environmental harm or harm to human health.***[3]

Alien invasive species are typically characterised by an ability to reproduce rapidly in their new environments, often due to a lack of natural enemies or to a resistance to local pathogens. Invasive plant species may have a more competitive growth strategy that indigenous species or may colonise disturbed areas faster and outgrow them. Biological invasions pose a threat to biodiversity, as alien species may outcompete or displace locally indigenous plants and animals. The structure, composition and function of ecosystems can be drastically affected by alien invasive plant or animal species. The productive potential of soils and arable land may be impacted on, and invasions by alien plants may intensify the damage caused by wildfires, flooding, and erosion. Ecosystem services, which are services humans derive from natural systems, may be threatened by biological invasions. For instance, the proliferation of alien tree species in key water catchments may reduce runoff and threaten water security, while the loss of indigenous plant species may reduce the availability of natural products important to human health or the economy.

It has been estimated that alien invasive species cost the South African economy about R 6.5 billion per year, and threaten the survival of more than 1 200 indigenous species.[2] Invasive species are particularly problematic in the Western Cape, an area with exceptionally high natural biodiversity. It is part of the Cape Floristic Kingdom, by far the smallest of the six floristic kingdoms in the world and the only one within a single country's borders. The region has exceptional species richness and a high proportion of endemics, species that occur only in the region and nowhere else.

Mountain catchment areas in the fynbos region are disproportionately affected by invasive alien trees such as pine, hakea, and Australian acacias. The same species also contribute to changes in the natural fire regime, leading to more frequent, hotter wildfires that disrupt the natural process of regeneration and reduce indigenous plant diversity, as well as threatening life and property. The productive potential of landscapes, both for grazing of livestock and for the production of crops, is impacted by agricultural weeds and other invasives. In the northern parts of the municipality, cacti and other succulent weeds are particularly problematic in this regard. Tourism and amenity values are also affected by the loss of indigenous biodiversity and by the aesthetic impact invasive plants have on scenic routes and areas of natural beauty.

1.3 Legislative context

Two sets of legislation regulate the declaration and control of invasive alien species in South Africa: the Conservation of Agricultural Resources Act (43 of 1983, **CARA**) and the National Environmental Management:

[2] SANBI and C·I·B, 2018. *The status of biological invasions and their management in South Africa in 2017*. South African National Biodiversity Institute, Kirstenbosch and DST-NRF Centre of Excellence for Invasion Biology, Stellenbosch.

[3] National Environmental Management: Biodiversity Act, 2004 section 1

Biodiversity Act (Act 10 of 2004, **NEMBA**). Although NEMBA was intended to replace the invasive species provisions of CARA, CARA's regulations have not been repealed and remain in force. Although many invasive plant species are listed under both CARA and NEMBA, this is not the case for all invasive species. In this document, both categorisations are given where applicable.

1.3.1 Conservation of Agricultural Resources Act

The CARA Regulations define three categories of invasive alien plants:

> **Category 1** plants are declared 'weeds' and must be controlled. They may not be established, planted, maintained, multiplied or propagated.
>
> **Category 2** plants are declared 'invaders', and may be retained and cultivated only in demarcated areas and with permission (typically for commercial purposes). Outside of demarcated and permitted areas, steps must be taken to prevent their spread.
>
> **Category 3** plants are also declared 'invaders' and may no longer be planted, although existing plants may be retained outside of watercourses so long as steps are taken to prevent their spread.

1.3.2 National Environmental Management: Biodiversity Act

NEMBA imposes a general duty of care in respect of invasive species. Every owner of land on which a listed invasive species occurs must—

> (a) **notify** the Department of Environmental Affairs in writing of the invasive species occurring on that land;
>
> (b) take steps to **control and eradicate** the listed invasive species and prevent it from spreading; **and**
>
> (c) take all required **steps** to prevent or **minimise harm to biodiversity**. [4]

The Act further provides that all organs of state in all spheres of government must prepare an invasive species monitoring, control and eradication plan for land under their control. The invasive species monitoring, control and eradication plans of municipalities must be part of their integrated development plans.

Categories of invasive alien species are defined as follows in the Alien Invasive Species Regulations (GN No 598 of 2014):

> **Category 1a** species must be combatted or eradicated. Any form of trade or planting is strictly prohibited.
>
> **Category 1b** species must be controlled and wherever possible, removed and destroyed. Any form or trade or planting is strictly prohibited.
>
> **Category 2** species are regulated by area, and require permits for importation, possession, growing, breeding, moving, or changing of ownership. A landowner or permit holder must ensure that the species does not spread beyond the land or the area in a permit. If an invasive species management programme has been developed for a particular species, the species must be controlled in accordance with the programme.
>
> **Category 3** species are regulated by activity. They may remain in prescribed areas or provinces, but further planting, propagation or trade, is prohibited. These species are considered to be Category 1b species where they occur in riparian areas.[5]

[4] NEMBA s73

[5] The greater of 32 metres from the edge of a river, lake, dam, wetland or estuary, or the 1:100 year floodline

1.3.3 Other legislation applicable to control activities

National Environmental Management Act, 107 of 1998

The National Environmental Management Act imposes a general duty of care, which provides that

> *Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring.*

The Act also defines activities which require environmental authorisation from the competent authority before they may proceed.

The construction of temporary roads and river crossings or the clearing of indigenous vegetation may trigger activities listed in terms of the Environmental Impact Assessment Regulations, including:

- The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse(Activity 19 of Listing Notice 1, GN 327 of 2017)
- The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan … Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA (Activity 12 of Listing Notice 3, GN 324 of 2017)

It is recommended that where there is uncertainty, the BM's Environmental Management department or a suitably qualified Environmental Assessment Practitioner should be consulted before commencement of control activities to determine whether authorisation is likely to be required. Formal confirmation may be obtained from the Department of Environmental Affairs and Development Planning on submission of a checklist in the required form.

National Water Act, 36 of 1998

Work taking place within 100 m from a watercourse (river or stream) and/or within 500 m from a wetland may require authorisation in terms of section 21(c) and (i) of the National Water Act.

It is recommended that for sites where the clearing of invasive alien species will take place within a watercourse or wetland, or within the regulated area (within 100 m of a river or stream or within 500 m of a wetland), the Berg-Olifants Catchment Management Agency or Department of Water and Sanitation should be approached at an early stage to assist in determining whether water uses are likely to be included in the control activities. If so, an assessment of the risks must be conducted by a suitably qualified freshwater ecologist. Should the outcome indicate that risks are low, the activity can be confirmed as Generally Authorised in terms of GN 509 of 2016 (a two-month process). For higher risks, a water use licence application will be required, a 300-day process.

Nature Conservation Ordinance, 19 of 1974 (Cape)

The Ordinance, still in force in areas formerly within the Cape Province, prohibits hunting and fishing for protected species without an appropriate permit. None of the invasive animal species occurring or potentially occurring on the BM's properties are listed in this Ordinance as protected, and hunting or angling permits are accordingly not required.

Animals Protection Act, 71 of 1962

Section 2(r)of the Act states that it is an offence to cause any unnecessary suffering to any animal. Implementation of control methods for invasive alien animal species must therefore be humane and in accordance with best practice.

Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 36 of 1947

Section 10 of the Act requires that any person who prescribes or uses herbicides 'for gain' must be registered a Pest Control Operator (PCO). The herbicide prescriptions in this Plan were made by a registered PCO (T Pongolo, with registration number #33718).

Eucalyptus cladocalyx in Aurora

PRINCIPLES

2 Principles

This plan is based on a set of core management principles, which should inform the implementation of each site-specific plan:

2.1.1 Integrated control

A coordinated management approach that utilises a combination of control methods most appropriate to the site, the timing, and the available resources. Management of invasive alien species will be most effective if it is integrated within and amongst municipal departments and with external partners. The BM does not have a dedicated invasive alien control unit or department, and the institutional arrangements for the management of alien invasive species are therefore likely to include the environmental management, parks and recreation, and coastal EPWP functions. There will be overlap with the mandate of other departments and of external organisations, particularly in areas such as the Berg River estuary. Where this is the case, coordination of efforts is vital to improve implementation and reduce costs.

2.1.2 Landscape-scale control

Invasive alien species will seldom be limited to a cadastral property or site, meaning that control efforts may be hindered by reinvasion from adjacent properties. A concerted effort to coordinate with and involve adjacent landowners and managers (particularly where adjacent land is owned by other organs of state) should be pursued.

2.1.3 Living document

The control programme is not static and should be reviewed from time to time (at least annually) and adapted to fit changing circumstance and budgets.

2.1.4 Focus on key assets and priority areas

In the inevitable context of a limited budget and limited capacity, control efforts should be focused on areas where invasives pose the greatest risk to property or sensitive biodiversity. Fire risk to structures and infrastructure is a priority, so where invasions pose a fire risk initial efforts should focus on the clearing of defensible firebreaks along property boundaries. Similarly, the areas in and around rivers and wetlands are a priority for clearing given the sensitivity of watercourses.

2.1.5 Minimise harm

Indigenous vegetation and watercourses should be protected from damage during clearing of invasives. Control methods, access routes, and training should be appropriate to the site sensitivities. A site camp area may be required for larger projects, to accommodate vehicles, storage areas, and ablutions. It must be located outside sensitive natural areas and must not restrict access routes or damage private property.

2.1.6 Minimise erosion

On steep slopes or dunes, erosion can result from the sudden removal of alien invasive vegetation that stabilises the soil. To reduce this, work should progress horizontally along contours in bands, leaving uncleared bands between cleared areas. After the cleared areas have revegetated with indigenous vegetation, work can begin on the uncleared bands.

2.1.7 Efficiency

Invasives will re-establish from seed or other regenerative material after initial clearing. Simple ways to minimise the duplication of effort include:

- Starting clearing at the head of a catchment or the top of a valley and working downward.
- On flatter terrain, starting clearing at the outside of a block or management unit and working inward.

2.1.8 Recognise use value of some invasive species

Many listed invasive species were planted or introduced for their use value, and some invasions may still have significant use value. Control methods must be sensitive to the current uses, and provide for replacement by indigenous species where required. For instance, the removal of shade trees from public parks may be viewed unfavourably by park users, irrespective of the legal requirement to control invasives. A sensitive phased approach should be pursued where removal is required, with indigenous replacements planted early and aliens

removed as late as possible. For highly invasive species, this may not be appropriate.

2.1.9 Plan for the management of biomass

Larger invasive alien plants require careful planning and budgeting for the management of woody biomass after clearing. Disposal methods include:

- burning on site (requires risk management and permits)
- chipping and composting (may lead to seed dispersal)
- offsite disposal
- beneficiation (timber, firewood or charcoal production)

2.1.10 Suit methods to the circumstances

Control methods must be suitable to the site and the target species, as well as to available resources (equipment, personnel, and training).

2.1.11 Adequate and thorough training

Staff and personnel responsible for implementation of the plan should be thoroughly trained for their respective roles. At a minimum, workers and supervisors should receive appropriate training and certification. This may include:

- Identifying invasive alien species
- Health and safety
- Herbicide application and chainsaw use (where required)
- Specialised access methods such as rope access

2.1.12 Communication with affected neighbours

Where invasive management activities have the potential to impact on other landowners or nearby residents (e.g. road closure, access over private land, herbicide spraying), they should be notified well in advance.

2.1.13 Responsible herbicide use

The use of herbicides must comply with relevant law and best practice. This includes:

- Using only herbicides registered for the target species
- Providing for safe storage and handling
- Using specific, rather than general, herbicides where possible to reduce collateral damage
- Certification and training for all herbicide applicators

PROPERTIES AND MANAGEMENT UNITS

Limonium sinuatum in Laaiplek

3 Properties and Management Units

The Bergrivier Municipality owns several properties throughout the municipal area. The 134 subject properties are located across all the urban areas in the municipal area. They range in size from 83 square metres (m^2) to 59.34 hectares (ha), with a median size of 3,186 m^2. The total area of the sites is 266.63 ha. See Table 1 and Maps 2 to 8.

Table 1. Properties forming part of this plan, divided into Management Units (MU) for planning and implementation

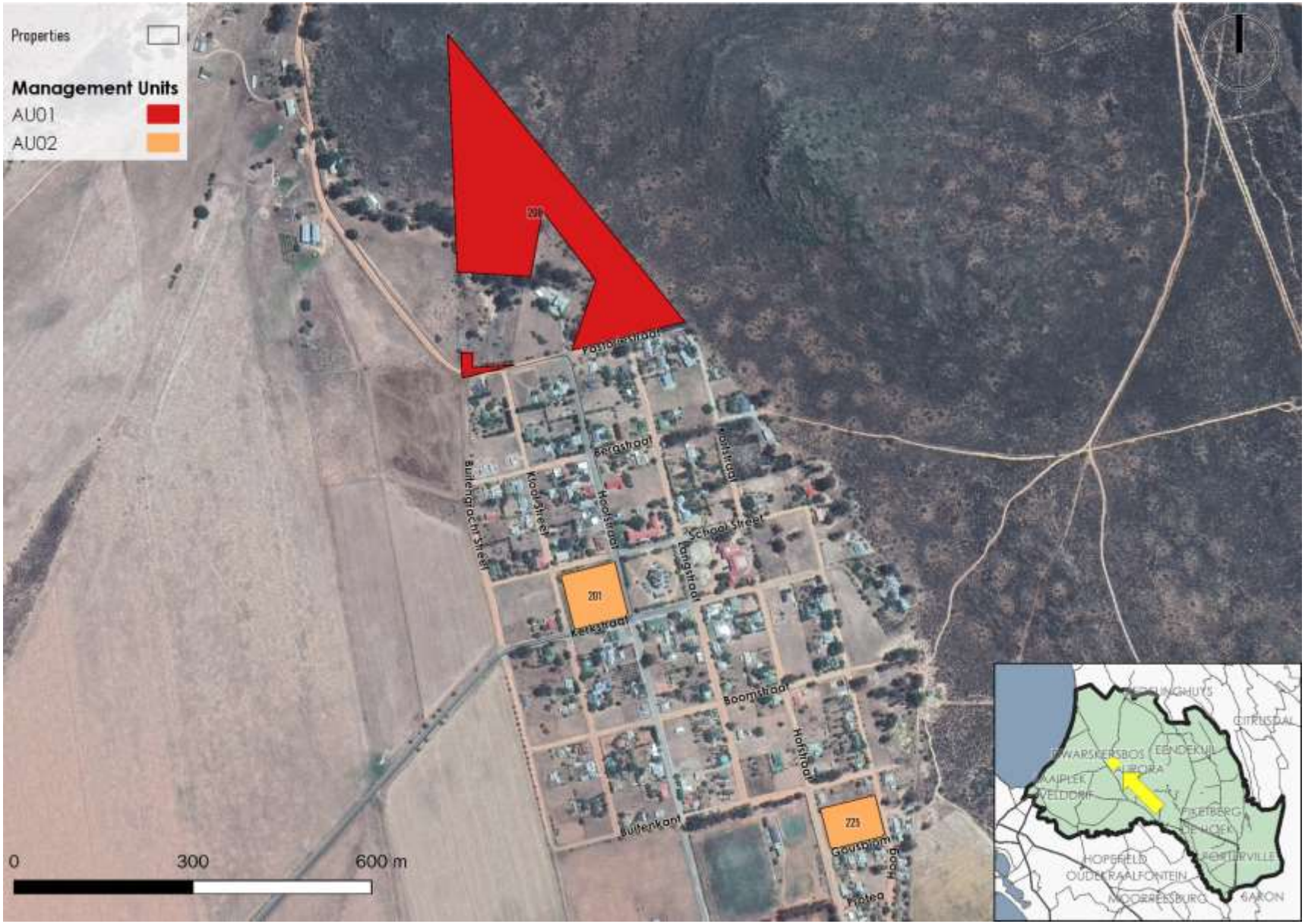
Property	Area (m^2)	MU	MU Name	MU Area (m^2)	MU Description
Aurora					
208	73 711	**AU01**	Aurora north	73 711	The MU is located at the northern end of Aurora on Pastorie Street, extending up the hill beyond the water reservoir. It is triangular in shape and excludes the residential property at the northern end of Hoofstraat.
201	8 783	**AU02**	Aurora parks	15 441	The MU comprises two small municipal parks located within the urban area of Aurora: the first (Erf 201) at the corner of Kerk and Hoof streets, and the second (Erf 225) at the corner of Hof and Gousblom streets.
225	6 658				
Dwarskersbos					
146	86 459	**DW01**	Dwarskersbos	379 859	The MU incorporates all municipally owned land in the small coastal settlement of Dwarskersbos. It is discontinuous and includes most public roads as well as a strip of land along the beach. The total extent of the properties is 38.4 hectares, much of which comprises surfaced roads.
154	78 585				
158	15 115				
319	81 416				
598	2 075				
802	30 669				
845	512				
Unknown	85 030				
Eendekuil					
27	340	**EK01**	Eendekuil north	36 679	The MU comprises nine erven located in the northern part of Eendekuil, including the municipal offices and adjacent vacant land as well as road reserves and a substation site to the north. It is 3.7 hectares in extent.
28	709				
29	3 756				
30	2 698				
52	596				
53	2 078				
65	23 728				
99	2 234				
295	541				
69	30 631				

Property	Area (m²)	MU	MU Name	MU Area (m²)	MU Description
72	6 209	**EK02**	Eendekuil west	64 435	This MU includes nine erven in the southwestern part of Eendekuil (west of Main Road). Erf 72, 140, and 121 are located along a drainage line discharging into the Kruismans River, which flows across Erf 69 at the westernmost edge of the MU. The remaining properties are small, servitude-like erven located along the railway line. The southernmost property (erf 87) is a sportsfield. The MU has a total extent of 6.44 hectares.
100	4 938				
121	2 431				
140	5 848				
266	521				
267	337				
296	542				
302	10 658				
493	2 319				
304	699	**EK03**	Eendekuil east	8 316	This MU includes three small erven in the southeastern part of Eendekuil (east of Main Road). All are vacant public spaces.
324	2 027				
369	5 590				
Laaiplek					
3823	12 474	**LA01**	Laaiplek beach	127 877	The MU comprises coastal access land along the beach in a new development north of Laaiplek town. It includes several erven, with a total area of 12.8 hectares.
3824	24 377				
4072	11 440				
4074	17 553				
4128	21 612				
4207	13 308				
4208	2 335				
4271	18 099				
4324	3 488				
4325	3 190				
470 (Portion of)	87 189	**LA02**	Laaiplek north	722 370	The MU includes a portion of the extensive commonage adjacent to Laaiplek's Noordhoek residential area (Erf 471 north of Lofdal St), as well as the road reserve of Main Road and a number of small urban parks and servitudes within Noordhoek. With a total extent of 72 hectares, the MU is the largest designated in the municipal area. Access is variable, with a major stormwater channel forming a barrier between Noordhoek and the northern parts of Erf 471.
471 (Portion of)	593 417				
624	2 940				
688	5 733				
2426	3 942				
2440	12 797				
2469	3 061				
2615	801				
3192	2 136				
3202	3 964				
4104	1 135				
4322	1 651				
4323	2 140				

Property	Area (m²)	MU	MU Name	MU Area (m²)	MU Description
4513	1 463				
192	50 810	**LA03**	Laaiplek south	437 902	The MU incorporates the southern section of the Laaiplek commonage (Erf 471 south of Lofdal Street) and smaller erven immediately adjacent to it. Erf 192, south of Voortrekker Road, is a public park.
219	2 765				
470 (Portion of)	8 753				
471 (Portion of)	34 381				
471 (Portion of)	340 317				
2338	878				
275	21 853	**LA04**	Laaiplek harbour area	55 341	This MU is a small cluster of municipally owned property in the vicinity of the Laaiplek harbour entrance. They are accessed from de Villiers Street and St Helena Street. The MU has a total extent of 5.53 hectares.
1070	6 711				
1102	2 502				
2792	829				
2831	18 963				
2840	2 201				
3728	1 101				
3893	1 181				
191	3 204	**LA05**	Port Owen	24 750	The Port Owen MU consists of a number of walkways and pocket parks within the marina. Most properties are directly on the estuary edge, and accessed on foot only. It is 2.47 hectares in extent.
922	10 036				
1272	2 947				
1368	188				
1392	151				
1582	1 069				
1633	273				
1646	2 080				
2056	4 720				
2315	83				
Piketberg					
841	478	**PK01**	Steynville	193 532	The Steynville MU includes several public spaces in the Steynville residential area, as well as a river / stormwater channel corridor at the northern edge of the town that flows eastward to the wastewater treatment works. The MU has a total extent of 19.5 hectares.
842	204				
1101	40 723				
1292	5 925				
2764	3 223				
2909	5 276				
2957	805				
3407	1 203				
3934	27 743				
4001	3 675				
4239	30 148				

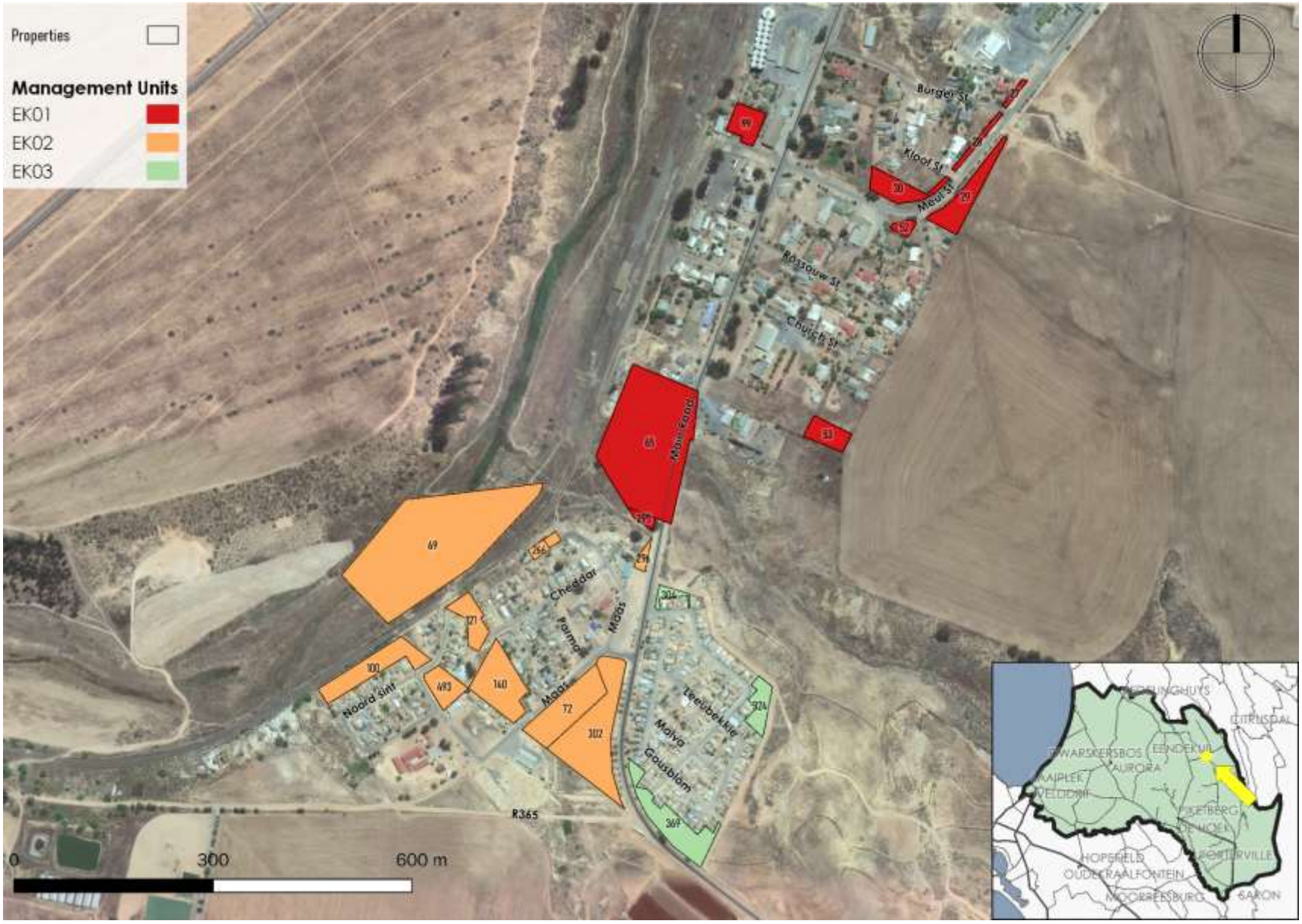
Property	Area (m²)	MU	MU Name	MU Area (m²)	MU Description
4273	14 229				
1100 (Portion of)	12 991				
1100 (Portion of)	46 910				
354	11 507	**PK02**	Piketberg west	54 385	The MU comprises several erven in the western part of Piketberg, most of which are public parks in residential areas. The total extent is 5.4 hectares.
530	793				
531	795				
532	2 206				
598	650				
654	2 608				
655	2 877				
705	2 282				
706	1 651				
843	495				
993	3 039				
1054	1 460				
1383	3 015				
1694	7 694				
1716	3 834				
1732	1 025				
1743	855				
2183	5 410				
3338	652				
3444	1 538				
3733	5 092	**PK03**	Piketberg farms	207 283	The MU comprises the extensive commonage (Farm 241/RE) east of Piketberg. The farm is under lease and is extensively cultivated. The municipal wastewater treatment works and a landfill site are also on the property. The terms of reference for this plan limited the area of interest to the two watercourses within the commonage, as the remainder is under cultivation. The area of these watercourses is approximately 21 hectares.
Various	18 550				
Various	171 240				
Various	12 402				
Porterville					
Various	19 981	**PV01**	Porterville north	19 981	The MU is a river corridor in the northern part of Porterville town, crossing several public roads as well as private residential properties. It is loosely defined as it is not all within municipal ownership but has been selected as a key focus for invasive species management in the town.
2288	3 182	**PV02**	Porterville south	112 699	The MU is a river corridor in the southern part of Porterville town, occurring primarily on municipal commonage (Farm 1002) but also traversing private property and roads in places. It is loosely defined as it is not all within municipal ownership but has been
2609	1 620				
3499	767				
Various	107 130				

Property	Area (m²)	MU	MU Name	MU Area (m²)	MU Description
					selected as a key focus for invasive species management in the town. The MU also includes two small public open spaces in the southwestern part of Porterville.
Velddrif					
482	7 368	**VD01**	Velddrif parks	64 239	The Velddrif parks MU consists of eight erven scattered across the town of Velddrif. The total extent of the MU is 6.42 hectares. Erf 485, the largest of the properties, is 3 hectares in extent and is a public park on Jacaranda Avenue.
485	29 965				
532	3 719				
694	394				
832	2 129				
1098	19 320				
1178	1 030				
1198	315				
484	10 221	**VD02**	Velddrif estuary edge	67 462	This MU incorporates five erven on the edge of the Velddrif estuary, extending (non-continuously) from the road bridge to the eastern edge of the town. They are seldom wider than 30 metres, and in some places (Erf 617) extend some distance into the Berg River. The total area of the MU is 6.75 hectares.
486	46 284				
586	6 595				
617	968				
1229	2 815				
1230	579				

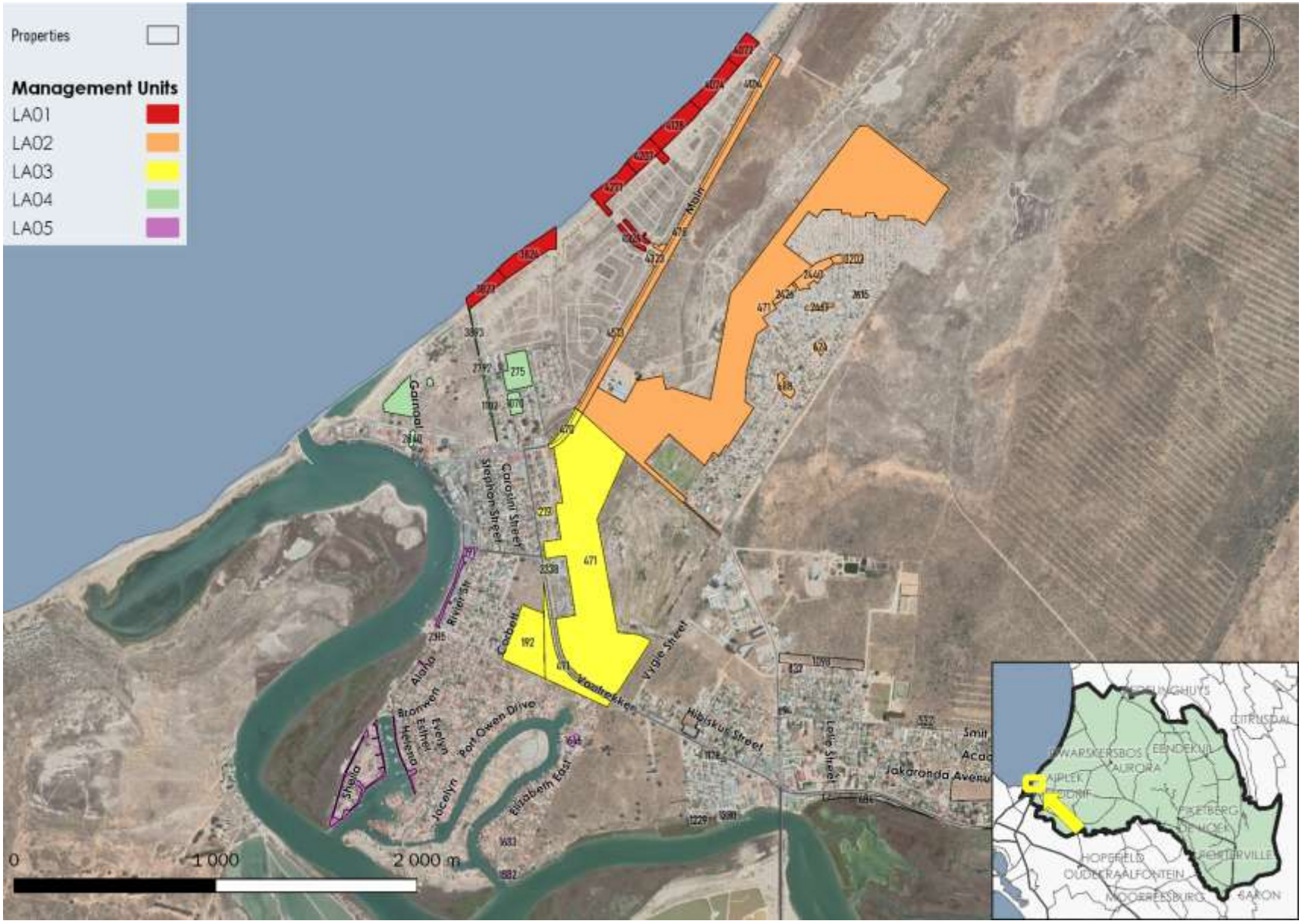


Map 2. Aurora properties and Management Units

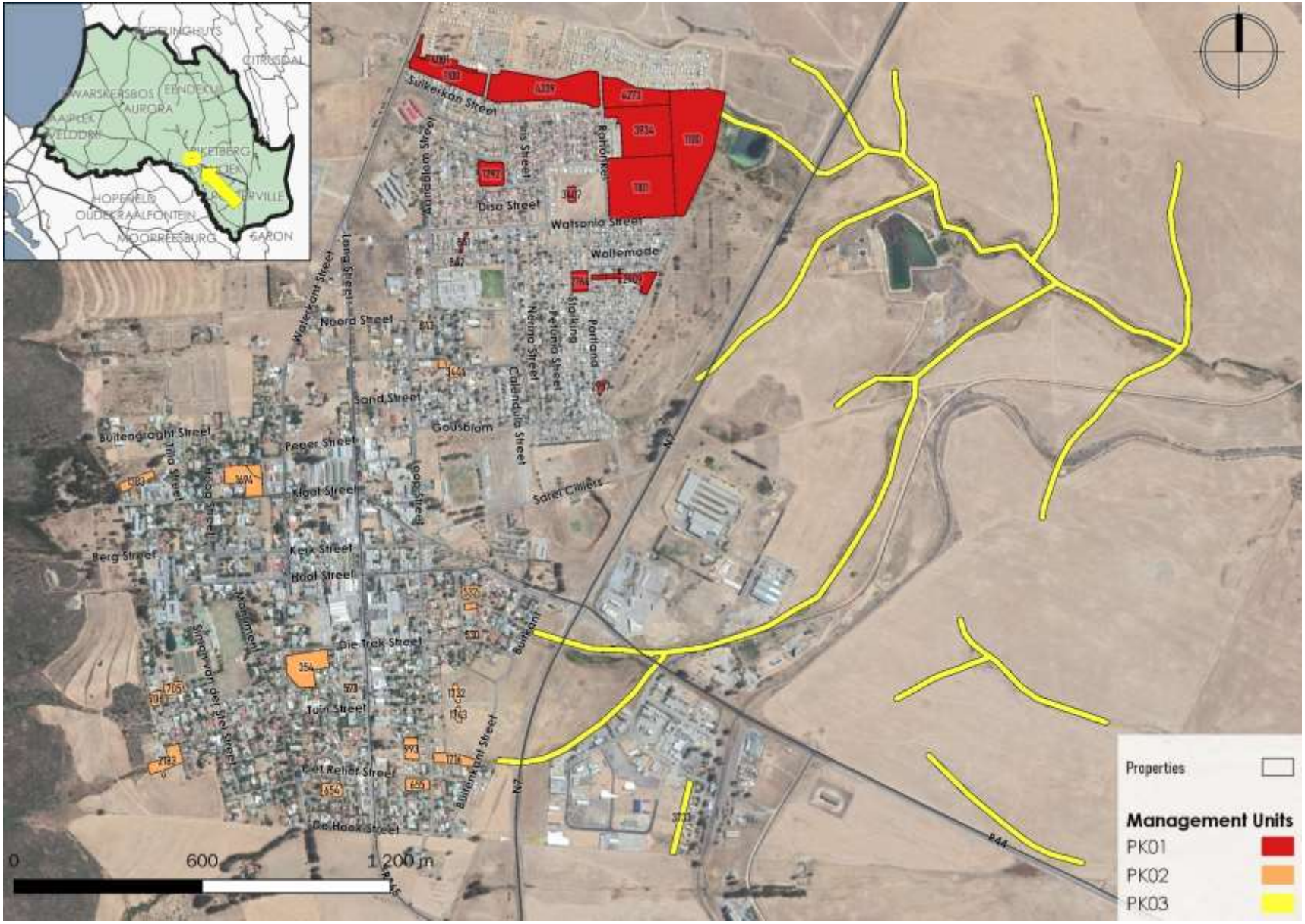
Map 3. Dwarskers properties and Management Units



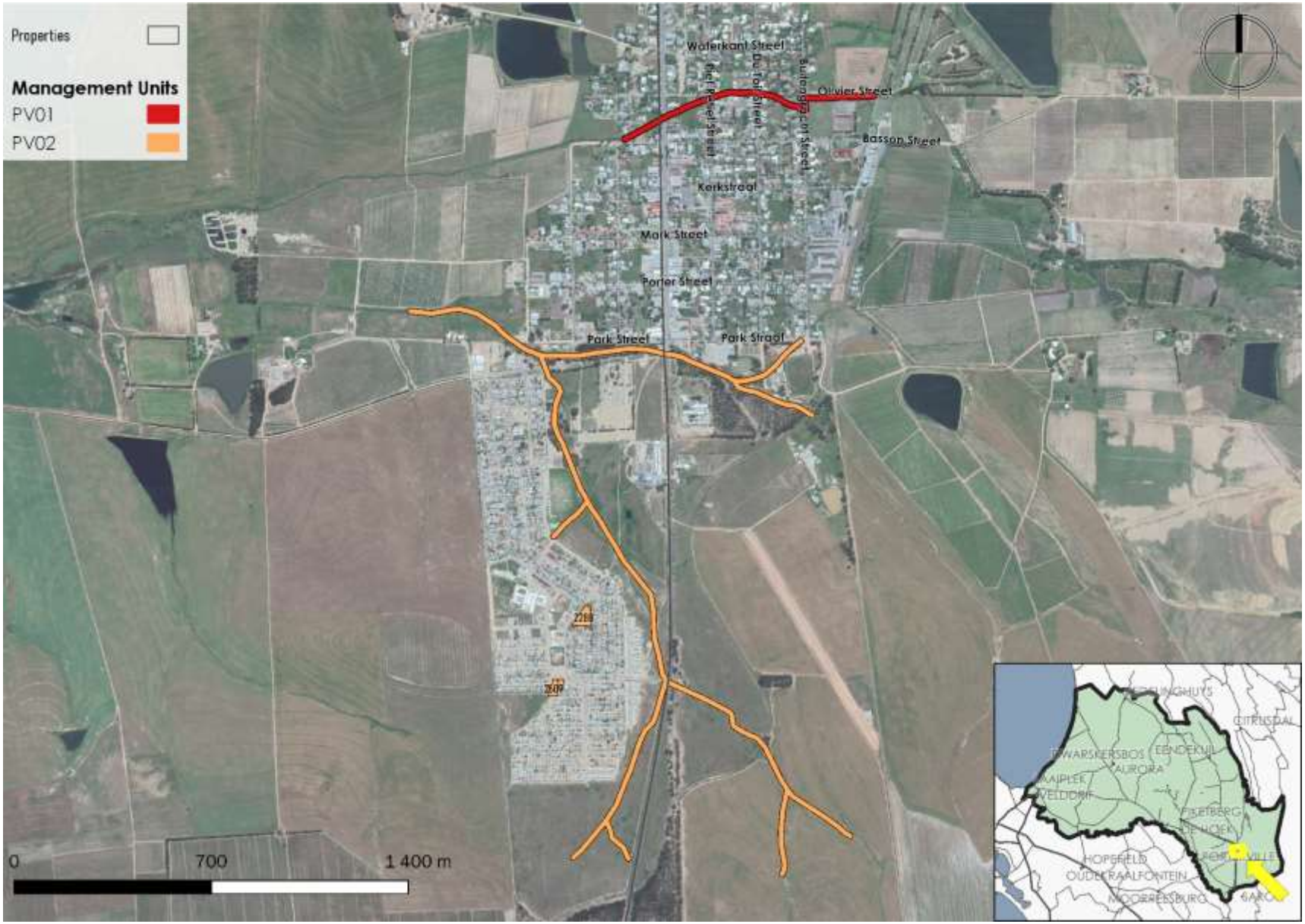
Map 4. Eendekuil properties and Management Units



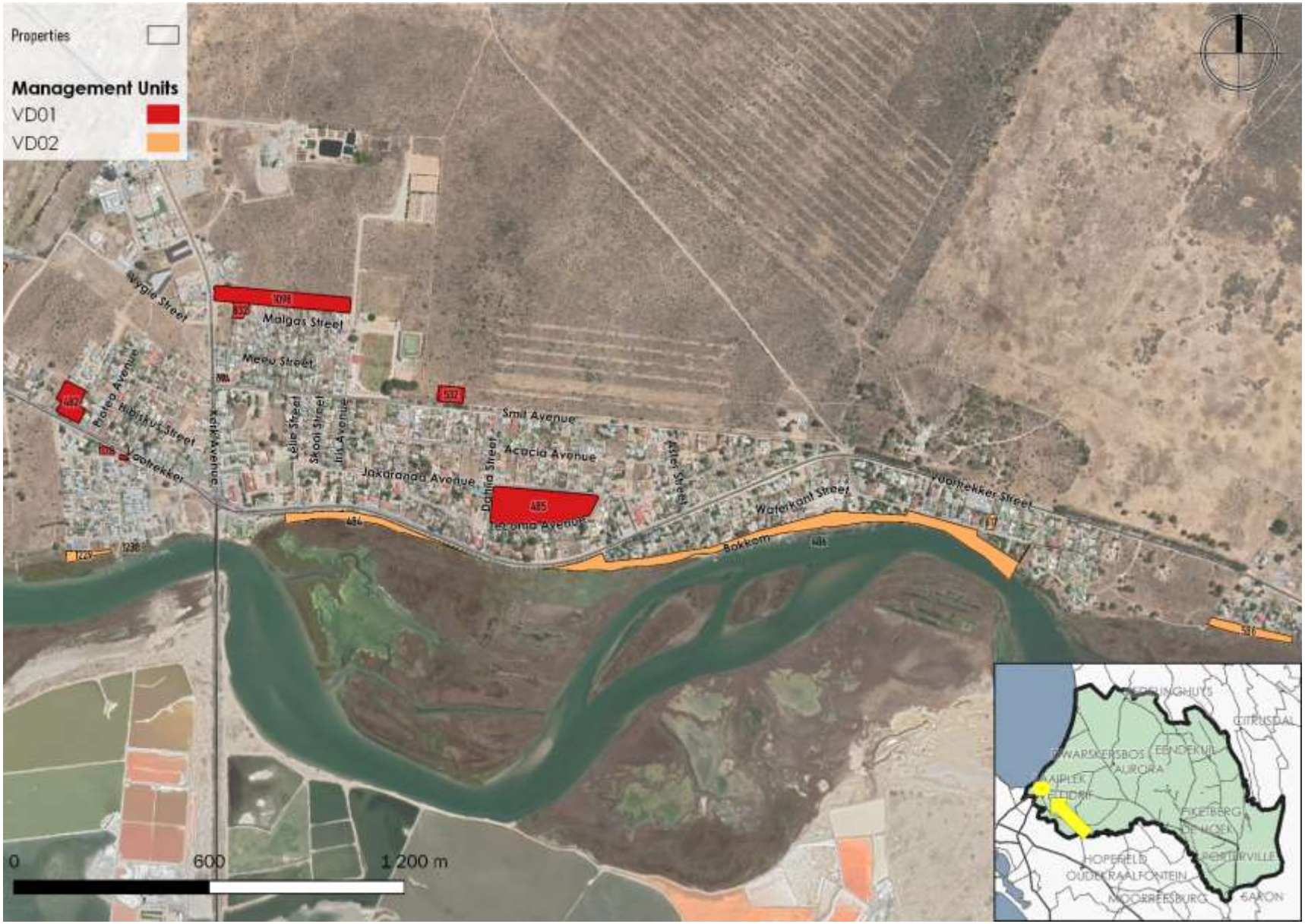
Map 5. Laaiplek properties and Management Units



Map 6. Piketberg properties and Management Units



Map 7. Porterville properties and Management Units



Map 8. Velddrif properties and Management Units

CONTROL PLANNING

4 Control Planning

4.1 Field surveys

The development of this invasive species monitoring, control and eradication plan was informed by visits to each site during November 2019. The study areas were surveyed on foot, and all alien plant species were noted and identified. Invasive alien species were identified to the lowest taxonomic level possible.[6] Photographic and GPS records of site visits were used to aid in mapping the density and extent of invasions. At each site, an effort was made to ensure that all habitat types occurring on the site were visited in order to identify as many as possible alien invasives. All field data was captured in a database and in a geographic information system (GIS) for further processing.

4.2 Management units

A management unit is a section of the property of a size and structure that allows for coherent management interventions to be implemented within that unit. For each property, management units were determined based on several factors:

- topography and access;
- land use;
- vegetation and soils;
- extent and density of major invasions; and
- ease of management (a combination of size and relative workload).

A total of 18 **management units** were determined and assigned unique identifiers.

4.3 Species classification

A total of 41 **listed invasive species** were identified on the municipal properties. These include

- 0 in NEMBA Category 1a,
- 27 in NEMBA Category 1b (and two animals which may occur),
- 4 in NEMBA Category 2, and
- 10 in NEMBA Category 3 (and two animals which may occur).

A different approach has been applied in the case of invasive animal species, due to project time constraints and the challenges of accurately determining numbers of invasive fauna or confirming absence. Instead, invasive animal species which are known to occur or may occur in the habitats found in a management unit are listed as potential invaders.

Each alien invasive plant invasion was further classified into one of the following size classes:

Seedling	Young	Adult	All
< 20 cm (herbs) < 30 cm (woody spp) Can be hand-pulled	Larger than a seedling but not yet at full height / maturity.	Fully-grown and capable of reproduction	A mix of adult and non-adult plants

The extent or density of invasion was then determined for each plant species in each management unit, based on the following simplified matrix:

Few	Ten or fewer individuals
Occasional	Less than 2% cover
Scattered	2-5% cover
Moderate	5-25% cover
High	25-75% cover
Closed	> 75% cover

6 Using, amongst others, Bromilow, C. 2018. *Problem Plants and Alien Weeds of South Africa*, Briza Publications, Pretoria. and online resources from www.invasives.org.za (accessed Jan 2019).

4.3.1 Limitations

The mapping and listing of invasive alien species on each site reflect the state of the sites in November 2019. The extent of invasions will change over time, and certain species may have been missed if they occur only in very localised populations or are identifiable only in certain seasons. Available time for the preparation of this plan, as well as access limitations, did not allow for every part of every site to be visited.

Therefore, invasive species that are not currently known to be invading in a management unit, but which have the potential to invade in the area, are also listed.

4.4 Selection of control methods

As outlined below, there are a variety of possibilities when it comes to control of invasive alien species. The selection of a control method is based on the long-term goals for the site.

Control Methods have been detailed at the species level in section 5, and each site-specific control plan recommends the most appropriate control method per species.

The most common control method proposed is cut stump and spray, which includes Felling (where chainsaws are used on larger trees) and Lopping (where loppers will be used on smaller trees). This method presents a biomass management challenge initially, but if the biomass is managed appropriately, it will result in a much more straightforward follow-up operation.

Control methods recommended in this plan include the following:

4.4.1 Mechanical control

Physical destruction or total removal of plants. Appropriate for sparser infestations and species that do not coppice.

Hand pull

Removal of plants by hand, ensuring that the root system is also removed. Only recommended where soil is soft or sandy, and plants are small enough to be successfully pulled out with the roots intact.

Cut-stump

Cut stem / trunk as low to the ground as possible with a saw, lopper or chainsaw (can also be referred to as Felling), not above ankle height. Apply herbicide to the cut surface immediately after cutting (if required – indicated by "cut-stump and spray").

Ring bark

For large trees, use an axe to remove the tree's bark and cambium in a horizontal band at least 30 cm wide, all the way around the stem and as low to the ground as possible. Apply herbicide to the cut area immediately after ring-barking (if applicable – this is also known as 'Filling'). Not all species require herbicide application.

Bark strip

Using an axe, strip bark of large trees from waist-height down to the ground all the way around the stem. Apply herbicide to the stripped area at the base of the tree immediately after ring-barking (if applicable).

Dig out and burn

Using a spade, dig out all roots and plant matter, ensuring that no material remains in the soil. Collect the material for safe burning. Permits must be obtained and appropriate precautions observed when burning plant material.

Felling

Using a chainsaw, fell larger trees and cut branches and logs into shorter lengths. Training for chainsaw operators is essential, as they must understand the techniques of felling and be able to apply safety precautions. No other persons should work in close proximity to a tree being felled.

4.4.2 Chemical control

Chemical control involves the use of herbicides (chemicals toxic to particular plants) to kill targeted plants. Herbicide must only be used on plant species for which it is registered, and may only be applied by properly trained and certified personnel. Herbicides may be applied using various techniques:

Foliar spray

Using a knapsack sprayer or a handheld sprayer loaded with appropriate herbicide, spray all leaves on plants being controlled to the point at which the herbicide starts to run off the leaves. Training and certification is required for herbicide application using this method.

Soil application

Apply appropriate herbicide directly to the soil surrounding an alien invasive plant.

Cut stump and spray

After cut-stumping, ring-barking, or lopping, apply herbicide directly to the cut surface. Use a handheld sprayer with a nozzle set to the correct spray width. Ensure that herbicide is applied as soon as possible after cutting. When applying herbicide to larger diameter stumps, only the cambium and bark area need to have herbicide applied (outer 50mm).

Stem inject

Using a syringe, inject herbicide directly into the stem or fleshy leaves of a plant. In some species it may be necessary to create a hole before injecting by using a spike or stick.

Basal stem with diesel

Mix herbicide with diesel rather than water, and apply to the base of the plant, preferably after frilling or ring-barking. Minimise runoff as diesel is harmful to the environment.

Cut stump and spray: the Eucalyptus above has been effectively prevented from resprouting by the application of herbicide. Compare with the image below where herbicide was not used

4.4.3 Biological control

Invasive alien plants are successful partly because of a lack of natural enemies that they would have faced in their place of origin. Biological control is based on the introduction of natural enemies that remove this competitive advantage of invasive aliens. Most biocontrol agents are insects, mites or micro-organisms such as fungi or bacteria. Biocontrol agents may attack the reproductive organs (i.e. flowers or fruit) of a plant, or the leaves. They may compromise the plant's reproductive capacity, or may cause stress that either kills a plant or prevents it from spreading.

Biocontrol is often slow, and will never entirely eradicate an invasive species since the biocontrol agent's own survival is usually dependent on the host plant. Passive biocontrol is already present on many species in the BM area, and it has not been recommended as a specific control measure in this control plan since it is unlikely to appreciably improve control efforts.

Rust fungus galls on a Port Jackson Willow (*Acacia saligna*) in Eendekuil. The fungus is a form of biocontrol that slows reproduction and spread but typically does not kill the tree.

***Cylindropuntia imbricata* affected by cochineal, tiny sap-sucking insects that feed only on cactus species. The cactus is damaged and eventually killed by the insect (below).**

4.4.4 Control of feral pigs

Feral pigs are wild populations of escaped or introduced domestic pigs (*Sus scrofa*) and reportedly occur in the Sandveld, which within the Bergrivier Municipality would include the areas surrounding Redelinghuys and possibly Aurora. No distribution data is available for this species.

Control may be achieved using non-lethal methods to prevent access by feral pigs: fencing or the use of guard animals would fall into this category. Lethal means, which include trapping, shooting, and hunting with dogs, are widely used. The primary purpose of control is to reduce feral pig numbers. Complete eradication is possible, but dependent on sustained annual control at a landscape scale – probably beyond the scope of municipal interventions.

It is recommended that the BM engage with and offer support as required in implementing existing management plans for feral pigs in the Sandveld areas of the municipality. Control of pigs on municipal properties alone is unlikely to be feasible.

A control programme for feral pigs has been implemented in the Swartland area near Malmesbury since 2012, funded by the national Department of Environmental Affairs. The programme developed a number of trapping and hunting methods that have been successfully implemented elsewhere.[7]

Corral trapping methods have been utilised with success in the Swartland area. Traps 10 m in diameter are constructed of galvanised mesh approximately 1.8 m in height and with a 2.4 m-wide guillotine-style trapdoor that can be remotely triggered using a cellphone-controlled gate opener. Traps are monitored by a trail camera. Traps are baited with carcases and acorns, and must be pre-baited with a constant supply of bait for one to two weeks before trapping, to condition pigs to entering and leaving the trap unharmed.

Commercially available cage traps may also be used, provided they include a top panel to prevent pigs from escaping. Once trapped, pigs are shot to humanely dispatch them.

The image below depicts one such trap constructed in the Swartland area. Details of the trap design and implementation can be obtained from the service provider responsible for implementing the Swartland programme, Riaan van der Walt of Advanced Environmental Corporation.

[7] AEC 2018. Landowners Guide for Feral Pig Management in the Buffeljags River Area, prepared for Overberg Renosterveld Conservation Trust by Advanced Environmental Corporation.

4.5 Workload assessments and budgeting

Determining the amount of effort required for implementation of control methods on a particular site involves innumerable variables. The assessment of workload and thus time and cost is based on the amount of time that would typically be required for certain tasks. For example, the amount of effort and time needed to cut down a large tree with a chainsaw is vastly different to the time needed to handpull a seedling. These differences must form the basis for workload assessments and budgeting.

The Working for Water programme has developed a set of norms, based on observations and records of the factors affecting productivity, in particular:

- Species,
- Density,
- Age class, and
- Control Method.

If this data is available for a site, a person-day calculation can be developed using the Norms. In most cases, the person-day calculations require significant adjustment for walk time, drive time, access, slope, and other factors. The complexity is increased when more species are involved. In these cases, the person-day figures must be adjusted based on industry experience.

The person-days allocated to each species on each site are loosely based on the Working for Water Programme species norms, but have been adjusted in certain cases due to site conditions, control methods, and previous project experience. It must be noted that the persondays allocated to each site do not include the persondays needed for biomass management.

All workload estimates and associated budgets are based on a set of assumptions regarding the effectiveness of the implementation of the control methods, which is itself a function of the effectiveness of management of the staff and contractors responsible for implementation. The workload, budget and timeframe assessments are to some extent a 'best-case' estimate, based on industry norms and on the authors' experience of implementation under the Natural Resource Management programme.

Should the quality of work not be effectively managed, or should the scheduled implementation, follow-up and monitoring not be adhered to, the workload and budget estimations may be significantly underestimated. Other factors outside the scope of this plan include changes to the site conditions as a result of fire, farming practices, or land use. The plan is based on site conditions during January 2019, and will require amendment and updating as conditions change.

Invasive species control is not a one-off intervention, since invasive alien species will typically rapidly recolonise or regrow in areas disturbed by initial clearing efforts or where other drivers such as wildfires have changed the conditions on the site. As there will always be some measure of regeneration after initial clearing, regular and effective follow-up and maintenance is vital. Should maintenance be neglected, all progress made during initial clearing may be lost within a few years. If implemented effectively, however, the costs of management will decline rapidly over time as the extent and density of invasion decreases. The reestablishment of indigenous vegetation should also be supported, to reduce the risk of erosion and to reduce reinvasion by alien invasive species.

On most sites, follow up has been recommended every year after the initial clearing for up to 5 years. Thereafter, follow up is less frequent. The first few years require frequent follow-up due to the seed bank that will produce more seedlings after the initial clearing. After 5 years of good quality, consistent clearing, if there is no significant disturbance (e.g. fire or erosion) then the infestation will be largely under control and will just need to be kept clear by removing individual alien invasives every few years. The timing of follow ups is also dependent on which species are being controlled. Acacias, for instance will need rapid follow up as they recolonise areas quickly, while pines can be revisited on a slower rotation.

4.5.1 Budgets and timeframes for regulatory approvals

In the event that a water use or environmental authorisation is required for the control activities, budgets and implementation timeframes will need to be adjusted accordingly.

4.6 Biomass management

Biomass management is critical to the success of control operations. Wherever there are dense infestations, it is recommended that the material be removed when inside the urban and riparian areas (as much as is possible). This will allow for better access to follow up control, facilitate rehabilitation and growth of indigenous vegetation, and in some cases can provide usable wood for firewood or timber. By removing the biomass, the fire hazard is also much reduced and the risk of wildfires is managed. On sites that are used as resorts or for farming, it is necessary to remove cut material to enable everyday operations.

The methods used for determining the biomass management strategy were based on:

- **Density of the infestation and type of material**. Typically, high density woody material should be chipped or at least debranched and material removed to a dump site.
- **The threat posed by cut material**. E.g. if wind or steep slopes increase the risk of material falling onto a road or into a river.
- **Accessibility and practica**lity of moving cut material (in very steep areas it is completely impractical to remove cut material).

4.6.1 Economic opportunities and biomass beneficiation

Aside from the direct subsidisation of employment and training opportunities through programmes such as the Expanded Public Works Programme, there are potential economic beneficiation opportunities associated with the clearing of alien invasive species. Specifically, the beneficiation of biomass from woody alien plants has the potential to assist in offsetting clearing costs. It is a readily available resource that has to be removed and can be used in a complementary way with other resources, depending on application.

Potential applications for woody alien biomass on the BM's properties include:

- Timber and furniture production
- Waste to energy
- Biochar
- Fire/braai wood

Although it is beyond the scope of this control plan to determine the viability of particular forms of biomass beneficiation on BM's properties, the following factors should be considered in the pre-implementation phase:

- Saleable value of the final product.
- Other input costs for processing of biomass.
- Distance to market and cost of transportation.
- Steep slopes and accessibility.

Clearing can produce large amounts of biomass that must be managed effectively to reduce fire risk and nuisance.

SPECIES

Malva dendromorpha in Velddrif

5 Species

The tables overleaf describe each listed alien invasive species identified on the BM properties, as well as various invasive alien animal species which are known or considered likely to occur on the sites. In each case, a general description and a selection of photographs is provided as well as the species' NEMBA and CARA status. Photographs are the authors' own unless otherwise indicated.

Correct identification of invasive alien species is vital for two reasons:

- Ensuring that existing or new invasions are recognised and combated
- Preventing harm to indigenous plants or animals

This is not an exhaustive guide and it is recommended that implementation staff undergo specific training in the identification of alien invasives, supported by field excursions. Identification begins with observation – looking at key features of a specimen to compare them with known species. In the case of plants, this involves looking at the **growth form** (grass, shrub, cactus, tree), the **leaves** (size, shape, arrangement, texture, colour, and number), the **bark** (texture, colour), the **flowers** (number, colour, size, shape), and the **seeds and fruit** (colour, shape, size) if present. For animals, the **habitat, size,** and **colouring** are important features.

Resources that may be of use in identifying invasive species include:

- Clive Bromilow's ***Problem Plants and Alien Weeds of South Africa*** published by Briza Publications in 2018
- Online resources maintained by Invasive Species South Africa at **www.invasives.org.za** (not operational as of February 2020)
- Species datasheets from the Invasive Species Compendium, hosted at **http://cabi.org/isc**
- The smartphone application and website iNaturalist (**www.inaturalist.org**)

5.1 Plants

Table 2. Listed invasive alien plant species

NEMBA = Category in terms of 2016 NEMBA Regulations (simplified). **CARA** = Category in terms of 1984 CARA Regulations. **"nl"** = not listed.

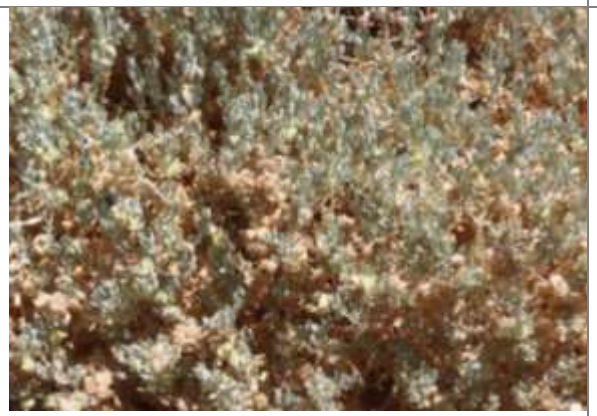
Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Acacia baileyana	Bailey's wattle	3	3	An attractive silver-grey tree with very fine bipinnate leaves and bright yellow round flowers.	Replaces indigenous species and threatens biodiversity.	**Cut stump.** No registered herbicide		1
Acacia cyclops	Rooikrans Red eye	1b	2	Tree or shrub, evergreen and thornless with a dense, untidy appearance. On the coast it grows as a low shrub up to 1.5 m, while inland it averages 3 m and may reach up to 8 m. Young branches are smooth. Leaves 3 to 9 cm long and up to 1.5 cm wide, and grow in a	Originally introduced to stabilise drifting sands, rooikrans forms dense, impenetrable thickets with intertwined crowns that exclude natural vegetation.	**Cut Stump** or **Foliar spray** with Garlon 4 at 0.5% mix and 0.5% wetter		1,3

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
				hanging position. Bright yellow flowers 7 to 8 mm in diameter, in inflorescences produced throughout the year but mainly Oct to Feb. Pods up to 15 cm long, often twisted. When mature, dark-brown or black seeds are exposed, surrounded by a bright red seed stalk. Does not coppice readily.				
Acacia elata	Pepper tree wattle	1b	3	Large, tall, graceful tree with pale brown bark and long rounded pinnate leaves. Often planted as an ornamental.	Large trees can replace indigenous vegetation	**Cut stump.** No registered herbicide		[1]

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Acacia saligna	Port Jackson willow	1b	2	Evergreen willowy shrub or tree up to ten metres high. Long, blue-green turning bright green leaves up to 20 cm long and 1-5 cm wide. Bright yellow, globe-shaped flowers bloom from August to November. Brown pods 5 to 10 cm long and 5 to 6 mm wide, flat, with hardened, whitish margins.	Grows very rapidly and produces copious amounts of long lived seed. Resistant to fire and felling – coppices and regrows rapidly afterwards – and germination of the seeds is stimulated by fire. Dense thickets of Port Jackson which exclude almost all other plants, drastically reducing biodiversity in the area. Increases biomass and decreases moisture content, resulting in changes in fire regime.	**Cut Stump** and Spray with Lumberjack 3% and 0.5% wetter **Foliar Spray** with Garlon 4 at 0.5% and 0.5% wetter	 	1,4

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Agave americana	Spreading century-plant, Agave	3	nl	Evergreen perennial subshrub with very large succulent sword-shaped leaves up to 2 m in height. Leaves are grey-green, sometimes with a pale central stripe or yellow margins. Margins have teeth of up to 10 mm long. Produces a single, tall inflorescence up to 9 m tall, with funnel-shaped greenish yellow flowers. Found around old habitations, along watercourses and roadsides.	Forms dense impenetrable stands. Renders areas inaccessible to humans, game and livestock.	**Foliar Spray** with Turbodor at 100% Or **Dig out** and cut up plant material		5

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Agave sisalana	Sisal hemp, Sisal	2	2	Evergreen perennial succulent shrub with no stem, with thick sword-shaped leaves up to 1 m long. Leaves are bright green with smooth margins. Single much-branched flower cluster as tall as 12 m.	Forms impenetrable barrier as leaves are tipped with a spine. Renders areas inaccessible to humans, game and livestock.	**Foliar Spray** with Turbodor at 100%		2
Ailanthus altissima	Tree-of-heaven	1b	3	A hardy and adaptable deciduous tree. Typical long graceful leaflets. Seeds are paper winged samaras. Very small flowers.	Aggressive, forms strong root suckers and can prove very difficult to kill. Outcompetes indigenous plants and gives off allelopathic chemicals to restrict competition	**Handpull.** Remove and incinerate all seedpods.		1,5

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Arundo donax	Spanish reed, Giant reed	1b	1	Tall, perennial cane- or reed-like grass 2-10 m tall. Stems are partitioned like bamboo, 1-4 cm in diameter. Pale blue-green leaves up to 70 cm in length. Flowers large, whitish, plume-like, 30-65 cm between March and September.	Aggressive, reproduces quickly and outcompetes indigenous species. Particularly invasive in riparian areas, where it lowers the groundwater table. Highly flammable and can change fire regimes.	**Cut Stump and spray** with Kilo WSG at 3% with 0.1% wetter. Ideally in late summer.		7
Atriplex inflata	Sponge-fruit Saltbush	1b	3	Low soft woody shrublet 20 to 40 cm in height, with creamy – white branches and grey to bluish-green leaves. Flowers cream to yellow, small. Fruits grey-green to pink or straw-coloured, spongy and inflated, up to 10 mm in size.	Forms dense stands, particularly on overgrazed land. Competes with and replaces indigenous vegetation.	**Handpull** or **cut stump**. No registered herbicide		2

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Atriplex nummularia	Old man saltbush	2	2	Large multi-stemmed shrub up to 3 m tall and 4 m wide, deciduous with silvery-grey leaves 1-5 cm in length. Fruits fan-shaped, up to 6 mm in diameter. Thrives in harsh saline environments.	Competes with and has the potential to replace and reduce indigenous species.	**Handpull** or **cut stump**. No registered herbicide		2
Callistemon viminalis	Weeping bottlebrush	3	nl	Shrub or small tree up to 8 m in height. Pendant branches with leaves 3 to 7 cm long and 3 to 7 mm wide. Distinctive bright red flower spikes are 4 to 10 cm long and 3 to 6 cm wide, borne in spring and summer. **Do not confuse with** indigenous bottlebrush species.	Competes with and replaces indigenous species.	**Cut stump and spray** with Format at 2% mix with 0.1% wetter.	 Source: invasives.org.za	2

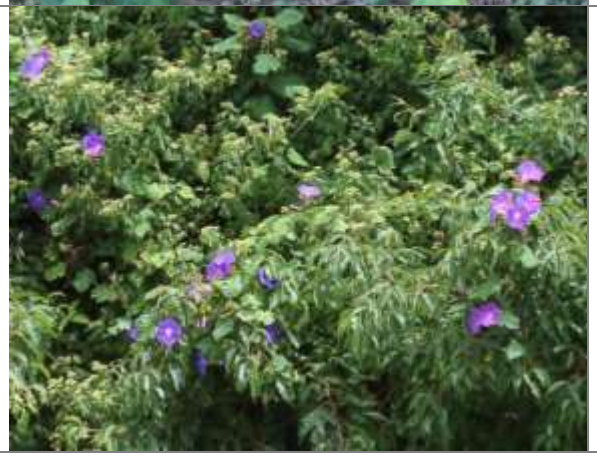
Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Canna indica	Canna, Indian shot	1b	1	Perennial leafy shrub 0.5 to 2.5 m in height with large, tapering green or purple leaves sheathing the stem. Red, orange or yellow flowers and green spiny fruits.	Forms dense spreading clumps that compete with and replace indigenous species.	**Dig out**. No registered herbicide	 Source: environment.co.za	2
Casuarina cunninghamiana	Beefwood	1b or 2	2	Evergreen tree with fine needle-like leaves and arching, slender branches. 10 to 35 m in height, with dense rough bark. Cones small, nearly round and 10 mm in diameter. Strongly resembles pine trees but unrelated.	Can invade even nutrient-poor soils as its roots can fix nitrogen. Alters the soil and local ecology, inhibiting natural vegetation growth by creating a thick layer of leaf litter and through allelopathic chemicals.	**Cut Stump and spray** with Garlon 4 at 3%, 0.1% wetter		1,2

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Cirsium vulgare	Scotch thistle	1b	1	Spiny, herbaceous biennial plant with a large basal rosette of leaves and a flowering stem up to 1.5 m high. Leaves dark green, deeply lobed with stiff hairs. Flowers purple to pink, thistle-like with spines around the base. Seeds silky, plumed.	Common in pastures and indicative of poor veld management. Reduces carrying capacity of pasture or natural veld.	**Hand pull** and remove material. Low infestations.		1,2,8
Echium plantigineum	Patterson's curse	1b	1	Annual or biannual herb, with hairy dark green oval leaves. Stems grow to 120 cm in height. Purple or blue, tubular flowers in clusters, 2-3 cm long.	Competes with pasture crops for space and moisture. May outcompete indigenous vegetation, particularly in disturbed areas. Toxic to livestock.	**Hand pull**. For very low infestations Or **Foliar spray** with Mamba at 4L/ha		1,2
Eucalyptus camaldulensis (and hybrids)	River red gum	Always **1b** in riparian areas, protected areas, or listed ecosystems.	2	Tall tree up to 40 m with a large spreading crown. Bark white or grey, sometimes red, smooth and	Competes with and replaces indigenous species. Reduces stream flow when occurring along watercourses.	**Cut Stump and spray** with Plenum 160ME at 4.5% mix, with 0.5% wetter.		9

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
		1b in the fynbos biome, but - **2** in plantations, windrows, bee forage areas or lining avenues. **nl** in cultivated land at least 50 m from untransformed land, or within 50 m of a farmhouse, or in urban areas for trees >400 mm in diameter.		sheds in strips or flakes. Rough bark may occupy the lower 1-2 m of the trunk. Leaves pale, dull green. Inflorescence axillary, 7-11-flowered. White flowers. Capsules hemispherical or egg-shaped, 5-7 mm long and wide, with exserted valves. Important in the bee industry, but must be controlled in riparian areas.	Suppresses ground vegetation and increases soil erosion. Increases fire hazard.			
Eucalyptus cladocalyx (and hybrids)	Sugar gum	Always **1b** in riparian areas, protected areas, or listed ecosystems. **1b** in the fynbos biome, but - **2** in plantations, windrows,	2	Tall, slender tree with smooth, flaky, tan-coloured bark. Leaves dark green and glossy above. Inflorescence axillary, 7-11-flowered. White flowers. Capsules barrel or urn-shaped, with included valves.	Competes with and replaces indigenous species. Reduces stream flow when occurring along watercourses. Suppresses ground vegetation and increases soil erosion. Increases fire hazard.	**Cut Stump and spray** with Plenum 160ME at 4.5% mix, with 0.5% wetter.		10

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
		bee forage areas or lining avenues. **nl** in cultivated land at least 50 m from untransformed land, or within 50 m of a farmhouse, or in urban areas for trees >400 mm in diameter.		Important in the bee industry, but must be controlled in riparian areas.				

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Eucalyptus gomphocephala *NOT listed as an invasive alien but occurs on several of the sites in this plan and is therefore included as a reference for identification.*	Tuart	NOT LISTED	NOT LISTED	Tall evergreen tree with dark, rough bark throughout. Adult leaves are glossy green and buds are mushroom-shaped. Capsules, large, barrel-like.		**Control not required at present**	 	
Grevillea robusta	Australian silky oak	3	3	Tall evergreen tree 18-30 m in height. Bark dark grey and furrowed. Leaves fern-like, 10 to 30 cm long, dark green above and greyish-white below. Flowers bright orange, bottle-brush like sprays. Seeds	Competes with and replaces indigenous species. Inhibits growth of indigenous species through allelopathic chemicals.	**Cut Stump.** No registered herbicide		2,11

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
				winged, up to 2 cm long.				
Hedera helix	English ivy	3	nl	Woody evergreen perennial climber with large glossy green heart-shaped leaves.	Spreads rapidly and may smother trees and shrubs. Grows readily in deep shade and wet areas.	**Hand-pull** No registered herbicide		
Ipomoea purpurea	Morning glory	1b	3	Herbaceous twining annual with bright green, heart-shaped leaves and purplish-blue, magenta or white funnel-shaped flowers.	Scrambles over and competes with other species.	**Foliar spray** with Springbok at 2%. No Wetter.		2

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Jacaranda mimosifolia *NOT listed as an invasive alien in the Western Cape in terms of NEMBA but occurs on several of the sites in this plan and is CARA listed.*	Jacaranda	nl in Western Cape	3	Striking ornamental tree with bipinnate leaves, clusters of lilac flowers in summer, and		Control of adult trees not required. **Handpull** seedlings		
Lavatera arborea	Tree mallow	1b	nl	Herbaceous, biennial plant up to 3m in height with a woody stem and large leaves. Produces large pink flowers	Typically invades waster areas, sand dunes and roadsides	**Cut stump** or **handpull** depending on size. No registered herbicide		[1]

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Limonium sinuatum	Statice	1b	nl	Herbaceous perennial, low-growing with dense basal dandelion-like leaves. Flowers conspicuous, blue, pink or white, and papery.	Invades grassland and fynbos, outcompeting indigenous species	**Handpull**		1
Melia azedarach	Syringa, Seringa	1b **or** 3 in urban areas	3	Large spreading tree up to 20 m in height with reddish brown, smooth bark. Serrated dark green glossy leaves. Clusters of purple to lilac flowers. Produces abundant marble-sized, pale yellow berries which often remain on the tree for a year or more.	Invades streams and riparian areas, establishing and growing rapidly in disturbed areas and replacing indigenous vegetation. Berries are poisonous.	**Cut Stump and spray** with Hatchet at 3%. No need for wetter or dye, it is included		1,2

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Myoporum tenuifolium	Manatoka	3	3	Large, densely branched shrub up to 10 m in height. Leaves thin, elliptic, 5 to 7 cm long and 1 cm wide.	Replaces indigenous vegetation in coastal fynbos, dunes and riverbanks. Poisonous to humans and animals.	**Cut Stump**. No registered herbicide		1
Nerium oleander	Oleander	1b	1	Evergreen shrub or small tree up to 6 m in height with dark, dull green leaves. Pink, red or white flowers with a single row of petals.	Competes with and replaces indigenous species. Plant is highly toxic to humans and animals and the sap is a skin irritant.	**Cut Stump and spray** with Hatchet at 10%. No need for wetter or dye, it is included		1,2

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Nicotiana glauca	Wild tobacco	1b	1	An evergreen shrub or small tree growing up to 6m high with blue- or grey-green, leathery leaves. Yellow, tubular flowers appear in terminal, drooping clusters all year.	Competes with indigenous species. Forms dense and extensive stands along watercourses, which may reduce water flow.	**Cut Stump.** No herbicide registered for cut stump. or **Foliar spray** with Springbok at 3% with 0.1% wetter		2,12
Opuntia aurantiaca	Jointed cactus	1b	1	Low-growing cactus seldom above 50 cm with elongated, cylindrical segments. Large numbers of sharp barbed spines, which cause segments to become attached to passing animals or humans. These joints will regenerate into new plants when dislodged. Bright yellow flowers like miniature of	Competes with indigenous species. Dense infestations reduce grazing potential for both livestock and wild animals.	**Foliar spray** with Turbodor (100%).	 Source: invasives.org.za	2,13

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
				those of *O. ficus-indica*.				
Opuntia ficus-indica	Sweet prickly pear	1b	1	Branched cactus up to 5 m in height. Flattened, grey to green cladodes branch from a central trunk. Spines up to 10 cm long in groups of 3 to 6. Bright yellow or orange flowers followed by edible fruit.	Can aggressively invade and render infested land inaccessible.	**Stem inject** with Springbok at 33%, 0.1% wetter Or **Dig out** and chop up with spade for very small plants and infestations. Ensure very well chopped up.		14

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Pennisetum clandestinum	Kikuyu	**1b** in protected areas and wetlands in which it does not already occur. **nl** elsewhere.		Rhizomatous grass with matted roots and a creeping habit. May grow up to half a metre high when ungrazed, but forms a dense turf when mowed or grazed.	Forms a thick mat that crowds out other species, particularly in wetlands.	**Foliar spray** with Springbok at 1.5% mix	  Source: invasives.org.za	2,15

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Pennisetum setaceum	Fountain grass	**1b**	1	Tussock-forming perennial grass with feathery, spike-like inflorescences 10 to 25 cm long and purple or pink-tinged.	Replaces indigenous vegetation.	**Foliar spray** with Seismic 1.5% mix with 1.5% wetter.		[1]
Pinus canariensis	Canary pine	**2**	3	Tall coniferous tree up to 40m in height. Long drooping needles, clustered. Grey to white young needles often emerge near the ground if the tree is under stress. Cones up to 18cm long and 5cm wide, becoming glossy chestnut in colour	Replaces indigenous vegetation	**Cut Stump.** No regisitered herbicide. Resprouts vigourously, Consider digging out.		[1]

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Pinus halepensis	Aleppo pine	**3**	2	Slender single-stemmed pine tree up to 20 m in height. Bark greyish and smooth at first, in older specimens reddish-brown or orange. Needles pale green or yellow-green 4-8 cm long. Cones conical, 5-12 cm long, turned downward.	Competes with and replaces indigenous species. Reduces water runoff and can pose a fire hazard.	**Cut Stump**. No herbicide necessary. **Ringbark** where needed.	 	16

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Pinus radiata	Radiata pine, Monterey pine	**2** for plantations and windrows **1b** elsewhere	2	Tall coniferous tree 8 to 15 m in height, conical when young becoming cylindrical. Bark reddish-brown, deeply cracked into plates. Needles dark green, usually in threes, very dense. Cones large, yellowish-brown, egg-shaped with large thick scales ending in a fine thorn.	Competes with and replaces indigenous species. Reduces water runoff and stream flow, and poses a fire hazard.	**Cut Stump**. No herbicide necessary **Ringbark** where needed		2

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Prosopis glandulosa	Honey mesquite	1b	2	Multi-stemmed, acacia-like shrub or small tree up to 10 m in height. Thick, straight spines on each twig. Leaves bipinnate, dark green. Flower spikes yellow, between June and November.	May lower water table and affect runoff and stream flow. Dense stands compete with and replace indigenous species.	**Cut Stump and spray** with Confront at Super 4% mix, add 0.5% wetter. or **Foliar spray** with Confront at 1.5% mix, add 0.5% wetter	 	2,17
Ricinus communis	Castor-oil plant	2	2	Annual shrub or small tree with distinctive green or red, spreading star-shaped leaves.	Competes with indigenous pioneering species especially in watercourses. Seeds very poisonous.	**Cut Stump and spray** with Hatchet at 3%. No need for wetter or dye, already included.		2

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Sambucus nigra	European Elder	1b	nl	An evergreen bush with bright green leaves, white flowers and Black berries. The leaves have a strong smell.	Establishes in waste areas and can replace indigenous vegetation.	**Cut Stump.** No registered herbicide.		[1]
Schinus terebinthifolius	Brazilian pepper tree	3	3	Evergreen tree or shrub reaching more than 6 m in height, with spreading branches. Leaves dark green. Bright red berries borne in late summer.	Aggressively invades disturbed sites and replaces indigenous vegetation. Particularly problematic in wetland or riparian areas.	**Cut Stump and spray** with Lumberjack at 3% mix with 0.1% wetter		[1,2]

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Sesbania punicea	Red Sesbania	1b	1	Small deciduous tree with compound pinnate leaves and bunches of bright red to orange flowers. Brown, winged pods 6 to 8 cm long.	Invades wetland and riverine areas, as well as disturbed sites. Forms dense monospecific stands that can transform the landscape and replace indigenous vegetation.	**Cut Stump and spray** with Hatchet at 2%. No need for wetter or dye, already included. **Handpull** where the plants are small enough		18
Tamarix ramosissima	Tamarisk	1b	1	Shrub or small tree 1 to 5 m high with reddish brown bark. Twiggy, woody branches covered with small, scale like leaves. Minute pink flowers are borne in long feathery terminal spikes. **Do not confuse with** indigenous *T. usneoides*, which has white (not pink) flowers.	Replace indigenous vegetation and increase salt levels in the soil. Invade watercourses, sandy river banks and drainage lines, removing soil moisture particularly in arid environments.	**Cut Stump and spray** with Lumberjack at 3% mix with 0.5% wetter		1,19

Species name	Common names	NEMBA	CARA	Description	Impact	Control method	Photo	Ref
Tecoma stans	Yellow bells	1b	1	Evergreen shrub or tree up to 10 m in height. Pinnate leaves, bright green with serrated margins. Bright yellow, trumpet-shaped flowers, followed by long green flattened seed pods turning brown before splitting to release winged seeds.	Forms dense stands, replaces indigenous vegetation and alters ecosystem structure.	**Cut Stump**. No registered herbicide		1,20
Tipuana tipu	Tipu tree	3	3	Large, massively branched, wide-spreading deciduous tree up to 23 m high. Bright green pinnate compound leaves up to 25 cm long. Sprays of bright yellow flowers in spring and summer. Yellowish-brown, seeded winged pods 5-6 cm long.	Competes with and replaces indigenous species, particularly in disturbed areas.	**Cut stump**. No registered herbicide		1,2

References for descriptions, impacts, and other information:

1	Bromilow, C. 2018. *Problem Plants and Alien Weeds of Southern Africa*. Pretoria: Briza.
2	Invasive Species South Africa. 2019. www.invasives.org.za (website). Accessed January-March 2019.
3	De Beer, H. 1986. Rooikrans species factsheet, Weeds A.7/1986
4	Impson & Lin Besaans. 2014. *Acacia saligna* factsheet. ARC Plant Protection Research Institute.
5	Baloyi, CM. &Klopper, RR. 2017. http://pza.sanbi.org/agave-americana (website) National Herbarium, Pretoria August 2017. Accessed March 2019.
6	Cape Town Invasives 2018. https://www.capetowninvasives.org.za/target-species/target-plants/tree-of-heaven-ailanthus-altissima. Accessed February 2020
7	CABI. 2018. Invasive Species Compendium: *Arundo donax*. https://www.cabi.org/isc/datasheet/1940 (website). Accessed March 2019
8	Ndou, M. & Koekemoer, M. 2017 http://pza.sanbi.org/cirsium-vulgare (website). National Herbarium, Pretoria May 2017. Accessed March 2019.
9	CABI. 2015. Invasive Species Compendium: *Eucalyptus camaldulensis*. https://www.cabi.org/isc/datasheet/22596 (website). Accessed March 2019
10	*Gums & Bees*, 2015. Published by SANBI, DEA, WFW.
11	CABI. 2018. Invasive Species Compendium: *Grevillea robusta*. https://www.cabi.org/isc/datasheet/25866 (website). Accessed March 2019
12	CABI. 2018. Invasive Species Compendium: *Nicotiana glauca*. https://www.cabi.org/isc/datasheet/36324 (website). Accessed March 2019
13	Klein, H. Jointed cactus (*Opuntia aurantiaca*) (website). http://www.arc.agric.za/arc-ppri/Pages/Jointed-cactus-(Opuntia-aurantiaca)-(Solanaceae).aspx. Accessed March 2019
14	Besaans, L. 2011. *Opuntia ficus-indica* factsheet. ARC Plant Protection Research Institute.
15	CABI. 2018. Invasive Species Compendium: *Pennisetum clandestinum*. https://www.cabi.org/isc/datasheet/39765 (website). Accessed March 2019
16	CABI. 2018. Invasive Species Compendium: *Pinus halepensis*. https://www.cabi.org/isc/datasheet/41617 (website). Accessed March 2019
17	CABI. 2018. Invasive Species Compendium: *Prosopis glandulosa*. https://www.cabi.org/isc/datasheet/44439 (website). Accessed March 2019
18	Klein, H. 2014. Red sesbania (Sesbania punicea). http://www.arc.agric.za/arc-ppri/Pages/Red-sesbania.aspx (website). Accessed March 2019.
19	CABI. 2019. Invasive Species Compendium: *Tamarix ramosissima*. https://www.cabi.org/isc/datasheet/52503 (website). Accessed March 2019
20	Besaans, L. 2014. *Tecoma stans* factsheet. ARC Plant Protection Research Institute.

5.2 Animals

Table 3. Listed invasive alien animal species

NEMBA = Category in terms of 2016 NEMBA Regulations (simplified).

Group	Species name	Common name	NEMBA	Description	Impact	Control method	Photo	Ref
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	Small, medium to dark brown ants, reaching 2 to 3mm in length. They are less tolerant to high temperatures and dry conditions, compared to native ants. **Habitat**: Occurs in agricultural areas, coastland, natural forests, planted forests, range/grasslands, riparian zones, disturbed areas, and urban areas. Constructs shallow, 1- to 2-inch deep mounds in open, often disturbed habitats, either moist or dry.	Reduces indigenous ant diversity, and reduces seed germination in fynbos.	It is not known whether control methods have been successfully applied in SA. Insecticide baits have been used with varying success in small populations in Australia and New Zealand.[8,9] Unlikely to be practicably controllable on municipal property.	 Image source: invasives.org.za	[1]

8 http://issg.org/database/species/management_info.asp?si=127&fr=1&sts=&lang=EN
9 https://www.cabi.org/isc/datasheet/30839

Freshwater fish	Cyprinus carpio	Common carp	3 where it occurs, 1b in protected areas, 2 for release where it does not occur	Large, omnivorous, toothless fish reaching over 1m in length and 24kg in weight. Colour is variable, in most cases olive above and with a lighter colour below. **Habitat**: Large, shallow, vegetated freshwater habitats. Known to occur in the upper Berg River estuary and may range closer to the mouth during dry summer months.				1,2

Mammals	*Sus scrofa*	Feral pig	1b Not listed when not feral	Domestic pigs which have escaped or been released into the wild and naturalised. Coat typically coarser than domestic counterparts. Feral pigs tend to be nocturnal especially in areas where they are actively hunted. Social and typically found in groups of 2 or more individuals. **Habitat:** Agricultural areas, often using adjacent natural areas for shelter and sleeping areas. Well-established populations are present on the West Coast near Hopefield and Redelinghuys. **Do not confuse with** indigenous Bushpig *Potamochoerus larvatus*	Compete with indigenous species, and predate on ground-nesting birds, small mammals, reptiles, and amphibians. Cause damage by rooting, wallowing and trampling indigenous vegetation, and may impact on watercourses. Cause damage to agricultural crops, and carry parasites that may pose threats to livestock and wildlife.	Nonlethal control methods include fencing, and the use of guard animals. Lethal methods include trapping and shooting. Unlikely to be practicably controllable on municipal property unless part of a coordinated landscape-scale intervention.	 Image source: CABI Invasive Species Compendium	3, 4

Birds	*Sturnus vulgaris*	Common starling	3	Robust medium-sized passerine with white-flecked glossy black plumage. Bright yellow bill. 21 cm in length. **Habitat**: Mainly cities, agricultural land.	Competes with indigenous species.	None	 Image source: invasives.org.za	1,5

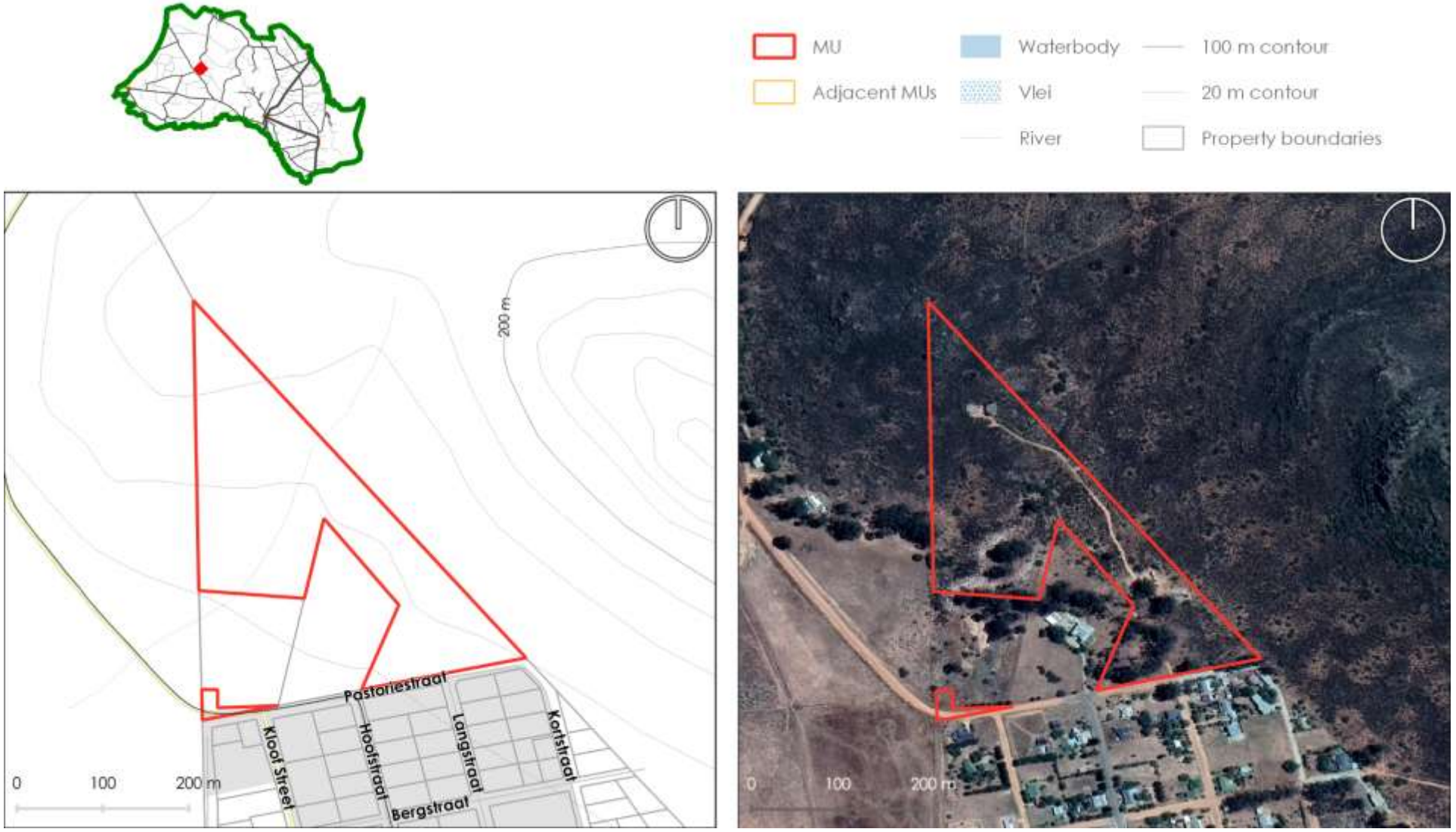
References for descriptions, impacts, and other information:

1	Invasive Species South Africa. 2019. www.invasives.org.za (website). Accessed January-March 2019.
2	Anchor Environmental, 2008. Berg Estuary Situation Assessment.
3	Van der Walt, 2018. Landowners Guide for Feral Pig Management in the Buffeljags River Area. Advanced Environmental Corporation.
4	CABI. Sus scrofa [Invasive Species Compendium] https://www.cabi.org/isc/datasheet/119688. Accessed February 2020.
5	Chittenden, H. et al. 2016. Roberts Bird Guide 2nd ed. Africa Geographic

SITE-SPECIFIC MONITORING AND CONTROL PLANS

Piketberg

6.1 Aurora North: Management Unit AU01



Map 9. Management unit AU01, Aurora North

6.1.1 Description

Locality

The MU is located at the northern end of Aurora on Pastorie Street, extending up the hill beyond the water reservoir. It is triangular in shape and excludes the residential property at the northern end of Hoofstraat. It is 7.4 hectares in extent.

Topography

The site slopes gently up to a high point near its northern extent. The lowest point on the site is at approximately 110 metres, and the highest at 170 metres.

Sensitivities

The majority of the site is designated a Critical Biodiversity Area (CBA1) by the Western Cape Biodiversity Spatial Plan. It is mapped as supporting the Vulnerable vegetation types Hopefield Sand Fynbos and Piketberg Sandstone Fynbos. A drainage line crosses the site from northeast to southwest.

The site is adjacent to human habitation, and many of the trees on the MU provide shade for the adjacent garden and road.

Land uses

Infrastructure (reservoirs), natural vegetation

6.1.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia baileyana*	Bailey's wattle	3	3	Few	Adult
Plants	*Acacia cyclops*	Rooikrans	1b	2	Few	Adult
Plants	*Acacia saligna*	Port Jackson Willow	1b	2	Few	Adult
Plants	*Casuarina cunninghamiana*	Beefwood	1b / 2	2	Few	Adult
Plants	*Echium plantigineum*	Pattersons curse	1b	1	Few	Adult
Plants	*Eucalyptus cladocalyx*	Sugar gum	2	2	Scattered	All
Plants	*Melia azedarach*	Syringa	1b	3	Few	Young
Plants	*Pinus canariensis*	Canary Island pine	2	3	Few	Adult

6.1.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Terrestrial Mammals	*Sus scrofa*	Feral Pig	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.1.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.1.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia baileyana	Bailey's wattle	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Acacia cyclops	Rooikrans	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	Municipality
Acacia saligna	Port Jackson Willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Casuarina cunninghamiana	Beefwood	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	Municipality
Echium plantigineum	Pattersons curse	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Eucalyptus cladocalyx	Sugar gum	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	Municipality
Melia azedarach	Syringa	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Pinus canariensis	Canary Island pine	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sus scrofa	Feral Pig	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.1.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up clearing methods
Plants	*Acacia baileyana*	Bailey's wattle	Cut Stump	Leave on site	Cut stump, handpull
Plants	*Acacia cyclops*	Rooikrans	Cut Stump	Leave on site	Cut stump, handpull
Plants	*Acacia saligna*	Port Jackson Willow	Cut stump and spray	Leave on site	Foliar spray if below 1.5 m. If larger Cut stump and spray
Plants	*Casuarina cunninghamiana*	Beefwood	Cut stump and spray	Leave on site	Cut stump and spray
Plants	*Echium plantigineum*	Pattersons curse	Foliar spray	None	Foliar spray
Plants	*Eucalyptus cladocalyx*	Sugar gum	Cut stump and spray	Leave on site	Cut stump and spray
Plants	*Melia azedarach*	Syringa	Cut stump and spray	Leave on site	Cut stump and spray
Plants	*Pinus canariensis*	Canary Island pine	Cut stump. Consider digging out stump as this is a vigorous resprouter with no registered herbicide.	Leave on site	Cut stump, dig out further
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sus scrofa*	Feral Pig	Fencing to exclude from municipal properties Baited traps as part of a landscape-scale initiative	Remove from site to municipal garden refuse site	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.1.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.2 Aurora Parks: Management Unit AU02

Map 10. Management unit AU02, Aurora Parks

6.2.1 Description

Locality
The MU comprises two small municipal parks located within the urban area of Aurora: the first (Erf 201) at the corner of Kerk and Hoof streets, and the second (Erf 225) at the corner of Hof and Gousblom streets. The sites have a combined area of 1.5 hectares

Topography
Both sites are flat and at approximately 100 m above sea level.

Sensitivities
The sites are mapped in the Western Cape Biodiversity Spatial Plan as 'Ecological Support Areas', for the purpose of water recharge, although they do not support indigenous vegetation and are surrounded by urban development. Both sites are urban parks, with lawns and planted shade trees.

The sites are well-used public spaces, adjacent to residential areas and public roads.

Land uses
Urban parks

6.2.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia elata*	Pepper tree wattle	1b	3	Few	Adult
Plants	*Melia azedarach*	Syringa	1b	3	Few	Adult
Plants	*Echium plantigineum*	Patterson's curse	1b	1	Occasional	Adult
Plants	*Melia azedarach*	Syringa	1b	3	Few	Adult
Plants	*Nicotiana glauca*	Wild tobacco	1b	1	Few	Adult
Plants	*Pinus radiata*	Radiata pine	1b	2	Few	Adult

6.2.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.2.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.2.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia elata	Pepper tree wattle	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Melia azedarach	Syringa	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	Municipality
Echium plantigineum	Patterson's curse	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Nicotiana glauca	Wild tobacco	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	Municipality
Pinus radiata	Radiata pine	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor and detect establishment	During clearing events.	Municipality

6.2.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up control methods
Plants	*Acacia elata*	Pepper tree wattle	Cut stump	Remove from site to municipal garden refuse site.	Cut stump
Plants	*Melia azedarach*	Syringa	Cut stump and spray	Remove from site to municipal garden refuse site.	Cut stump and spray
Plants	*Echium plantigineum*	Patterson's curse	Foliar spray	None	Foliar spray
Plants	*Nicotiana glauca*	Wild tobacco	Cut stump	Remove from site to municipal garden refuse site	Foliar spray
Plants	*Pinus radiata*	Radiata pine	Cut stump	Remove from site to municipal garden refuse site	Cut stump

6.2.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.3 Dwarskersbos: Management Unit DW01

Map 11. Management unit DW01, Dwarskersbos

6.3.1 Description

Locality
The MU incorporates all municipally owned land in the small coastal settlement of Dwarskersbos. It is discontinuous and includes most public roads as well as a strip of land along the beach. The total extent of the properties is 38.4 hectares, much of which comprises surfaced roads.

Topography
The site is flat and located just above sea level.

Sensitivities
The site is located on and near the coastline, and includes small pockets of indigenous vegetation, notably near the southern and northern ends of the MU. The southernmost portion of the MU (a new development area) is mapped as Critical Biodiversity Area. The coastal strip is an Ecological Support Area.

Land uses
Coastline, roads and road reserves

6.3.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia cyclops*	Rooikrans	1b	2	Occasional	All
Plants	*Agave americana*	Agave	3	nl	Few	Adult
Plants	*Grevillea robusta*	Australian silky oak	3	3	Few	Adult
Plants	*Myoporum tenuifolium*	Manatoka	3	3	Occasional	Adult
Plants	*Opuntia aurantiaca*	Jointed cactus	1b	1	Few	Adult
Plants	*Opuntia ficus-indica*	Sweet prickly pear	1b	1	Few	Adult
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	3	3	Occasional	Adult
Plants (not listed)	*Eucalyptus gomphocephala*	Tuart	nl	nl	Few	Adult

6.3.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.3.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.3.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia cyclops	Rooikrans	Complete eradication	3 years from start of implementation. Follow ups every 6 Months	EPWP – Working for the Coast
Agave americana	Agave	Complete eradication	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Grevillea robusta	Australian silky oak	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	EPWP – Working for the Coast
Myoporum tenuifolium	Manatoka	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Opuntia aurantiaca	Jointed cactus	Complete eradication	3 years from start of implementation. Follow ups every 6 Months	EPWP – Working for the Coast
Opuntia ficus-indica	Sweet prickly pear	Complete eradication	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Schinus terebinthifolius	Brazilian pepper tree	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	EPWP – Working for the Coast
Eucalyptus gomphocephala	Tuart	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.3.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Acacia cyclops*	Rooikrans	Cut stump	Remove from site to municipal garden refuse site	Handpull or cut stump for non-adult plants
Plants	*Agave americana*	Agave	Foliar spray	Leave	Foliar spray
Plants	*Grevillea robusta*	Australian silky oak	Leave adult plants, handpull or cut stump non-adults	None	Handpull or cut stump for non-adult plants
Plants	*Myoporum tenuifolium*	Manatoka	Leave adult plants, handpull or cut stump non-adults	None	Handpull or cut stump for non-adult plants
Plants	*Opuntia aurantiaca*	Jointed cactus	Foliar spray	None	Foliar spray
Plants	*Opuntia ficus-indica*	Sweet prickly pear	Stem inject	None	Stem inject
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	Leave adult plants, handpull or cut stump and spray non-adults	None	Handpull or cut stump and spray non-adult plants
Plants	*Eucalyptus gomphocephala*	Tuart	Leave adult plants, handpull or cut stump non-adults	None	Handpull or cut stump
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.3.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.4 Eendekuil North: Management Unit EK01

Map 12. Management unit EK01, Eendekuil North

6.4.1 Description

Locality
The MU comprises 10 erven located in the northern part of Eendekuil, including the municipal offices and adjacent vacant land as well as road reserves and a substation site to the north. It is 3.7 hectares in extent.

Topography
Eendekuil is at 100 metres above sea level, and the northern part of the town slopes gently down toward the Kruisman's River, located west of the town. Erf 65 (on which the municipal offices are located) slopes down to a minor drainage line.

Sensitivities
Erf 65 is designated as a Critical Biodiversity Area in the Western Cape Biodiversity Spatial Plan, as it supports remnants of the Critically Endangered Swartland Shale Renosterveld. A tributary of the Kruisman's River crosses Erf 65. The remaining sites making up this MU are transformed by urban development.

The properties are in the urban area of Eendekuil.

Land uses
Municipal buildings, road reserves, vacant municipal land.

6.4.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Casuarina cunninghamiana*	Beefwood	1b / 2	2	Occasional	Adult
Plants	*Acacia saligna*	Port Jackson willow	1b	2	Few	Adult
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	3	3	Few	Adult
Plants	*Echium plantigineum*	Patterson's curse	1b	1	Few	Adult
Plants	*Melia azedarach*	Syringa	1b	3	Few	Adult
Plants	*Eucalyptus cladocalyx*	Sugar gum	1b / 2 / nl	2	Few	Adult
Plants	*Atriplex nummularia*	Old man saltbush	2	2	Occasional	Adult
Plants	*Prosopis glandulosa*	Mesquite	1b	2	Few	Adult

6.4.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.4.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.4.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Casuarina cunninghamiana	Beefwood	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Acacia saligna	Port Jackson willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Schinus terebinthifolius	Brazilian pepper tree	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Echium plantigineum	Patterson's curse	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Melia azedarach	Syringa	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Eucalyptus cladocalyx	Sugar gum	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Atriplex nummularia	Old man saltbush	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Prosopis glandulosa	Mesquite	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

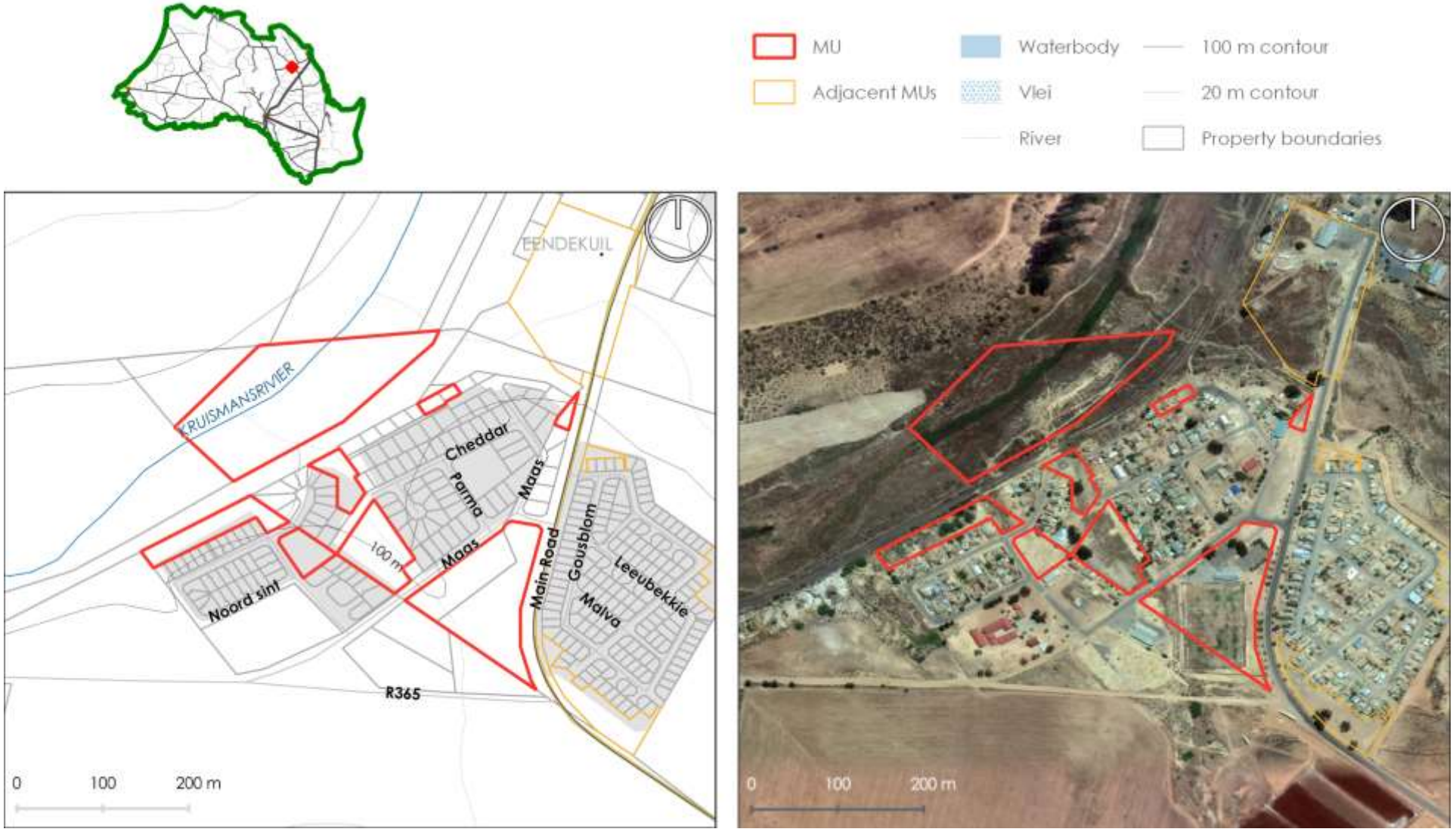
6.4.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Casuarina cunninghamiana*	Beefwood	Leave adult plants, handpull or cut stump and spray non-adults	None	Cut stump and spray plants that are not adult trees
Plants	*Acacia saligna*	Port Jackson willow	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	Leave adult plants, handpull or cut stump and spray non-adults	None	Cut stump and spray or handpull depending on size
Plants	*Echium plantigineum*	Patterson's curse	Foliar spray	None	Foliar spray
Plants	*Melia azedarach*	Syringa	Leave adult plants, handpull or cut stump and spray non-adults	None	Handpull or cut stump and spray non-adults
Plants	*Eucalyptus cladocalyx*	Sugar gum	Leave adult plants, handpull or cut stump and spray non-adults	None	Handpull or cut stump and spray non-adults
Plants	*Atriplex nummularia*	Old man saltbush	Cut stump	None	Cut stump or handpull non-adult plants
Plants	*Prosopis glandulosa*	Mesquite	Cut stump and spray	None	Cut stump and spray
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.4.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.5 Eendekuil West: Management Unit EK02



Map 13. Management unit EK02, Eendekuil West

6.5.1 Description

Locality
This MU includes eight separate erven in the southwestern part of Eendekuil (west of Main Road). Erf 72, 140, and 121 are located along a drainage line discharging into the Kruismans River, which flows across Erf 69 at the westernmost edge of the MU. The remaining properties are small, servitude-like erven located along the railway line. The southernmost property (erf 87) is a sportsfield. The MU has a total extent of 6.44 hectares.

Topography
The MU slopes down toward the northwest. A steep bank abuts the railway line at the southern extent of the MU.

Sensitivities
Erf 69 is the channel of the Kruismans River where it flows through Eendekuil. It is designated as a Critical Biodiversity Area (both terrestrial and aquatic) and appears to support riparian wetland habitat. A tributary of the river flows across the MU from south to north, parts of which are also designated as CBA.

The MU is in an urban area and surrounded by residential land uses.

Land uses
River corridors, servitudes and sportsfields.

6.5.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Eucalyptus cladocalyx*	Sugar gum	1b / 2 / nl	2	Few	Adult
Plants	*Prosopis glandulosa*	Honey mesquite	1b	2	Scattered	Adult
Plants	*Ricinus communis*	Castor-oil plant	2	2	Few	Adult
Plants	*Atriplex nummularia*	Old man saltbush	2	2	Dense	Adult
Plants	*Atriplex inflata*	Sponge-fruit Saltbush	1b	3	Few	Adult
Plants	*Salsola kali*	Tumbleweed	1b	nl	Few	Adult
Plants	*Acacia saligna*	Port Jackson willow	1b	2	Occasional	Adult
Plants	*Echium plantigineum*	Patterson's curse	1b	1	Dense	Adult

6.5.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.5.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.5.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Eucalyptus cladocalyx	Sugar gum	Leave adult plants, control all non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Prosopis glandulosa	Honey mesquite	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Ricinus communis	Castor-oil plant	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Atriplex nummularia	Old man saltbush	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Atriplex inflata	Sponge-fruit Saltbush	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Salsola kali	Tumbleweed	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Acacia saligna	Port Jackson willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Echium plantigineum	Patterson's curse	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

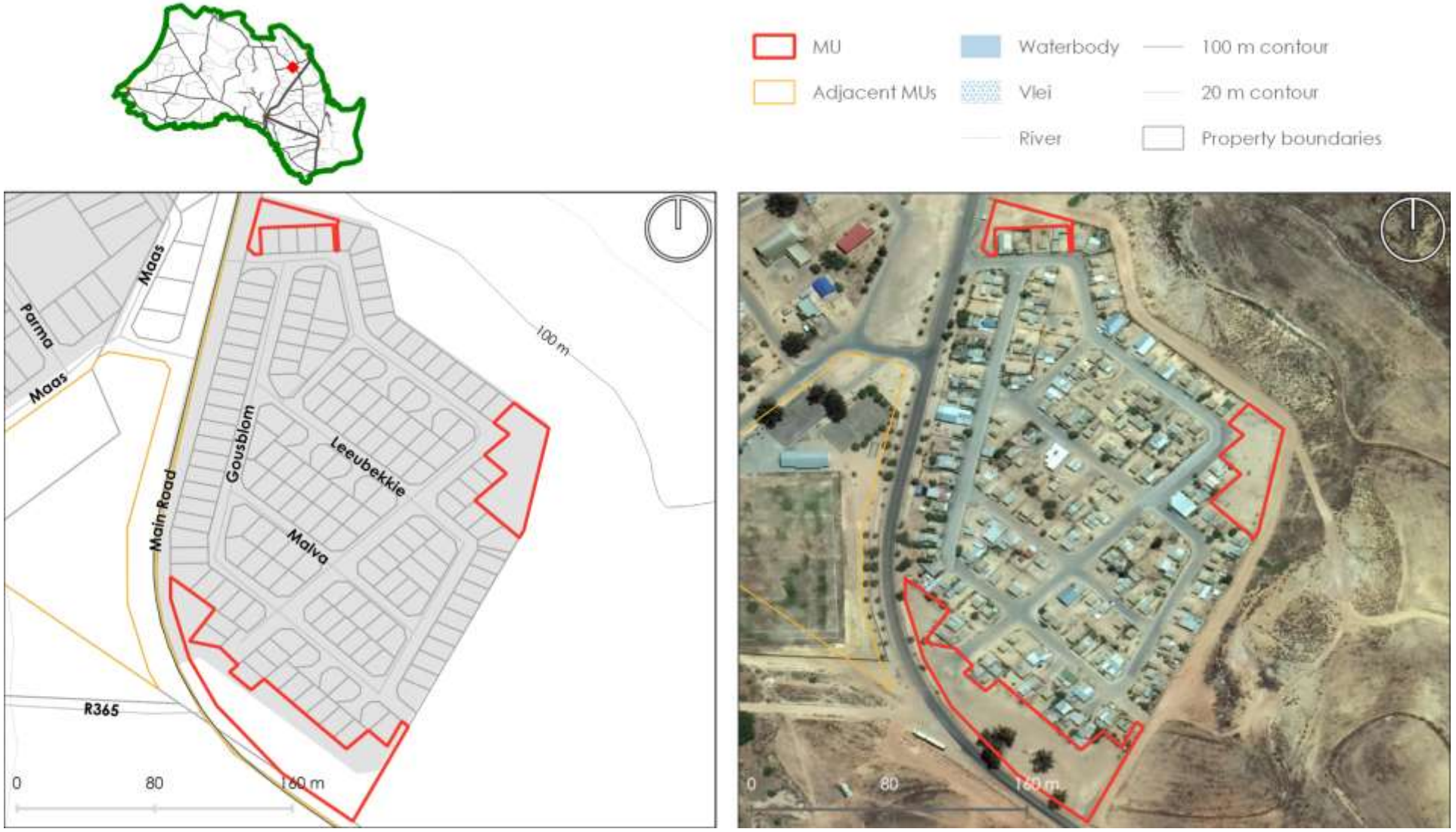
6.5.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Eucalyptus cladocalyx*	Sugar gum	Leave adult plants, handpull or cut stump and spray non-adults	None	Handpull or cut stump and spray non-adult plants
Plants	*Prosopis glandulosa*	Honey mesquite	Cut stump and spray	Leave on site	Cut stump and spray
Plants	*Ricinus communis*	Castor-oil plant	Cut stump and spray	Leave on site	Cut stump and spray
Plants	*Atriplex nummularia*	Old man saltbush	Cut stump	Leave on site	Cut stump
Plants	*Atriplex inflata*	Sponge-fruit Saltbush	Handpull	Remove from site to municipal garden refuse site	Handpull
Plants	*Salsola kali*	Tumbleweed	Handpull	Remove from site to municipal garden refuse site	Handpull
Plants	*Acacia saligna*	Port Jackson willow	Cut stump and spray	Leave on site	Cut stump and spray
Plants	*Echium plantigineum*	Patterson's curse	Foliar spray	None	Foliar spray
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.5.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.6 Eendekuil East: Management Unit EK03



Map 14. Management unit EK03, Eendekuil East

6.6.1 Description

Locality
This MU includes three small erven in the southeastern part of Eendekuil (east of Main Road). All are vacant public spaces.

Topography
The MU is flat, and at approximately 100 metres above sea level.

Sensitivities
The sites in this MU have little to no vegetation cover and are in an urban area. The sites are surrounded by residential areas.

Land uses
Urban parks

6.6.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Eucalyptus cladocalyx*	Sugar gum	1b / 2 / nl	2	Few	Adult

6.6.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.6.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.6.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Eucalyptus cladocalyx	Sugar gum	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor and detect establishment	During clearing events.	Municipality

6.6.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up control methods
Plants	*Eucalyptus cladocalyx*	Sugar gum	None	None	Handpull or cut stump and spray non-adult plants
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.6.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.7 Laaiplek beach: Management Unit LA01

Map 15. Management unit LA01, Laaiplek beach

6.7.1 Description

Locality
The MU comprises coastal access land along the beach in a new development north of Laaiplek town. It has a total area of 12.8 hectares.

Topography
The site is flat and located just above sea level.

Sensitivities
The MU is located on and near the coastline, and supports indigenous coastal vegetation. The coastal strip is a Critical Biodiversity Area.

Land uses
Coastline

6.7.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Atriplex nummularia*	Old man saltbush	2	2	Occasional	Adult

6.7.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.7.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.7.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Atriplex nummularia	Old man saltbush	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.7.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Atriplex nummularia*	Old man saltbush	Cut Stump	Leave on site	Cut stump or Handpull
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.7.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.8 Laaiplek North: Management Unit LA02

Map 16. Management unit LA02, Laaiplek North

6.8.1 Description

Locality
The MU includes a portion of the extensive commonage adjacent to Laaiplek's Noordhoek residential area (Erf 471 north of Lofdal St), as well as the road reserve of Main Road and a number of small urban parks and servitudes within Noordhoek. With a total extent of 72 hectares, the MU is the largest designated in the municipal area. Access is variable, with a major stormwater channel forming a barrier between Noordhoek and the northern parts of Erf 471.

Topography
Noordhoek is on a flat sandy plain separated from the coast by a low dune ridge, which lies to the west of the MU. The MU itself is low-lying and flat.

Sensitivities
Much of the commonage on Erf 471 is designated as a Critical Biodiversity Area, particularly near the northeastern edge of the MU. Other sensitivities include adjacent residential areas, cemeteries, and schools.

Land uses
Disturbed natural vegetation, roads, footpaths, cemetery, stormwater infrastructure and parks.

6.8.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia cyclops*	Rooikrans	1b	2	Occasional	Adult
Plants	*Atriplex nummularia*	Old man saltbush	2	2	Few	Adult
Plants	*Casuarina cunninghamiana*	Beefwood	1b / 2	2	Occasional	Adult
Plants	*Limonium sinuatum*	Statice	1b	nl	Scattered	Adult

6.8.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.8.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.8.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia cyclops	Rooikrans	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Atriplex nummularia	Old man saltbush	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Casuarina cunninghamiana	Beefwood	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Limonium sinuatum	Statice	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.8.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Acacia cyclops*	Rooikrans	Cut stump	None	Cut stump and handpulling
Plants	*Atriplex nummularia*	Old man saltbush	Cut stump and handpull	None	Cut Stump and handpull
Plants	*Casuarina cunninghamiana*	Beefwood	Cut Stump and spray	Remove from site to municipal garden refuse site	Cut Stump and Spray
Plants	*Limonium sinuatum*	Statice	Handpull	None	Handpull
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.8.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.9 Laaiplek South: Management Unit LA03

Map 17. Management unit LA03, Laaiplek South

6.9.1 Description

Locality
The MU incorporates the southern section of the Laaiplek commonage (Erf 471 south of Lofdal Street) and smaller erven immediately adjacent to it. Erf 192, south of Voortrekker Road, is a public park.

Topography
The site is flat, located at a lower elevation than the surrounding roads.

Sensitivities
Much of the MU is a Critical Biodiversity Area, associated with the Velddrif Estuary, and supports varying levels of remnant natural vegetation, including salt pan species. Adjacent land uses include a golf course, residential areas, and main roads.

Land uses
Disturbed natural vegetation, roads, footpaths and parks.

6.9.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia cyclops*	Rooikrans	1b	2	Occasional	Adult
Plants	*Acacia saligna*	Port Jackson willow	1b	2	Few	Adult
Plants	*Agave sisalana*	Sisal hemp	2	2	Few	Adult
Plants (not listed)	*Eucalyptus gomphocephala*	Tuart	nl	nl	Few	Adult
Plants	*Limonium sinuatum*	Statice	1b	nl	Moderate	Adult
Plants	*Nerium oleander*	Oleander	1b	1	Few	Adult
Plants	*Nicotiana glauca*	Wild tobacco	1b	1	Few	Adult
Plants	*Opuntia ficus-indica*	Sweet prickly pear	1b	1	Few	Adult
Plants	*Pinus halepensis*	Aleppo pine	3	2	Few	Adult
Plants	*Myoporum tenuifolium*	Manatoka	3	3	Few	Adult

6.9.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.9.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.9.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia cyclops	Rooikrans	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Acacia saligna	Port Jackson willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Agave sisalana	Sisal hemp	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Eucalyptus gomphocephala	Tuart	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Limonium sinuatum	Statice	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Nerium oleander	Oleander	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Nicotiana glauca	Wild tobacco	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Myoporum tenuifolium	Manatoka	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Opuntia ficus-indica	Sweet prickly pear	Complete eradication	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Pinus halepensis	Aleppo pine	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.9.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Acacia cyclops*	Rooikrans	Cut stump	Leave on site	Cut stump or handpull
Plants	*Acacia saligna*	Port Jackson willow	Cut stump and spray	Leave on site	Foliar spray
Plants	*Agave saligna*	Sisal hemp	Foliar spray	Leave on site	Foliar spray
Plants	*Eucalyptus gomphocephala*	Tuart	Handpull or cut stump for non-adult plants	Leave on site	Cut stump or handpull
Plants	*Limonium sinuatum*	Statice	Handpull	Leave on site	Handpull
Plants	*Nerium oleander*	Oleander	Cut stump and spray	Leave on site	Cut stump and spray
Plants	*Nicotiana glauca*	Wild tobacco	Cut stump	Leave on site	Foliar spray
Plants	*Myoporum tenuifolium*	Manatoka	Handpull or cut stump for non-adult plants	Leave on site	Handpull or cut stump for non-adult plants
Plants	*Opuntia ficus-indica*	Sweet prickly pear	Stem inject	Leave on site	Stem inject
Plants	*Pinus halepensis*	Aleppo pine	Handpull or cut stump for non-adult plants	Leave on site	Leave on site
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.9.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.10 Laaiplek Harbour: Management Unit LA04

Map 18. Management unit LA04, Laaiplek Harbour

6.10.1 Description

Locality
This MU is a small cluster of municipally owned property in the vicinity of the Laaiplek harbour entrance. They are accessed from de Villiers Street and St Helena Street. The MU has a total extent of 5.53 hectares.

Topography
The sites are low-lying and flat.

Sensitivities
The properties are near the coast, and (with the exception of Erf 2840 and Erf 1070) are designated as Critical Biodiversity Areas. Remnant natural coastal vegetation occurs on parts of the MU. Nearby land uses are both residential and industrial.

Land uses
Road reserve, parking, public parks

6.10.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia cyclops*	Rooikrans	1b	2	Few	Adult
Plants	*Malva dendromorpha*	Tree mallow	1b	nl	Few	Adult
Plants	*Myoporum tenuifolium*	Manatoka	3	3	Few	Adult
Plants	*Nicotiana glauca*	Wild tobacco	1b	1	Few	Adult
Plants (not listed)	*Eucalyptus gomphocephala*	Tuart	nl	nl	Occasional	Adult
Plants	*Ailanthus altissima*	Tree-of-heaven	1b	3	Few	Young
Plants	*Tecoma stans*	Yellow bells	1b	1	Few	Young

6.10.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.10.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.10.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia cyclops	Rooikrans	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Malva dendromorpha	Tree mallow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Myoporum tenuifolium	Manatoka	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Nicotiana glauca	Wild tobacco	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Eucalyptus gomphocephala	Tuart	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Ailanthus altissima	Tree-of-heaven	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Tecoma stans	Yellow bells	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.10.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Acacia cyclops*	Rooikrans	Cut stump	Leave on site	Cut Stump or Handpulling
Plants	*Malva dendromorpha*	Tree mallow	Cut stump	Leave on site	Cut Stump or Handpulling
Plants	*Myoporum tenuifolium*	Manatoka	Cut stump and Handpull of seedlings	Leave on site	Cut Stump and handpull of seedlings
Plants	*Nicotiana glauca*	Wild tobacco	Cut Stump	Leave on site	Foliar spray
Plants	*Eucalyptus gomphocephala*	Tuart	Cut stump and Handpull of seedlings	Leave on site	Cut Stump and handpull of seedlings
Plants	*Ailanthus altissima*	Tree-of-heaven	Handpull	Leave on site	Handpull
Plants	*Tecoma stans*	Yellow bells	Cut stump	Leave on site	Cut Stump or handpull
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.10.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.11 Port Owen: Management Unit LA05

Map 19. Management unit LA05, Port Owen

6.11.1 Description

Locality
The Port Owen MU consists of a number of walkways and pocket parks within the marina. Most properties are directly on the estuary edge, and accessed on foot only. It is 2.47 hectares in extent.

Topography
The sites are on the edge of the Berg River estuary and are flat.

Sensitivities
The sites are in residential areas and some are directly on the marina.

Land uses
Marina walkways, public parks

6.11.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Grevillea robusta*	Australian silky oak	3	3	Few	Adult
Plants	*Malva dendromorpha*	Tree mallow	1b	nl	Few	Adult
Plants	*Myoporum tenuifolium*	Manatoka	3	3	Few	Adult
Plants	*Acacia cyclops*	Rooikrans	1b	2	Few	All
Plants	*Acacia saligna*	Port Jackson willow	1b	2	Few	Young
Plants	*Casuarina cunninghamiana*	Beefwood	1b / 2	2	Few	Adult
Plants	*Melia azedarach*	Syringa	1b / 3	3	Few	Adult
Plants	*Opuntia ficus-indica*	Sweet prickly pear	1b	1	Few	Young
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	3	3	Few	Adult
Plants	*Hedera helix*	English ivy	3	nl	Few	Adult
Plants	*Opuntia aurantiaca*	Jointed cactus	1b	1	Few	Young
Plants	*Tecoma stans*	Yellow bells	1b	1	Few	Adult

6.11.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.11.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.11.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Grevillea robusta	Australian silky oak	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Malva dendromorpha	Tree mallow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Myoporum tenuifolium	Manatoka	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Acacia cyclops	Rooikrans	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Acacia saligna	Port Jackson willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Casuarina cunninghamiana	Beefwood	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Melia azedarach	Syringa	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Opuntia ficus-indica	Sweet prickly pear	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Agave Americana	Agave	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Schinus terebinthifolius	Brazilian pepper tree	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast

Hedera helix	English ivy	Maintain or reduce current size of plant	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Tecoma stans	Yellow bells	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

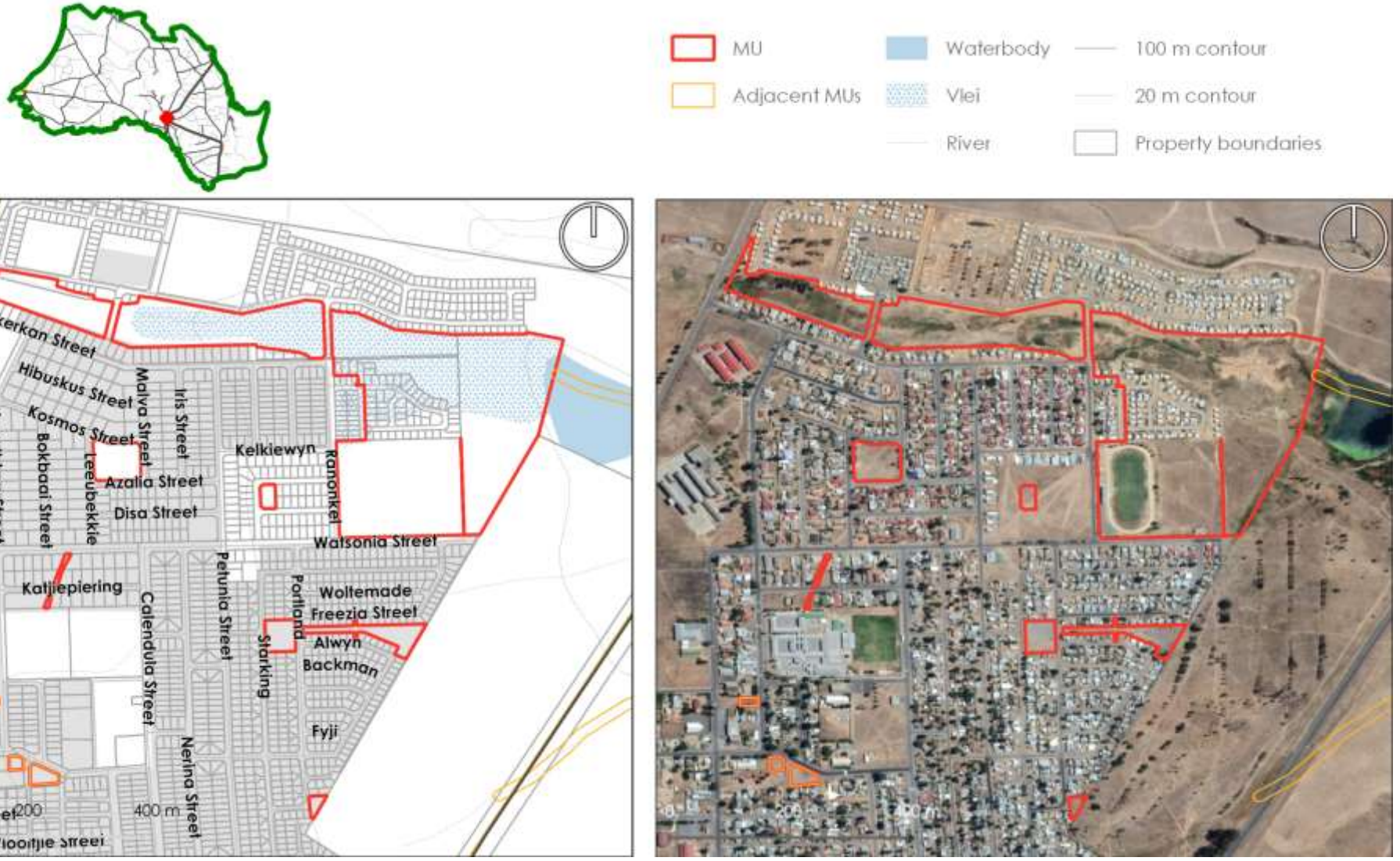
6.11.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Grevillea robusta*	Australian silky oak	Cut Stump of any non-adult plants	Remove from site to municipal garden refuse site	Cut Stump or handpull
Plants	*Malva dendromorpha*	Tree mallow	Cut Stump	Leave on site	Cut Stump or handpull
Plants	*Myoporum tenuifolium*	Manatoka	Cut Stump or handpull of any non-adult plants	Remove from site to municipal garden refuse site	Cut stump or handpull
Plants	*Acacia cyclops*	Rooikrans	Cut stump	Remove from site to municipal garden refuse site	Cut stump or handpull
Plants	*Acacia saligna*	Port Jackson willow	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plants	*Casuarina cunninghamiana*	Beefwood	Cut stump and spray or Handpull seedlings	Remove from site to municipal garden refuse site	Cut stump and spray or Handpull
Plants	*Melia azedarach*	Syringa	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray or handpull
Plants	*Opuntia ficus-indica*	Sweet prickly pear	Dig out and remove from site	Remove from site to municipal garden refuse site	Dig out and remove from site
Plants	*Agave Americana*	Agave	Foliar spray	Leave on site	Foliar spray
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	Cut Stump or handpull of any non-adult plants	Remove from site to municipal garden refuse site	Cut Stump or handpull of any non-adult plants
Plants	*Hedera helix*	English ivy	Handpull any new seedlings	Remove from site to municipal garden refuse site	Handpull any new seedlings
Plants	*Tecoma stans*	Yellow bells	Cut stump	Remove from site to municipal garden refuse site	Cut stump
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.11.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.12 Steynville: Management Unit PK01



Map 20. Management unit PK01, Steynville

6.12.1 Description

Locality
The Steynville MU includes several public spaces in the Steynville residential area, as well as a river / stormwater channel corridor at the northern edge of the town that flows eastward to the wastewater treatment works. The MU has a total extent of 19.6 hectares.

Topography
Each property is essentially flat, located at approximately 180 metres above sea level. The drainage line at the northern extent of the MU slopes gently downward to the east.

Sensitivities
The river corridor at the northern edge of Steynville is designated an Ecological Support Area in the Western Cape Biodiversity Spatial Plan. A farm dam is present at its downstream end.

Other sites are within residential areas

Land uses
Sports field, river corridor, public parks and servitudes.

6.12.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia saligna*	Port Jackson willow	1b	2	Scattered	All
Plants	*Echium plantigineum*	Patterson's curse	1b	1	Scattered	All
Plants	*Eucalyptus cladocalyx*	Sugar gum	1b / 2 / nl	2	Few	Adult
Plants	*Myoporum tenuifolium*	Manatoka	3	3	Occasional	Adult
Plants	*Pennisetum clandestinum*	Kikuyu	1b / nl	nl	Moderate	All
Plants	*Pennisetum setaceum*	Fountain grass	1b	1	Few	Adult
Plants	*Prosopis glandulosa*	Honey mesquite	1b	2	Few	Adult
Plants	*Ricinus communis*	Castor-oil plant	2	2	Few	Young

6.12.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.12.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.12.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia saligna	Port Jackson willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Echium plantigineum	Patterson's curse	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Eucalyptus cladocalyx	Sugar gum	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Myoporum tenuifolium	Manatoka	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Pennisetum clandestinum	Kikuyu	Prevent spread into wetland	3 years from start of implementation. Follow ups every 6 Months	Municipality
Pennisetum setaceum	Fountain grass	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Prosopis glandulosa	Honey mesquite	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Ricinus communis	Castor-oil plant	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.12.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Acacia saligna*	Port Jackson willow	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray or foliar spray
Plants	*Echium plantigineum*	Patterson's curse	Foliar spray	Leave on site	Foliar spray or handpulling
Plants	*Eucalyptus cladocalyx*	Sugar gum	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray or foliar spray
Plants	*Myoporum tenuifolium*	Manatoka	Handpull or cut stump non-adult plants	Remove from site to municipal garden refuse site	Cut stump or handpulling of seedlings
Plants	*Pennisetum clandestinum*	Kikuyu	Foliar spray only where spreading into wetland	Leave on site	Foliar spray only where spreading into wetland
Plants	*Pennisetum setaceum*	Fountain grass	Foliar spray	Leave on site	Foliar spray
Plants	*Prosopis glandulosa*	Honey mesquite	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plants	*Ricinus communis*	Castor-oil plant	Cut stump and spray	Leave on site	Cut stump and spray
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.12.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.13 Piketberg West: Management Unit PK02

Map 21. Management unit PK02, Piketberg West

6.13.1 Description

Locality
The MU comprises several erven in the western 'bodorp' section of Piketberg, most of which are public parks in residential areas. The total extent is 5.4 hectares.

Topography
The MU slopes upward to the west, with the westernmost sites located at the base of the Piket Berg.

Sensitivities
The properties are in residential areas, and used as public parks.

Land uses
Public parks

6.13.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia saligna*	Port Jackson willow	1b	2	Occasional	All
Plants	*Nicotiana glauca*	Wild tobacco	1b	1	Few	Adult
Plants	*Tipuana tipu*	Tipu tree	3	3	Scattered	Adult
Plants	*Callistemon viminalis*	Weeping bottlebrush	3	nl	Few	Adult
Plants	*Casuarina cunninghamiana*	Beefwood	1b / 2	2	Few	Adult
Plants	*Tamarix sp.*	Unconfirmed tamarisk species	1b / nl	0	Few	Adult
Plants	*Tecoma stans*	Yellow bells	1b	1	Few	Adult
Plants	*Jacaranda mimosifolia*	Jacaranda	nl here	3	Few	Adult
Plants	*Melia azedarach*	Syringa	1b / 3	3	Few	Adult
Plants	*Echium plantigineum*	Patterson's curse	1b	1	Few	Adult
Plants	*Grevillea robusta*	Australian silky oak	3	3	Few	Adult
Plants	*Acacia cyclops*	Rooikrans	1b	2	Few	Adult
Plants	*Opuntia ficus-indica*	Sweet prickly pear	1b	1	Few	Young

6.13.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.13.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.13.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia saligna	Port Jackson willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Nicotiana glauca	Wild tobacco	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Tipuana tipu	Tipu tree	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Callistemon viminalis	Weeping bottlebrush	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Casuarina cunninghamiana	Beefwood	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Tamarix sp.	Unconfirmed tamarisk species	First confirm species. If listed invasive (*T. rammossisima*), then completely eradicate. If not, then leave and remove from plan	3 years from start of implementation. Follow ups every 6 Months	Municipality
Tecoma stans	Yellow bells	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Jacaranda mimosifolia	Jacaranda	No control required. Avoid further planting.		Municipality
Melia azedarach	Syringa	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality

Echium plantigineum	Patterson's curse	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Grevillea robusta	Australian silky oak	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Acacia cyclops	Rooikrans	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Opuntia ficus-indica	Sweet prickly pear	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.13.6 Control methods and biomass

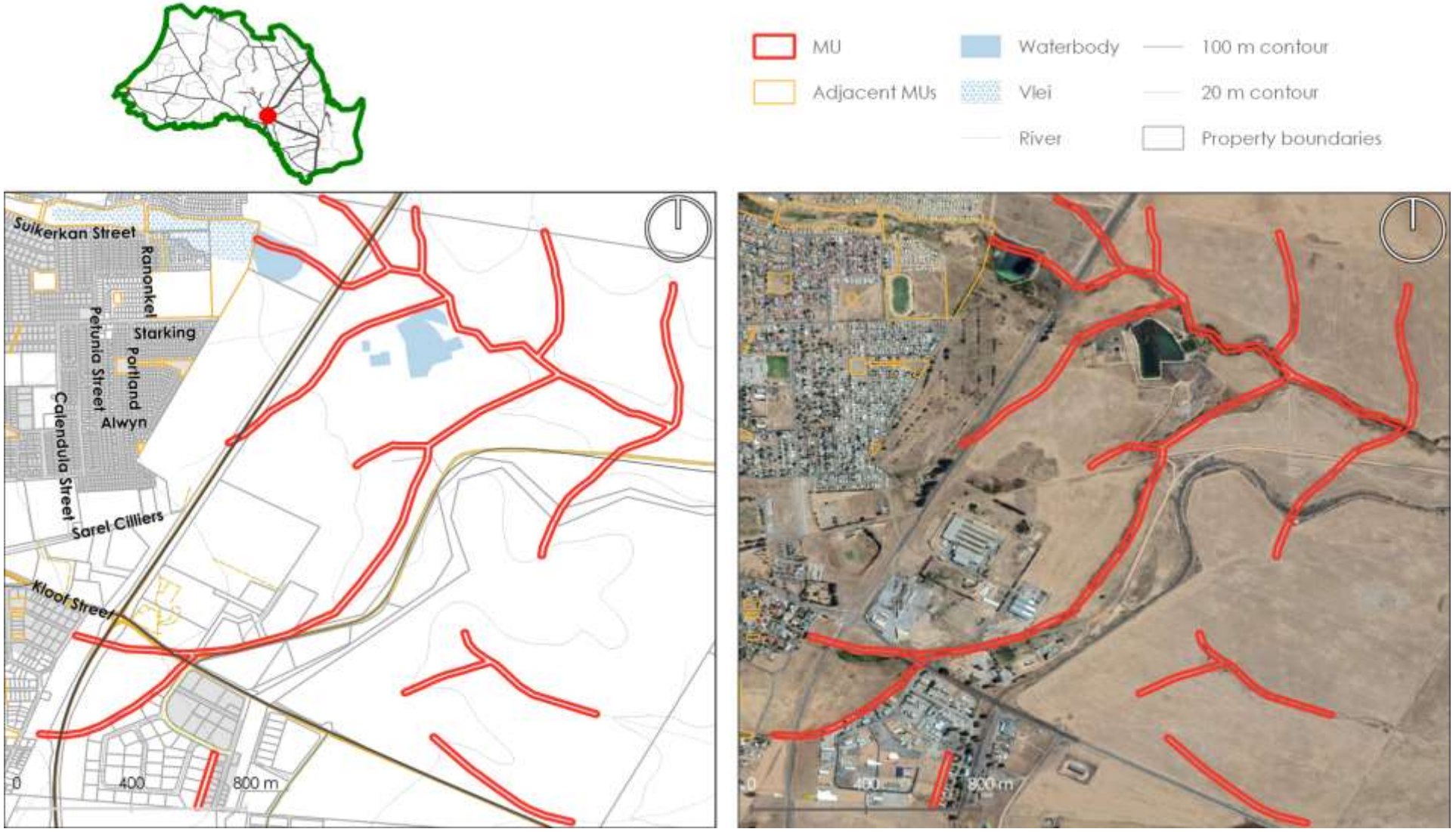
Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Acacia saligna*	Port Jackson willow	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray or Foliar spray
Plants	*Nicotiana glauca*	Wild tobacco	Cut Stump	Leave on site	Foliar spray
Plants	*Tipuana tipu*	Tipu tree	Cut stump or handpull non-adult plants	Leave on site	Cut stump or handpull non-adult plants
Plants	*Callistemon viminalis*	Weeping bottlebrush	Cut stump and spray or handpull non-adult plants	Leave on site	Cut stump and spray or handpull non-adult plants
Plants	*Casuarina cunninghamiana*	Beefwood	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plants	*Tamarix sp.*	Unconfirmed tamarisk species	Leave until confirmed. If listed invasive, cut stump and spray	Remove from site to municipal garden refuse site	If listed invasive, cut stump and spray
Plants	*Tecoma stans*	Yellow bells	Cut stump	Remove from site to municipal garden refuse site	Cut stump

Plants	*Jacaranda mimosifolia*	Jacaranda	No control of existing specimens required but avoid further planting		
Plants	*Melia azedarach*	Syringa	Cut stump and spray or handpull non-adult plants	Leave on site	Cut stump and spray or handpull non-adult plants
Plants	*Echium plantigineum*	Patterson's curse	Foliar spray	Leave on site	Foliar spray or handpull
Plants	*Grevillea robusta*	Australian silky oak	Cut stump or handpull non-adult plants	Leave on site	Cut stump or handpull non-adult plants
Plants	*Acacia cyclops*	Rooikrans	Cut stump	Remove from site to municipal garden refuse site	Cut stump or foliar spray
Plants	*Opuntia ficus-indica*	Sweet prickly pear	Stem inject	Leave on site	Stem inject
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.13.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.14 Piketberg Farms: Management Unit PK03



Map 22. Management unit PK03, Piketberg Farms

6.14.1 Description

Locality
The MU comprises the extensive commonage (Farm 241/RE) east of Piketberg. The farm is under lease and is extensively cultivated. The municipal wastewater treatment works and a landfill site are also on the property. The terms of reference for this plan limited the area of interest to the two watercourses within the commonage, as the remainder is under cultivation. The area of these watercourses is approximately 21 hectares.

Topography
The site is undulating, sloping in general downward to the west. Several drainage lines converge on the MU.

Sensitivities
The drainage lines are designated as ecological support areas, and support riverine and wetland vegetation in places. Most of the property is transformed and in active use for agricultural and service provision purposes.

Land uses
Agriculture, wastewater treatment works, landfill, roads

6.14.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia saligna*	Port Jackson willow	1b	2	Scattered	All
Plants	*Arundo donax*	Spanish reed	1b	1	Occasional	Adult
Plants	*Callistemon viminalis*	Weeping bottlebrush	3	nl	Few	Adult
Plants	*Echium plantigineum*	Patterson's curse	1b	1	Scattered	Adult
Plants	*Eucalyptus cladocalyx*	Sugar gum	1b / 2 / nl	2	Few	Adult
Plants	*Melia azedarach*	Syringa	1b / 3	3	Few	Adult
Plants	*Myoporum tenuifolium*	Manatoka	3	3	Few	Adult
Plants	*Nicotiana glauca*	Wild tobacco	1b	1	Scattered	Adult
Plants	*Pennisetum setaceum*	Fountain grass	1b	1	Occasional	Adult
Plants	*Prosopis glandulosa*	Honey mesquite	1b	2	Scattered	Adult
Plants	*Ricinus communis*	Castor-oil plant	2	2	Scattered	All
Plants	*Tamarix ramosissima*	Tamarisk	1b	1	Few	Adult

6.14.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown

6.14.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.14.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia saligna	Port Jackson willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Arundo donax	Spanish reed	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Callistemon viminalis	Weeping bottlebrush	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Echium plantigineum	Patterson's curse	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Eucalyptus cladocalyx	Sugar gum	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Melia azedarach	Syringa	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Myoporum tenuifolium	Manatoka	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Nicotiana glauca	Wild tobacco	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Pennisetum setaceum	Fountain grass	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Prosopis glandulosa	Honey mesquite	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Ricinus communis	Castor-oil plant	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Tamarix ramosissima	Tamarisk	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality

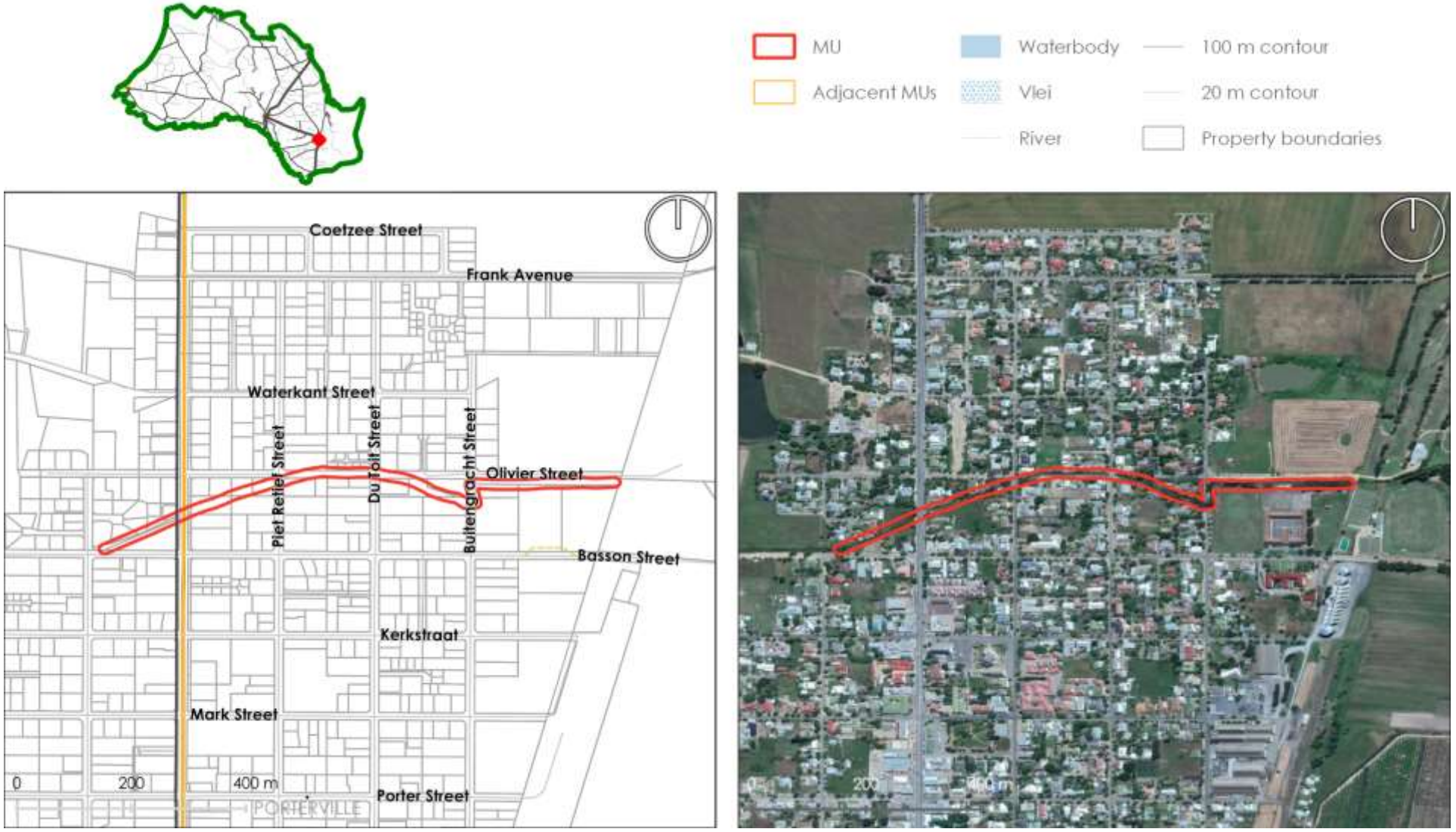
6.14.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Acacia saligna*	Port Jackson willow	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray or Foliar spray
Plant	*Arundo donax*	Spanish reed	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plant	*Callistemon viminalis*	Weeping bottlebrush	Cut stump and spray	Remove from site to municipal garden refuse site	Handpull or cut stump and spray
Plant	*Echium plantigineum*	Patterson's curse	Foliar spray	Leave on site	Foliar spray
Plant	*Eucalyptus cladocalyx*	Sugar gum	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plant	*Melia azedarach*	Syringa	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plant	*Myoporum tenuifolium*	Manatoka	Cut stump	Remove from site to municipal garden refuse site	Cut stump or handpull
Plant	*Nicotiana glauca*	Wild tobacco	Cut stump	Leave on site	Foliar spray
Plant	*Pennisetum setaceum*	Fountain grass	Foliar spray	Leave on site	Foliar spray
Plant	*Prosopis glandulosa*	Honey mesquite	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plant	*Ricinus communis*	Castor-oil plant	Cut stump and spray	Leave on site	Cut stump and spray
Plant	*Tamarix ramosissima*	Tamarisk	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	

6.14.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.15 Porterville North: Management Unit PV01



Map 23. Management unit PV01, Porterville North

6.15.1 Description

Locality
The MU is a river corridor in the northern part of Porterville town, crossing several public roads as well as private residential properties. It is loosely defined as it is not all within municipal ownership, but has been selected as a key focus for invasive species management in the town.

Topography
The MU is predominantly flat, and occurs within built-up urban areas.

Sensitivities
The MU is a drainage line, and is a fairly typical urban river confined within a concrete canal.

Land uses
Residential, roads

6.15.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia saligna*	Port Jackson willow	1b	2	Few	Adult
Plants	*Arundo donax*	Spanish reed	1b	1	Occasional	Adult
Plants	*Callistemon viminalis*	Weeping bottlebrush	3	nl	Few	Adult
Plants	*Canna indica*	Canna	1b	1	Few	Adult
Plants	*Eucalyptus camaldulensis*	River red gum	1b in riparian areas	2	Few	Adult
Plants	*Eucalyptus cladocalyx*	Sugar gum	1b in riparian areas	2	Few	Adult
Plants	*Hedera helix*	English ivy	3	nl	Occasional	Adult
Plants	*Ipomoea purpurea*	Morning glory	1b	3	Scattered	Adult
Plants	*Melia azedarach*	Syringa	1b / 3	3	Few	Adult
Plants	*Pennisetum clandestinum*	Kikuyu	1b / nl	nl	Moderate	Adult
Plants	*Sambucus nigra*	Elder	1b	nl	Moderate	Adult
Plants	*Ricinus communis*	Castor-oil plant	2	2	Few	Adult
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	3	3	Few	Adult
Plants	*Tamarix ramosissima*	Tamarisk	1b	1	Few	Adult
Plants	*Tipuana tipu*	Tipu tree	3	3	Few	Adult

6.15.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.15.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.15.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia saligna	Port Jackson willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Arundo donax	Spanish reed	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Callistemon viminalis	Weeping bottlebrush	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Canna indica	Canna	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Eucalyptus camaldulensis	River red gum	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Eucalyptus cladocalyx	Sugar gum	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Hedera helix	English ivy	Maintain or reduce current size of plant	3 years from start of implementation. Follow ups every 6 Months	Municipality
Ipomoea purpurea	Morning glory	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Melia azedarach	Syringa	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Pennisetum clandestinum	Kikuyu	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Sambucus nigra	Elder	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Ricinus communis	Castor-oil plant	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Schinus terebinthifolius	Brazilian pepper tree	Maintain or reduce current number of plants	3 years from start of implementation. Follow ups every 6 Months	Municipality

Tamarix ramosssissima	Tamarisk	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Tipuana tipu	Tipu tree	Maintain or reduce current number of plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.15.6 Control methods and biomass

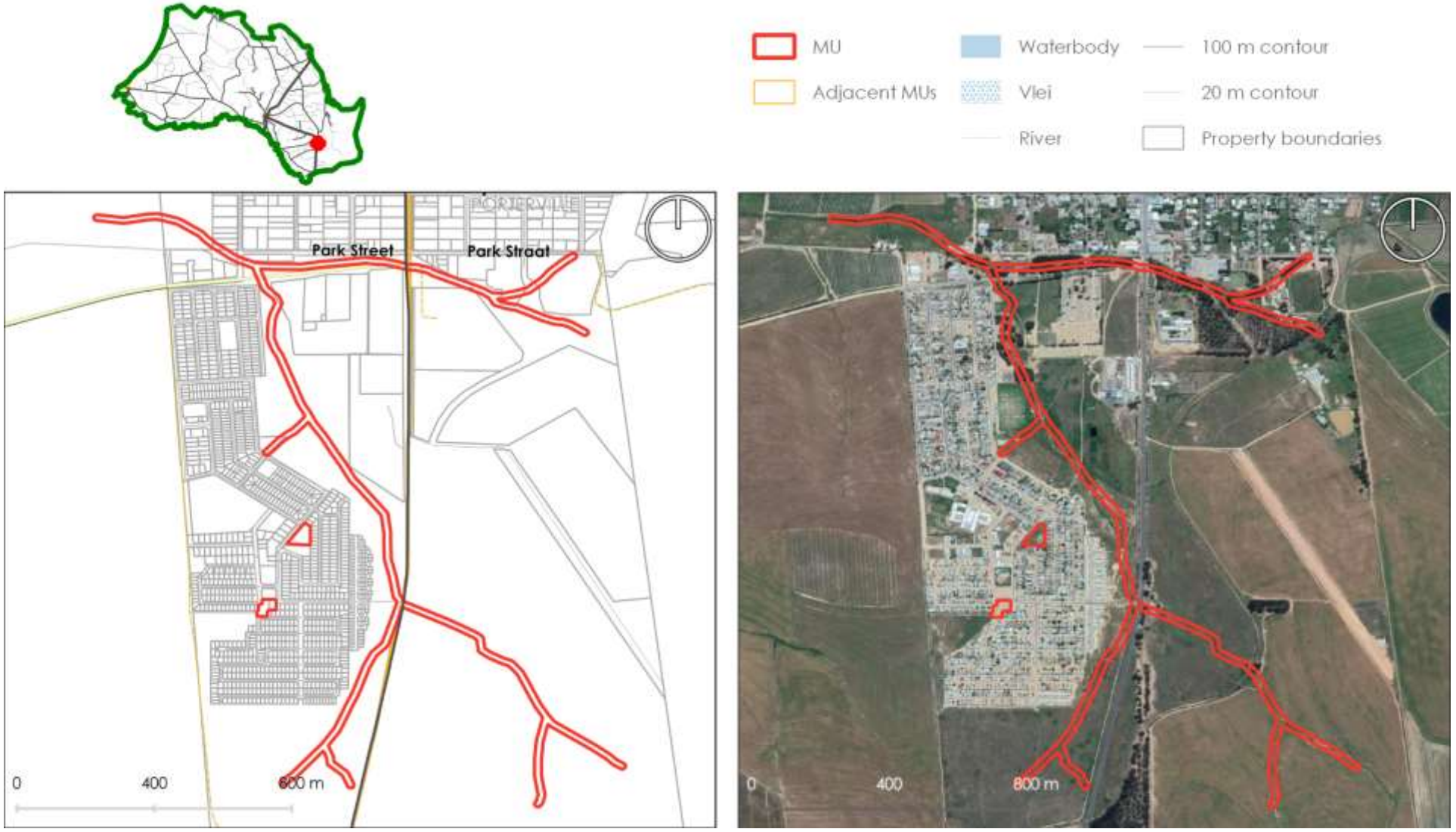
Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Acacia saligna*	Port Jackson willow	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray or Foliar spray
Plants	*Arundo donax*	Spanish reed	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plants	*Callistemon viminalis*	Weeping bottlebrush	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plants	*Canna indica*	Canna	Dig out, ensure all roots and Rhizomes are removed	Remove from site to municipal garden refuse site	Dig out and remove
Plants	*Eucalyptus camaldulensis*	River red gum	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray or handpull
Plants	*Eucalyptus cladocalyx*	Sugar gum	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray or handpull
Plants	*Hedera helix*	English ivy	Handpull or cut stump of any new growth away from parent plant	Remove from site to municipal garden refuse site	Handpull or cut stump of any new growth away from parent plant
Plants	*Ipomoea purpurea*	Morning glory	Pull off from other plants and foliar spray	Leave on site	Foliar spray
Plants	*Melia azedarach*	Syringa	Cut stump and spray any non-Adult plants	Remove from site to municipal garden refuse site	Cut stump and spray or handpull non-adult plants
Plants	*Pennisetum clandestinum*	Kikuyu	Foliar spray if encroaching into a wetland	Leave on site	Foliar spray if encroaching into a wetland
Plants	*Sambucus nigra*	Elder	Cut stump	Remove from site to municipal garden refuse site	Cut stump
Plants	*Ricinus communis*	Castor-oil plant	Cut stump and spray	Leave on site	Cut stump and spray
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	Cut stump and spray or Handpull any seedlings	Leave on site	Cut stump and spray or Handpull any seedlings
Plants	*Tamarix ramosssissima*	Tamarisk	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray

Plants	*Tipuana tipu*	Tipu tree	Cut stump and spray or Handpull any seedlings	Leave on site	Cut stump and spray or Handpull any seedlings
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.15.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.16 Porterville South: Management Unit PV02



Map 24. Management unit PV02, Porterville South

6.16.1 Description

Locality
The MU is a river corridor in the southern part of Porterville town, occurring primarily on municipal commonage (Farm 1002) but also traversing private property and roads in places. It is loosely defined as it is not all within municipal ownership, but has been selected as a key focus for invasive species management in the town. The total extent is 11.3 hectares. The MU also includes two small public open spaces in the southwestern part of Porterville.

Topography
The MU slopes generally downward to the north and west, comprising three tributaries of the Jakkalskloof River that converge east of the town.

Sensitivities
The MU is defined along the drainage lines in the southern part of Porterville, which are designated as Ecological Support Area. It is an important public space, traversed by footpaths and providing a shaded walkway connecting different parts of town. Residential and agricultural land uses are immediately adjacent.

Land uses
Commonage, largely vacant west of the R44 and under cultivation east of the R44. Public space, non-motorised transport routes, and parks.

6.16.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Acacia saligna*	Port Jackson willow	1b	2	Scattered	Young
Plants	*Casuarina cunninghamiana*	Beefwood	1b / 2	2	Few	Adult
Plants	*Cirsium vulgare*	Scotch thistle	1b	1	Occasional	All
Plants	*Echium plantigineum*	Patterson's curse	1b	1	Scattered	Adult
Plants	*Eucalyptus spp.*	Eucalyptus	nl	nl	Moderate	Adult
Plants	*Eucalyptus cladocalyx*	Sugar gum	1b/2/nl	2	Moderate	Adult
Plants	*Jacaranda mimosifolia*	Jacaranda	nl here	3	Few	Adult
Plants	*Nicotiana glauca*	Wild tobacco	1b	1	Occasional	Adult
Plants	*Pennisetum clandestinum*	Kikuyu	1b / nl	nl	Moderate	Adult
Plants	*Ricinus communis*	Castor-oil plant	2	2	Scattered	All
Plants	*Sesbania punicea*	Red sesbania	1b	1	Few	All

6.16.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.16.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.16.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Acacia saligna	Port Jackson willow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Casuarina cunninghamiana	Beefwood	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months	Municipality
Cirsium vulgare	Scotch thistle	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Echium plantigineum	Patterson's curse	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Eucalyptus camaldulensis	River red gum	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	None
Eucalyptus cladocalyx	Sugar gum	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Jacaranda mimosifolia	Jacaranda	No control of existing specimens required but avoid further planting	None	None
Nicotiana glauca	Wild tobacco	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Pennisetum clandestinum	Kikuyu	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Ricinus communis	Castor-oil plant	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Sesbania punicea	Red sesbania	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months	Municipality
Linepithema humile	Argentine ant	Monitor and detect establishment	Monitor at Every clearing event	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	Monitor at every clearing event	Municipality

6.16.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Acacia saligna*	Port Jackson willow	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray or Foliar spray
Plants	*Casuarina cunninghamiana*	Beefwood	Handpull or cut stump and spray non-adult plants	Leave on site	Handpull or cut stump and spray non-adult plants
Plants	*Cirsium vulgare*	Scotch thistle	Handpull	Remove from site to municipal garden refuse site	Handpull
Plants	*Echium plantigineum*	Patterson's curse	Foliar spray	Leave on site	Foliar spray
Plants	*Eucalyptus camaldulensis*	River red gum	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plants	*Eucalyptus cladocalyx*	Sugar gum	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plants	*Jacaranda mimosifolia*	Jacaranda	No control of existing specimens required but prevent new introductions		
Plants	*Nicotiana glauca*	Wild tobacco	Cut stump	Leave on site	Foliar spray
Plants	*Pennisetum clandestinum*	Kikuyu	Foliar spray	Leave on site	Foliar spray
Plants	*Ricinus communis*	Castor-oil plant	Cut stump and spray	Leave on site	Cut stump and spray
Plants	*Sesbania punicea*	Red sesbania	Cut stump and spray or handpull	Leave on site	Cut stump and spray or handpull
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.16.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.17 Velddrif Parks: Management Unit VD01

Map 25. Management unit VD01, Velddrif Parks

6.17.1 Description

Locality
The Velddrif parks MU consists of eight erven scattered across the town of Velddrif. The total extent of the MU is 6.42 hectares. Erf 485, the largest of the properties, is 3 hectares in extent and is a public park on Jacaranda Avenue.

Topography
The sites are flat, located in the low-lying estuary town of Velddrif.

Sensitivities
Erf 485 is mapped as a Critical Biodiversity Area. The remaining properties have minimal biophysical sensitivities but are located in public spaces in residential areas.

Land uses
Public parks

6.17.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Casuarina cunninghamiana*	Beefwood	1b / 2	2	Scattered	Adult
Plants	*Jacaranda mimosifolia*	Jacaranda	nl here	3	Occasional	Adult
Plants	*Myoporum tenuifolium*	Manatoka	3	3	Few	Adult
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	3	3	Few	Adult
Plants (not listed)	*Eucalyptus gomphocephala*	Tuart	nl	nl	Few	Adult
Plants	*Opuntia aurantiaca*	Jointed cactus	1b	1	Few	Young
Plants	*Grevillea robusta*	Australian silky oak	3	3	Few	Adult

6.17.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.17.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.17.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Casuarina cunninghamiana	Beefwood	Maintain or reduce current number of plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Jacaranda mimosifolia	Jacaranda	No control of existing specimens required but prevent new introductions	None	None
Myoporum tenuifolium	Manatoka	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Schinus terebinthifolius	Brazilian pepper tree	Maintain or reduce current number of plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Eucalyptus gomphocephala	Tuart	Maintain or reduce current number of plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Opuntia aurantiaca	Jointed cactus	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Grevillea robusta	Australian silky oak	Maintain or reduce current number of plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

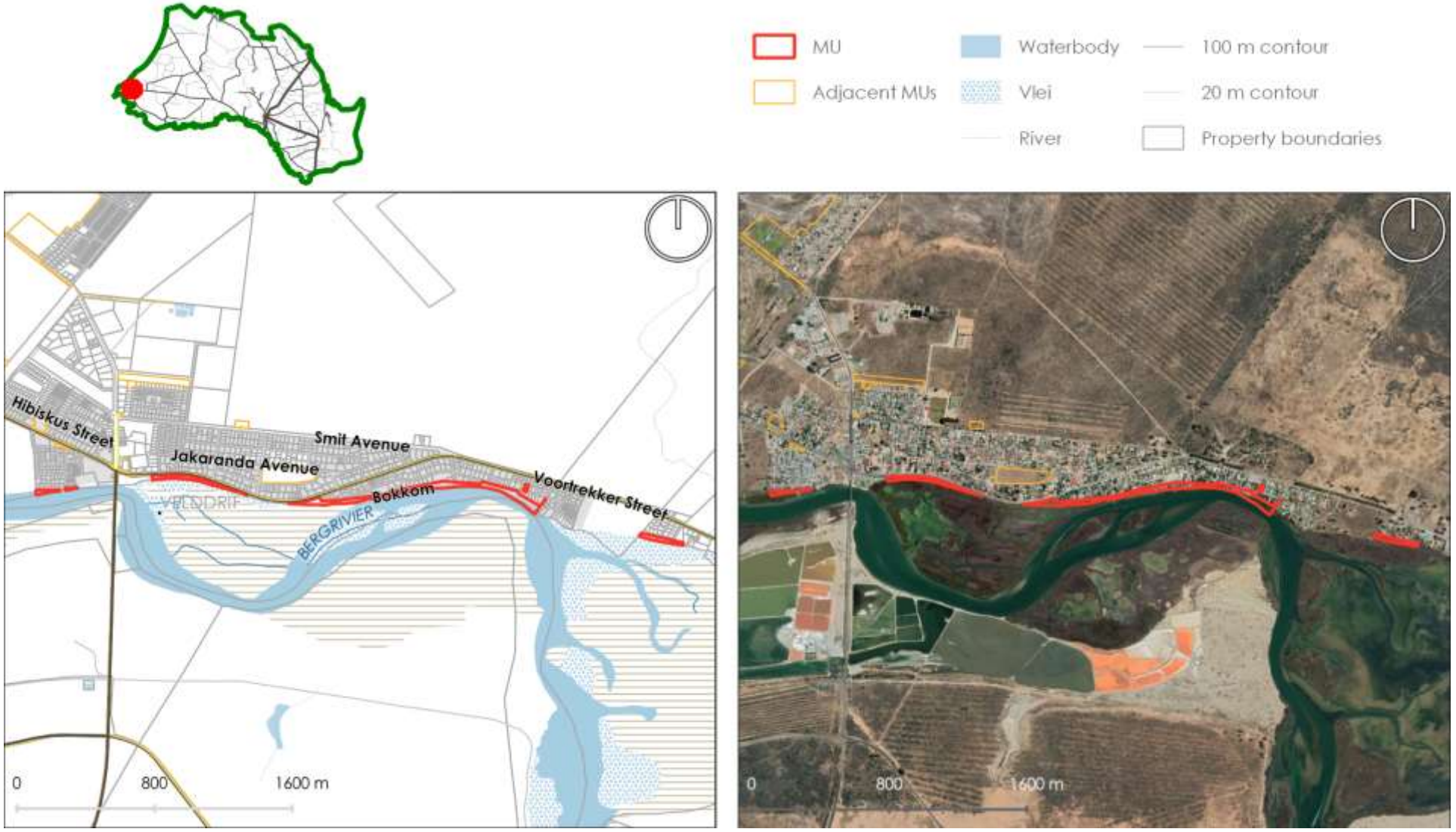
6.17.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Casuarina cunninghamiana*	Beefwood	Handpull or cut stump and spray non-adult plants	Remove from site to municipal garden refuse site	Handpull or cut stump and spray non-adult plants
Plants	*Jacaranda mimosifolia*	Jacaranda	No control of existing specimens required but prevent new introductions		
Plants	*Myoporum tenuifolium*	Manatoka	Handpull or cut stump non-adult plants	Remove from site to municipal garden refuse site	Handpull or cut stump non-adult plants
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	Handpull or cut stump and spray non-adult plants	Remove from site to municipal garden refuse site	Handpull or cut stump and spray non-adult plants
Plants	*Eucalyptus gomphocephala*	Tuart	Handpull or cut stump and spray non-adult plants	Remove from site to municipal garden refuse site	Handpull or cut stump and spray non-adult plants
Plants	*Opuntia aurantiaca*	Jointed cactus	Dig out and remove from site	Remove from site to municipal garden refuse site	Dig out and remove from site
Plants	*Grevillea robusta*	Australian silky oak	Handpull or cut stump non-adult plants	Remove from site to municipal garden refuse site	Handpull or cut stump non-adult plants

6.17.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.

6.18 Velddrif Estuary Edge: Management Unit VD02



Map 26. Management unit VD02, Velddrif Estuary Edge

6.18.1 Description

Locality
This MU incorporates five erven on the edge of the Velddrif estuary, extending (non-continuously) from the road bridge to the eastern edge of the town. They are seldom wider than 30 metres, and in some places (Erf 617) extend some distance into the Berg River. The total area of the MU is 6.75 hectares.

Topography
The sites are at sea level, on the edge of the Berg River Estuary.

Sensitivities
Located on the edge of the Berg River Estuary, these properties form part of the estuarine environment and are designated Critical Biodiversity Areas.

Land uses
Public estuary access

6.18.2 Invasive species and densities

Group	Species	Common name	NEMBA	CARA	Density	Size class
Plants	*Atriplex nummularia*	Old man saltbush	2	2	Few	Adult
Plants	*Malva dendromorpha*	Tree mallow	1b	nl	Moderate	Adult
Plants	*Acacia cyclops*	Rooikrans	1b	2	Few	Young
Plants	*Myoporum tenuifolium*	Manatoka	3	3	Few	Adult
Plants	*Opuntia ficus-indica*	Sweet prickly pear	1b	1	Few	Adult
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	3	3	Few	Adult
Plants	*Agave americana*	Agave	3	nl	Few	Adult
Plants	*Arundo donax*	Spanish reed	1b	1	Scattered	Adult
Plants	*Nicotiana glauca*	Wild tobacco	1b	1	Few	Adult
Plants	*Tamarix ramosissima*	Tamarisk	1b	1	Scattered	Adult

6.18.3 Invasive animal species which may occur in the MU

Species which were not identified during surveys, but which may occur or invade in the MU include those in the table below.

Group	Species	Common name	NEMBA	CARA	Likelihood of occurrence / invasion
Terrestrial Invertebrates	*Linepithema humile*	Argentine ant	1b	N/A	Unknown
Fish	*Cyprinus carpio*	Common carp	3	N/A	Known to occur in the upper estuary; may occur in lower reaches in summer
Birds	*Sturnus vulgaris*	Common starling	3	N/A	Unknown

6.18.4 Previous control efforts

No information is available on the history of past efforts to control invasive species in the MU.

6.18.5 Objectives per species

Species	Common name	Objectives	Timeframes	Implementation
Atriplex nummularia	Old man saltbush	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Malva dendromorpha	Tree mallow	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Acacia cyclops	Rooikrans	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Myoporum tenuifolium	Manatoka	Leave adults but control non adult plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Opuntia ficus-indica	Sweet prickly pear	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Schinus terebinthifolius	Brazilian pepper tree	Maintain or reduce current number of plants	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Agave americana	Agave	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Arundo donax	Spanish reed	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Nicotiana glauca	Wild tobacco	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Tamarix ramosissima	Tamarisk	Completely eradicate	3 years from start of implementation. Follow ups every 6 Months.	EPWP – Working for the Coast
Linepithema humile	Argentine ant	Monitor and detect establishment	During clearing events.	Municipality

Cyprinus carpio	Common carp	Prevent transfer to other catchments	Ongoing	CapeNature
Sturnus vulgaris	Common starling	Monitor establishment / numbers	During clearing events.	Municipality

6.18.6 Control methods and biomass

Group	Species name	Common name	Initial Control Methods	Biomass management	Follow up Control Methods
Plants	*Atriplex nummularia*	Old man saltbush	Cut stump	Remove from site to municipal garden refuse site	Cut stump or Handpull
Plants	*Malva dendromorpha*	Tree mallow	Cut stump	Remove from site to municipal garden refuse site	Cut stump
Plants	*Acacia cyclops*	Rooikrans	Cut stump	Remove from site to municipal garden refuse site	Cut stump
Plants	*Myoporum tenuifolium*	Manatoka	Handpull or cut stump non-adult plants	Remove from site to municipal garden refuse site	Handpull or cut stump non-adult plants
Plants	*Opuntia ficus-indica*	Sweet prickly pear	Stem inject	Leave on site	Stem inject
Plants	*Schinus terebinthifolius*	Brazilian pepper tree	Handpull or cut stump non-adult plants	Remove from site to municipal garden refuse site	Handpull or cut stump non-adult plants
Plants	*Agave americana*	Agave	Foliar spray	Leave on site	Foliar spray
Plants	*Arundo donax*	Spanish reed	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Plants	*Nicotiana glauca*	Wild tobacco	Cut stump	Remove from site to municipal garden refuse site	Foliar spray or Handpull
Plants	*Tamarix ramosissima*	Tamarisk	Cut stump and spray	Remove from site to municipal garden refuse site	Cut stump and spray
Animals	*Linepithema humile*	Argentine ant	Insecticide: liquid bait followed by spraying of colonies	n/a	
Animals	*Cyprinus carpio*	Common carp	Signage or education, enforcement of fishing permit requirements		
Animals	*Sturnus vulgaris*	Common starling	Control not required (Category 3)		

6.18.7 Monitoring and evaluation

1. Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid.
2. Evaluate success after initial clearing. All alien invasive plants in the MU to have been controlled according to the prescribed methods before initial clearing is considered completed.
3. Monitor annually, assessing
    a. the extent and density of listed invasive species
    b. the presence of any new invasions
    c. the need for follow-up clearing activities.


WORKLOAD ASSESSMENTS

7 Workload Assessments

This section provides an estimate of the effort and time (expressed as person-days) required to implement initial and follow-up control on each MU. Please see section 4.5 for an outline of the workload assessment methodology. A single person-day is the quantity of work typically completed by one person working for one day.

MU	Initial clearing	Follow-up 1	Follow-up 2	Follow-up 3	Follow-up 4	Follow-up 5	Follow-up 6
AU01	80	30	10	10	5	5	5
AU02	10	10	10	10	5	5	5
DW01	80	60	40	30	20	10	10
EK01	40	30	20	20	5	5	5
EK02	45	30	20	20	5	5	5
EK03	2	5	5	5	5	5	5
LA01	5	5	5	5	5	5	5
LA02	40	15	15	10	10	10	5
LA03	30	20	20	15	15	15	10
LA04	5	5	5	5	5	5	5
LA05	15	10	5	5	5	5	5
PK01	180	100	100	60	60	40	40
PK02	50	30	30	20	20	15	10
PK03	100	60	40	30	20	15	15
PV01	120	50	20	20	20	15	15
PV02	450	120	60	60	60	40	40
VD01	2	2	2	2	2	2	2
VD02	80	60	40	30	30	20	20
Total	**1334**	**642**	**447**	**357**	**297**	**222**	**207**

IMPLEMENTATION AND MONITORING FRAMEWORK

Sesbania punicea

8 Implementation and monitoring framework

8.1 Roles and coordination

8.1.1 Implementation

The implementation of this plan will be the primary responsibility of the BM and is likely to involve staff from the community services and roads departments, with technical support provided by the Environmental Management offices. In the coastal areas, Working for the Coast teams may be the main implementers.

8.1.2 Land users

Where BM property is leased, the users of the land have a key role to play in implementation. For sites such as the Piketberg commonage, the farmers who utilise the property for grazing and cultivation are key roleplayers in invasive control efforts. It is recommended that site-specific engagement be carried out in advance of implementation to explain the programme, obtain buy-in, and allocate roles.

8.1.3 Other agencies

It is recommended that the BM engage with other agencies (DEA's Natural Resource Management programmes, the district municipality and conservation authorities including CapeNature) to share its area management plan, coordinate control efforts for adjacent properties, and access available funding and support.

8.1.4 Other key roleplayers

It is further recommended that the BM engage with the Greater Cederberg Fire Protection Association (https://www.cederbergfpa.co.za/) and relevant associations of land owners and managers (e.g. Potatoes South Africa) to share this plan and to coordinate control efforts at the landscape scale.

8.2 Funding sources

8.2.1 Capital expenditure

Many of the costs associated with control efforts are of a capital nature, such as the provision of equipment (chainsaws, hand tools, chippers) and vehicles. Although a detailed financial analysis is beyond the scope of this plan, it is recommended that the BM consider the purchase or lease of high-value assets such as vehicles, rather than renting them on an ad hoc basis.

8.2.2 Operational expenditure

Operational funding for invasive species management may be obtained from various sources:

- the municipal budget,
- EPWP grants,
- or via existing budgets for, e.g., property and facilities management.

Municipalities are able to access grant funding from the EPWP, and it is recommended that the workload assessments and associated budgets in this plan be utilised to support applications for grant funding.

8.3 Budgeting and timeframes

A draft implementation budget has been developed for consideration by the BM based on budget availability and operational capacity.

The 'person-day' workload and budget assessment outlined in section 4.5 of this report is the standard method of determining implementation costs in the 'Working for/on' programmes implemented nationally. Based on Working for Water norms and industry experience, an estimated person-day rate has been determined for each management unit based on the terrain, the nature of the control methods (i.e. tree-felling vs hand-pulling), and the accessibility of the site. This rate has been adjusted for the reduced economies of scale associated with a small-scale municipal implementation programme.

There are many assumptions implicit in the budget, and it is suggested that a detailed operational budget be drawn up by the BM taking these scenarios as a starting point. Perhaps the most significant assumption is the assumed effectiveness of implementation of physical control methods, which is itself a function of the effectiveness of management of the staff and contractors responsible for implementation. The workload, budget and timeframe assessments are entirely dependent on the quality of management and on the scheduled implementation, follow-up and monitoring.

The budgets exclude costs associated with any required regulatory approvals such as environmental and water use authorisation.

8.3.1 Timeframes for implementation and the achievement of objectives

The recommended timeframe for implementation envisages immediate (2020/21) clearing on all MU's, with follow-ups every 6 months thereafter. The Initial clearing for all MU's can occur in the first year of implementation. Two follow up events can be conducted in each year thereafter.

It is important to note the difference between objectives (the desired end state) and implementation timeframes. The general objective is for eradication of alien invasive species on municipal properties within three years.

The matrices overleaf indicate the timing of initial implementation and follow up work on each MU.

Table 4. Implementation timeframes for MUs

MU	2020/21	2021/22	2021/22	2022/23	2022/23	2023/24	2023/24
AU01	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
AU02	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
DW01	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
EK01	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
EK02	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
EK03	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
LA01	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
LA02	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
LA03	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
LA04	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
LA05	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
PK01	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
PK02	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
PK03	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
PV01	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
PV02	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
VD01	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up
VD02	**Initial**	1st Follow up	2nd Follow up	3rd Follow up	4th Follow up	5th Follow up	6th Follow up

8.3.2 Summary budgets

Table 5 and Figure 1 are summaries of the detailed budgets in Annexure 1.

Table 5. Summary budgets for implementation

Budget year	Annual budget
2020/2021	882,400
2021/2022	450,000
2022/2023	316,000
2023/2024	242,000

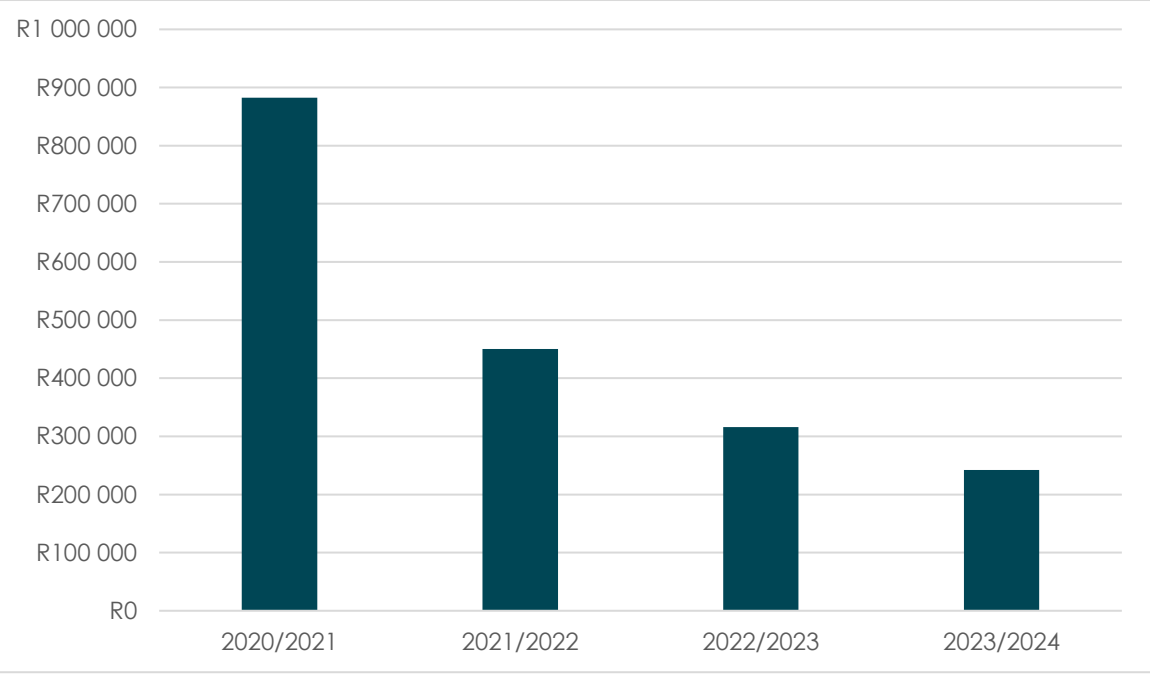


Figure 1. Summary budgets

8.4 Monitoring framework

In order to assess the impact of the control measures, it is necessary to monitor and evaluate regularly. At minimum, the following monitoring schedule has been proposed for each MU:

8.4.1 Pre-implementation assessment

Reassess density six months prior to initial clearing to confirm control methods and workload assessments remain valid. Keep photographic records of the area prior to clearing, and compare with densities assessed at the planning stage.

8.4.2 Implementation monitoring

Keep simple records of daily operations during initial clearing activities: area cleared, number of labour units and amount of herbicide used. Keep regular photographic records as clearing progresses.

8.4.3 Post-implementation evaluation

Keep photographic records of the area immediately after initial clearing has been completed. Evaluate the success of initial clearing, by determining whether all alien invasive plants in the MU have been controlled according to the prescribed methods.

8.4.4 Annual monitoring

Monitor annually, assessing

- the extent and density of listed invasive species
- the presence of any new invasions
- the need for follow-up clearing activities.

SAFETY AND ENVIRONMENTAL GUIDELINES

9 Safety and environmental guidelines

A safe working environment is of utmost importance during the implementation of alien invasive management. Implementing staff often work in remote areas, with inherently hazardous tools and chemicals. The BM as implementer is responsible for ensuring a safe working environment and adherence to certain minimum safety requirements. Furthermore, many of the sites are in sensitive environments which could easily be harmed if inadequate attention is given to mitigating potential risks.

9.1.1 Basic health and safety

Basic health and safety requirements are provided below. These should be adapted to site-specific and project-specific conditions and requirements to ensure a safe working environment.

Emergency procedures in place and familiar to all team members.

Daily safety toolbox talks by a certified Safety Officer or SHE representative.

First aid kit readily available on site and trained first aiders with every team.

Fully charged cellphone on site with local emergency numbers saved, especially in remote areas.

Water readily available for drinking and mixing of herbicides.
Containers with drinking water clearly labelled and not used for other purposes.

All staff provided with appropriate personal protective clothing and equipment.

Sufficient toilets available and maintained for the duration of the operation.

Areas used for eating must be kept clean. A bin for litter must be made available and its use strictly enforced.

Smoking areas must be designated, well away from fuel stores and natural vegetation. Cigarette butts must be disposed of in bins, not dropped on site.

9.1.2 Herbicide safety

The following recommendations are minimum best-practice in the use of herbicides. Crew supervisors and workers using herbicides should undergo herbicide applicator training and apply the generic specifications to each site.

Choosing a herbicide

- Herbicides contain active ingredients that make them effective against particular plants.
- Only herbicides registered for the target species may be used.
- The concentration of the active ingredient may vary in purchased herbicides. It is critical that the mixing ratio be adhered to, to ensure that the correct concentration.

Storage

- Always store herbicides in the original container in a secure storage area out of reach of children or animals.
- At the worksite, keep herbicide in the shade to keep it cool.
- Keep herbicide containers on a waterproof surface, such as a tarpaulin or in a larger plastic bucket.
- Keep a spill kit in the storage facility, containing at minimum a bucket of clean sand, a spade and thick plastic bags. Absorbent pads and cushions are useful additions. In the event of a spill the sand and absorbent material should be used to soak up the spilled chemical, then collected in bags or buckets for safe disposal.
- Keep the material safety datasheet for each herbicide in the storage facility.

Mixing

- All containers in which herbicide is mixed must be clearly marked (e.g. "Lumberjack mix")
- All persons must wear the appropriate personal protective equipment when working with herbicides, including rubber gloves and overalls.
- Avoid skin contact with herbicides, and do not breathe in the vapour.
- Use a measuring jug to ensure the correct quantity is used.
- Half-fill an appropriately sized mixing container with water, then add herbicide. Close the container and shake before adding the rest of the water.

Disposal

- All empty herbicide containers, or herbicides that have reached their expiry date, need to be safely disposed of at a registered chemical recycling company.
- Spike all empty containers before disposal to ensure that they cannot later be used for carrying drinking water or food.

9.1.3 Personal Protective Equipment

The use of personal protective equipment and clothing (PPE and PPC) is a legal requirement, and the employer is responsible for providing equipment that enables workers to carry out their tasks safely. Different PPE is required for different control methods and personnel – see Table 6

Table 6. PPE requirements for implementation personnel

Item	Crew supervisor	Chainsaw operator	General workers, First Aider, SHE rep	Herbicide applicator
T-shirt	✓	✓	✓	✓
Overall Two-piece 100% cotton overalls or Conti suit	✓	✓	✓	✓
Safety boots With ankle support and steel toecap	✓	✓	✓	✓
Gumboots When working in wetlands or riverine environments	✓		✓	✓
Chainsaw safety boots		✓		
Chainsaw operators' trousers		✓		
Leather gloves Wrist-length, for hand-tools and machine use	✓	✓	✓	✓
Rubber gloves Wrist-length, for handling, mixing and applying herbicides				✓
Wide-brim hat For sun protection, particularly during follow-up operations	✓		✓	✓
Hard hat When working near chainsaws, under large trees, or on steep slopes	✓		✓	✓
Hard hat with visor and certified earmuffs For chainsaw operators		✓		
Face mask To cover nose and mouth, when mixing or applying herbicides				✓
Rain suit Standard two-piece, for use in rainy conditions	✓	✓	✓	✓
Safety goggles	✓	✓	✓	✓

9.1.4 Health and Safety representatives and First Aiders

For every 20 people employed, one person needs to be trained as a First Aider and a separate person as a Health and Safety Representative.

Appointments must be made in writing and the person must clearly understand his/her responsibilities before signing.

Persons appointed can be one of the workers, with these appointments bearing additional responsibilities.

It is advisable to train an extra person for each role in case of resignation or absence.

First Aider Responsibilities

- Provide first aid in case of injury
- Manage the first aid kit
- Record usage of first aid material:
    - Which first aid materials were used;
    - To whom these materials were issued/used; and
    - When these materials were used/issued.
- Report to manager when stock is low in the first aid kit
- Attend health and safety meetings when required

Health and Safety Representative Responsibilities

- Conduct regular safety talks with workers to ensure everyone is aware of the relevant safety precautions.
- Record near misses and all (minor/ major) injuries.
- Assist the supervisor in identifying possible hazards or risks and reporting these to the relevant persons for action.
- Encourage workers to report unsafe conditions including faulty equipment or PPE that could pose a risk to their health or well-being.
- Attend safety meetings when required.
- Assist the supervisor in ensuring that all workers are wearing their PPE.

9.1.5 Environmental Specifications

Invasive species management can cause damage to sensitive environments if not implemented with due care and caution. The following generic measures should be adhered to when implementing the plan. Site-specific sensitivities are noted elsewhere in this report and must be considered. It is recommended that the BM's Environmental Management Department be involved to provide guidance in planning for implementation in a given MU.

Invasive species management can cause damage to sensitive environments if not implemented with due care and caution. Generic management requirements are outlined below.

Issue	Impact	Management measures
Access 	Vehicle and pedestrian movement can damage sensitive natural vegetation and wetlands, and poorly-placed access routes can cause erosion and damage to soils.	- Minimise the number of access routes to a site, especially where there is indigenous vegetation or other sensitivities. - Wherever possible make use of existing footpaths, roads or transformed areas (e.g. agricultural fields) to access a site rather than creating new paths. - Keep vehicles out of areas of indigenous vegetation, wetlands and other sensitive areas. - Designate a single site camp area where vehicles can be parked, equipment can be stored, and ablution and eating facilities can be provided. The site camp should be in an already-transformed area wherever possible, and should have as small a footprint as possible.
Waste and ablutions 	Improper disposal of waste or inadequate provision of ablution facilities can pose a health risk and cause damage to the natural environment.	- Provide garbage bags to each crew for collection of litter at mealtimes and in the course of the day. Ensure that filled bags are collected at end of day and disposed of in a municipal bin or at a licensed landfill facility. - Provide ablution facilities where required, at a rate of one toilet per 15 crew. If chemical toilets are used, ensure they are adequately secured to prevent them from toppling, and ensure regular emptying and maintenance so that they do not overflow. - Place ablution facilities at least 50 metres from any resource (stream, wetland, dam) on the site.
Fire and other emergencies 	Invasive control implementation often takes place in remote areas without easy access to emergency services and where wildfires are possible.	- Allow smoking only within designated areas, such as at the site camp or vehicles. Cigarette butts to be disposed of in bins and not discarded. - Prohibit the lighting of fires for heating, cooking, or waste disposal on site. - Where conditions are favourable for wildfires (e.g. high fuel load and high fire danger index – see https://www.afis.co.za/), teams should be provided with basic firefighting equipment (at least two fire beaters) and training. - Crew supervisors to have a charged cellphone with airtime and with local emergency numbers saved.

Issue	Impact	Management measures
Handling herbicides, fuels and chemicals 	Herbicides and fuels can cause significant damage to indigenous vegetation and watercourses if incorrectly used or if they are spilled. Ambient temperatures and weather can impact on the effectiveness of herbicides.	- Herbicides should not be used in aquatic (rivers, streams, wetlands) environments or within 15 metres of any water resource. - Fuels must be stored in appropriate leakproof containers (e.g. jerry cans) and correctly labelled. Refuelling of equipment must take place well away from watercourses and sensitive features. A basic spill kit should be kept with the vehicle in case of fuel spills. - Always store herbicides in the original container in a secure storage area out of reach of children or animals. - At the worksite, keep herbicide in the shade to keep it cool. - Keep herbicide containers on a waterproof surface, such as a tarpaulin or in a larger plastic bucket. - Keep a spill kit in the storage facility, containing at minimum a bucket of clean sand, a spade and thick plastic bags. Absorbent pads and cushions are useful additions. In the event of a spill the sand and absorbent material should be used to soak up the spilled chemical, then collected in bags or buckets for safe disposal. - Avoid herbicide application on rainy days or up to 2 hours before rain is expected to prevent it from being washed off and affecting non-target species. - Avoid foliar spraying on windy days, to prevent drift and impacts on other vegetation.
Noise and nuisance 	Sites that are close to other land uses, particularly residential areas and resorts, require extra care to avoid creating unnecessary nuisance during clearing operations.	- Restrict noise-generating activities such as powertool use to working hours, namely 07:00 to 17:00 on week days and 07:00 to 14:00 on Saturdays. - Keep neighbours who are likely to be affected informed of the work to be undertaken, and provide them with contact details in case of issues. - Do not block access routes or close roads without prior written permission and notifying all users.

9.1.6 Training recommendations

The table below outlines courses that are legally compulsory, courses that are necessary to enable the teams to perform their duties, and recommended additional training for employee development.

Table 7. Training requirements for implementation personnel

Course	Manager	Crew supervisor	Chainsaw operator	Brushcutter operator	First Aider	Health & Safety rep. (1/20 staff)	General Worker
Compulsory training courses (for legal compliance)							
First Aid Level 2 / 3 Valid for 2 years	✓	✓			✓		
Health & Safety Rep course	✓	✓				✓	
Chainsaw Operator Annual refreshers		✓	✓				
Brushcutter Operator Annual refreshers		✓		✓			
Basic Wildfire Suppression Where operations require it	✓	✓	✓	✓	✓	✓	✓
Other essential courses							
Site induction *	✓	✓	✓	✓	✓	✓	✓
Herbicide Applicator		✓	✓	✓	✓	✓	✓
Species Identification	✓	✓	✓	✓	✓	✓	✓
Recommended additional training							
Environmental Awareness		✓	✓	✓	✓	✓	✓
Personal finance management / life skills		✓	✓	✓	✓	✓	✓

* To cover contract requirements, type of work to be performed, hours of work, payment, what is required of the employee and employer, emergency procedures, protective clothing and equipment issuing and responsibility thereof, introduction to manager, first aider and health and safety representative, transportation procedures, safety in the workplace, and environmental awareness.

Annexure 1: Budgets

Cost estimates per Management Unit												
MU	**Initial clearing**		**First follow up**		**Second Follow up**		**Third Follow up**		**Fourth Follow up**		**Fifth Follow up**		**Sixth Follow up**	
AU01	R	64 000.00	R	12 000.00	R	4 320.00	R	4 665.60	R	2 519.42	R	2 720.98	R	2 938.66
AU02	R	4 500.00	R	4 000.00	R	4 320.00	R	4 665.60	R	2 519.42	R	2 720.98	R	2 938.66
DW01	R	32 000.00	R	24 000.00	R	17 280.00	R	13 996.80	R	10 077.70	R	5 441.96	R	5 877.31
EK01	R	16 000.00	R	12 000.00	R	8 640.00	R	9 331.20	R	2 519.42	R	2 720.98	R	2 938.66
EK02	R	18 000.00	R	12 000.00	R	8 640.00	R	9 331.20	R	2 519.42	R	2 720.98	R	2 938.66
EK03	R	700.00	R	2 000.00	R	2 160.00	R	2 332.80	R	2 519.42	R	2 720.98	R	2 938.66
LA01	R	1 750.00	R	2 000.00	R	2 160.00	R	2 332.80	R	2 519.42	R	2 720.98	R	2 938.66
LA02	R	18 000.00	R	6 000.00	R	6 480.00	R	4 665.60	R	5 038.85	R	5 441.96	R	2 938.66
LA03	R	10 500.00	R	8 000.00	R	8 640.00	R	6 998.40	R	7 558.27	R	8 162.93	R	5 877.31
LA04	R	1 750.00	R	2 000.00	R	2 160.00	R	2 332.80	R	2 519.42	R	2 720.98	R	2 938.66
LA05	R	6 000.00	R	4 000.00	R	2 160.00	R	2 332.80	R	2 519.42	R	2 720.98	R	2 938.66
PK01	R	144 000.00	R	40 000.00	R	43 200.00	R	27 993.60	R	30 233.09	R	21 767.82	R	23 509.25
PK02	R	22 500.00	R	12 000.00	R	12 960.00	R	9 331.20	R	10 077.70	R	8 162.93	R	5 877.31
PK03	R	50 000.00	R	24 000.00	R	17 280.00	R	13 996.80	R	10 077.70	R	8 162.93	R	8 815.97
PV01	R	96 000.00	R	20 000.00	R	8 640.00	R	9 331.20	R	10 077.70	R	8 162.93	R	8 815.97
PV02	R	360 000.00	R	48 000.00	R	25 920.00	R	27 993.60	R	30 233.09	R	21 767.82	R	23 509.25
VD01	R	700.00	R	800.00	R	864.00	R	933.12	R	1 007.77	R	1 088.39	R	1 175.46
VD02	R	36 000.00	R	24 000.00	R	17 280.00	R	13 996.80	R	15 116.54	R	10 883.91	R	11 754.62
Total	**R**	**882 400.00**	**R**	**256 800.00**	**R**	**193 104.00**	**R**	**166 561.92**	**R**	**149 653.79**	**R**	**120 811.42**	**R**	**121 660.36**

Estimated person days per Management Unit							
MU	**Initial clearing**	**First follow up**	**Second Follow up**	**Third Follow up**	**Fourth Follow up**	**Fifth Follow up**	**Sixth Follow up**
AU01	80	30	10	10	5	5	5
AU02	10	10	10	10	5	5	5
DW01	80	60	40	30	20	10	10
EK01	40	30	20	20	5	5	5
EK02	45	30	20	20	5	5	5
EK03	2	5	5	5	5	5	5
LA01	5	5	5	5	5	5	5
LA02	40	15	15	10	10	10	5
LA03	30	20	20	15	15	15	10
LA04	5	5	5	5	5	5	5
LA05	15	10	5	5	5	5	5
PK01	180	100	100	60	60	40	40
PK02	50	30	30	20	20	15	10
PK03	100	60	40	30	20	15	15
PV01	120	50	20	20	20	15	15
PV02	450	120	60	60	60	40	40
VD01	2	2	2	2	2	2	2
VD02	80	60	40	30	30	20	20
Total	**1334**	**642**	**447**	**357**	**297**	**222**	**207**

Estimated cost per person day per MU							
MU	Initial clearing	First follow up	Second Follow up	Third Follow up	Fourth Follow up	Fifth Follow up	Sixth Follow up
AU01	R 800.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
AU02	R 450.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
DW01	R 400.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
EK01	R 400.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
EK02	R 400.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
EK03	R 350.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
LA01	R 350.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
LA02	R 450.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
LA03	R 350.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
LA04	R 350.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
LA05	R 400.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
PK01	R 800.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
PK02	R 450.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
PK03	R 500.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
PV01	R 800.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
PV02	R 800.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
VD01	R 350.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73
VD02	R 450.00	R 400.00	R 432.00	R 466.56	R 503.88	R 544.20	R 587.73