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INVASIVE AND ALIEN PLANT SPECIES MANAGEMENT PLAN

STELLENOSCH UNIVERSITY CAMPUSES

2020 – 2025

(Revision of 2016-2021 IAPSMP)

In compliance with National Environmental Management Biodiversity Act, 2004
(Act 10, of 2004) and Invasive Species Regulations (October 2014)

Facilities Management

Property Services



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LIST OF ABBRIVIATIONS

IAPSCP	Invasive and Alien Plant Species Control Plan
IAPS	Invasive and Alien Plant Species
IAP	Invasive and Alien Plants
CARA	Conservation of Agricultural Resources Act
COID	Compensation for Occupational Injuries and Diseases
DEAT	Department of Environmental Affairs and Tourism
DBH	Diameter of Breast Height
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
EDRR	Early Detect & Rapid Response
FDI	Fire Danger Indices
FPA	Fire Protection Associations
MCAA	Mountain Catchment Areas Act
NEMBA	National Environmental Management Biodiversity Act
NEMA	National Environmental Management Act
NWA	National Water Act
NV&FFA	National Veld and Forest Fire Act
NWRS	National Water Resource Strategy
PPE	Personal Protective Equipment
PrDP	Professional Driving Permit
SUAR	Sustainable Use of Agricultural Resources
SANBI	South African National Biodiversity Institute
SHE	Safety, Health and Environment
SU	Stellenbosch University
Ha	Hectares

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1. INTRODUCTION

Stellenbosch University Invasive and Alien Plant Species Control Plan (IAPSCP), in compliance with the National Environmental Management Biodiversity Act (NEMBA) 2004 (Act 10, of 2004) and Invasive Species regulations (October 2014), this plan was submitted on 09-11-2016 to Department of Environmental Affairs (Biosecurity- Compliance), stated occurring Invasive and Alien Plant Species (IAPS) invasion (in %) across Stellenbosch Campuses. It has been acknowledged that there are also other applicable laws and regulations pertaining to IAPS (Table 1.). To elaborate further, Government has enacted eleven national and various provincial laws which contain mechanisms for regulating the different threats posed by IAPS. The main reason for Stellenbosch University to consider applicable laws and regulations is that IAPS are well known to pose ecological, social and economic challenges. These plant species are heavily threatening our rich biodiversity, deplete our scarce water resources, causing soil erosion, increase the risk of flooding and fires and damage to infrastructure.

As of January 2004, government expenditure on the Working for Water programme alone amounted to R3.2 billion and it is estimated that it will cost R650 million per year for the next twenty years to bring IAPS under control. Hence the National Environmental Management Biodiversity Act, 10 of 2004 (NEMBA), Section 76, states that all organs of state are required to draw up an invasive and alien monitoring, control and eradication plan for the land under their control. Such a plan must include:

- A detailed list and description of any listed invasive species occurring on the relevant land;
- A description of the parts of that land that are infested with such listed invasive species;
- An assessment of the extent of such infestation;
- A status report on the efficacy of previous control and eradication measures
- The current measures to monitor, control and eradicate such invasive species; and
- Measurable indicators of progress and success, and indications of when the control plan is to be completed.

The above information is informing individuals to take steps to control and eradicate IAPS in areas that they own or manage. The purpose of this document is to respond to this obligation and to coordinate Stellenbosch University's approach in this regard, in order to manage current and future IAPS control, costs and to improve the integrity of the campus landscape and its ecosystems. Stellenbosch University needs to be compliant with NEMBA and other applicable laws and regulations by bringing all IAPS category 1a, 1b and 2 (priority) on campus properties under control by 2025. It is also important for Stellenbosch University to be more sustainable in its operation by creating more water-wise landscapes and increase biodiversity by eradicating IAPS.

2. STELLENBOSCH UNIVERSITY CONTEXT

Stellenbosch University (SU) is an academic institution embedded within the town of Stellenbosch. Stellenbosch is located about 50 kilometres from Cape Town and is situated on the banks of the Eersterivier ("First River") in the famous wine-growing region and is encircled by picturesque mountains. The character of Stellenbosch town Central Business District is strongly interconnected with that of the University. Stellenbosch University is located within the administrative boundaries of Cape Winelands District Municipality and City of Cape Town.



Figure 1: Location of University of Stellenbosch Campuses within administrative boundaries of City of Cape Town Municipality.

Teaching, learning and research at Stellenbosch University is divided between the main campus in Stellenbosch, the *Tygerberg campus* (where the Faculty of Medicine and Health Sciences is situated), the *Bellville Park campus* (where the Stellenbosch University Business School is situated), the *Worcester campus* (Ukwanda Rural Clinical School: Faculty of Medicine and Health Sciences), and the *Saldanha campus* (housing the Faculty of Military Science at the Military Academy of the South African National Defence Force). Stellenbosch University also holds a strong social-ecological relationship with its surrounds. The SU therefore recognises the inextricably interconnected and interdependent social ecological system within which they are embedded. In doing so, the SU acknowledges its responsibility of ensuring the sustainability of the economy, society and the environment. Stellenbosch University, as part of both the local and global economy, needs to examine its own impact on our fragile planet, and develop methods to ensure that all operations and businesses within SU are engaged in

creating a better and more sustainable environment. To achieve these aims, this requires that the SU operates with a new and different ethic focused greening its operations. This real commitment to our environment can be achieved by developing goals and strategies to reduce impacts on the environment. In addition to this, the SU recognises that the case for sustainability and sustainable development has long since been made. A Strategic Plan is being prepared as a high-level framework to achieving environmental sustainability. This sustainable Strategic Plan for the SU is the second iteration and covers the reporting period of 2018-2022. It provides a statement of environmental sustainability, which defines the University's understanding of its commitments. It also contains the University's sustainable vision, mission and goals; as well as the high-level approach to achieving these commitments.

3. OBJECTIVES OF SU INVASIVE AND ALIEN PLANT SPECIES MANAGEMENT PLAN

To control invasive and alien plant infestation to bring the infestation on the properties under control by 2025. Secondly, prevention by placing measures in place to prevent the introduction of new NEMBA listed invasive and alien plant species onto the properties, and from spreading from our properties to neighboring properties and preventative action that:

- No listed invasive and alien plant species will be planted
- Areas bordering onto neighboring land will be prioritized for control to prevent existing invasive plants from spreading beyond the boundaries of the property
- No listed invader animal species will be introduced on the property
- These prevention measures will be communicated to all users of the properties (where applicable)

To Early Detect & Rapid Response (EDRR) and eradicate to overcome emerging alien invasive plant species through regular surveys and remove them before they become established, produce seeds or offspring and start spreading. The actions would:

- a) Regularly survey the property to detect any new or emerging listed invasive plant species
- b) Regularly survey the property to detect any new or emerging listed invasive animal species
- c) Learn more about the SANBI/City of Cape Town/ eThikweni EDRR programmes and register as a spotter where applicable
- d) Report category 1a species immediately to the Department of Environmental Affairs/Provincial Conservation Agency/Local Municipality/South African National Biodiversity Institute (SANBI) EDRR program and ask for assistance with the control of the species
- e) Not allowing emerging or new species to produce seeds or off-spring, or start growing vegetative, act immediately by removing them
- f) Update the species list by including these species and indicate where on the property they were located
- g) Increase surveillance in the areas after the species were controlled to quickly remove re-sprouting plants or seedlings.

4. FRAMEWORK LEGISLATIVE CONTEXT

It is imperative to consider broad legislative context when dealing with Invasive and Alien Plant Species. Without bearing in mind other applicable South African laws pertaining to this issue, the opportunity to manage alien and invasive plant species in holistic manner might not be achieved and that will become problematic in the long run.

Table 1: Broad summary of South African applicable register of legislation to IAPS issues

Law	Planning Framework	Overseeing Authority
Framework provisions		
NEMA	NEMA Principles	All organs of state
Property Rates Act	National Rates Framework	Treasury
	Annual Municipal Rates Policy	Municipality
Biodiversity Conservation		
Biodiversity Act	National Biodiversity Framework	Minister (Enviro)
	Bioregional Plans	Minister (Enviro) or MEC
	Biodiversity Management Plans	Person, organization or organ of state
	National and Provincial Listing of Invasive Species	Minister (Enviro) or MEC
	Invasive Species Control and Eradication Strategies	Management Authority
Provincial Legislation	Listing of AIPs	Provincial Conservation Authority
Agricultural Conservation		
CARA	Listing of Weeds and Invader Plants	Minister (Agriculture)
	Designation of Biological Control Reserves	Executive Officer
SUAR Bill	Listing of Weeds and Invader Plants	Minister (Agriculture)
Water Management		
NWA	National Water Resource Strategy	Minister (Water Affairs & Forestry)

4.1 National Environmental Management Act

The National Environmental Management Act (NEMA) is South Africa's main framework environmental law that seeks to prescribe an integrated environmental management framework for the country. NEMA has purposes of which are of relevance to the regulation of IAPS. Firstly, it purports to give effect to the overarching principles of co-operative governance contained in *Constitution of the Republic of South Africa* (hereafter the Constitution) and co-ordinates the functions of the myriad authorities whose activities may impact on the "environment". Secondly, it aims to fulfil the government's constitutional imperative under section 24(b) of the Constitution

to take “reasonable legislative and other measures” to protect the environment. NEMA provides tools to foster co-operative environmental governance. It prescribes a range of National Environmental Management Principles that must be taken into account by any organ of state whose actions “may significantly affect the environment”. Many of these principles are of relevance to the regulation of IAPS and should inform the actions of all organs of state. Regarding the duty of care, Threats posed by IAPS could well fall within the ambit of this duty of care and compel owners, persons in control or who have a right to use the land, to undertake reasonable measures to eradicate or control the spread of these species.

4.2 Environment Conservation Act

The *Environment Conservation Act (ECA)* is also of potential relevance to the regulation of IAP for two reasons. Firstly, any person wishing to undertake a range of activities relating to the cultivation and importation of IAP must undertake an EIA in terms of the EIA Regulations prior to doing so. Secondly, a failure of any person to control or eradicate AIP which in the opinion of a broad range of authorities may seriously damage, endanger or detrimentally affect the “environment”, may be directed to do so under the *ECA*. This latter provision has similarly not been utilised in the context of AIP regulation.

4.3 Local Government: Municipal Property Rates Act

Property tax can significantly influence land-use options and activities of landowners, including those relating to IAPS. The Local Government: Municipal Property Rates Act (Property Rates Act) that regulates municipalities’ power to impose property tax, significantly reforms the manner in which property tax is currently levied in South Africa. The Property Rates Act compels every municipality to adopt an annual rates policy and prescribes a list of factors that they must take into account when doing so. These factors will ultimately determine the value of any property for rates purposes. A municipality is empowered, in terms of the criteria set out in its rates policy, to levy different rates for different categories of rateable property. These criteria provide a potential mechanism through which a municipality could implement a differential-rating system to encourage landowners to clear IAPS situated on their land. This could be achieved, for example, by prescribing a favourable rating for those properties where landowners undertake alien-invasive clearing.

Various municipalities have already implemented tax benefits of this nature under the previous property tax regime. Alternatively, this could be achieved by including similar provisions in the national framework governing municipal rates policies that may be prescribed by Treasury in the future. However, the factors that must be taken into account by a municipality in determining its property rate’s policy do not currently include the potential for property rates to be used to achieve the above purpose. The inclusion of various conservation related issues as factors that must be taken into account by any municipality when formulating its rating policy may create the legal framework within which municipalities could develop mechanisms and associated tax incentives, such as preferential rating systems, to reward those landowners who clear IAPS situated on their land. This approach would also provide the necessary flexibility to enable municipalities to introduce incentives that are appropriate within their given context.

4.4 National Environmental Management: Biodiversity Act

Chapter 5 of the Biodiversity Act deals specifically with species and organisms posing potential threats to biodiversity. The Act draws a distinction between “alien species” and “invasive species” which are subject to different regulation. Firstly, a person wishing to undertake certain defined “restricted activities” regarding a specimen of an alien species must obtain a permit unless he or she has been exempted from doing so. The permit may only be issued after a “prescribed assessment” of the risks and potential impacts has been carried out.

Secondly, the Biodiversity Act allows the Minister to publish a list of alien species in respect of which “restricted activities” are absolutely prohibited. Provision is made for the regular review of this list. Finally, the Act imposes a duty of care on any person seeking to undertake a restricted activity involving an alien species whether permitted to do so or not. This duty of care is very similar to that prescribed under NEMA but unfortunately does not prescribe a procedure to compel the relevant authority to issue a directive to a person who fails to comply with the duty of care.

Although appearing satisfactory with regard to planning, very little guidance is provided as to how the remainder of the Biodiversity Act should be aligned and coordinated with relevant overlapping provisions in NEMA, the ECA, National Water Act (NWA), Conservation of Agricultural Resources Act (CARA), Mountain Catchment Areas Act (MCAA) and National Veld and Forest Fire Act (NV&FFA), Plant Improvement and relevant provincial legislation, for example. The Alien Invasive Regulations, currently being drafted by the Department of Environmental Affairs and Tourism (DEAT), provide a valuable opportunity to attempt to remedy this fragmentation.

4.5 Water conservation

Water scarcity is perhaps one of the greatest challenges facing South Africa. The problem is compounded by IAPS which, according to current estimates, consumes around 3.300 billion m³ of water per year, about seven percent of South Africa's mean annual runoff. This consumption is nearly equal to total domestic and industrial consumption in South Africa's major urban and industrial centres. It is therefore essential that South Africa's two main laws aimed at conserving the country's water resources, the NWA and MCAA, satisfactorily address the threats posed by IAPS.

The purpose of the NWA is to ensure that the nation's “water resources” are protected, used, developed, conserved, managed and controlled to achieve various ends including: promoting equitable access to water; redressing past inequalities; promoting sustainable use; facilitating social and economic development; protecting aquatic ecosystems; and reducing and preventing pollution. Although one would expect the NWA to provide for the regulation of IAPS in the context of water resource management, the Act contains no express reference to these species. Nonetheless, the NWA contains a number of provisions of relevance to the regulation of IAPS. Firstly, it prescribes a range of water management strategies that once finalised, will prescribe the framework within which water resources will be managed. These include a National Water Resource Strategy (NWRS) and regional Catchment Management Strategies.

The NWRS makes express reference to the impact of IAPS on South Africa's scarce water resources and calls for a "coordinated multi-sectoral" management approach. From a water resource management perspective, the NWRS envisages that IAP control should be undertaken at catchment management level and may be prioritised in specific catchment management strategies. In addition, it provides that where vegetation clearing activities contribute to improved water security the costs may be funded by water management institutions using water resource management charges on water users. A further shortcoming is that very little provision is made for the alignment of the above strategies with those prescribed in other legislation of relevance to IAP regulation. Secondly, the measures aimed at preventing pollution are also of potential relevance to the regulation of IAP given the broad definition of "pollution". Thirdly, certain activities relating to IAP may constitute a "water use" and therefore be subject to the provisions regulating water use in the Act. The general rule is that no one may use water unless: it has been declared a *de minimus* use; it is subject to a general authorisation; it constitutes a continuation of existing lawful water uses; or the use has been licensed or exempted. Finally, certain activities relating to IAPS may constitute offences under the NWA. Although appearing to prescribe a number of planning frameworks and mechanisms that could be utilised to regulate IAP in the context of water resource management, the extensive delays in the implementation of many of the essential planning frameworks and the establishment of key water management institutions currently undermine their effectiveness.

4.6 Agricultural management

South Africa's key agricultural legislation, CARA and the Regulations promulgated under it (CARA Regulations) currently provide the main tool for directly regulating IAPS in South Africa. Although originally enacted to deal specifically with IAPS in the context of agriculture, the CARA Regulations have been applied to regulate these species' impact on biodiversity conservation, water resource management and fire management in the absence of alternate relevant legislation. The government is in the process of reviewing CARA which will ultimately be repealed by the Sustainable Use of Agricultural Resources Draft Bill (SUAR Bill) currently being drafted by the Department of Agriculture.

4.7 Conservation of Agricultural Resources Act

The objects of CARA, administered by the Department of Agriculture, include

...the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land [...] and by the protection of the vegetation and the combating of weeds and invader plants.

The Act empowers the Minister of Agriculture to declare plants as "weeds" throughout the country or in respect of one or more areas. The Minister exercised these powers and published the CARA 155 Didiza "Invasive Species" 5. Regulations which list weeds and invader plants and prescribe a range of tools that impose various obligations on "land users" on whose land these species occur.

The 198 listed species are divided into three categories each subject to a different level of regulation. The principal Act prohibits the deliberate or unintentional spread of listed weeds through sale, the transfer of agricultural produce and the movement of livestock. CARA Regulations govern the control and eradication of plants which occur contrary to its provisions. Land users are compelled to select control measures that are appropriate for the species and ecosystem concerned and these measures must be applied to propagating material and re-growth to prevent listed plant species from forming seed or re-establishing in any manner.

Any action must be undertaken with caution and in manner that will cause the least possible “damage” to the “environment”. These two terms are unfortunately not defined and therefore the scope of this provision is plagued with uncertainty. Given that these control measures have the potential to cause greater harm to the environment than the existence of the AIP and fall almost entirely within the discretion of the land user, it would be advisable to provide detailed guidelines regarding what control measure would be “appropriate” in the specific context in any future regulation. Although imposing a number of obligations on land users, neither CARA nor the CARA Regulations provide that a failure to comply with the above measures constitutes a criminal offence. However, if these obligations are regarded as control measures, as provided for under CARA, refusal or failure to comply with these obligations constitutes an offence. In addition, if a direction has been issued to a particular land user to comply with certain control measures, and the land user fails or refuses to do so, he/she is guilty of an offence.

4.8 Fire risk management

One may well ask what the relevance of AIPs is to veld fires. Indigenous plants have a very low biomass and have a natural resistance to fire. IAPS, in contrast, have a high biomass which significantly increases the intensity of veld fires. This added intensity kills indigenous vegetation, increases erosion and stimulates the germination of IAPS seedlings. It is interesting to note that every house burnt down in the devastating fires that swept through Cape Town in 2000 was surrounded by IAPS. Three laws are of relevance to the regulation of IAPS in the context of fire management, namely: the NV&FFA, MCAA and CARA.

4.9 National Veld and Forest Fire Act

The NV&FFA is the main law aimed at preventing and combating veld, forest and mountain fires in South Africa. The Act, administered by the DWAF, imposes three main duties on landowners to control veldfires, namely to: prepare and maintain firebreaks; acquire equipment and have available personnel to fight fires; and take action to prevent the spread of fires. Although none of the above provide expressly for the control of IAPS, given their propensity to increase the intensity of veld fires, these obligations are of relevance to owners of land on which these species occur.

In addition, the Act provides for two potentially important planning mechanisms. Firstly, landowners who wish to co-operate in fire prevention, management and control, can form fire protection associations (FPAs). These FPAs are required to develop and apply a veldfire management strategy for their area which must include an identification of ecological conditions

that affect fire danger, such as that posed by IAP, and how they purport to deal with these risks. The final law of potential relevance to the regulation of IAPS in the context of fire management is CARA. It empowers the Minister of Agriculture to prescribe control measures relating to the “prevention and control of veld fires”.

5. STELLENBOSCH UNIVERSITY CAMPUSES

It is imperative to emphasize that this report captured 99% listed garden species category 1a, 1b and 2 (priority categories) of Stellenbosch University properties. However, there are few listed species category 3 that the University is aware of. In addition, *Pinus* and *Eucalyptus* genus species occurring on University properties are under carefully assessment and identification through assistance of Stellenbosch University Forestry Department. We only control the seedlings and re-sprouts of these two genus. The main aim for considering category 1a, 1b and 2 is strictly based on control approach which focuses on priority listed plant species.

On each campus, spaces are labeled or divided into management unit areas as an approach system that guides the management of Invasive and Alien Plant Species on each campus. Stellenbosch campus has four management units of which one of them is Stellenbosch University Botanical Garden as management unit 4. Due to Stellenbosch University Botanical Garden business Management plan which encompasses educational purposes, it would be great if the garden could get exemption for Invasive and Alien Plant Species and the garden will also clearly mark these species as NEMBA listed, ensure that none of them are for sale or distribution to the public and control them from spreading. Tygerberg campus consists of one management unit as same applies with Worcester campus. Bellville campus has two management units in total.

5.1 STELLENBOSCH CAMPUS

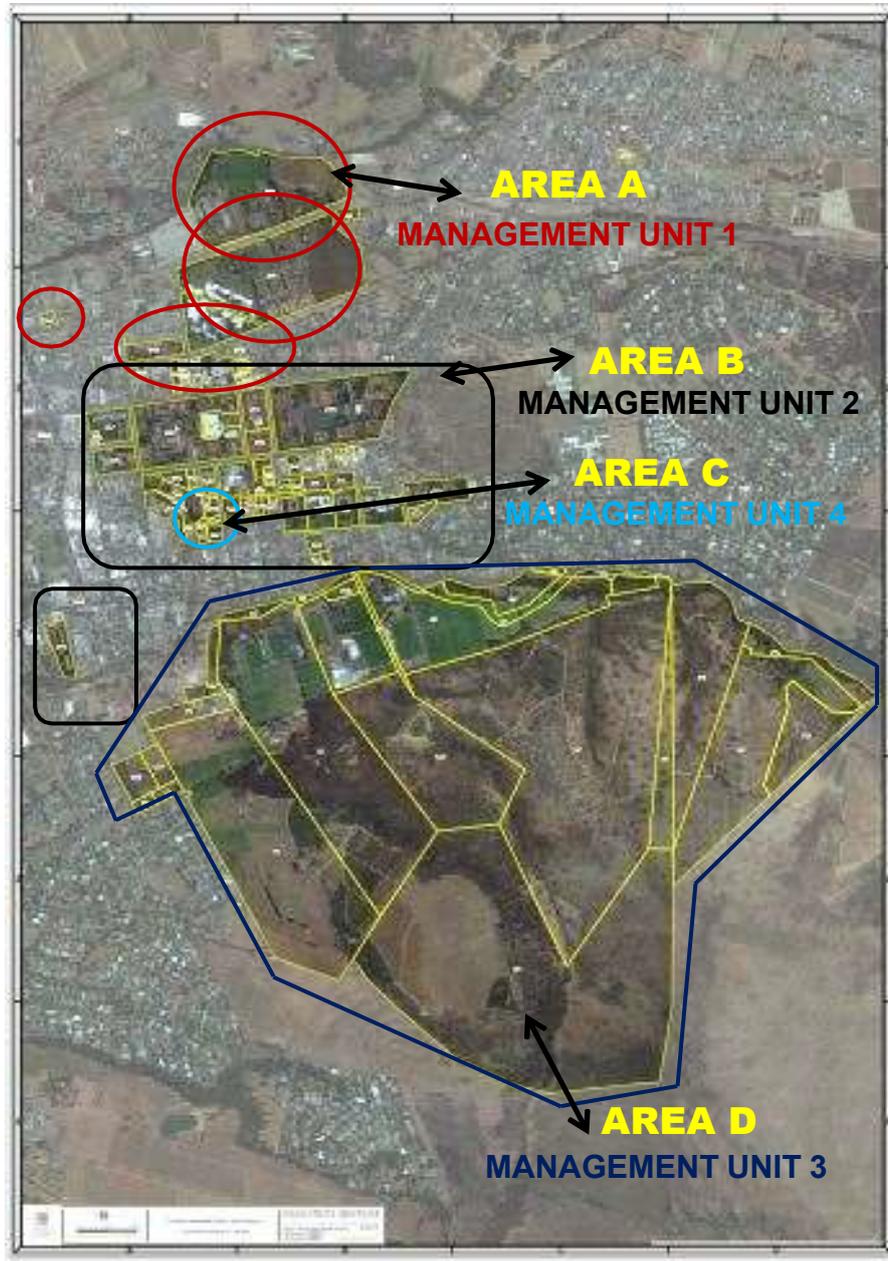


Figure 2: University properties within administrative boundaries of Stellenbosch Municipality.

5.1.1 THE EXTENT AND DISTRIBUTION

Table 2: Management Units: The invasion, distribution and extent per species.

Species	Seedling	Young	Mature	Extent
		DBH < 1m	DBH > 1m	
		Diameter < 60cm	Diameter > 60cm	
MANAGEMENT UNIT 1				
<i>Acacia cyclops</i>			x	0.03%
<i>Acacia dealbata</i>			x	0.02%
<i>Acacia saligna</i>			x	0.002%
<i>Ageratina adenophora</i>	x	x	x	0.06%
<i>Anredera cordifolia</i>		x	x	0.03%
<i>Arundo donax</i>		x	x	0.03%
<i>Casuarina equisetifolia</i>			x	0.019%
<i>Cestrum laevigatum</i>			x	0.003%
<i>Echium plantagineum</i>	x	x		0.05%
<i>Homalanthus populifolius</i>			x	0.002%
<i>Ligustrum ovalifolium</i>		x	x	0.01%
<i>Paulownia tomentosa</i>			x	0.01%
<i>Pittosporum undulatum</i>	x	x	x	0.01%
<i>Plectranthus barbatus</i>		x	x	0.04%
<i>Tradescantia fluminensis</i>	x	x		0.15%
<i>Vinca major</i>	x	x		0.19%
Overall density (%)				+ – 0.276 %
Overall total (m ²)				+ – 1040m ²
MANAGEMENT UNIT 2				
<i>Acacia cyclops</i>			x	0.001%
<i>Acacia saligna</i>			x	0.004%
<i>Ageratina adenophora</i>		x	x	0.005%
<i>Anredera cordifolia</i>			x	0.001%
<i>Canna indica</i>		x		0.0003%
<i>Callistemon rigidus</i>			x	0.001%
<i>Cotoneaster species</i>		x	x	2.81%
<i>Duchesnea indica</i>		x		0.0004%
<i>Gleditsia triacanthos</i>			x	0.001%
<i>Hedychium coccineum</i>		x	x	0.0003%
<i>Hedychium flavescens</i>		x	x	0.001%
<i>Hypericum androsaemum</i>		x		0.0003%
<i>Ipomoea indica</i>			x	0.001%
<i>Iris pseudacorus</i>			x	0.002%
<i>Lantana camara</i>		x	x	0.004%
<i>Ligustrum japonicum</i>			x	0.006%
<i>Ligustrum lucidum</i>			x	0.0003%
<i>Ligustrum ovalifolium</i>			x	0.019%

<i>Melaleuca quinquenervia</i>			x	0.01%
<i>Nephrolepis cordifolia</i>	x	x		0.01%
<i>Nephrolepis exaltata</i>	x	x		0.002%
<i>Nerium oleander</i>			x	0.001%
<i>Paraserianthes lophantha</i>		x	x	0.002%
<i>Persicaria capitata</i>	x	x		0.01%
<i>Pittosporum undulatum</i>	x	x	x	0.001%
<i>Populus alba</i>	x	x	x	0.003%
<i>Pyracantha angustifolia</i>			x	0.01%
<i>Pyracantha coccinea</i>			x	0.002%
<i>Robinia pseudoacacia</i>			x	0.001%
<i>Spartium junceum</i>		x	x	0.002%
<i>Vinca major</i>	x	x		0.0006%
Overall density (%)				+ –2,903%
Overall total (m ²)				+ –3848m²
MANAGEMENT UNIT 3				
<i>Acacia dealbata</i>	x	x	x	0.004%
<i>Acacia longifolia</i>	x	x	x	0.0001%
<i>Acacia saligna</i>	x	x	x	0.001%
<i>Ageratina adenophora</i>	x	x	x	0.012%
<i>Anredera cordifolia</i>	x	x	x	0.01%
<i>Araujia sericifera</i>	x	x	X	0.001%
<i>Arundo donax</i>	x	x	X	0.001%
<i>Cana indica</i>	x	x		0.002%
<i>Cotoneaster species</i>		x	x	0.005%
<i>Echium plantagineum</i>	x	x		0.01%
<i>Furcraea foetida</i>			x	0.001%
<i>Homalanthus populifolius</i>		x	x	0.0001%
<i>Ipomoea indica</i>			x	0.01%
<i>Lantana camara</i>		x	x	0.004%
<i>Ligustrum lucidum</i>		x	x	0.01%
<i>Ligustrum ovalifolium</i>	x	x	x	0.003%
<i>Lonicera japonica</i>	x	x	x	0.01%
<i>Nephrolepis cordifolia</i>	x			0.001%
<i>Nerium oleander</i>			x	0.001%
<i>Opuntia ficus-indica</i>			x	0.0001%
<i>Pittosporum undulatum</i>			x	0.002%
<i>Plectranthus barbatus</i>		x	x	0.002%
<i>Populus alba</i>	x	x	x	0.01%
<i>Ricinus communis</i>		x	x	0.001%
<i>Solanum mauritianum</i>		x	x	0.0003%
<i>Tradescantia fluminensis</i>	x	x		0.01%
<i>Vinca major</i>	x	x		0.001%
Overall density (%)				+ –0.111%
Overall total (m ²)				+ –827m²

Species	Seedling	Young	Mature	Extent
		DBH < 1m	DBH > 1m	
		Diameter < 60cm	Diameter > 60cm	
MANAGEMENT UNIT 4 (Stellenbosch University Botanical Garden)				
<i>Ardisia crenata</i>				
<i>Bartlettina sordida</i>				
<i>Cotoneaster sp.</i>				
<i>Crotalaria agatiflora</i>				
<i>Eugenia uniflora</i>				
<i>Furcraea foetida</i>				
<i>Hydrocleys nymphoides</i>				
<i>Ipomoea alba</i>				
<i>Iris pseudacorus</i>				
<i>Lantana camara</i>				
<i>Ligustrum lucidum</i>				
<i>Ligustrum ovalifolium</i>				
<i>Metrosideros excelsa</i>				
<i>Nicandra physalodes</i>				
<i>Opuntia ficus-indica</i>				
<i>Opuntia ficus-indica</i> 'Spineless'				
<i>Parkinsonia aculeata</i>				
<i>Pereskia aculeata</i>				
<i>Pistia stratiotes</i>				
<i>Pontederia cordata</i>				
<i>Pontederia crassipes</i>				
<i>Psidium cattleianum</i>				
<i>Pyracantha angustifolia</i>				
<i>Salvinia molesta</i>				
<i>Sambucus nigra</i>				
<i>Schefflera actinophylla</i>				
<i>Tephrocactus articulatus</i>				
<i>Tephrocactus articulatus</i> var.				
<i>Hylocereus undatus</i>				
<i>Rubus fruticosus</i> 'Waldo'				
<i>Rubus fruticosus</i>				
Overall density (%)				
Overall total (m ²)				

5.1.2 OVERALL EXTENT OF INVASIVE AND ALIEN PLANT SPECIES ON THIS CAMPUS.

Table 3: Total Invasive and Alien Plant Species infestation per management unit.

Management Units	Unit Size (Ha)	Extent of overall invasion (m ²)	Extent of overall invasion (%)	Priority
1	42.11 ha	+ –1040m ²	+ –0.276%	2rd Priority area
2	49.26 ha	+ –3848m ²	+ –2.903%	1st Priority area
3	77.61 ha	+ –827m ²	+ –0.111%	3rd Priority area
4	3.2 ha	m ²	%	Special Unit Area
Total	172.18 ha	+ –5715 m²	+ –3.29%	

5.2 TYGERBERG CAMPUS

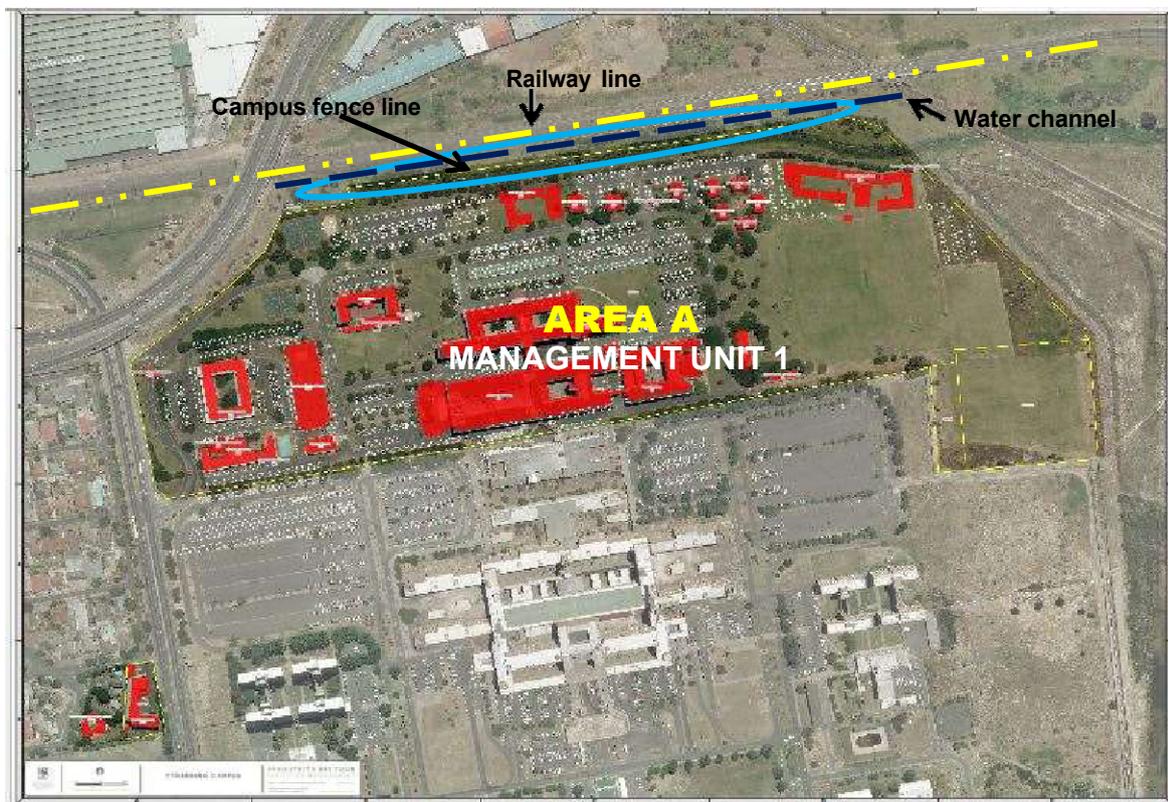


Figure 3: Map showing the location of Stellenbosch University Tygerberg Campus properties in Tygerberg.

5.2.1 THE EXTENT AND DISTRIBUTION

Table 4: Management Units: The invasion, distribution and extent per species.

Species	Seedling	Young	Mature	Extent
		DBH < 1m	DBH > 1m	
		Diameter < 60cm	Diameter > 60cm	
MANAGEMENT UNIT 1				
<i>Ricinus communis</i>	x	x		
<i>Solanum mauritianum</i>	x	x		
<i>Echium plantagineum</i>	x			
<i>Arundo donax</i>		x		
<i>Acacia saligna</i>		x		
		x		
Overall density (%)				+ – 0.27%
Overall total (m ²)				+ –104m ²

The campus (Tygerberg) within campus boundaries is clean from invasive and alien plant species. The outside area (marked with blue line on the map: see Fig. 3) between railway line and the campus fence is invested by invasive and alien plant species. In addition, the same outside area has a water channel running parallel between the railway line and the campus fence. Therefore, it is important to note that the University is only responsible to control invasive and alien plants species between the water channel and fence of the campus. The invasive and alien plant species currently occurring in this area are growing in small portions. This area has a flat gradient and there are indications of previous attempts to control invasive and alien plant species. The control approach will commence and completed between August and November 2020 if Covid-19 regulations permits. The control would be Mechanical & manual control methods and no chemical would be used.

5.2.2 OVERALL EXTENT OF INVASIVE AND ALIEN PLANT SPECIES ON THIS CAMPUS.

Table 5: Total Invasive and Alien Plant Species infestation per management unit.

Management Units	Unit Size (Ha)	Extent of overall invasion (m ²)	Extent of overall invasion (%)	Priority
1 (Area A)	+- 6.4 ha	+ –104m ²	+ – 0.27%	1st Priority area
Total	+- 6..4 ha	+ –104m ²	+ – 0.27%	

5.3 BELLVILLE CAMPUS

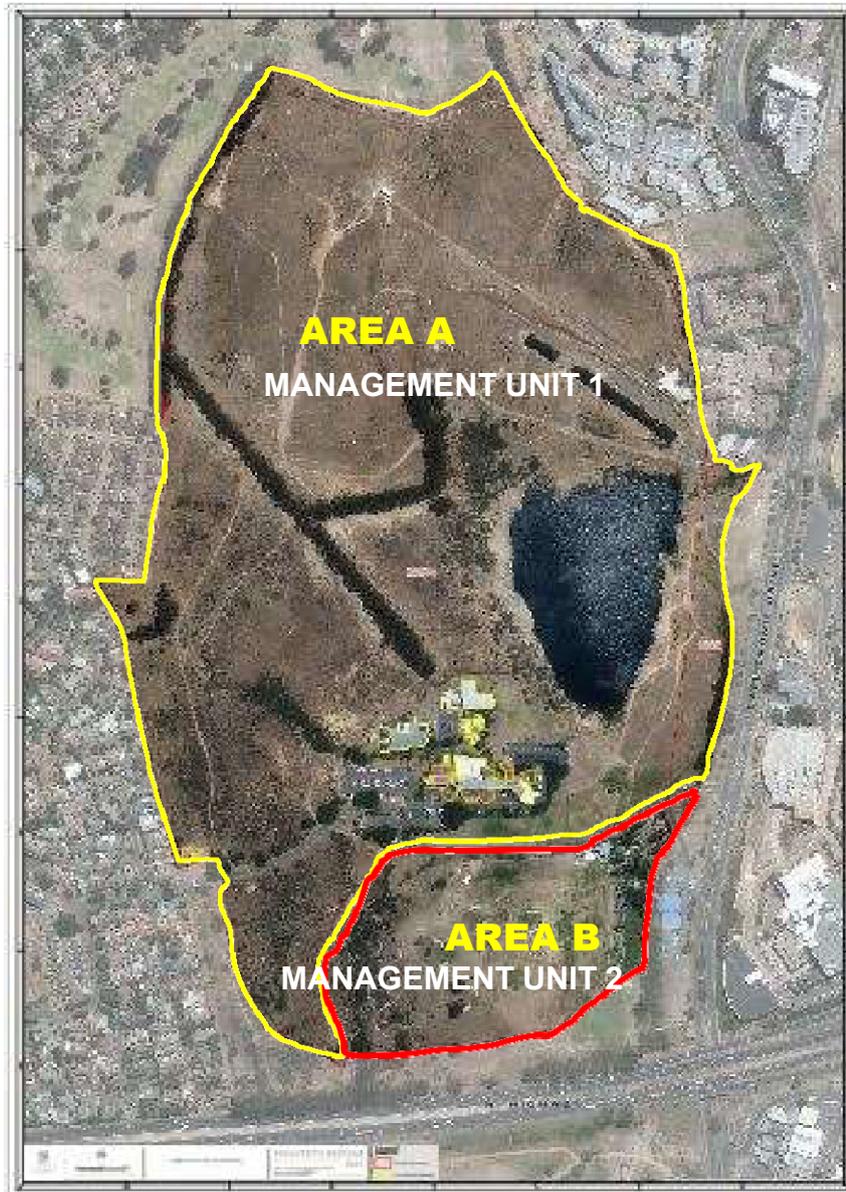


Figure 4: Stellenbosch University Bellville Park property sectioned to area A (SU Business School) and area B (Golf Course Drive Range) in Bellville.

5.3.1 THE EXTENT AND DISTRIBUTION

Table 6: Management Units: The invasion, distribution and extent per species.

Species	Seedling	Young	Mature	Extent
		DBH < 1m	DBH > 1m	
		Diameter < 60cm	Diameter > 60cm	
MANAGEMENT UNIT 1				
<i>Acacia saligna</i>	x	x		0.003%
<i>Spartium junceum</i>	x	x		0.002%
<i>Eucalyptus sp. (seedlings)</i>	x	x		0.003%
Overall density (%)				0.008 %
Overall total (m ²)				7.5m²
MANAGEMENT UNIT 2				
<i>Acacia longifolia</i>	x	x		0.01%
<i>Acacia saligna</i>	x	x		0.5%
<i>Eucalyptus sp. (seedlings)</i>	x			0.01%
<i>Solanum mauritianum</i>		x		0.01%
<i>Nicotiana glauca</i>		x		0.02%
<i>Spartium junceum</i>		x		0.05%
Overall density (%)				+ –0,6%
Overall total (m ²)				+ –110m²

5.3.2 OVERALL EXTENT OF INVASIVE AND ALIEN PLANT SPECIES ON THIS CAMPUS.

Table 7: Total Invasive and Alien Plant Species infestation per management unit.

Management Units	Unit Size (Ha)	Extent of overall invasion (m ²)	Extent of overall invasion (%)	Priority
1 (Area A)	6.2 ha	+ –7.5m ²	+ –0.008%	1st Priority area
2 (Area B)	1.2 ha	+ –110m ²	+ –0.6%	1st Priority area
Total	+ – 7.4 ha	+ –117.5 m²	+ –0.608%	

5.4 THE WORCESTER CAMPUS



Figure 5: Map showing the location of Stellenbosch University Worcester campus property in Worcester.

5.4.1 THE EXTENT AND DISTRIBUTION

Table 8: Management Units: The invasion, distribution and extent per species.

Species	Seedling	Young	Mature	Extent
		DBH < 1m	DBH > 1m	
		Diameter < 60cm	Diameter > 60cm	
MANAGEMENT UNIT 1				
<i>Atriplex species</i>	x	x		0.003%
Overall density (%)				+ –0.003 %
Overall total (m ²)				+ –7.5m ²

5.4.2 OVERALL EXTENT OF INVASIVE AND ALIEN PLANT SPECIES ON THIS CAMPUS.

Table 9: Total Invasive and Alien Plant Species infestation per management unit

Management Units	Unit Size (Ha)	Extent of overall invasion (m ²)	Extent of overall invasion (%)	Priority
1 (Area A) total	+ – 3.2 ha	+ –7.5 m ²	+ –0.003%	1st Priority area
	+ – 3.2 ha	+ –7.5 m ²	+ –0.003%	

6. PLANNING, BUDGET, CLEARING AND METHODS OF MANAGEMENT UNITS

Table 10: The structure for cleared, planned schedules and methods

Management units	Description/ Location	Year	I = Initial clearing	F 1 = First follow-up	F2 = Second follow-up	F3 = Third follow-up	DS = Desired State	Comments & Herbicide Control
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STELLENBOSCH CAMPUS (PLANNED AND COMPLETED WORK)

1	The entire unit including Krom river, Lentelus Sport Field, FM, Goldfields and Food Sciences.	2016	Initial clearing was done in 2016	First follow-up is required				No herbicide was used.
2	STIAS property	2018	Initial clearing was done in 2018	First follow-up is required				Diesel and salt was used on cut stumps
2	Huis Neethling Residence	2018	Initial clearing was done in 2018	First follow-up is required				Diesel and salt was used on cut stumps
2	Entire unit	2018	Initial clearing was done in 2018	First follow-up is required				No herbicide was used
4	Stellenbosch University Botanical Garden	To be compiled/supplied						Waiting for information

1	Duthie Nature Reserve	2020				3 rd Follow-up		No chemicals used
2	Eerste River including Koloniesland Park	2019	Initial clearing was done in 2019	First follow-up is required				No herbicide was used

3	Stellenbosch Mountain (Old Chip Area, Plantation area, Compost site and dongas area, Eucalyptus plantation area Ertjiesvlei area and Study area)	2019-2020	Mixture (I, F1, F2, F3 and DS)					*Cut stump, Some areas: Garlon and confront, In other areas: *Sulphate mix *Glyphosate
3	Welgevallen Natural area (Stellenbosch Mountain)	2017	Initial clearing was done in 2017	First follow-up was done this year 2020	Second follow-up is required			Herbicide used on cut stumps was Triclopyr, crop oil and dye.
3	Welgevallen Farm between houses		Initial clearing required urgent				Desired state	Clearing has been proposed and herbicide will be used.
Management units	Description/ Location	Year	I = Initial clearing	F 1 = First follow-up	F2 = Second follow-up	F3 = Third follow-up	DS = Desired State	Comments & Herbicide Control

TYGERBERG CAMPUS
(PLANNED AND COMPLETED WORK)

1	The entire unit within property boundary	2020	Initial clearing was done in 2017	First follow-up was done in 2018	Second follow-up was done in 2019	Third follow-up was done this year 2020		Under-monitoring and free from priority categories.
1	The outside area between the fence and the railway line		Initial clearing required urgent				Desired state	Clearing has been proposed. Up-rooting would be the method to use.
Management units	Description/ Location	Year	I = Initial clearing	F 1 = First follow-up	F2 = Second follow-up	F3 = Third follow-up	DS = Desired State	Comments & Herbicide Control

BELLVILLE PARK CAMPUS
(PLANNED AND COMPLETED WORK)

1	The entire unit within property boundary including the natural area	2020	Initial clearing was done in 2017	First follow-up was done in 2018	Second follow-up was done in 2019	Third follow-up was done this year 2020		Inspection is outstanding. Herbicide used on cut stumps was Triclopyr, crop oil and dye.
2	The entire unit (Golf Driving Range)	Clearing proposed	Initial clearing required urgent				Desired state	Clearing has been proposed.

Management units	Description/ Location	Year	I = Initial clearing	F 1 = First follow-up	F2 = Second follow-up	F3 = Third follow-up	DS = Desired State	Comments & Herbicide control
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**WORCESTER CAMPUS
(PLANNED AND COMPLETED WORK)**

1	The campus	2019	This was initial clearing in 2019	First follow-up was done this year 2020	Not needed	Not needed	Not needed	<i>Under-monitoring and free from priority categories. No herbicide used.</i>
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7. BIOMASS MANAGEMENT

All Management Units will be in maintenance by 2025. Control operations will be conducted in such a way to ensure enhanced recovery of native plants. Clearing methods will include cutting, felling and treating the stumps with registered herbicides by appropriately skilled herbicide applicators. The follow-up methods include a combination of manual and herbicide control. Stack in “Teepee” for burning if necessary (the smaller the piles, the better), it also means fewer piles, leave 70 meters between stacks, the minimum distance between the stacks and the crops is 100 m. Include dry material left after previous control to minimize fire risk. Prepare 20m wide firebreak along crops and along the site boundaries. Burn stacks during spring/early winter. Obtain a burning permit and fire-fighting support.

8. MONITORING

Monitoring framework, planning and budget, clearing schedule, control methods, fire prevention and preparedness including Safety, Health and Environment (**SHE**) would be generated as indicated below:

Table 11: Steps to be followed as a monitoring framework

WHAT	FREQUENCY	HOW	RESPONSE
<i>How effective are the control methods</i>	4-6 months after every operation	Survey the cleared areas and look for regrowth. Before and after pictures are very effective. Look out for non-target effects of	<i>If the survey reveals that the control methods are effective, e.g. low levels of re-sprouting, continue following the herbicide mixtures and control methods. If non-target plants are dying off where herbicides were applied, ensure appropriate training for herbicide</i>

		Herbicide application.	<i>Applicators, demonstrate the off-target effects to herbicide applicators to ensure they are using the correct methods and herbicides. (Gums are difficult to control and re-sprouting often occurs, therefore shorter follow-up interventions may be required). If the results show that the control methods are not effective, adapt by e.g. cutting lower above ground or changing herbicides or timing of herbicide application.</i>
<i>Do the infestation levels decrease</i>	Annually	Survey the cleared areas and record species, densities and size. Before and after pictures are very effective.	<i>If the infestation levels are not decreasing, reconsider clearing intervals and look at clearing methods. If infestation levels are decreasing - continue clearing, you are doing well!</i>
<i>How much herbicides were used</i>	During every operation (If WFW provides the herbicides, a landowner agreement will be signed and	Keep track of cost and ensure no wastage. Record herbicide usage	<i>Track usage over time, it will reveal a certain trend in quantities for different infestation levels. Less herbicides should be used when the infestation levels are lower. Record herbicide cost.</i>
<i>Does the indigenous vegetation recover in the cleared areas?</i>	Annually	Survey the cleared areas and look out for indigenous species variety and presence. Before and after pictures are very effective.	<i>If it does – you are doing well, if not, look at clearing methods, clearing intervals or consult an expert</i>
<i>How many jobs were created</i>	After every operation	Timesheets	<i>Job creation figures are useful when asking for landowner assistance from WFW or to demonstrate contributions to jobs and socio-economic conditions</i>
<i>How many person days (PD) were spent per operations</i>	After every operation	Timesheets	<i>Keep track of cost and assist with planning and budgeting. Determine cost per personday (PD)</i>

9. PLANNING AND CLEARING APPROACH

- Planning and Budget**

Planning will be guided by Management units as indicated on each campus together with the clearing schedule and method baselines. The management unit area that is infested the most will be the first priority to plan and control. The availability of funds is the main resource to respond to planning and IAPS control annually.

- Control Methods**

Following best practice described in this document, ensures compliance with NEMBA Section 75 (1) (2) & (3) in that the means and methods of control are appropriate to the species and environment and are implemented in such a way that it minimizes the risk to biodiversity and

the environment. Control actions must be taken with caution to cause the least possible harm to biodiversity and the environment (take care not to remove native species or damage them for example by using the incorrect herbicide application; or bulldozing). Offspring, propagating material and regrowth should be tackled to prevent species from producing offspring, forming seed, regenerate or re-establish. Implement measures to prevent the starting of wildfires, including spreading to neighbouring land and to be ready and able to combat fires on the farm should they occur. Mechanical and hand tools must be best suited to the work and the size of plants being cleared and in a good working condition

Initial clearing: Equipment required: Chainsaws, loppers, bow saw, 2ℓ handheld herbicide cans. Pines and Hakea: fell and cut, no herbicides required. Port Jackson & longleaf wattle: fell and cut, apply herbicide to stumps within 1 minute after cutting or felling. Apply herbicides at applicable rates. Follow up clearing: conduct follow up within six months after initial clearing, before plants have the opportunity to produce seeds. Pines and Hakea: cut, no herbicides required Port Jackson & longleaf wattle: cut, apply herbicide to stumps within 1 minute after cutting or felling. Apply herbicides at applicable rates. Mechanical & manual control methods: Fell trees with a stem diameter of > 200mm with a chainsaw, Cut trees with a stem diameter of < 200mm with a bow saw or silky saw or chainsaw, Cut trees and plants with a stem diameter of < 100mm with a lopper. Cut as low as possible above ground level, ideally 10 cm or below the last growth point, ensure even cuts and seedlings can be hand-pulled in sandy soil, important to uproot the entire plant, breaking off will cause it to regrow. Herbicide application: ensure herbicide applicators are appropriately skilled and registered, Wear correct personal protective equipment (PPE), and only apply registered herbicides at prescribed rates, follow label instructions. Cut stump treatment: Use spray can (2ℓ spraymaker) for smaller plants and knapsack for larger trees and apply herbicides to the stump immediately after cutting or felling, For larger stumps, only apply herbicides to the outer 50mm (cambium), and minimize collateral damage by applying herbicides using the correct nozzle and pressure. Foliage treatment: Suitable for plants up to 1m tall and use a knapsack sprayer with a pressure regulator to evenly apply herbicides at the required mixture. Precautions during herbicide application: The risk of herbicide drift exists especially in the vicinity of vineyards/orchards or crops, Apply only under suitable weather conditions, at appropriate rates by appropriately qualified herbicide applicators. Treatment is least effective in very hot weather or when the plants are water stressed. Do not apply herbicides during windy conditions to prevent herbicide drift and damaging non-target plants.

- **Fire prevention and preparedness**

Implement measures to prevent the starting of wildfires, including spreading to neighbouring land and to be ready and able to combat fires on the farm should they occur. Should landowners fail to adhere to the provisions of the National Veld and Forest Act, 1998 (Act 101 of 1998), (NVFA) e.g. preparing of a fire break, notifying about their intention to conduct a burn on their land, or meeting the standards, penalties are involved (NVFA, Sec 19). In addition, NVFA Sec 19 (5) states that any owner, occupier of person in control of land on which a fire occurs who fails to take reasonable steps to extinguish the fire, or to confine it to that land, or to prevent it from causing damage to property on adjoining land, is guilty of an

offence. Bringing alien plant infestations under control is an important step towards preventing fires from spreading to neighbouring land as these fires burn up to 10 times hotter than fynbos fires. Fires in alien invested land are very difficult to control, especially under windy and very hot conditions.

Prepare and maintain a fire break around the property that is it is wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, does not cause soil erosion; and is reasonably free of inflammable material capable of carrying a veldfire across it. We will join the Fire Protection Association if necessary, be ready to fight fires by acquiring equipment and having available personnel to fight fires. In an emergency certain persons and officials will be given permission to enter land and fight fires and Notify the FPA and neighbouring landowners about fires and take the necessary steps to stop the spread of fires should they occur (for more information see section 18 of the National Veld and Forest Act, 1998 (Act 101 of 1998).

- **Safety, Health and Environment (SHE)**

It is the landowner's responsibility to ensure a safe working environment and that the teams working on the property adhere to the minimum safety requirements. This can be achieved by sourcing appropriately trained and experienced teams. The principle of "leave no trace" applies. The landowner should liaise with the contractor to ensure that the contractor is responsible for providing a mobile toilet on site for the duration of the work (it is not in all cases possible to provide a mobile toilet, where the field conditions are not suitable for a mobile toilet, human waste should be buried by digging a hole of at least 20 cm deep) and clean water must be made available in suitable containers for drinking and mixing herbicides,

In terms of team's skills requirements, chainsaw operators must be in possession of valid certificates and Herbicide applicators certified. Work methods and equipment must be suitable for the work, in good working condition and adhere to work methods stipulated in the site specification. Vehicle and drivers, the driver must be in possession of a valid PrDP, the vehicle must be roadworthy and tools must be transported in the trailer, separately from the workers. Regarding safety precautions, certified SHE Rep, Safety Office and first aid kit must be on site. In addition, the SHE Rep must conduct daily safety talks.

In terms of COID, the contractor must be in possession and present proof of a valid certificate of good standing with the Compensation Commissioner, any incidents must be reported to the landowner, an indemnity form must be signed stating that the contractors accepts full liability for any COID related matters and that the landowner will not be held liable should the contractor not comply with minimum standards, the contractor deals with COID cases and not the landowner and near misses, incidents and accident register must be kept.

Insurance, the contractor must be appropriately insured for the vehicle and equipment. The contractor must provide proof of third party and liability insurance and sign an agreement whereby the contractor accepts liability for damages in case of negligence. Storage of fuel and

herbicides, Fuel and herbicides must be left in a shady area, away from the resting/eating area, the area must be clearly marked with bunting, the bunting must be removed on completion of the job, herbicide mixing and re-fueling must be conducted on a spill blanket, a spade must be on site to cover any accidental spillage and a serviced and functional fire extinguisher must be kept at the fuel refilling area. Preventing of fires, No smoking while working, assign a designated smoking area, remove cigarette butts, no smoking during windy conditions, keep 1 fire beater for every team member within reach of the workers and no chainsaw work during Code Red days - Fire Danger Indices (FDIs) obtainable from FPA.

Table 12: Correct Personal Protection Equipment that must be worn at all times

Item	Supervisor	Machine operator	General workers SHE Rep; 1 st Aid Rep;	Specialized herbicide applicator
<i>Sunhat (follow up operations)</i>	✓	✓	✓	✓
<i>Hard hat (when chainsaws are being used)</i>	✓	✓	✓	✓
<i>Hard hat with visor and certified earmuffs (SABS or EU),</i>	x	✓	x	x
<i>T-shirt</i>	✓	✓	✓	✓
<i>Conti suit</i>	✓	✓	✓	✓
<i>FESA approved chainsaw pants (eleven layers) with broad belt or braces</i>	x	✓	x	x
<i>Whistle</i>	✓	✓	x	x
<i>Safety boots</i>	✓	✓	✓	✓
<i>Gumboots (only when working in riverine/wetland areas)</i>	✓	✓	✓	✓
<i>Chainsaw safety boots</i>	x	✓	x	x
<i>Gloves</i>	✓	✓	✓	✓
<i>Chainsaw operators gloves</i>	x	✓	x	x
<i>Safety goggles</i>	✓	✓	✓	✓
<i>Cape (when using a knapsack)</i>	x	x	x	✓
<i>Mask (when applying herbicides)</i>	x	x	x	✓
<i>Rubber gloves (for mixing herbicides)</i>	x	x	x	✓
<i>Rubber apron (for mixing herbicides)</i>	x	x	x	✓
<i>Rain suit (during rainy conditions)</i>	✓	✓	✓	✓

