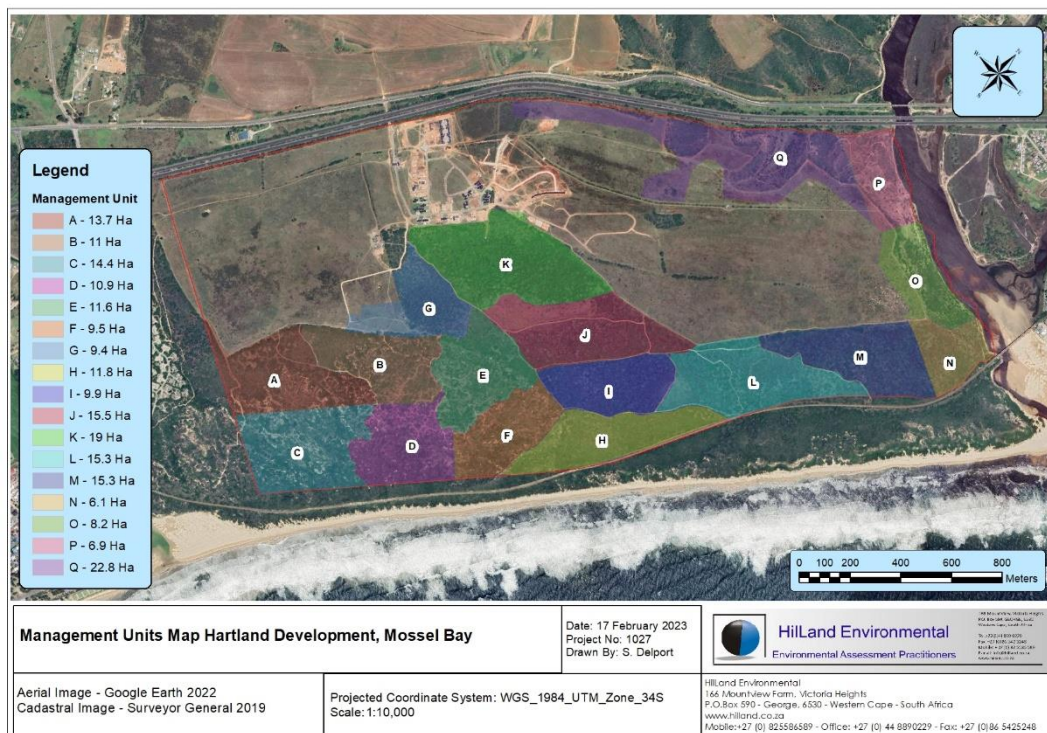


INVASIVE ALIEN PLANT CONTROL PLAN (ACP) FOR HARTLAND DEVELOPMENT, HARTENBOS, MOSSEL BAY

In terms of the National Environmental Management: Biodiversity Act (NEM:BA Act No 10 of 2004, as amended) and Invasive Species Regulations (October 2020)



Compiled by	Hilland Environmental
Hilland reference	MOS23/1027/01
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ISSUED BY:

HillLand Environmental
Environmental Management Consultants
Victoria Heights
P.O. Box 590
George, 6530

Tel: 044 889 0229
Fax: 086 542 5248
E-mail: cathy@hilland.co.za / environmental@hilland.co.za /
admin@hilland.co.za
Website: www.hilland.co.za

Invasive Alien Plant Control Plan for Portion 11 of Farm Vaale Valley 219 (Hartland Development), Hartenbos, Mossel Bay

Submitted to: **DFFE – Biosecurity**

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Report Author: Stefan Delport – HillLand Environmental

Report reviewed by: Cathy Avierinos and Inge Delport – HillLand Environmental

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1 EXECUTIVE SUMMARY

HilLand Environmental, have been appointed by **Hartland Lifestyle Village**, as Independent Environmental Assessment Practitioners (EAPs) and Environmental Control Officer (ECO), to facilitate an Invasive Alien Plant Control Plan in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004).

Invasive Alien Plant eradication has been included in the **approved EMP** (EIR/MSB/MS/36/SD/3/8) and is approved in the EA (3/6/3 – 18 Aug 2009). This report expands on the methods of eradication, measures to prevent further establishment and an indicative list of listed invasive alien plant species. The vulnerability and risk of increased infestation of alien invasive species remain high due to the long history of infestation and the nature of the seed bank present in the soil of the natural vegetated area. The implementation of the control plan and continuation of alien invasive species eradication will assist in the long-term managing of alien vegetation and subsequent re-growth on the estate.

The main goal of the plan is to retain the property free of alien invasive species and as such continual follow-up control will be required. In the event of a fire (wildfire and control burn) within the area, there will be mass alien seedling germination as they are stimulated by fire and more frequent follow-up control will be required.

This report also includes rehabilitation measures to be implemented within the specific areas highlighted.

2 INTRODUCTION

This control plan is produced in terms of Section 76 of NEM:BA and monitoring, control and eradication plan guidelines (dated: 30 September 2015).

The property is on portion 11 of the farm Vaale Valley 219, Mossel Bay, situated 2km Northeast of Hartenbos and 2km Southwest of Little Brak River. The property is approximately 370ha in extent of which approximately 208ha is to be dedicated for conservation of natural vegetation and consists of Thicket and Fynbos/ renosterveld vegetation, with a moderate to high level of alien invasive vegetation infestation (mostly *Acacia cyclops* (Rooikrans)).

**Table 1: Property details**

Property number	Portion 11 of Farm Vaale Valley No. 219, Mossel Bay
Land use	Residential Estate (development) and natural vegetation
Contact person (Developers)	Andre le Roux and Duane Holliday
GPS coordinates (middle of the property)	34°6'5.79"S; 22°7'32.20"E (middle point of Hartland)

This control plan will assist in the long-term managing of alien vegetation and subsequent re-growth on the property. Alien clearing already started in 2021 with systematic eradication of *Acacia cyclops* (Rooikrans) and will continue in accordance with this ACP.

The main goal of the plan is to retain the property (natural area and developable area) free of alien invasive species and the continual follow-up control that will be required. In the event of a fire within the area (wildfire and control burning), there will be mass alien seedling germination as they are stimulated by fire and more frequent follow-up control will be required.

****It is important to note that all vegetation clearance must be undertaken with utmost care to ensure that only the vegetation, which needs to be removed, is removed. Eradication of**

alien plants must be completed in such a manner that indigenous vegetation is not damaged.

It is important to remove both young plants (saplings) and old trees that are seed bearing.

Different strategies can be employed to remove different species, but all methods will involve manual labour such as chain saws and brush cutters and woodchipper should be used where necessary (no heavy machinery (such as TLB) may be used for alien clearing in the natural areas). It is important to remove the smaller, more dispersed plants first, and then the larger stands of alien vegetation.

To ease the removal of the alien plants, present on the site, it is recommended that all alien plants be removed during the initial site clearing activities at the start of the construction process rather than during the operational phase of the development.

Maintenance and follow-up sessions will be important to assist with the eradication of invasive alien plants.

**Information gathered from the "Construction Phase Environmental Management Plan" done by Sharples Environmental Services in March 2008 (EIR/MSB/MS/36/SD/3/8).

3 MAPS OF THE MANAGEMENT UNITS

The purpose of this plan is to address the clearing and controls of alien invasive vegetation recorded on the estate and continue with the restoration of indigenous vegetation on the entire estate. The plan is to implement the control plan for the entire operation of the estate which already started in 2021 with systematic eradication of *Acacia cyclops* and will continue in accordance with this ACP.

The Management Units set out for Hartland Development as illustrated (Figure 2) consist of the sensitive areas which is off limits for any construction activity (No-Go area). Other areas not mapped as part of this IACP will either be developed or controlled as private open spaces. There are seventeen (17) Management Units (A-Q) along the North-, East- and Southern boundaries of the estate (the natural/conservation area). Management units were planned with suitable access (tracks/fire break / existing jeep tracks) and manageable size in mind.

Firebreaks were recently constructed along the perimeter of the entire property which doubles for access to the management units during implementation phase of this ACP.

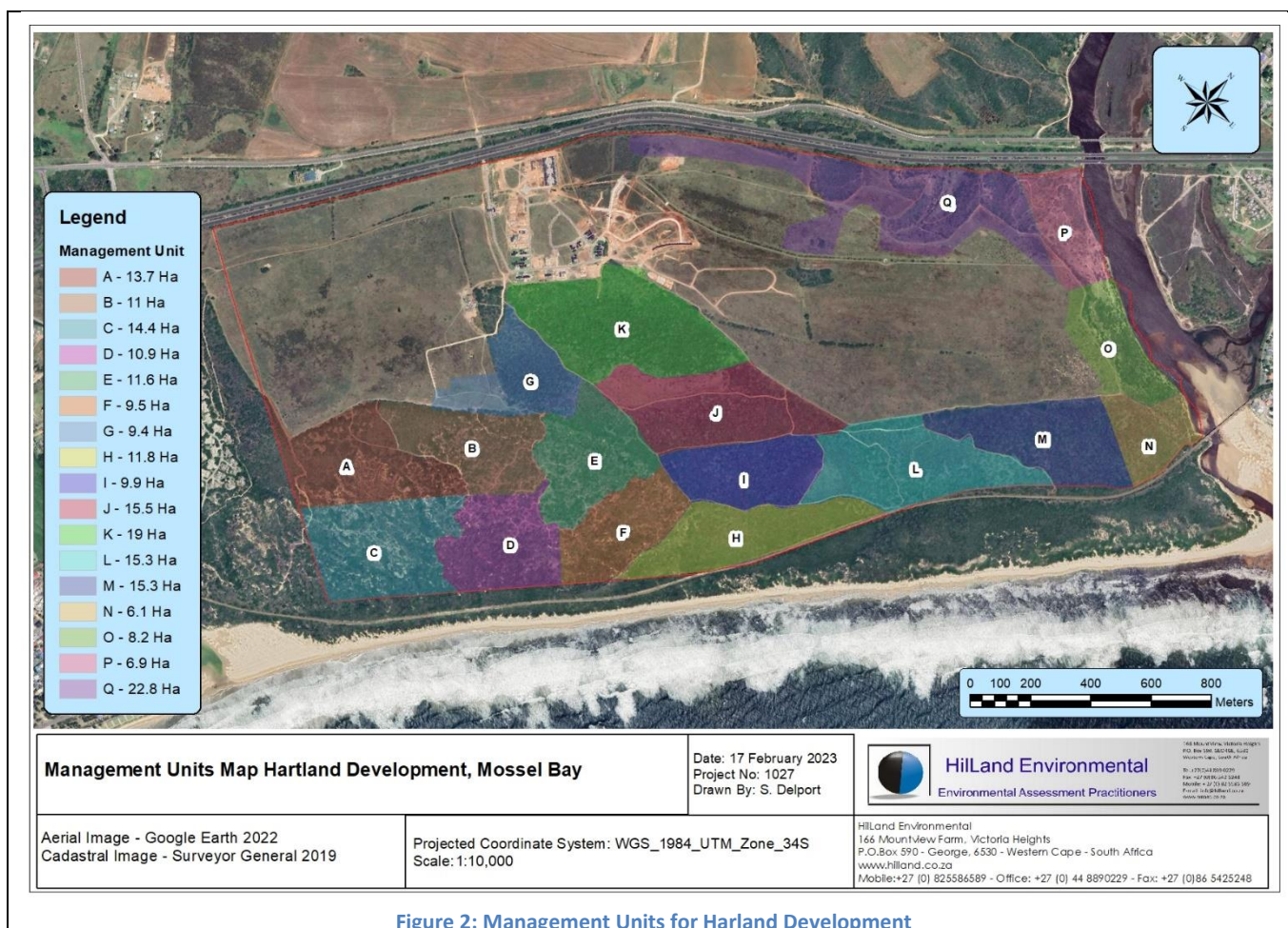


Figure 2: Management Units for Harland Development

Management Unit	Size (Hectare)
A	13.69
B	11.03
C	14.40
D	10.90
E	11.64
F	9.49
G	9.44
H	11.82
I	9.88
J	15.46
K	19.02
L	15.34
M	12.60
N	6.13
O	8.19
P	6.85
Q	22.80

4 LISTED ALIEN INVASIVE PLANT SPECIES PRESENT

The National Environmental Management: Biodiversity Act (NEM: BA) listed Invasive Alien Plants (IAPs) species present on the property are recorded in the below table, according to scientific-, common-names and the category listed in the NEM: BA Alien and Invasive Species list (October 2014, as amended in 2020). These species are prioritised in accordance with the category in which they are listed and the potential risk of invasion.

Recommendations are given in this report on the control of alien invasive plants present on the property and a monitoring programme will be implemented in order to detect new and/or secondary invasions. The alien invasive plant species list will be updated frequently to include any new and/or secondary infestations as and when detected within the estate.

The following list includes the listed alien invasive species recorded by Ken Coetzee in 2005** and species most likely to occur within the area and species recoded by HillLand Environmental during site inspections.

Table 2: NEM:BA listed (October 2014, as amended 2020) alien invasive species potentially present on the Hartland Development

Plant species	Common name	NEM:BA Category
<i>Acacia cyclops</i> **	Red eye wattle (Rooikrans)	1b
<i>Acacia mearnsii</i>	Black Wattle	2
<i>Acacia melanoxylon</i>	Australian Blackwood	2
<i>Agave americana</i>	American Agave	3 (WC)
<i>Eucalyptus species</i>	Gum species	1b
<i>Lantana camara</i>	Lantana	1b
<i>Opuntia sp</i> **	Cactus species	1b
<i>Solanum mauritianum</i> **	Bugweed	1b
<i>Solanum sisymbriifolium</i> **	Wild tomato	1b
<i>All Pinus species</i>	Pine species	2
<i>Datura species</i>	Thorn apple	1b

*Please note there may be other NEM:BA listed plant species present within the surveyed area. This table needs to be updated as new/different species are detected.

Table 3: Description of NEM:BA Categories: 1 (a and b), 2 and 3

NEM:BA Category	Description
Category 1 (a and b)	Invasive species falling under this category are prohibited plants, i.e. are illegal to grow or keep and must be controlled / eradicated. These plant species possess characteristics that can prove harmful to humans and/or have a detrimental impact on the environment, people or the economy. These plant species are only allowed in biological control reserves that are designed for the breeding of bio-control agents. Road reserves are not considered biological control reserves and as such these species need to be removed from such area unless specifically permitted to be there.
Category 2	Invasive species falling under this category are planted with a commercial or utility value. These species have certain useful qualities, which include the commercial use of for timber, animal fodder, food, soil stabilisation etc. The species falling under this category are only permitted in demarcated areas, under controlled conditions and in bio-control reserved. However, they are not permitted within 30 m of 1:50 year floodline or a watercourse or wetlands unless it is authorised by the National Department of Water Affairs. Road reserves are not considered demarcated areas or control conditions and as such these species need to be removed from such area unless specifically permitted to be there.

Category 3	These species are primarily 'exotic' or ornamental horticultural plants that escaped from residential gardens. These species may not be planted and propagative material may not be traded (except where the appropriate permits are in place). Eradication of these species is not required- except within 30 m of 1:50 year floodline or a watercourse or wetlands. The spread of these species must be prevented.
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5 MANAGEMENT UNITS

To effectively manage and control all of the alien species on the property, manageable units were set out in accordance with the site plan of the development.

Management Units A, B, C, D, E, F, H, L & M are densely populated by *Acacia cyclops* (Rooikrans) and is to be prioritized (note that systematic clearing already started in 2021 in both Management units A, B, C, D, E, F, L, M, N & O).

Management Units N, O P & Q have moderate steep slopes and *Acacia cyclops* infestation is moderate in these areas.

Open space / conservation areas will be the main focus areas for alien invasive clearing (including road verges). Continuing systematic alien clearing is to occur within the areas containing alien invasive vegetation and specific trees that will be retained for raptor perching sites (if any) will be identified by the ECO (currently conducting weekly ECO site inspections).

Residential erven will be managed by each owner through the enforcement of the estate's rules and regulations, which prohibits the planting / growing of listed alien invasive vegetation.

Systematic clearing (including follow-up control) of the open space / conservation areas will be done throughout the lifetime of the estate and will fall under the responsibility of the HOA. A six (6)-monthly sweep will be required through each management unit already cleared to keep seedling re-growth to a minimum and within hand pulling follow-up height.

All management and rehabilitation efforts in these units require a cautious approach as the open space / conservation areas consist of thicket and fynbos vegetation. Once the initial clearing process has run its course, the programme will begin running through each management unit maintaining the follow-up seedling alien control.

Due to the restoration potential of all manageable units, control operations will be conducted in such a way that thicket and fynbos recovery are enhanced (brush packing and creating windrows with cut material). Clearing methods will include hand-pulling of seedlings, cutting of trees with herbicide application as a follow-up, herbicide foliar application by appropriately skilled herbicide applicators. Cut branches and stumps will be pulled by hand to the nearest track where a tractor will haul the stumps to the construction site camp for processing – creating fire wood. Branches will be chipped at the edge of the track and used as mulch in the development area and rehabilitation. The follow-up methods

include a combination of manual and herbicide control. **No heavy machinery (TLB's etc) is to be allowed to perform alien clearing activities.**

Firebreaks along the property boundary must be maintained as approved by the FPA.

6 ERADICATION METHODS TO BE EMPLOYED

Various control methods can be applied to each listed invasive species.

Methods for controlling alien vegetation:

Biological control, chemical control, mechanical clearing, and burning have all been used with varying results. Each method has been successful but nearly all require follow-up control. The most successful clearing projects have included an integrated approach to account for initial clearing and continued management.

Mechanical control:

- Mature non-coppicing trees must be cut as low as possible and no herbicide treatment is needed on the cut stumps.
- Debris may be removed immediately from site to be burned in a safe area, mulched or used as firewood.
- Large branches should be used as firewood.
- Smaller branches should be mulched.
- Alien material containing seed must be removed from the site and burned.
- Should debris be left on site:
 - o In sparser areas, where felled debris will not hinder follow-up operations, plants can be felled and left *in situ*.
 - o In dense areas, stack debris in rows five metres apart parallel to the contours to facilitate follow-up operations.
- Removal of debris to a distance of 20 m from urban fringe to reduce fire hazard.
- Low density seedling regeneration must be hand pulled.
- Hand pulling around pockets of indigenous vegetation (1m swathe around clumps)

Chemical control:

- Follow-up control no later than six months after initial operation.
- Follow-up control will be needed because soil stored seed may stay dormant in soil for up to 50 years.
- Follow-up control will involve a combination of hand pulling and foliar spraying.
- Seedlings, saplings and coppice can be foliar sprayed.
- Follow-up spray operation when sufficient regeneration has taken place.
- Blanket or foliar spray.

Tools

- Loppers, bow saws, chainsaws, tree poppers etc.
- Recommend a 12 –15 litre back pack spray units
 - o Flat fan nozzles or solid cone and 1 bar constant flow valves

Follow up

Once the source of the problem has been removed, namely the seed bearing trees, it is important to follow up on any seedlings and saplings that may have grown in the interim. If this is not done the effort of the removal of the adult trees will have been wasted, as the alien vegetation problem will intensify.

Information gathered from the "Construction Phase Environmental Management Plan" done by Sharples Environmental Services in March 2008.

It is important to ensure that **NO heavy machinery (TLB, excavator etc.)** is allowed for the clearing of alien invasive vegetation. Vegetation will be removed by hand within each unit to the nearest track where a tractor will collect the stumps for further processing (firewood) and branches will be chipped and used as mulch. Control burning (if required) can be conducted in collaboration with the FPA. Seedlings pulled out can be left to decompose. Rehabilitation measures should be taken in order to avoid any erosion within all management units using the cut vegetation.

When references are made to herbicide application, please ensure the use to the correct herbicides as listed in Annexure B.

Table 4: Methods to be employed for the control of listed species on the property

Group	Species name	Common name	Common methods	Source of control methodology
Plant	<i>Acacia cyclops</i>	Red eye wattle (Rooikrans)	Seedling: Hand-pull Seedlings, saplings and coppice: Foliar spray Young: Lopping / pruning Adult: cut stump / frill	Working for Water program's approved methods for the control of <i>Acacia cyclops</i>
	<i>Acacia mearnsii</i>	Black Wattle	Seedling: Hand-pull Seedlings, saplings and coppice: Foliar spray or tree popper >2 m tall and coppice: Spot spray Adult/mature: Bark strip. Cut stump, frill with herbicide treatment after	Working for Water program's approved methods for the control of <i>Acacia mearnsii</i>
	<i>Acacia melanoxylon</i>	Australian Blackwood	Seedling: Hand-pull Seedlings, saplings and coppice: Foliar spray or tree popper Adult/mature: Cut stump or frill with herbicide application	Working for Water program's approved methods for the control of <i>Acacia melanoxylon</i>
	<i>Eucalyptus</i> species	Gum species	Seedling: Hand-pull Seedlings, saplings and coppice: Foliar spray Adult/mature: Cut stump or fell with herbicide treatment after	Working for Water program's approved methods for the control of <i>Eucalyptus</i> species

	<i>Datura species</i>	Thorn apple	All: Hand-pull or tree popper (before flowering)	Working for Water program's approved methods for the control of <i>Datura species</i>
	<i>Agave americana</i>	American Agave	All: Foliar spray or removal of base with roots (by hand)	Working for Water program's approved methods for the control of <i>Agave americana</i>
	<i>Lantana camara</i>	Lantana	All: Foliar spray / cut and spot spray	Working for Water program's approved methods for the control of <i>Lantana camara</i>
	<i>Opuntia species</i>	Cactus species	Young: physical eradication and disposal/burn off site Adult: Stem injection	Working for Water program's approved methods for the control of <i>Opuntia species</i>
	<i>Solanum sisymbriifolium</i>	Wild tomato	Seedling: Hand-pull Seedlings, saplings and coppice: Foliar spray Adult/mature: Cut stump or frill with herbicide treatment after	Working for Water program's approved methods for the control of <i>Solanum sisymbriifolium</i>
	<i>Solanum mauritianum</i>	Bugweed	Seedling: Hand-pull Seedlings, saplings and coppice: Foliar spray Adult/mature: Cut stump or frill with herbicide treatment after	Working for Water program's approved methods for the control of <i>Solanum mauritianum</i>
	All <i>Pinus species</i>	Pine species	Seedling: Hand pull Young and adult: Cut	Working for Water program's approved methods for the control of <i>Pinus species</i>

7 TARGETS AND TIMELINE

This control plan's main goal is to have eradicated all invasive alien plants by 2030 (approximately 52 months), with ongoing follow-up control. The following timeline has been set out for the developer/HOA:

Proposed Invasive Alien Clearing programme

		Months																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Management Unit	A																									
	B																									
	C																									
	D																									
	E																									
	F																									
	G																									
	H																									
	I																									
	J																									
	K																									
	L																									
	M																									
	N																									
	O																									
	P																									
	Q																									

Key:

	Initial clearing
	Follow up clearing
	Continual follow up clearing

		Months																											
		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
Management Unit	A																												
	B																												
	C																												
	D																												
	E																												
	F																												
	G																												
	H																												
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	M																												
	N																												
	O																												
	P																												
	Q																												

Key:

	Initial clearing
	Follow up clearing
	Continual follow up clearing

The property can also be guided by SMART goals (Specific, Measurable, Assignable, Realistic and Time-bound), which is summarised in the table below.

Table 5: SMART goals for the control of listed invasive species in the management unit compartment

Group	Species	Specific goal	Measurable goal	Assignable goal	Realistic goal	Time-bound goal
Plants	All alien invasive species on the property	Reduce total area infested	Area completely cleared	Work will be done by a team that is appointed and managed by the Developer (number of employees unknown at this stage)	Budget secured to ensure that all invading species can be cleared on the estate	Infestation down by 50% within four years (2026), 95% by 2028. To be revised based on actual progress on site – ECO monitoring required.

8 OBJECTIVES AND ACTIONS

The following two objectives will give effect to the overarching objective of becoming NEM: BA compliant.

8.1 OBJECTIVE 1: PREVENTION

To put measures in place to prevent the introduction of new NEM: BA listed IAS into the surveyed area (from neighbouring properties), and from spreading from the affected area to neighbouring properties or erven.

8.1.1 PREVENTATIVE ACTION

- No listed invasive and alien plant species shall be planted in private open space or private gardens;
- All invasive and alien plants **MUST** be monitored;
- Effective rehabilitation should take place in disturbed areas and prevent any unnecessary disturbances;
- Areas bordering onto neighbouring land will be prioritised for control to prevent existing invasive plants from spreading beyond the boundaries of these property; &
- These prevention measures will be communicated to the respective owners and managers of the property.

8.2 OBJECTIVE 2: EARLY DETECTION AND RAPID RESPONSE AND ERADICATION

To put measures in place whereby new and secondary invasive species are detected early and removed before establishing sustainable populations and start spreading (Early Detection and Rapid Response).

8.2.1 EARLY DETECTION AND RAPID RESPONSE AND ERADICATION ACTIONS

- Regularly survey the property to detect any new or emerging listed invasive plant species (using internal tracks – no new tracks may be created);
- Learn more about the SANBI programmes and register as a spotter where applicable;
- Report category 1a species immediately to the Department of Environmental Affairs/Provincial Conservation Agency/Local Municipality/South African National Biodiversity Institute (SANBI) EDRR programme and ask for assistance with the control of the species;
- Do not allow emerging or new species to produce seeds or off-spring, or start growing vegetative, act immediately by removing them;
- Update the species list by including these species and indicate where on the property they were located; &
- Ensure bio-controls are in place where available to assist in the control efforts
- Increase surveillance in the areas after the species were controlled to quickly remove re-sprouting plants or seedlings.

The main objective is to bring the invasive plant infestation on the property under control including the implementation of continual follow up control.

Table 6: Desired state for invasive alien plants on the estate

Category	Desired state
Category 1 b trees	All mature trees are removed; follow- up control programme in place. All the management units are in maintenance. Overall infestation does not exceed 10% of the property. (These will include seedlings and re-sprouting trees. Acacia species will be under control with the correct control methods).
Category 1b herbaceous species	Less than 2% of the property
Category 1b annual species	Less than 2% of the property

9 RESPONSIBILITIES AND REQUIREMENTS

The density of alien invasive plants that will be removed will depend on the work speed and effectiveness of the team assigned to this project. All clearing must be done by following the approved methodology that can be seen in Table 4 and Annexure B of this report.

It is the responsibility of the developer (and later HOA) of the estate to ensure that the employee(s) implements the correct methodology and that a record is kept on the progress of the alien clearing and the use of approved herbicides. It will be the responsibility of the developer (and later HOA) to ensure that the recommended erosion control and restoration efforts are employed in order to avoid any environmental damage and to restore the property to natural indigenous vegetation. Furthermore, it will be the responsibility of the developer (and later HOA) to make good of any damage caused by their actions.

A suitable and qualified Environmental Control Officer (ECO) is employed to monitor construction and rehabilitation weekly in terms of the EMPr and will continue to provide support and advice on alien clearing and rehabilitation efforts. The ECO is to update the competent authority (DEA: Biosecurity case officer) on the progress of alien clearing should this be a requirement. This will include a photographic record of the clearing and restoration efforts.

10 MONITORING AND EVALUATION

It is of utmost importance that control efforts are monitored, a summary of a monitoring framework is included in the table below.

The appointed Environmental Control Officer (ECO) for the duration of the construction phase (and if appointment is extended to the operational phase) will monitor alien clearing during regular ECO site inspections. Progress can be measured against the alien clearing

programme (see above). Any contravention must be reported to the Competent authority (DFFE: Biosecurity).

Table 7: Monitoring framework

WHAT	FREQUENCY	HOW	RESPONSE
How effective are the control methods?	4-6 months after every operation	Survey and look for re-growth in areas	Continue with suggested methodology and adapt as necessary
Do the infestation levels decrease?	Annually	Survey area, including records of densities and species. Photographic evidence should be taken	Continue with clearance and adapt intervals as needed
How much herbicide has been used?	After every operation	Herbicide records should be kept, see Annexure B	Keep track of the costs and ensure that the right amounts are being used to minimize waste
Does the indigenous vegetation recover in the cleared areas?	Annually	Survey area for indigenous vegetation, keeping track of the variety of species. Photographic evidence can be useful	An increase in indigenous vegetation (high recovery) - control methods are effective. If not - look at clearing methods, clearing intervals or consult an expert
How many jobs were created?	After every operation	Timesheets	Keep it on records
How many person days (PD) were spent per operations	After every operation	Timesheets	Keep track of cost and assist with planning and budgeting. Determine cost per person-day (PD)

11 REFERENCES

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12 ANNEXURES

Table 8: Details on the follow-up intervals

PROGRAM	TIMING
First follow up	Must take place within 6 months after the initial clearing of each management unit
Second follow up	Must take place within 6 months after the completion of the first follow up
Third follow up	Must take place through the first spring after the completion of the second follow up
Fourth follow up	Must take place annually midway through spring, where the first spring will be after the third follow up and into perpetuity

12.1 ANNEXURE B: CONTROL METHODS

The following Annexure deals with the initial clearance activities along with the proposed methodology. It assumes the following:

- That the recommended methodology that is proposed below is implemented and followed.
- That the funding allows for short- and long-term commencement of the tasks.
- No thorough provisions have been made for natural occurrences for instance wildfires, floods and droughts.
- That person(s) undertaking the task of clearance and control are suitably trained and experienced.

Depending on species, age/size of the plant and growth form, the following methods can be used for the initial clearance of the alien invasive plants:

Hand pulling

This method is the removal on alien invasive plants by hand; it is important to ensure that the roots are also removed. This method can be applied to areas that are sparsely invaded and seedlings present within each unit.

Foliar spraying

This method is the usage of spray equipment, such as a knapsack sprayer, to spray alien invasive plants one meter in height or that is still at a young age. The foliage/leaves of the plants should be sprayed by the herbicide-water mixture up until it starts to run off. This method is most effective early mornings on a wind-still day. It is important that the correct protective equipment (PPE) (refer to Annexure D) should be worn at all times and the proper methodology should be followed. For the use of the correct herbicides, refer to the below table.



Figure 3: Herbicide application to foliage of alien invasive plants (conservation contracts northwest, 2018)

The following Table should be completed to maintain usage record, this will fall under the responsibility of the developer (and HOA / estate manager thereafter).

Table 9: Herbicide control sheet

Herbicide Control Sheet							
Manageable Unit:						Hectares:	
Date	Herbicide (name)	Herbicide (name)	Herbicide (name)	Herbicide (name)	Herbicide (name)	Actipron	Dye

Mechanical control methods

Felling

Trees with a stem diameter of more than 200 mm can be felled with a chainsaw, the remaining stump should be treated with an herbicide application immediately after cutting. All felled tree stumps should be cut into manageable log sizes and be transported manually out of the area (store as firewood). Large stumps can be kept within the units for erosion control and natural decay.

Manual control methods

Trees with a stem diameter of less than 200 mm can be cut down with a chainsaw / bow saw / skill saw, whereas stems with a diameter of less than 100 mm can be cut down with a lopper or can be pulled out using a tree popper. These trees must be cut as low as possible to the ground, as low as 10 cm or lower.

Herbicide cut stump treatment

A two-litre spray marker can be used for small trees and knapsacks for larger trees. The herbicides should be applied to the stumps immediately after felling/cutting (see below figure).



Figure 4: Herbicide application to stump directly after felling / cutting (DEADP, 2018)

Frilling

This method uses a bush knife/axe to make angled cuts downwards into the trees' cambium layer (see below figure for an example of a frilled tree). Cuts should be made around the entire stem. Herbicide is applied to the cutline with a marker dye to show where herbicide has been applied.



Figure 5: Frilled tree (DEADP, 2018)

Ring barking

For this method the bark of the tree is stripped from the bottom (below ground level) to a height of 0.75 - 1 m, by using bush knives or hatchets. If this method is not possible, due to exposed root systems or crevices in the stem, a combination of bark removal and stem treatments should be followed. Herbicide application should follow where the species is known to coppice.



Figure 6: ring barking of tree (invasive species of South Africa, 2018)

Follow up clearing

The preferred method for follow up clearances is **hand-pulling** and **foliar spray**. Follow-up clearance should occur at different times/stages as stipulated in the plan. Large trees that are considered too big for hand-pulling, tree popping or foliar spray, can be cut down, slashed or ring barked – ring barking of larger trees is preferred in forested areas to reduce the damage caused by trying to remove the trees and in areas where they are left to increase the perching sites for raptors.

Table 10: Invasive alien plant species herbicide list (Working for Water, 2022)

Species	Common name	Size class	Treatment method	Herbicide
<i>Acacia cyclops</i>	Red eye wattle (Rooikrans)	Seedling	Hand pull	No herbicide needed
		Seedling	Foliar spray	Clopyralid 90 + Triclopyr (as amine salt) 270 g/L SL
				Fluroxypyr 200 g/L EC
				Triclopyr (as butoxy ethyl ester) 480 g/L EC
				Triclopyr (as triethyl ammonium) 120 g/L + Aminopyralid 12 g/L
				Triclopyr (as butoxy ethyl ester) 240 g/L + Aminopyralid 30 g/L
		Adult	Cut stump / frill	Cylindrobasidium laeve
<i>Acacia mearnsii</i>	Black Wattle	Seedling	Hand pull	No herbicide needed
		Seedling	Foliar spray	Clopyralid 90 + Triclopyr (as amine salt) 270 g/L SL
				Fluroxypyr 200 g/L EC
				Glyphosate (as isopropylamine salt) 480 g/L SL
				Glyphosate (as sodium salt) 500g/kg WG
				Triclopyr (as triethyl ammonium) 120 g/L + Aminopyralid 12 g/L
				Triclopyr (as butoxy ethyl ester) 480 g/L EC
				Triclopyr (as butoxy ethyl ester) 240 g/L + Aminopyralid 30 g/L
				Fluroxypyr 80 + Picloram 80 g/L ME
				Triclopyr 600g/kg WG
				Fluroxypyr (pyridyloxy compound) 320g/L + Triclopyr (Pyridyloxy compound) 160g/L
		Young	Lopping / Pruning	Fluroxypyr 80 + Picloram 80 g/L ME
				Imazapyr 100 g/L SL
				Picloram (as potassium salt) 240g/L SL
				Triclopyr (as amine salt) 360 g/L SL
				Triclopyr (as triethyl ammonium) 120 g/L + Aminopyralid 12 g/L
		Adult	Bark strip	No herbicide needed
			Cut stump /Frill	Picloram (Pyridine compound) 80g/L + Fluroxypyr (Pyridine compound) 80g/L ME

				Imazapyr 100 g/L SL
				Picloram (as potassium salt) 240g/L SL
				Triclopyr (as amine salt) 360 g/L SL
				Picloram (as potassium salt) 50g/kg + Triclopyr (as triethylamine salt) 50g/kg
				Triclopyr (as pyridine compound) 270g/L + Clopyralid (as pyridine compound) 90g/L
			Frill	Triclopyr (as triethyl ammonium) 120 g/L + Aminopyralid 12 g/L
			Basal stem	Cylindrobasidium laeve

Eucalyptus species	Gum species	Seedling Seedling	Hand pull Foliar spray	No herbicide needed
				Fluroxypyr 80 + Picloram 80 g/L ME
		Young	Lopping / Pruning	Imazapyr 100 g/L SL
				Metsulfuron methyl 500g/kg WP
				Metsulfuron methyl 600g/kg WP
				Picloram (as potassium salt) 240g/L SL
				Triclopyr (as butoxy ethyl ester) 240 g/L EC
				Triclopyr (as butoxy ethyl ester) 480 g/L EC
				Clopyralid 90 + Triclopyr (as amine salt) 270 g/L SL
				Fluroxypyr 80 + Picloram 80 g/L ME
				Glyphosate (as ammonium salt) 680 g/kg WG
				Glyphosate (as isopropylamine salt) 360 g/L SL
				Glyphosate (as potassium salt) 450g/L SL
				Glyphosate (as potassium salt) 500 SL
				Glyphosate (as sodium salt) 500g/kg WG
				Imazapyr 100 g/L SL
				Metsulfuron methyl 500g/kg WP
				Metsulfuron methyl 600g/kg WP
				Picloram (as potassium salt) 240g/L SL
				Triclopyr (as butoxy ethyl ester) 240 g/L EC
				Triclopyr (as amine salt) 360 g/L SL
				Glyphosate (as isopropylamine salt) 360 g/L SL
		Adult	Cut stump / Frill	Clopyralid 90 + Triclopyr (as amine salt) 270 g/L SL
				Fluroxypyr 80 + Picloram 80 g/L ME
				Glyphosate (as ammonium salt) 680 g/kg WG
				Glyphosate (as isopropylamine salt) 360 g/L SL
				Glyphosate (as potassium salt) 450g/L SL
				Glyphosate (as potassium salt) 500 SL

				Imazapyr 100 g/L SL
				Metsulfuron methyl 500g/kg WP
				Metsulfuron methyl 600g/kg WP
				Picloram (as potassium salt) 240g/L SL
				Triclopyr (as butoxy ethyl ester) 240 g/L EC
				Triclopyr (as amine salt) 360 g/L SL
				Glyphosate (as isopropylamine salt) 360 g/L SL
			Cut Stump	Triclopyr (as butoxy ethyl ester) 480 g/L EC
			Frill	Picloram (as potassium salt) 240g/L SL
				Triclopyr (as amine salt) 360 g/L SL

<i>Lantana camara</i>	Lantana	Young	Foliar spray	Picloram (Pyridine compound) 80g/L + Fluroxypyr (Pyridine compound) 80g/L ME
				Glyphosate (as ammonium salt) 710 g/kg WG
				Glyphosate (as isopropylamine salt) 360 g/L SL
				Glyphosate (as isopropylamine salt) 480 g/L SL
				Glyphosate (as potassium salt) 500 SL
				Glyphosate (as sodium salt) 500g/kg WG
				Imazapyr 100 g/L SL
				Picloram (as potassium salt) 240g/L SL
		Adult	Cut & Spray	Picloram (Pyridine compound) 80g/L + Fluroxypyr (Pyridine compound) 80g/L ME
				Imazapyr 100 g/L SL
			Cut stump	Picloram (as potassium salt) 240g/L SL
				Imazapyr 100 g/L SL
				Picloram (as potassium salt) 50g/kg + Triclopyr (as triethylamine salt) 50g/kg

Acacia melanoxylon	Blackwood	Seedling	Hand pull	No herbicide needed
		Seedling	Foliar spray	Clopyralid 90 + Triclopyr (as amine salt) 270 g/L SL
				Fluroxypyr 200 g/L EC
				Triclopyr (as butoxy ethyl ester) 480 g/L EC
				Triclopyr (as triethyl ammonium) 120 g/L + Aminopyralid 12 g/L
				Picloram (Pyridine compound) 80g/L + Fluroxypyr (Pyridine compound) 80g/L ME
				Triclopyr (as butoxy ethyl ester) 240 g/L + Aminopyralid 30 g/L
		Young	Lopping / Pruning	Clopyralid 90 + Triclopyr (as amine salt) 270 g/L SL
				Triclopyr (as amine salt) 360 g/L SL

		Adult	Cut stump	Triclopyr (as triethyl ammonium) 120 g/L + Aminopyralid 12 g/L
				Clopyralid 90 + Triclopyr (as amine salt) 270 g/L SL
				Triclopyr (as amine salt) 360 g/L SL
				Picloram (Pyridine compound) 80g/L + Fluroxypyr (Pyridine compound) 80g/L ME

Datura stramonium	Common Thorn Apple	Young	Hand pull	No herbicide
			Foliar spray	2.4D (as dimethylamine salt) 480g/L SL
				Chlorimuron ethyl (as sulfonyl urea) 500g/kg WP
				Glyphosate (as isopropylamine salt) 360 g/l SL
				Glyphosate (as sodium salt) 500g/kg WG
				Glyphosate (as isopropylamine salt) 180 g/l SL
		Adult	Hand pull / Soil application	Tebuthiuron 250g/L + Bromacil 250g/L SC

Solanum mauritianum	Bugweed	Young	Hand pull	No herbicide needed
			Foliar spray	Glyphosate (as isopropylamine salt) 360 g/L SL
				Clopyralid 90 + Triclopyr (as amine salt) 270 g/L SL
				Fluroxypyr 200 g/L EC
				Picloram (Pyridine compound) 80g/L + Fluroxypyr (Pyridine compound) 80g/L ME
				Glyphosate (as isopropylamine salt) 360 g/L SL
				Glyphosate (as isopropylamine salt) 480 g/L SL
				Glyphosate (as potassium salt) 500 SL
				Glyphosate (as sodium salt) 500g/kg WG
				Glyphosate (as sodium salt) 700g/kg WG
				Glyphosate (as ammonium salt) 710 g/kg SG
				Imazapyr 100 g/L SL
				Triclopyr (as butoxy ethyl ester) 240 g/L EC
				Triclopyr (as butoxy ethyl ester) 480 g/L EC
				Triclopyr (as butoxy ethyl ester) 240 g/L + Aminopyralid 30 g/L
		Adult	Foliar spray	Picloram (as potassium salt) 50g/kg + Triclopyr (as triethylamine) 50g/kg
				Glyphosate (as isopropylamine salt) 480 g/L SL

				Imazapyr 100 g/L SL
				Picloram (as potassium salt) 240g/L SL
				Triclopyr (as amine salt) 360 g/L SL
				Picloram (as potassium salt) 50g/kg + Triclopyr (as triethylamine salt) 50g/kg
				Glyphosate (as sodium salt) 500g/kg WG

Solanum sisymbriifolium	Wild tomato, Dense - thorned bitter apple	Young	Foliar spray	Triclopyr (as butoxy ethyl ester) 480 g/L EC
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12.2 ANNEXURE C: FIRE PREVENTION AND PREPAREDNESS (ADAPTED FROM INVASIVE SPECIES CONTROL PLAN GUIDELINES FOR PRIVATE LAND BY L. STAFFORD & DR. M. GEARTNER)

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 Fire Act, 1998 (Act 101 of 1998), (NVFFA)** 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, ensure

- it is wide enough and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land;
- it does not cause soil erosion; and
- it is reasonably free of inflammable material capable of carrying a veldfire across it
- Join the Fire Protection Association (FPA)
- 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
- 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))

12.3 ANNEXURE D: SAFETY, HEALTH AND ENVIRONMENT (SHE) (ADAPTED FROM INVASIVE SPECIES CONTROL PLAN GUIDELINES FOR PRIVATE LAND BY L. STAFFORD & DR. M. GEARTNER)

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 the following minimum SHE requirements are adhered to:

Toilet facilities

- 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)
- Clean water must be made available in suitable containers for drinking and mixing herbicides

Team's skills requirements

- Chainsaw operators in possession of valid certificates
- Herbicide applicators certified

Work methods and equipment

- Equipment must be suitable for the work and in good working condition
- Adhere to work methods stipulated in the site specification

Vehicle and driver

- The driver must be in possession of a valid PrDP
- The vehicle must be roadworthy
- Tools must be transported in the trailer, separately from the workers

Safety precautions

- Certified SHE Rep on site
- Certified Safety Office on site
- The SHE Rep must conduct daily safety talks
- The first aid kit must be on site

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 excepts 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
- 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
- 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 refuelling must be conducted on a spill blanket
- A spade must be on site to cover any accidental spillage
- A serviced and functional fire extinguisher must be kept at the fuel refilling area

Preventing fires

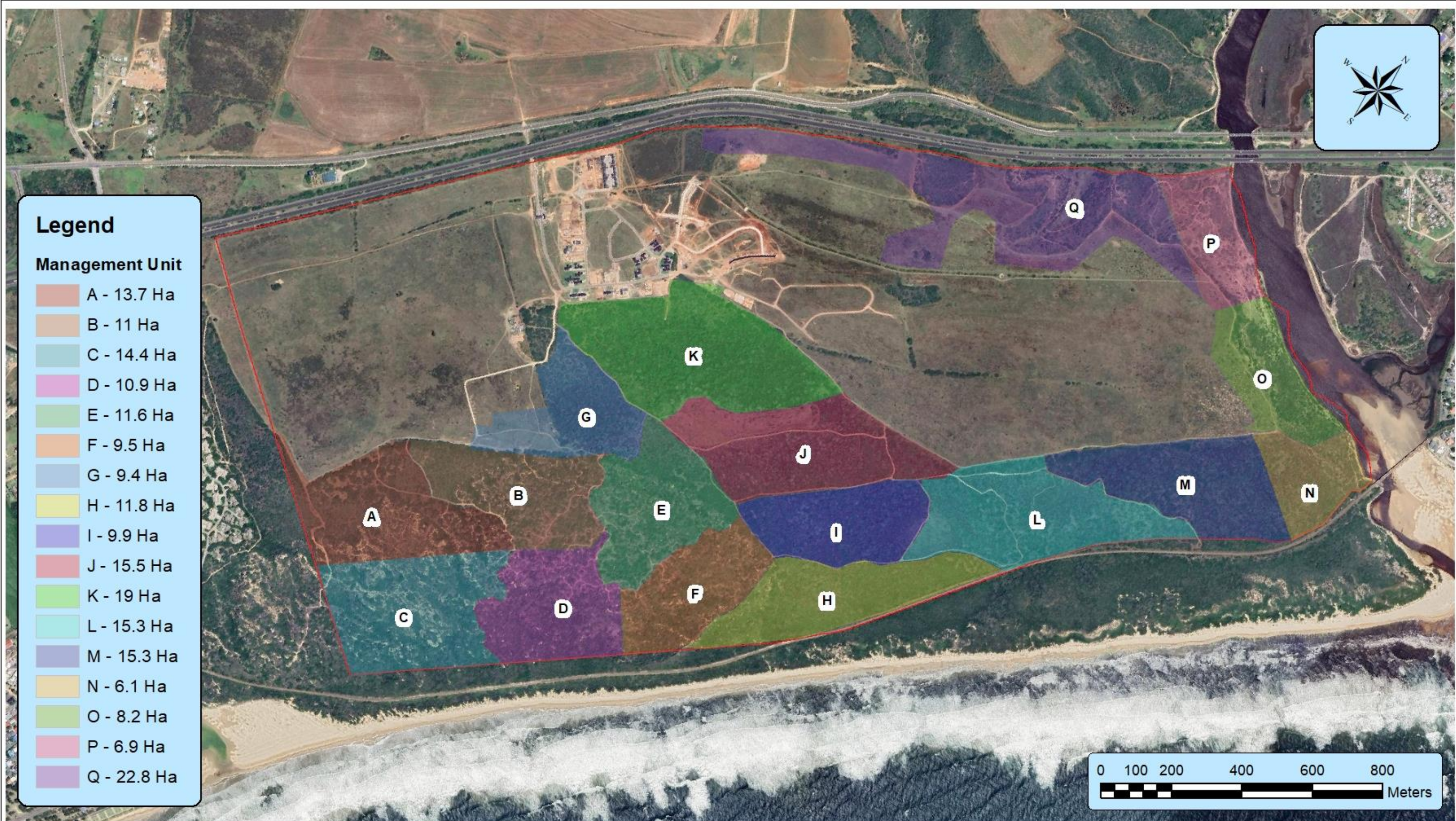
- No smoking while working, assign a designated smoking area
- Remove cigarette butts
- No smoking during windy conditions
- Keep 1 fire beater for every team member within reach of the workers
- No chainsaw work during Code Red days - Fire Danger Indices (FDIs) obtainable from FPA

Table 11: Correct PPE that should be worn

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

Mask (when applying herbicides)	x	x	x	✓
Rubber gloves (for mixing herbicides)	x	x	x	✓
Rubber apron (for mixing herbicides)	x	x	x	✓
Rain suit (during rainy conditions)	✓	✓	✓	✓

It is recommended that the requirements are stipulated in the work specifications and the contractor accept accountability in writing.



Management Units Map Hartland Development, Mossel Bay

Date: 17 February 2023
Project No: 1027
Drawn By: S. Delport



Hiland Environmental
Environmental Assessment Practitioners

166 Mountview, Victoria Heights
P.O. Box 590, GED-49L, G590
Western Cape, South Africa
Tel: +27 (0) 44 889 0229
Fax: +27 (0) 86 542 5248
Mobile: +27 (0) 82 558 5589
Email: info@hiland.co.za
www.hiland.co.za

Aerial Image - Google Earth 2022
Cadastral Image - Surveyor General 2019

Projected Coordinate System: WGS_1984_UTM_Zone_34S
Scale: 1:10,000

Hiland Environmental
166 Mountview Farm, Victoria Heights
P.O.Box 590 - George, 6530 - Western Cape - South Africa
www.hiland.co.za
Mobile: +27 (0) 825586589 - Office: +27 (0) 44 8890229 - Fax: +27 (0) 86 5425248