

# Cervantes Pyp Grass, *Ehrharta villosa* Management Plan

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**Regen4 Environmental Services**  
for the  
**Northern Agricultural Catchments Council**  
**June 2012**



CARING  
FOR  
OUR  
COUNTRY

## **Acknowledgements**

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- Shire of Dandaragan
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This report has been prepared for the Northern Agricultural Catchments Council (NACC) by Regen4 Environmental Services. Every effort has been taken to ensure that the recommendations made in this report are based on accurate, site specific information and current best practice for management of environmental weed control.

Regen4 Environmental Services accepts no responsibility for the implementation of this report's recommendations or the implementation of the recommended weed control actions. The Northern Agricultural Catchments Council is advised to ensure that all weed control contractors working on the Site are experienced and qualified to control weeds in a bushland setting and where possible, are members of the Australian Association of Bush Regenerators or other professional bushland management association.

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## Abbreviations and Acronyms

CALM	Department of Conservation and Land Management (now DEC)
DEC	Department of Environment and Conservation
EWSWA	Environmental Weed Strategy for Western Australia
NACC	Northern Agricultural Catchments Council

# Executive summary

The coastal dunes at Cervantes are one of the town's key natural assets and provide significant ecosystem services to the local community. However Pyp Grass, *Ehrharta villosa*, has been found and this weed threatens the integrity and rich biodiversity of these dunes. Pyp Grass is an aggressive invader of dunes, and it is known to smother and totally replace native flora.

Pyp grass occurs in three locations: One (Drummond Circus site) occurs within Shire Reserve R31313 but the largest infestation (Barcelona Dr site) plus the recently discovered infestation at Hansen Bay Lookout occur within a large parcel of Unallocated Crown Land.

This Management Plan looks at progressively controlling this weed with the ultimate aim of eradication. This is the best environmental outcome but it is acknowledged that approval for treating infestations may be more difficult for those occurring on Unallocated Crown Land.

Two management strategies have been drafted to provide the basis for the Plan, namely:

1. Implementing weed control activities;
2. Monitoring, evaluation and reporting

Weed control activities have been prioritised in order to provide a progressive treatment plan. Priorities have been set (In order of importance) dependant on:

1. Immediate threat posed by expansion at the invading front into Spinifex on the primary dune
2. Threat to better condition bushland
3. Areas of lower density Pyp Grass and higher number of native individuals
4. Areas of high density Pyp Grass with fewer native individuals

Eradication of Pyp Grass is expected to be a medium-term activity (5-8 yrs) particularly as control in highly degraded areas will probably need to be accompanied by replacement planting of appropriate natives

Monitoring, evaluation and reporting is considered an important component of the plan as, in order to determine the effectiveness of any weed control programme, there needs to be a method of measuring ongoing progress and ultimately success. It is also important to demonstrate to the local community, Shire and DEC that control of the Pyp Grass is effective and worthwhile.

# PART A: BACKGROUND

## Introduction

Cervantes is approximately 185 km north of Perth, in the Shire of Dandaragan Western Australia (Figure 1) and is surrounded by areas of extremely high conservation value: the Southern Beekeepers Reserve to the north and east, and the Nambung National Park to the south. The Cervantes Townsite itself is bounded to the north, south and west by vegetated coastal dunes. Sections of this primary dune system are potentially at risk of losing their rich biodiversity due to the invasive weed *Ehrharta villosa*, commonly known as Pyp Grass. This plant originates from South Africa and was introduced as a sand-binder; its root system establishing quickly to produce a perennial 'mat' of rhizomes that can spread at a rate of up to 9 metres per year.



Figure 1: Location map, Cervantes

### 1.1. The important role of Cervantes' coastal dunes

The coastal dunes at Cervantes provides significant ecosystem services to the local community. These include:

- Storm protection
- Erosion protection
- Habitat and protection of biodiversity
- Visual amenity
- Recreation and public enjoyment

### 1.1.1. Storm and Erosion Protection

Native vegetation helps to stabilise dune systems through complex, deep root systems that protect dunes from erosion caused by storm surges, strong winds and rising sea levels. The Pyp Grass invading the project area has poor deep soil holding capacity and compared with native vegetation does not effectively reinforce dunes against storms and extreme weather events.

### 1.1.2. Habitat and protection of biodiversity

Pyp Grass significantly impacts the growth of native vegetation and prevents smaller plants establishing through competition for resources. Its current invasion of the primary dunes can be seen by a distinct boundary between areas overrun by Pyp Grass and the remaining native vegetation. The takeover is resulting in a loss of biodiversity and the degradation of indigenous habitat.

### 1.1.3. Visual amenity

The diversity of the indigenous vegetation provides unique and aesthetic landscapes. Dunes overrun by Pyp Grass eventually become a monoculture that produces a visual 'sameness'.

### 1.1.4. Recreation and public enjoyment

The diversity of ecological character of coastal dunes supports education, tourism and public enjoyment. Healthy dunes contribute to a healthy offshore habitat which also benefits tourism as well as commercial and recreational fishing industries.

## 1.2. Project brief

This Management Plan was commissioned by the Northern Agricultural Catchments Council (NACC), with support from the Shire of Dandaragan, in 2012 in order to facilitate and guide the eradication of Pyp Grass, *Ehrharta villosa*, from the project area and that:

- Succinctly communicates next steps and on-ground works required for such eradication;
- Is accepted by the Shire, NACC, DEC and other stakeholders;
- Can be used to source funding for and to conduct on-ground works and,
- Notes and records other key weed species found whilst mapping Pyp Grass.

## 1.3. Summary of methods

The coastal dunes were surveyed during the months of May and June 2012 and the following approach was used:

- The Boundary of the Pyp Grass was mapped.
- The co-occurrence of Pyp Grass and Spinifex on the foredunes was mapped
- Bushland impacted upon by Pyp Grass was assessed as being in 'good' or 'poor' condition and the boundary between them was mapped.

- All spatial information was recorded on-site via a hand-held GPS (Trimble GPS unit with MobileMap) and geo-referenced to a digital aerial photo.

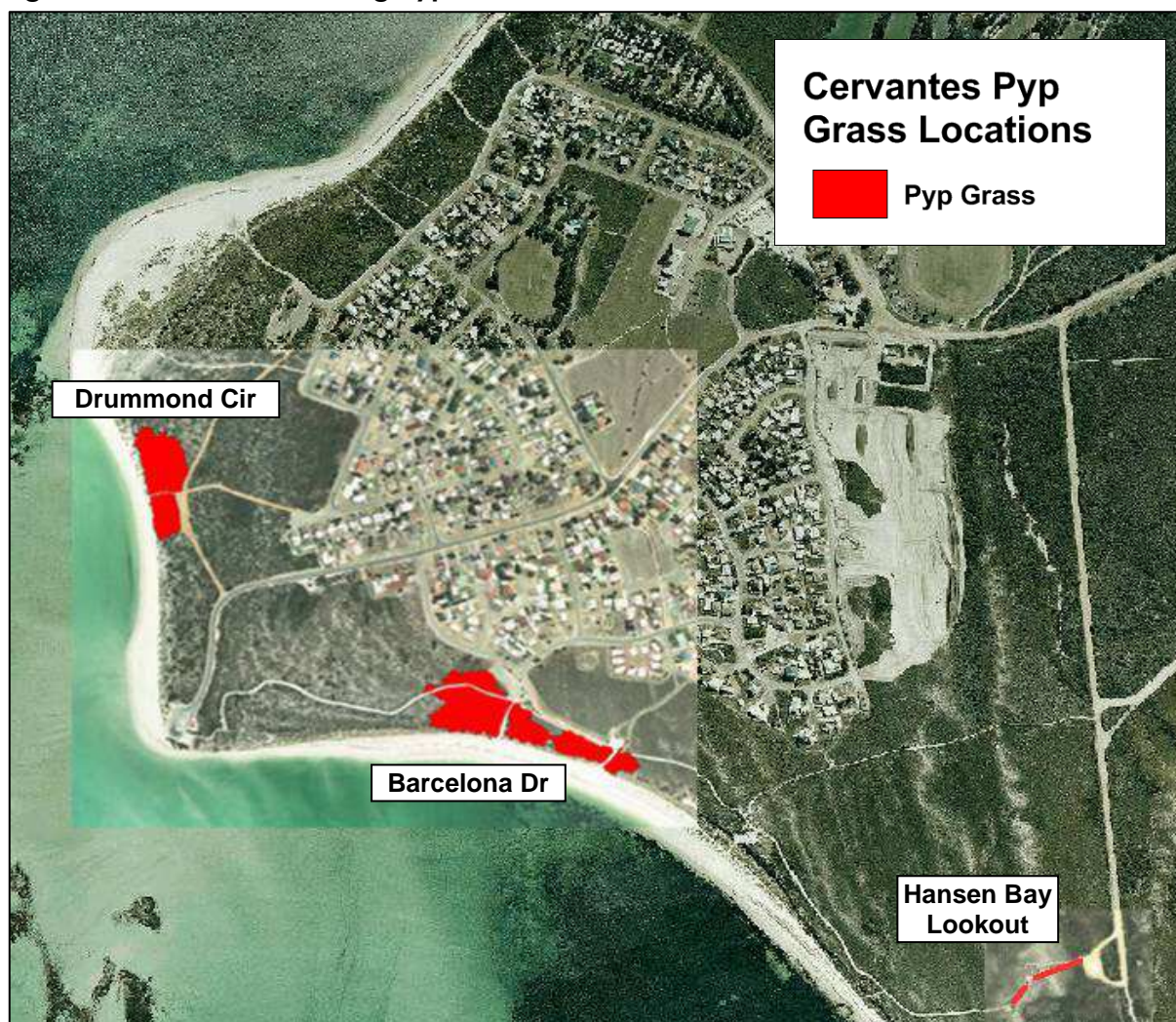
## 1.4. General description and features

### 1.4.1. Pyp Grass Locations

Three distinct locations where Pyp Grass occurs have been identified at Cervantes

- At the western end of Drummond Circus (Drummond Cir)
- South of Barcelona Drive (Barcelona Dr)
- At the Hansen Bay Lookout

Figure 2: Cervantes showing Pyp Grass locations



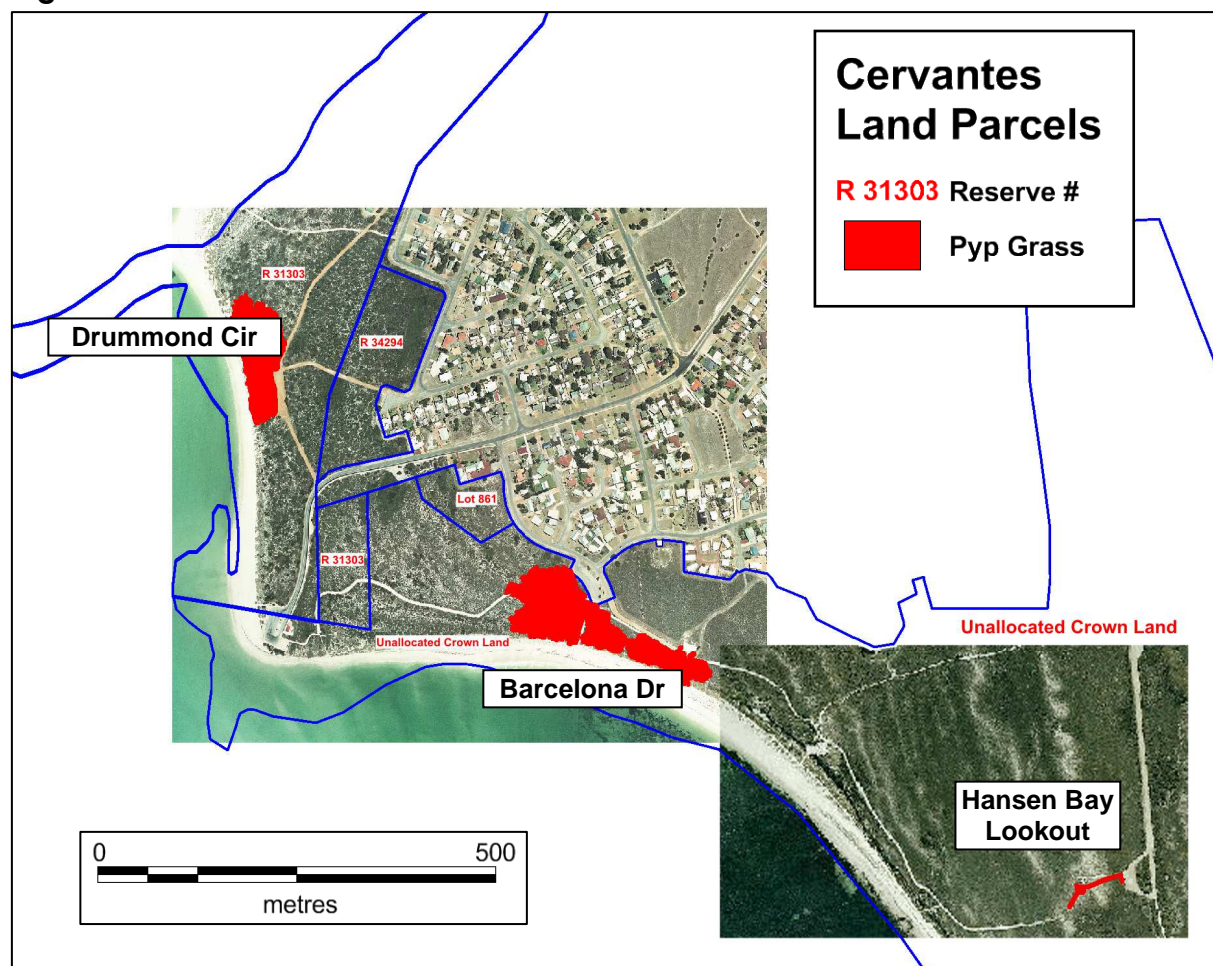
### 1.4.2. Land ownership

The Cervantes coastal dunes comprise a number of Crown Reserves and one very large parcel of Unallocated Crown Land. The relevant parcels are shown below in Table 1 and Fig. 3.

**Table 1: Land parcels within the Reserve**

<u>Land parcel/ reserve</u>	<u>General Description</u>	<u>Vesting and Reserve purpose</u>
Reserve 31303	Beach and coastal dunes to the west of the townsite. Encompasses the Drummond Cir Pypgrass location	Vested in the Shire of Dandaragan for Recreation
Unallocated Crown Land (UCL) parcel	Beach and coastal dunes to the south and southeast of the townsite. Encompasses the Barcelona Dr and Hansen Bay Lookout Pypgrass locations	Vested in the State Of WA UCL - no purpose

**Figure 3: Cervantes Land Parcels**



# Current state of the Coastal Dunes

## 1.1. Pyp Grass

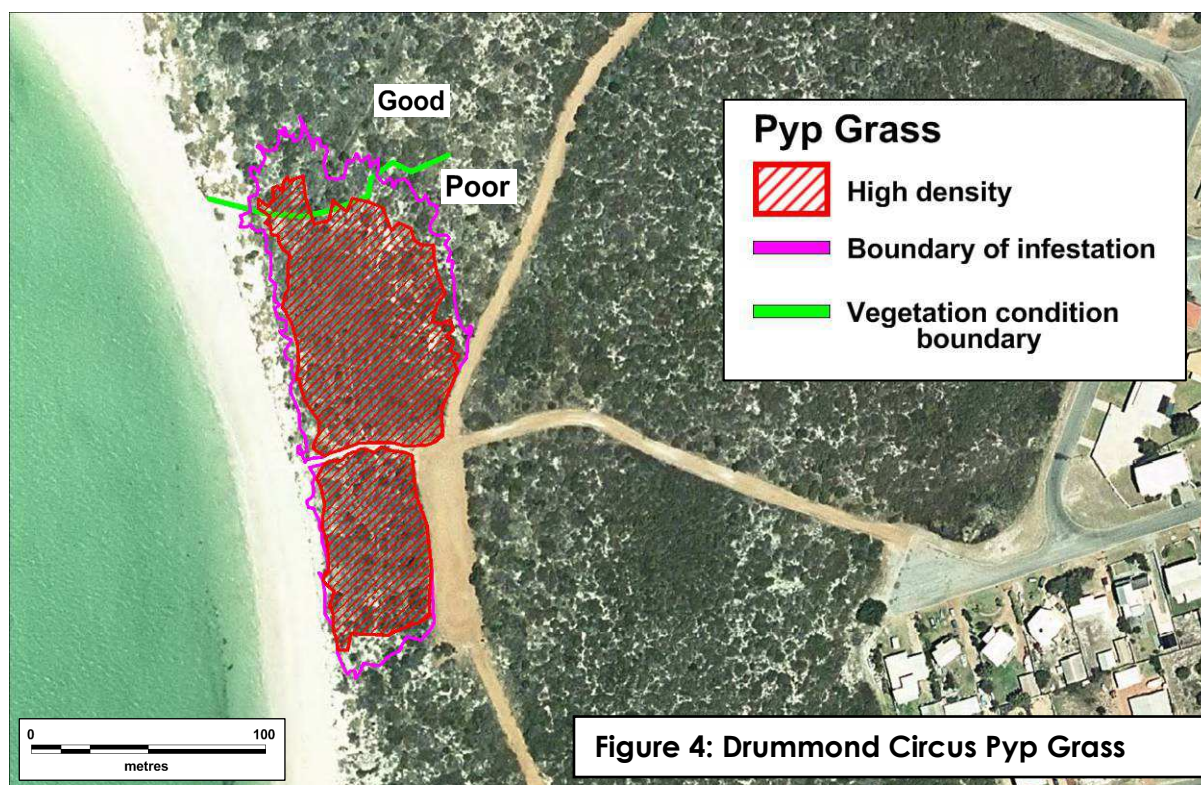
Pyp Grass, *Ehrharta villosa*, is an aggressive invader of dunes, where it smothers and replaces native flora. This fact was not initially recognised and Pyp Grass was used extensively in WA during the 1960s-1980s for sand stabilization and dune rehabilitation. However by the early 1990s the threat was starting to be seen and the Dept of Agriculture, in their Coastal Rehabilitation manual (1992), recommended against the use of Pyp Grass for this purpose.

Local community members have suggested that Pyp Grass was planted at several locations around Cervantes in the mid-1980's, including in the vicinity of the car parks, to stabilise dunes and prevent sand drift. If this is correct, this would indicate an approximate annual rate of spread since then of between 2.5m and 4m (over 27 years).

As a result of a Coastal Rehabilitation Workshop in Sep 2010, two occurrences of Pyp Grass were identified; one immediately to the south of the townsite (Barcelona Dr site) and one immediately to the west of the townsite (Drummond Cir site). A further occurrence of Pyp Grass (identified by this author in June 2012) is approximately 1.1km SE of the townsite at the Hansen Bay lookout.

## 1.2. Pyp Grass mapping

### 1.2.1. Drummond Circus



### 1.2.2. Barcelona Drive

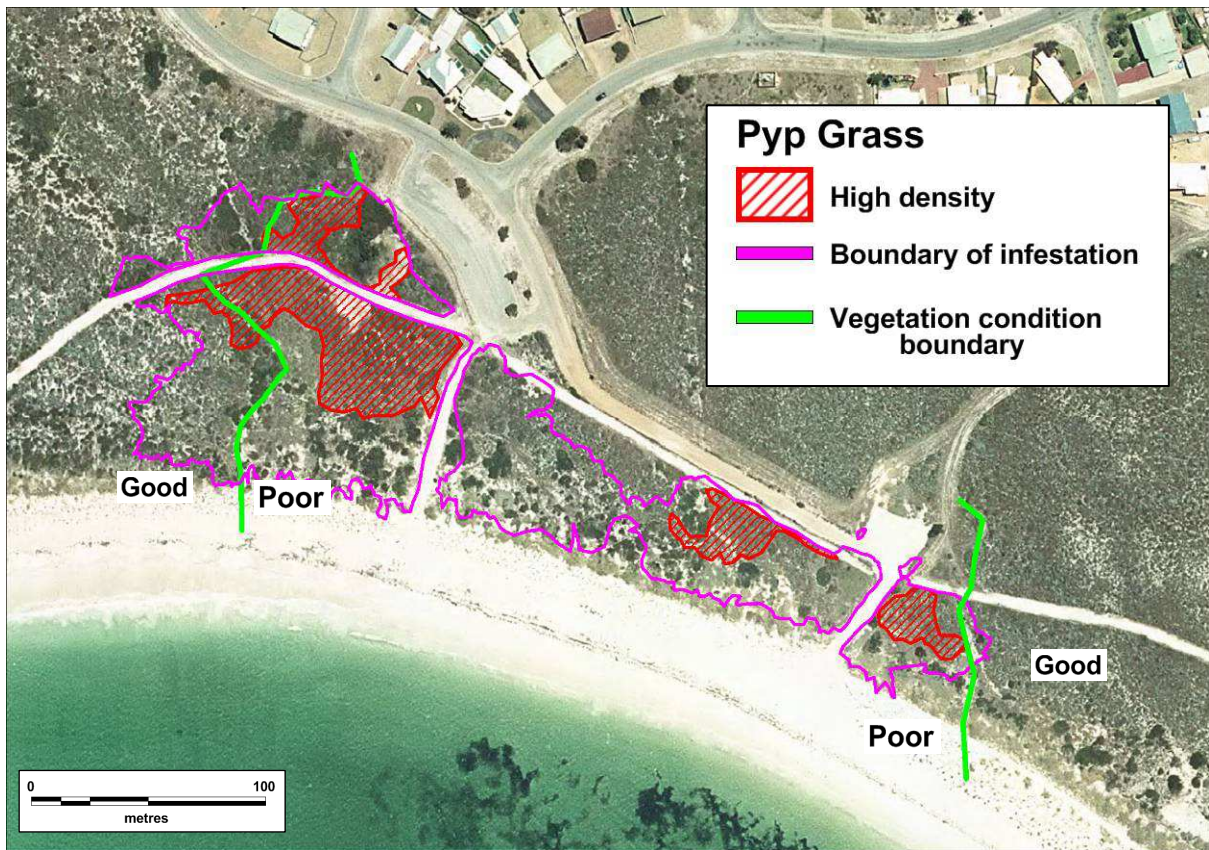


Figure 5: Barcelona Drive Pyp Grass

### 1.2.3. Hansen Bay Lookout

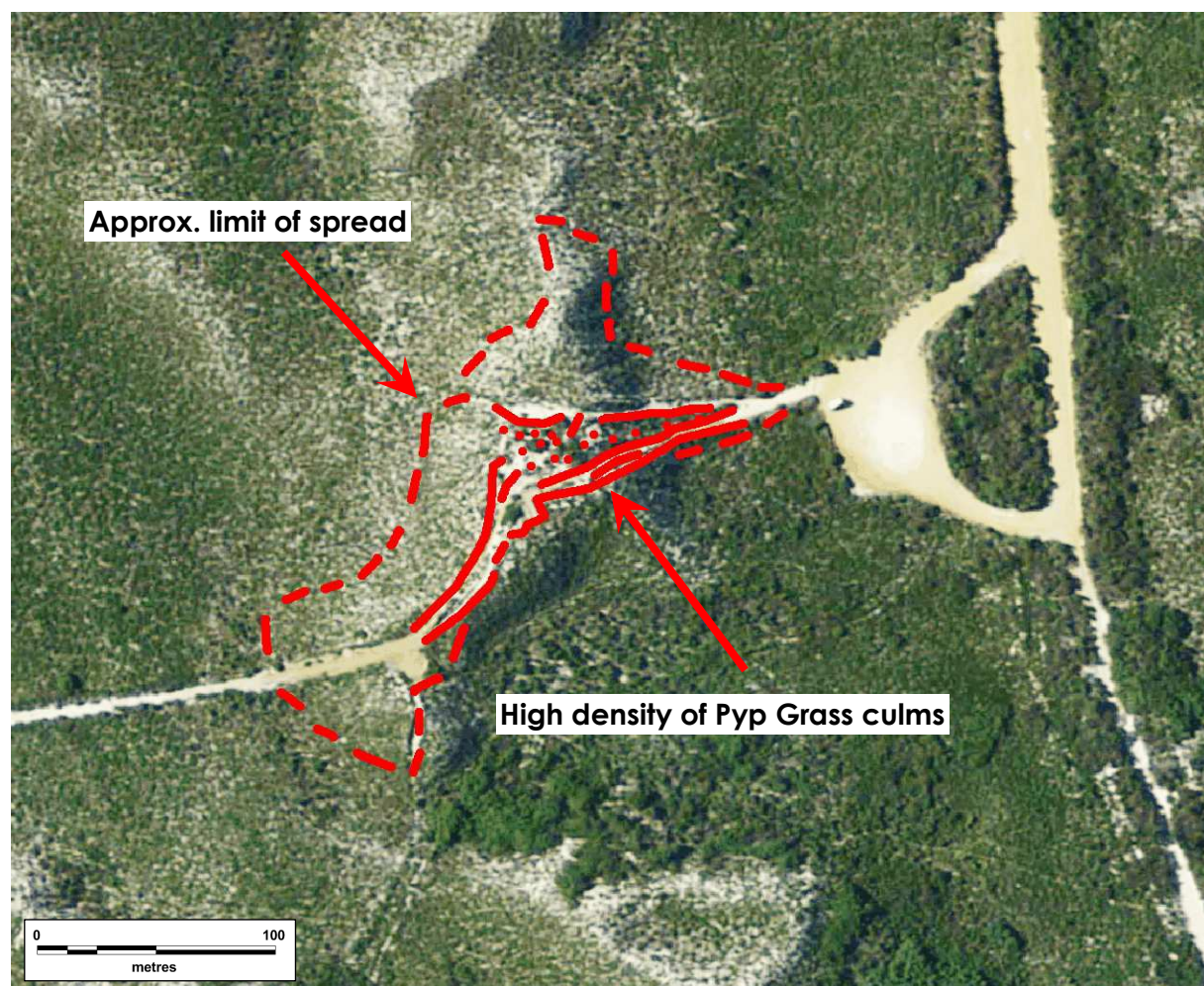


Figure 6: Hansen Bay Lookout Pyp Grass

# PART B: MANAGEMENT

## Management objective and Strategies

### 1.3. Management objective

The overarching management objective of this Plan is to eradicate Pyp Grass, *Ehrharta villosa*, from the coastal dune system.

This objective has been set on the basis of:

- the project brief, and
- the community's desire to protect the coastal dunes' natural vegetation, wildlife habitat and visual amenity.

### 1.4. Management options

At a Pyp Grass workshop held on the 4th of April 2012 in Cervantes, a range of management and treatment options were discussed:

- Physical removal
- Install a plastic root barrier to retain infestations
- Burn then spray regrowth
- Brush cut then spray regrowth
- Spray only.

The advantages and disadvantages of each approach are shown in table 2.

**Table 2: Pros and cons of different management strategies**

	<u>Pros</u>	<u>Cons</u>
Physical removal using heavy machinery	Complete removal of weed biomass	Wind erosion from exposed soil extremely likely Complete loss of any existing native plants Complete loss of native soil seed bank Damage likely to surrounding areas during access
Install root barrier membrane	Prevents spread of infestation	High level of mechanical damage to native plant roots when excavating trench Possibility of introduction of pathogens Doesn't contribute to eradication of Pyp Grass Regular monitoring needed to ensure Pyp Grass doesn't 'escape'
Burn then spray	Regrowth more susceptible to herbicide	Coastal dunes are not tolerant of fire, and damage to existing ecosystem will be high Likely mass germination of weed seeds from soil seed bank

Brush cut then spray	Regrowth more susceptible to herbicide Can be done in stages	Likely damage to existing native plants Very labour intensive
Spray only	Can be done in stages	Off-target damage to Spinifex and other grass spp

It was considered that the optimal treatment method was 'Spray only' and the remainder of this management plan is based on that premise.

## 1.5. Management strategies

Two management strategies have been drafted under the management objective to provide the basis for the Plan (Table 3). The two management strategies can be summarised as:

1. Implement weed control activities;
2. Monitoring, evaluation and reporting

**Table 3: Management strategies and overview of actions**

<b>Management Strategy 1. Implement weed control activities</b> Section 4.2
a. Implement weed control activities
b. Minimise the extent of off-target damage
c. Prevent establishment of new weed species
<b>Management Strategy 2: Carry out sufficient monitoring, evaluation and reporting to maintain support for ongoing weed control activities.</b> Section 4.4
It is important to demonstrate to the local community, and other stakeholders, that control of the Pyp Grass is effective and worthwhile.
a. Establish and use monitoring quadrats or photo reference points.
b. Keep the community, Shire and DEC informed of progress towards Plan implementation.
c. Record any new occurrences of Pyp Grass
d. Remap weeds in 2017, or earlier if major changes are observed to have occurred during this time.

## Management actions

All management actions recommended to implement this plan are summarised in Table 4

### 1.6. Prioritisation of actions

The recommended actions have been prioritised based on the urgency and importance of actions.

Vegetation condition mapping was outside the brief for this project; however, consideration was given to areas of vegetation in obviously better condition to assist with setting of priorities.

## 1.7. Actions towards management strategy 1

### 1.7.1. Priority 1 spraying areas

The areas that are considered the highest priority for treatment are the whole of the infestation at Hansen Bay Lookout, plus the western edge of the invasion front at Drummond Cir, and southern edge of the invasion front at Barcelona Dr.

At the Hansen Bay Lookout, the Pyp Grass has a fairly high culm (stem) density in close proximity to the track and steps leading from the carpark, around the lookout pad, and for approx 50m along the track heading west to the sea. This suggests that it was introduced in contaminated fill, probably brought from Cervantes, when the lookout was first constructed (date of construction is unknown but aerials show the lookout in existence in 2000). In addition there are scattered culms in an area that extends approximately 100m north of the lookout and approximately 30m radiating outwards from the track that heads west from the lookout.

**Fig 7 Pyp Grass in the vicinity of the Hansen Bay Lookout.**



**On the track and steps leading to the Lookout (top and right)**



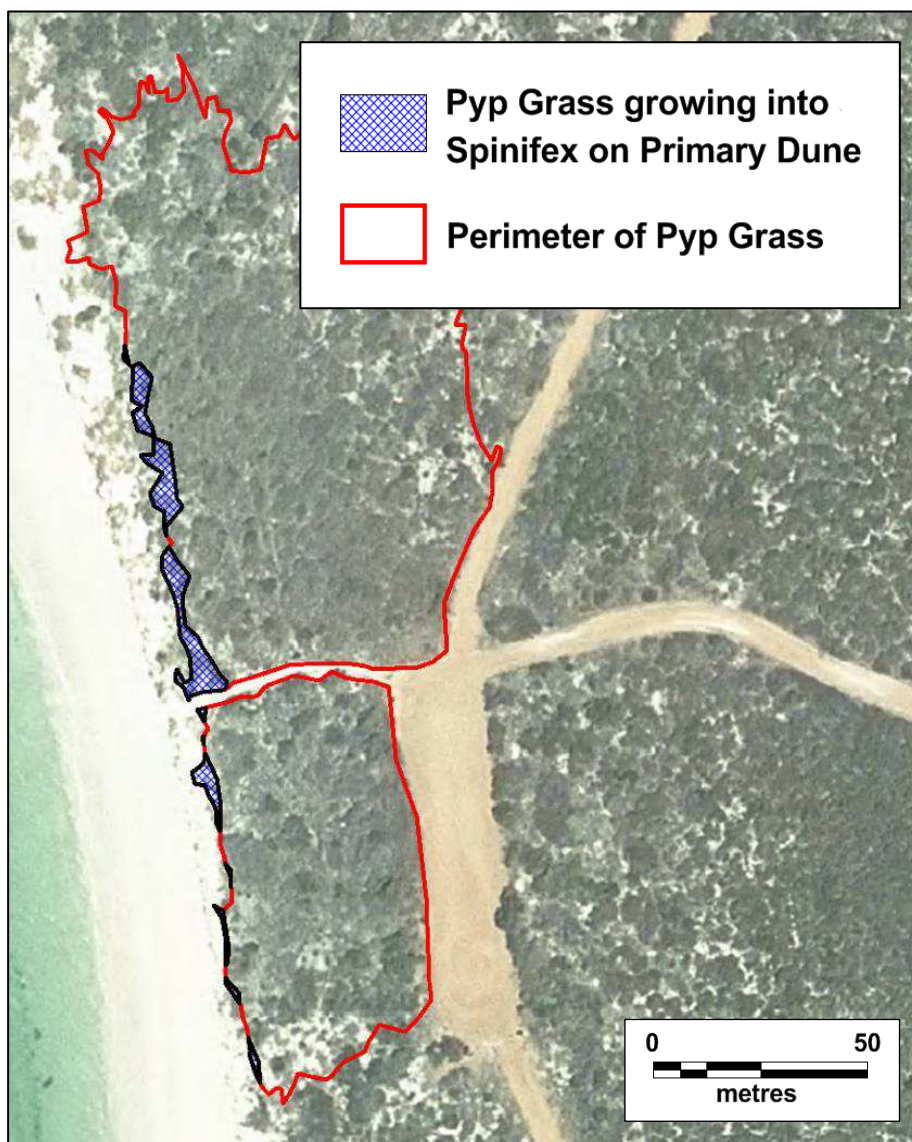
**Around the lookout pad (middle)**

**Scattered culms of Pypgrass north of the lookout (bottom)**



Given that control work will be somewhat arduous because of the terrain and because of the difficult caused by restricted access, it would be prudent to start treatment as soon as possible to reduce any further spread.

Of concern at Drummond Cir and Barcelona Dr, is where Pyp Grass is invading the Spinifex that grows on the back slope of the primary dune and particularly where it is starting to encroach on the front slope. Spinifex is susceptible to both selective and non-selective herbicides so, as treatment of Pyp Grass will result in considerable off-target damage, it is prudent to start treatment as soon as possible so as to minimise the amount of Spinifex loss and thus minimise the threat of any blowouts developing as a consequence of that loss.



**Fig 8 Pyp Grass / Spinifex overlap at Drummond Circus**



**Fig 9 Pyp Grass moving up back slope of primary dune at Barcelona Drive.**

The strategy should be, in most cases, to target ALL the Pyp Grass and accept that this will result in the death of Spinifex. However, where Pyp Grass has started to move onto the crest and over onto the front slope and if resources permit a combination of careful spot spraying and weed wiping can be used. N.B. This strategy is NOT recommended over large areas as it is very labour-intensive.

### **1.7.2. Priority 2 spraying areas**

The areas that are considered of next importance are:

- a) A 5-10m wide strip landward of the Priority 1 zones, where Pyp Grass is of relatively low density, and
- b) At the northern end (Drummond Cir) and western and eastern ends (Barcelona Dr) where Pyp Grass is invading areas of high quality bushland. In addition there are two small outliers on either side of the carpark/turning circle at the end of Barcelona Dr. These are the only known occurrences of Pyp Grass on the north side of Barcelona Dr.

**Fig 10 Pyp Grass invading excellent condition bushland at the western end of Barcelona Drive.**



It will be difficult to get adequate coverage when spraying Pyp Grass in dense shrubland (such as shown above) so it is anticipated that numerous repeated sprays will be required.

There are several patches of native Marine Couch, *Sporobolus virginicus*, at the northern end of Drummond Cir. Marine Couch is a rhizomatous or stoloniferous perennial grass that, whilst widespread throughout the coastal regions of Australia, is showing signs of decline in some areas of WA. It is recommended that NO SPRAYING be done in these patches but that the Pyp Grass be weed-wiped.



**Fig 11. Pyp Grass starting to invade a patch of Marine Couch, *Sporobolus virginicus*, at the northern end of Drummond Circus.**

Another native grass species (probably Coastal Tussock Grass, *Poa poiformis*) was also noticed in this area and particularly at the western end of Barcelona Dr. Care should be taken when blanket spraying so as to avoid spray contact with these plants.

### **1.7.3. Priority 3 spraying areas**

The Priority 3 spraying targets the remainder of the areas at both Drummond Cir and Barcelona Dr wherever Pyp Grass density is relatively low.

There is still a reasonable number and diversity of native species and it is quite likely that assisted regeneration will not be required.

### **1.7.4. Priority 4 spraying areas**

The final priority for spraying is where Pyp Grass density is extremely high and there has been a substantial loss of native plants. It is expected that a considerable amount of assisted regeneration and planting will be required and these areas will need to be monitored carefully during and after Pyp Grass has been controlled to determine whether:

- a) There is any natural recruitment of natives occurring from the soil seed-bank, and if
- b) More difficult to control weeds are appearing.

There are six discrete zones designated as Priority 4 and It is recommended that they be treated sequentially and that the speed of treatment of new zones be directed by the rate of recovery of previously treated zones.

**Fig 12a High density Pyp Grass towards the western end of Barcelona Drive**



**Fig 12b High density Pyp Grass in the centre of the Drummond Circus site**

**Both these areas are devoid of understorey species.**

## **1.8. Scheduling works**

The scheduling of works is challenging given that these activities are likely to be carried out or organised by a range of stakeholders that may include local government, NRM groups and community groups and will possibly be dependent on obtaining grants over an extended period. There are also many unknowns when working with natural landscapes, weed control and both natural and assisted regeneration.

Achieving control and, ultimately, eradication of Pyp Grass must be considered as a medium-term activity (5-8 yrs), particularly as eradication of Pyp Grass in highly degraded areas will probably need to be accompanied by replacement planting of appropriate natives to reduce the chance of depauperate areas being colonised by weed species that are even more difficult to control. It is important to note that one of the major causes of failure of bushland management programmes

is attempting to do too much, too soon, and in too large an area (resources spread too thin and/or insufficient resources committed for on-going maintenance).

It is important that the schedule, the activities being undertaken and those which are planned to commence, be reviewed each year or so. It is recommended that the scheduling of works be adapted to available resources and the results of monitoring, rather than attempting to work to a fixed programme that subsequently produces numerous sites all with ongoing management problems.

Priority 1, Priority 2 and Priority 3 work (table 4) can be combined and done simultaneously if resources permit. However, it is imperative that some level of confidence in the procedure as well as confidence that the desired results can be achieved over a particular time frame be developed before moving further. As a result, it is not recommended that any Priority 4 work commence before year 3

**Fig. 13 Hansen Bay Lookout – priority for spraying**

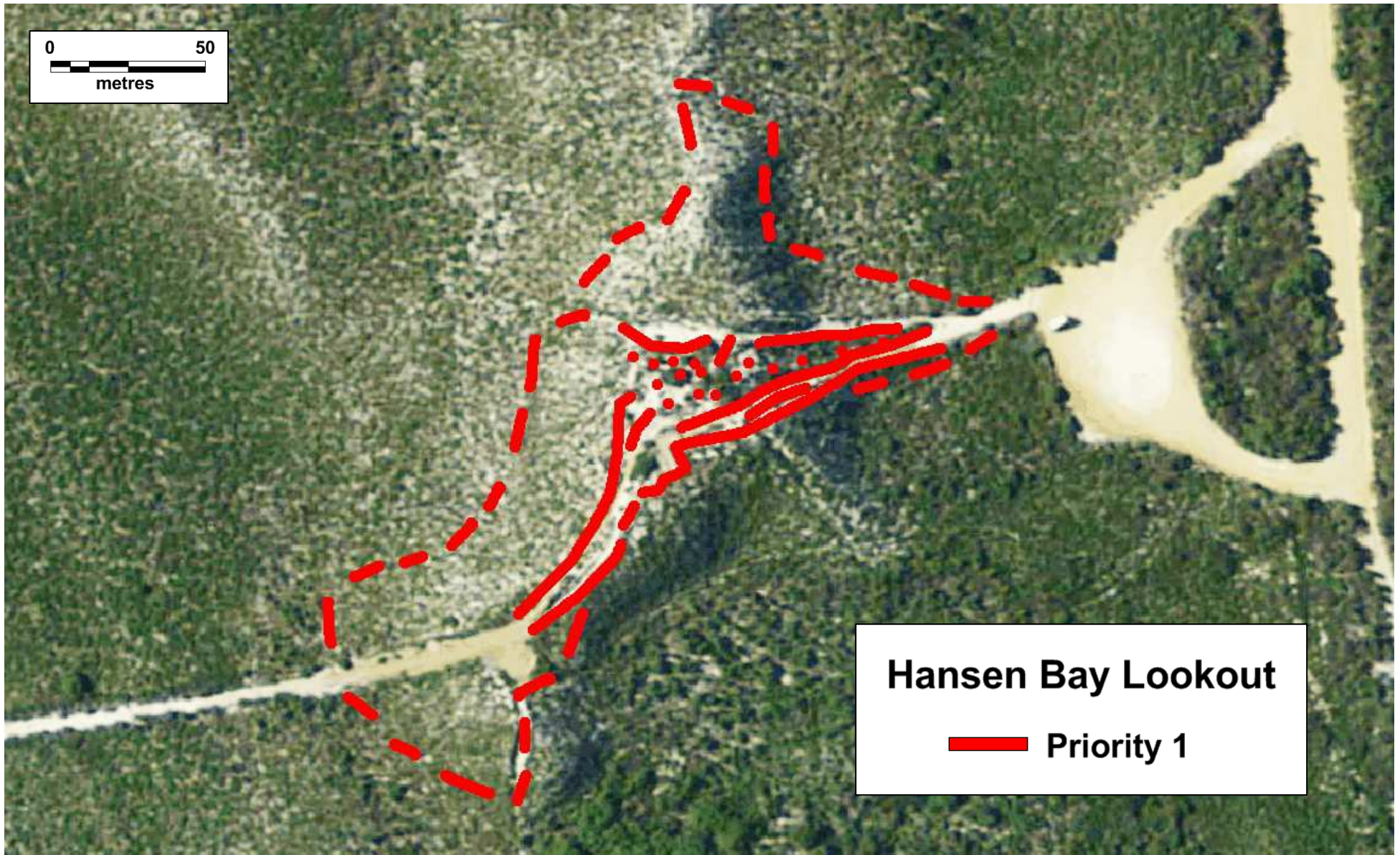


Fig 14 Drummond Circus Pyp Grass treatment zones

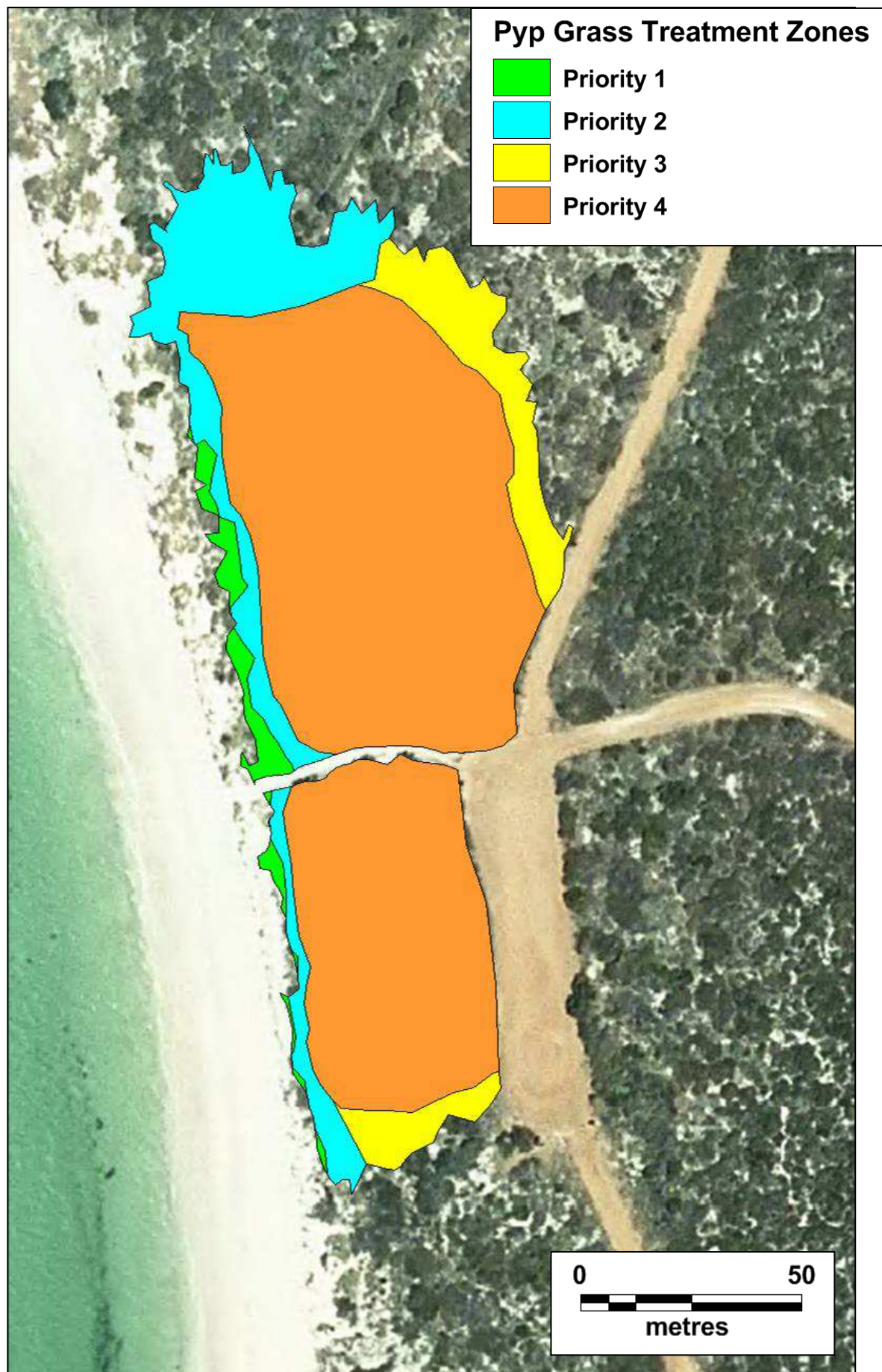


Fig 15 Barcelona Drive Pyp Grass treatment zones

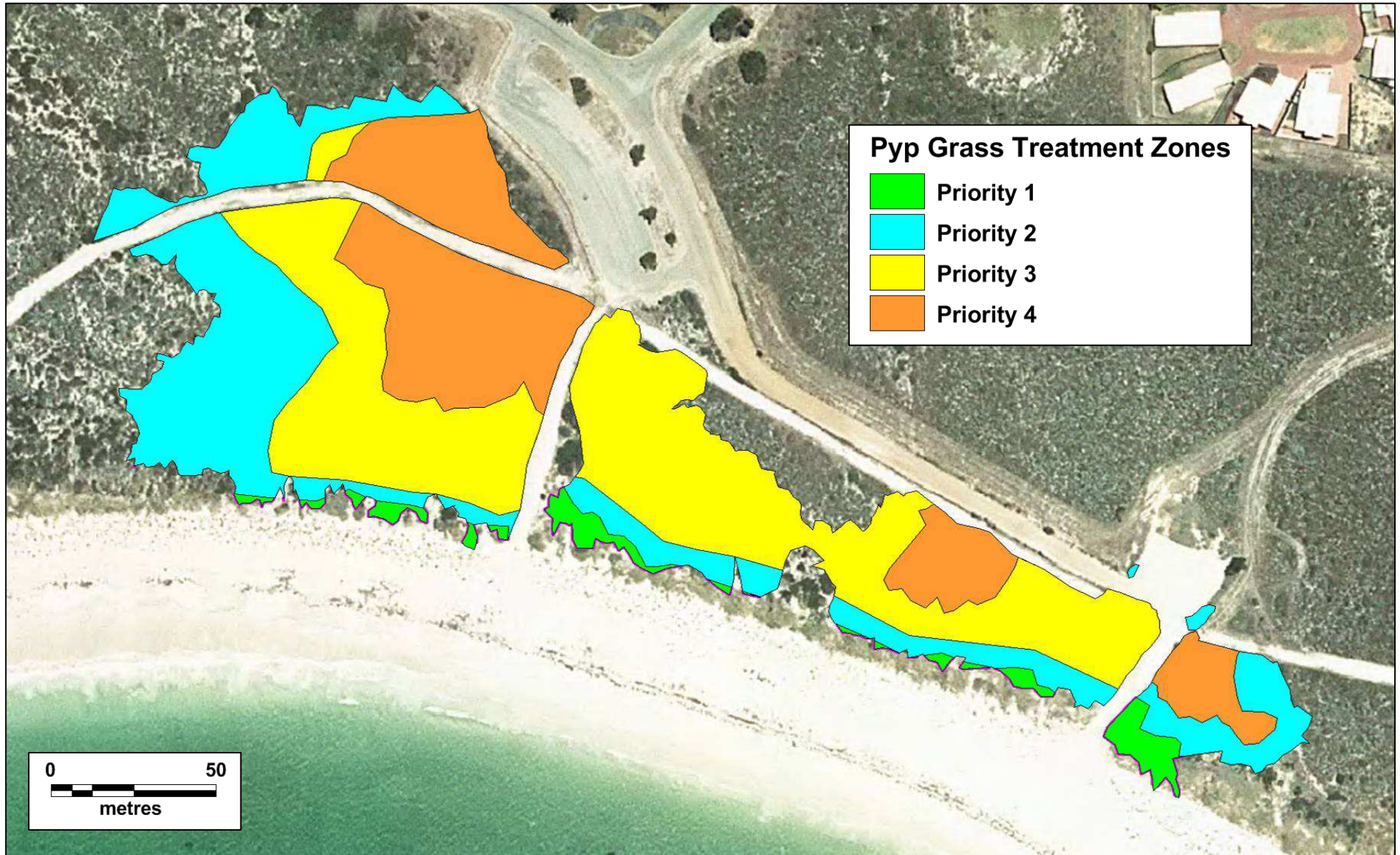


Table 4: Prioritised Weed Control actions

Suggested Action Sequence	Location	Action	Approx timing	Approx area (ha)	Cost estimate *	
1	Hansen Rd Lookout	Spray all Pyp Grass	Spring 2012	0.25	\$600	\$850
	Barcelona Dr – Priority 1 area	Spot spray Pyp Grass amongst Spinifex along back slope of primary dune		0.07	\$80	
	Drummond Cir – Priority 1 area	Spot spray Pyp Grass amongst Spinifex along back slope of primary dune		0.03	\$170	
2	Barcelona Dr – Priority 2 area	Spray Pyp Grass in a 5-10m wide strip along southern edge of infestation, plus in better quality bushland at both western and eastern ends	Spring 2012	0.6	\$1,090	\$1,440
	Drummond Cir – Priority 2 area	Spray Pyp Grass in a 5-10m wide strip along western edge of infestation, the two small outliers adjacent to western carpark, plus in better quality bushland at northern end of infestation		0.2	\$360	
3	Hansen Rd Lookout	Respray all Pyp Grass	Autumn 2013	0.25	\$600	\$850
	Barcelona Dr – Priority 1 area	Respray Priority 1 area		0.07	\$80	
	Drummond Cir – Priority 1 area	Respray Priority 1 area		0.03	\$170	
4	Barcelona Dr – Priority 2 area	Respray Priority 2 area	Autumn 2013	0.6	\$1,090	\$1,450
	Drummond Cir – Priority 2 area	Respray Priority 2 area		0.2	\$360	
5	All Priority 1 + Priority 2 areas	Respray Pyp Grass as needed	Spring 2013	1.15		\$1,380
6	Barcelona Dr – Priority 3 area	Spray low density Pyp Grass (Priority 3 area)	Spring 2013	0.85	\$1,530	\$1,710
	Drummond Cir – Priority 3 area	Spray low density Pyp Grass along southern and north-eastern edge of infestation (Priority 3 area)		0.1	\$180	

Suggested Action Sequence	Location	Action	Approx timing	Approx area (ha)	Cost estimate *	
7	All Priority 1 + Priority 2 areas	Respray Pyp Grass as needed	Autumn 2014	1.15		\$1,380
	Barcelona Dr – Priority 3 area	Respray Priority 3 area		0.85	\$1,530	\$1,710
	Drummond Cir – Priority 3 area	Respray Priority 3 area		0.1	\$180	
8	Drummond Cir – Priority 4 area south of footpath	Spray Pyp Grass through Priority 4 area south of footpath	Autumn 2014	0.28	\$504	\$504
9	All Priority 1 + Priority 2 areas	Inspect and spray if needed	Spring 2014			
	All Priority 3 areas	Respray Pyp Grass as needed	Spring 2014	0.95		\$1,026
	Drummond Cir – Priority 4 area south of footpath	Respray Priority 4 area south of footpath	Spring 2014	0.28	\$504	\$504
10	All Priority 3 areas	Respray Pyp Grass as needed	Autumn 2015	0.95		\$1,026
	Drummond Cir – Priority 4 area south of footpath	Respray Priority 4 area south of footpath		0.28		\$302
	Drummond Cir – Priority 4 area north of footpath	Spray Pyp Grass through Priority 4 area north of footpath	Autumn 2015	0.54	\$972	\$972
11	All Priority 3 areas	Inspect and spray if needed	Spring 2015			
	Drummond Cir – Priority 4 area south of footpath	Respray Pyp Grass as needed	Spring 2015	0.28		\$302
12	Drummond Cir – Priority 4 area north of footpath	Respray Priority 4 area north of footpath	Spring 2015	0.54		\$972
13	Drummond Cir – Priority 4 area south of footpath	Inspect and spray if needed	Autumn 2016			
	Drummond Cir – Priority 4 area north of footpath	Respray Priority 4 area north of footpath	Autumn 2016	0.54		\$583
	Barcelona Dr – Priority 4 area	Spray Pyp Grass through Priority 4 area	Autumn 2016	0.53	\$954	\$954

- \* Costs are difficult to estimate. The average spraying cost for Perth is approx \$1200 per hectare. Due to the considerably higher costs of travel and materials for Cervantes, a premium of 150% has been applied. Where use of backpacks, or spot-spraying is indicated, a premium of 200% has been applied.
- \*\* It has been assumed that the cost of respraying reduces by 40% in the second year.  
No costs have been allocated if respraying is required in year 3  
No scheduling is shown after Autumn 2016 as details are too tenuous

## 1.9. Actions towards management strategy 2

It is important to demonstrate to the local community, potential funders and coastal managers that control of the Pyp Grass is effective and worthwhile.

### 1.9.1. Establish monitoring quadrats or photo reference points

In order to determine the effectiveness of any weed control programme, there needs to be a method of measuring ongoing progress and ultimately success. Monitoring data is useful not only for determining the success of weed control programmes, but also for planning weed control activities from year to year. However, in order for monitoring data to be useful, it needs to be fed back to, and collated by, one individual (or team). That is, any work undertaken in the field, whether it be actual weeding, or monitoring of previous weed control sites, (and including any other monitoring work) should be fed back into a central management system to ensure efforts are being focussed where they are most needed and to ensure the groups are aware of each others' activities.

#### a) Monitoring quadrats

Establish monitoring quadrats to record the effectiveness of weed control methods. Quadrats should be a minimum size of 10m by 10m size. The actual location chosen is not critical, as long as it is representative of the zone of interest. It is recommended that monitoring quadrats are set up to monitor weed control as well as to monitor revegetation activities and any changes in vegetation condition. A useful starting point would be to set up quadrats at each location where a particular management action is to occur (e.g. each of the three locations for 'Suggested Action Sequence' #1+2 [Table 4]). However, if this is beyond the scope of resources, just establish photo points.

#### b) Photo Points

Photo-points are set points from which a photograph is taken, in a set direction and at regular time intervals (e.g. every six months). They are a faithful record of changes over time. Photopoints allow you to easily, efficiently and cost effectively monitor change. They are also a powerful tool for convincing others that significant change has or has not occurred.

Ideally take photographs twice yearly (e.g. spring and autumn) - at the same dates and same time of day gives best information but this is not crucial. It is also suggested that the photos be uploaded to a web-based photo repository to allow viewing photos online. This would enable a wide range of stakeholders to become involved in the project and to monitor progress.

### **c) Marker Pegs**

As the monitoring quadrats and/or photo points are to be revisited, they need to be marked, easily identifiable and easily relocatable. Marker pegs can be vandalised or obscured by vegetation over time so, regardless of apparent visibility, the photo-point marker should be able to be relocated using a GPS and/or a compass and tape from a distinct and immovable feature. Sketch the layout of all of the photo point plots approximately to scale and indicate all angles and distances to other useful landscape features as well as the GPS coordinates of that point. If vandalism or theft of the marker peg is a concern it is suggested that a second smaller peg be installed immediately adjacent to the primary peg but hammered in flush with the ground surface. Suitable marker pegs are readily available from survey supply companies.

If photo points as well as monitoring quadrats are used, one corner of the quadrat could be the photopoint.

### **d) Monitoring Measurements**

It is suggested that whenever a monitoring quadrat is established, plus each time it is visited for monitoring purposes, that the following be measured and recorded:

1. Percentage cover of Pyp Grass. (This will indicate if control work is successful)
2. Number of individual native plants. (This will indicate if natural recruitment of natives is occurring and/or success of any assisted regeneration)
3. Actual native species present. (This will indicate any change in species diversity)
4. Weed species present. (This will indicate whether new weed species are invading)
5. Percentage cover of weed species other than Pyp Grass. (This will indicate whether the Pyp Grass is being replaced by other weeds)

A suggested template is included as Appendix 5

### **e) Some suggested Performance Criteria/Performance Targets**

Some of the following performance criteria and targets require a baseline measurement to be made at the start of the project. Some also will need to be set dependant on the specific site and the amount and diversity of native species at the start, and whether natural recruitment or revegetation is occurring:

1. 50% decrease in Pyp Grass density in 12 months (requires a baseline measurement)
2. Eradication of Pyp Grass in 3 years
3. 10% Increase in number of natives in 2 years (requires a baseline measurement)
4. 10-100% increase in native species diversity in 2 years (requires a baseline measurement)
5. No invasion by new weed species (requires a baseline measurement)

N.B. These performance criteria and targets are specific for EACH location, so should be duplicated for EACH new location worked in.

### 1.9.2. Communications, Reporting and Plan Review

The Project Team should maintain regular communications with each other and with other stakeholders via a simple 1– 2 page report on progress of works. An article in the local paper or shops should be considered at least once a year. These can prove useful to attach to funding applications or when approaching potential funders.

It is recommended that the Plan should be formally reviewed in 2017 to report the progress on implementation of actions, and to adapt management to changes that have been identified through remapping weeds and vegetation condition.

It is recommended that signage be installed at each site (and additionally at the spray trial site) to educate and inform the community about Pyp Grass and the work in progress.

### 1.9.3. Record new occurrences of Pyp Grass

It is believed that Pyp Grass produces little or no viable seed in Western Australia (*Herbiguide 2012*). That being the case, new infestations can only be the result of moving soil contaminated with pieces of rhizome. It is recommended that all areas of earthworks done in the Cervantes environs during the last ten years, and within the coastal dune arena be inspected opportunistically for new occurrences of Pyp Grass. Should any be found, these should be mapped and added into the Pyp Grass management works programme.

### 1.9.4. Remapping of weeds

EWSWA (CALM 1999) recommends mapping high rated weed populations at regular intervals (e.g. every 5 years). It is suggested that the Pyp Grass be remapped in 2017, or earlier if major changes are observed to have occurred during this time.

## Community Involvement

Most of the work of this plan is only appropriate for suitable experienced and licenced contractors, however it is suggested that some activities could be done by members of the local community or friend's groups, namely:

1. Installation of monitoring quadrats and photopoints
2. Monitoring activities
3. Weed wiping
4. Assisted regeneration
5. Planting
6. Seed collection (requires the appropriate collecting licence from DEC)

# References

Brown, Kate., Brooks, Kris., (2002), *Bushland Weeds A practical guide to their management*, Environmental Weeds Action Network Inc., Greenwood, Western Australia.

Department of Conservation and Land Management (1999) *Environmental Weed Strategy for Western Australia*. Environmental Protection Branch, CALM.

Brown, K.L. and Bettink, K.A. (2009-) *Swan Weeds: Management Notes*, FloraBase - The Western Australian Flora. Department of Environment and Conservation. <http://florabase.dec.wa.gov.au/weeds/swanweeds/>

DEC (2009) DEC Midwest weed assessment Nov.08 [Online 2 Nov 2011]. <http://www.dec.wa.gov.au/content/view/6295/2358/1/1/>.

DEC (2011) *Techniques for mapping weed distribution and cover in bushland and wetlands SOP No: 22.1*

Harrington, K.C., Hodder, L.M. & Outred, H.A. (1998) *Biology and Control of Pypgrass*. In 51st New Zealand Plant Protection Conference. New Zealand Plant Protection Society.

Herbiguide (2012) Herbiguide website: <http://www.herbiguide.com.au>.

Hussey, BMJ., Keighery, GJ., Dodd, J., Lloyd, SG., Cousens, RD., (2007), *Western Weeds A Guide to the weeds of Western Australia*, (2<sup>nd</sup> edition), Weeds Society of Western Australia Inc., Victoria Park, Western Australia.

Oma V.P.M. et al (1992) *Coastal Rehabilitation Manual*. Dept of Agriculture, Western Australia

# PART C: ADDITIONAL REFERENCE INFORMATION

Appendix 1	<i>Ehrharta villosa</i> - Pyp Grass Weed Notes
Appendix 2	Extract from Minor Use Permit – PER13333
Appendix 3	Herbicides and Pyp Grass
Appendix 4	Approximate Herbicide Costs
Appendix 5	Suggested template for quadrat monitoring
Appendix 6	Additional significant weed species within project area

## Appendix 1: *Ehrharta villosa* – Pyp Grass Weed Notes



### Description

A slender rhizomatous, perennial grass from South Africa. Grows to 1.5 m high and produces purple- green flowers Oct–Jan with sporadic flowering Sept + Feb/Mar. Spreads by rhizomes and seed, although seed viability is believed to be very low. Resprouts from the rhizome after fire.

Pypgrass is an aggressive invader of dunes, where it is known to smother native flora. Rate of spread is as much as 9m per year and climax culm (stem) densities of <180 per m<sup>2</sup> have been recorded. Populations tend to senesce where sand movement has been reduced. Culms become largely dormant during winter, although root and rhizome growth continues.

### Control Techniques

Method	Chemical	Rate	Comments
Wipe	Glyphosate	50%	For Pyp Grass growing amongst Spinifex (and other native grasses). Use penetrant and/or spray-oil. Several applications per season will be required to obtain control
Selective Spray	Haloxypop	1 L/ha or 30ml/10li	Use 1% spray oil. Several sprays per season will be needed to obtain control
Non-selective Spray	Glyphosate	2%	Use penetrant and/or spray-oil. Several sprays per season will be required to obtain control

### Management Calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dormant						O	O	O				
Active Growth	Y	Y	Y	Y	O			O	Y	Y	Y	Y
Flowering	Y	O	O						O	Y	Y	Y
Herbicide	Y	Y	Y	Y	O	O			O	Y	Y	Y

**Legend:** Y = Yes, regularly, O = Occasionally

Adapted from Florabase (<http://florabase.calm.wa.gov.au>) and Herbiguide 2010 (<http://www.herbiguide.com.au>) © D. Bright 2012

## Appendix 2: Extract from Minor Use Permit – PER13333



**Australian Government**  
**Australian Pesticides and  
Veterinary Medicines Authority**

**PERMIT TO ALLOW MINOR USE OF AN AGVET CHEMICAL PRODUCT  
FOR THE CONTROL OF ENVIRONMENTAL WEEDS IN VARIOUS SITUATIONS**

**PERMIT NUMBER – PER13333**

This permit is issued to the Permit Holder in response to an application granted by the APVMA under section 112 of the Agvet Codes of the jurisdictions set out below. This permit allows a person, as stipulated below, to use the product in the manner specified in this permit in the designated jurisdictions. This permit also allows any person to claim that the product can be used in the manner specified in this permit.

**THIS PERMIT IS IN FORCE FROM 2 MARCH 2012 TO 31 MARCH 2017.**

**Permit Holder:**

DEPARTMENT OF AGRICULTURE AND FOOD WESTERN AUSTRALIA  
444 Albany Highway  
ALBANY WA 6330

**Persons who can use the product under this permit:**

Persons generally.

**Extract from Minor Use Permit – PER13333 (cont.)**

**Directions for Use:**

Crop	Pest	Rate
NON-AGRICULTURAL AREAS BUSHLAND & FORESTS, WETLANDS, ROADSIDES, INDUSTRIAL AREAS.	ENVIRONMENTAL WEEDS	Apply in accordance with those instructions as contained in Attachment 1.

**Critical Use Comments:**

Apply strictly in accordance with the application methods listed in Attachment 1.

**Jurisdiction:**

WA only.

**Additional Conditions:**

Use of Glyphosate formulations in aquatic situations; only those specific glyphosate products that have label approvals currently in place for aquatic use may be used in or near aquatic areas.

Crop/animal/situation			
Non-crop areas			
Active ingredient	Weed	Rate	Application method and comments
Fluazifop 212 g/L Eg Fusilade	Annual and perennial grasses	400 mL/100 L water plus wetting agent or spray oil. Or 4 L/ha. Or label rate for specific weed.	Spot spray. Or overall spray in broad leaf host situations.
Haloxifop 520 g/L Eg Verdict	Annual and perennial grasses	100 mL/100 L water plus wetting agent or spray oil. Or 1 L/ha. Or label rate for specific weed.	Spot spray. Or overall spray in broad leaf host situations.
Quizalofop 100g/L Eg Targa, Leopard and Pantera.	Annual and perennial grasses	300 mL/100 L water plus wetting agent or spray oil. Or 3 L/ha. Or label rate for specific weed.	Spot spray. Or overall spray in broad leaf host situations.

## Appendix 3: Herbicides and Pyp Grass

Notes from a personal conversation between this author and John Moore, Senior research officer, Department of Agriculture and Food, 'Weed Guru' and author of Herbiguide. June 2012

**Q.** There appears to be a discrepancy between the active ingredient concentrations of different herbicides and the Minor-Use Permit rates. Why is this?

**A.** There actually isn't a discrepancy. The rates are approximately comparable because there are different proportions of left-handed and right-handed chains in the active ingredient itself which have different efficacies.

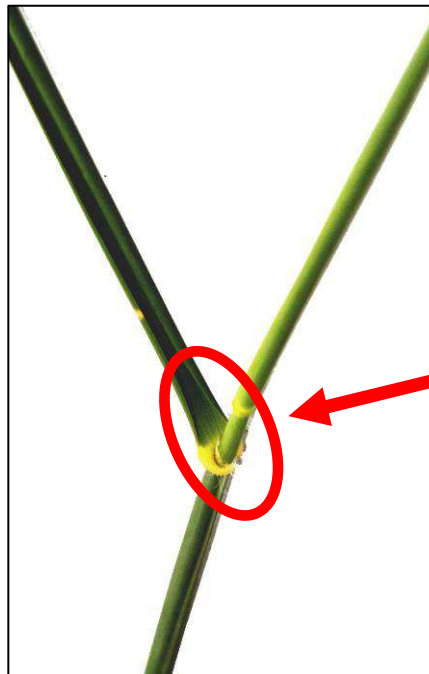
**Q.** Why are the minor-use-permit spot-spraying concentrations so low?

**A.** They are set purposely low to cater for inexperienced operators who apply far TOO much liquid to plants when spraying. It is acceptable to increase the concentration by several orders of magnitude (for experienced operators) as long as the per hectare rate IS NOT EXCEEDED. What drives all the regulations is concern about chemicals in the water table.

All the documented work from New Zealand on Pyp Grass control only seems to mention the use of Haloxyfop (Verdict) (and this author believes Verdict works better) however John Moore recommended using whichever herbicide is cheapest at time of purchase. Although JM didn't think that any one herbicide gave better results, he did state that probably not enough rigorous work had been done to state that categorically.

John Moore also expressed interest in the spraying trials being done by NACC at Cervantes but did say that, because maximum uptake of herbicide (perhaps as much as 75-80%) occurs in ONLY a small zone right at the base of actively growing leaves (before the waxy cuticle has properly developed), he believes that spraying (even with higher concentrations of herbicides) when the leaves have stopped growing is a waste of time – i.e. as a maximum of 25% of herbicide is probably only absorbed.

Nevertheless, documenting the results that show success and/or failure is valuable and he would very much like to see a copy of the report.



**Fig 16. Pyp Grass leaf/stem junction**

**Possibly 75-80% of herbicide absorbed in this small area**

## Appendix 4: Approximate Herbicide Costs

		minimum quantity	approx cost	Rate per ha	Dilution	cost/ha
<b>Fusilade</b>	<b>128g/li</b>	<b>5li</b>	<b>\$297</b>	<b>6.6 li</b>		<b>\$392</b>
		<b>20li</b>	<b>\$1,087</b>			<b>\$359</b>
<b>Targa</b>	<b>100g/li</b>	<b>10li</b>	<b>\$107</b>	<b>3 li</b>		<b>\$32</b>
<b>Verdict</b>	<b>520g/li</b>	<b>5li</b>	<b>\$280</b>	<b>1 li</b>		<b>\$56</b>
<b>Wetter</b>		<b>20li</b>	<b>\$79</b>		<b>0.2%</b>	<b>\$0.8</b>
		<b>5li</b>	<b>\$18</b>		<b>0.2%</b>	<b>\$0.7</b>
<b>Uptake spray oil</b>		<b>20li</b>	<b>\$130</b>		<b>1%</b>	<b>\$13</b>

## Appendix 5: Suggested template for quadrat monitoring

### Cervantes Pyp Grass Monitoring

Quadrat # \_\_\_\_\_ Location \_\_\_\_\_

	Date _____	Date _____	Date _____	Date _____	Date _____	Date _____
	Photo ID _____	Photo ID _____	Photo ID _____	Photo ID _____	Photo ID _____	Photo ID _____
Percentage cover of Pyp Grass						
Number of individual native plants						
Actual native species present						
Number of native species present						
Weed species present						
Number of weed species present						
Percentage cover of weed species other than Pyp Grass						

## Appendix 6: Additional significant weed species within the project area

	<u>Genus</u>	<u>Species</u>	<u>Family</u>	<u>Common name</u>	<u>Weed Ranking</u>				Suggested Ranking/ Environmental significance for Cervantes
					Dixon and Keighery (1995)	Environmental Weed Strategy (1999)	DEC (2008-2009)		
						Ecological Impact	Invasiveness		
*	<i>Euphorbia</i>	<i>terracina</i>	Euphorbiaceae	Geraldton Carnation Weed	Major	High	High	Rapid	High
*	<i>Pelargonium</i>	<i>capitatum</i>	Geraniaceae	Rose Pelargonium	Major	High	High	Rapid	High
*	<i>Tetragonia</i>	<i>decumbens</i>	Aizoaceae	Sea Spinach	Minor	Moderate	High	Rapid	High
*	<i>Avena</i>	<i>fatua</i>	Poaceae	Wild Oat	Major	Moderate	High	Rapid	Medium
*	<i>Cakile</i>	<i>maritima</i>	Brassicaceae	Sea Rocket	Minor	Moderate	Low	Rapid	Medium
*	<i>Euphorbia</i>	<i>paralias</i>	Euphorbiaceae	Sea Spurge	NR	Moderate	High	Rapid	Medium
*	<i>Lagurus</i>	<i>ovatus</i>	Poaceae	Hare's Tail Grass	Nuisance	High	Unknown	Mod/ Rapid	Medium
*	<i>Thinopyrum</i>	<i>distichum</i>	Poaceae	Sea Wheat	NR	Moderate	High	Moderate	Medium
*	<i>Trachyandra</i>	<i>divaricata</i>	Asphodelaceae	Onion Weed	Minor	Mild	High	Rapid	Medium
NR = not rated						*	*		
* = combination of "DEC South west weed assessment Mar.09" and "DEC Midwest weed assessment Oct 08"									