



ST MARYS PROPERTY - CENTRAL PRECINCT

Weed Management Plan

For:

MARYLAND DEVELOPMENT COMPANY

July 2008

Final Report

Cumberland Ecology
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Report No. 7070RP5

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Date: 16 July, 2008

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Executive Summary

This Weed Management Plan (WMP) has been prepared for the Central precinct of the St Marys Property (SMP) in order to comply with the Environmental Planning Strategy. The WMP addresses environmental management issues relating to exotic plant species that may result from the development of the Central Precinct.

This WMP describes weed occurrence in the Central Precinct but more detailed vegetation community and condition descriptions may be found in the Central Precinct Biodiversity Assessment.

Weed management under this WMP focuses on noxious and environmental weeds, including Weeds of National Significance (WONS), but particularly significant weeds of the SMP.

The vegetation of the Central precinct is generally in low to moderate condition with exotic species occurring frequently across most of the precinct. A large proportion of the precinct is covered by exotic grassland, reflecting the agricultural history of the SMP as exotic species would have been introduced to improve pasture and inadvertently introduced with stock. The most significant weeds in the Central Precinct are African Lovegrass (*Eragrostis curvula*), Blackberry (*Rubus fruticosus* spp agg) and Small-leaved Privet (*Ligustrum sinense*).

The WMP describes weed control techniques for these significant weeds and management strategies to prevent the spread of weeds in the precinct and surrounding Regional Park. Strategies are specified for the construction and occupation phases of the development of the Central Precinct.

Introduction

1.1 Purpose

This Weed Management Plan (WMP) has been prepared for the Central Precinct of the St Marys Property (SMP). The aim of this plan is to identify and manage weeds during and after construction on the Central Precinct to prevent both the spread of weeds into the Regional Park and the growth of weeds within the precinct.

The objectives of this plan are to:

- Review existing legislative obligations and weed control guidelines;
- Identify infestations of significant weeds across the Central Precinct;
- Identify and prepare prescriptions for the control of significant weed species within the Central Precinct development area during and after construction;
- Detail a five-year weed control program for the Central Precinct development area; and
- Make provision for weed control guidelines for building and landscaping, and educational material for future residents.

This WMP is designed to meet the appropriate legislative requirements and be guided by relevant weed control policies, guidelines and strategies.

1.2 Background

The SMP is a 1,545 hectare area of land which is situated north of St Marys and east of Penrith in Western Sydney. The site is bounded by Ninth Avenue, Palmyra Avenue, Forrester Road, Dunheved Golf Course, The Northern Road and the suburbs of Cambridge Gardens and Werrington County. The SMP is located within both the Blacktown and Penrith Local Government Areas (LGAs). It incorporates areas of cleared agricultural land, developed areas and areas of regenerating Western Sydney woodland vegetation.

The SMP was originally used for grazing, and a butchery and saleyard were located on the land. Following the outbreak of World War II, the Australian Government established an explosives and munitions filling factory on these lands. Extensive works were undertaken on the site involving the construction of more than 800 buildings, a transport network including roads and railway lines, as well as major services infrastructure and telecommunications facilities. This complex of munitions factories operated until production ceased in 1994. The site has subsequently been decontaminated, and the great majority of the buildings and other infrastructure removed.

In 1993 the State Government included the SMP in its Urban Development Program for future urban development, in recognition of its ability to meet future regional housing needs. The site is currently owned by St Marys Land Limited and is being jointly developed by ComLand Limited and Lend Lease Development Pty Ltd through the joint venture company, Maryland Development Company.

The SMP was rezoned in January 2001 by *St Marys Regional Environmental Plan No 30* (SREP 30) to permit its development for a combination of urban, employment, regional open space and regional park purposes. The SMP comprises six future development precincts, namely the Western Precinct, Central Precinct, North and South Dunheved Precincts, Ropes Creek Precinct and Eastern Precinct, identified by SREP 30 (Figure 1.1).

In accordance with SREP 30, St Marys Land Limited signed a Deed of Agreement with the NSW State Government in December 2002 which in part details the methodology for the establishment, funding and management of the Regional Park. This is an area approximately 900 ha in size that will be retained for conservation, as a mitigation measure for the development of the six future development precincts.

In 2003, the Eastern, North Dunheved and South Dunheved Precincts were released, and Precinct Plans have since been submitted and adopted by Blacktown City Council and Penrith City Council for these areas. The Eastern Precinct is currently under development and development of the Dunheved Precincts is expected to commence in 2008.

In 2006 the Central, Western, and Ropes Creek Precincts were released, allowing the planning process to proceed to the preparation of the Central Precinct Plan. The Central Precinct is located in the central part of the SMP and comprises land zoned for urban and employment uses. SREP 30 is currently being amended to consolidate the employment zones from the Western and Ropes Creek Precincts into the Central Precinct.

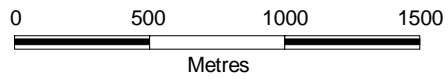
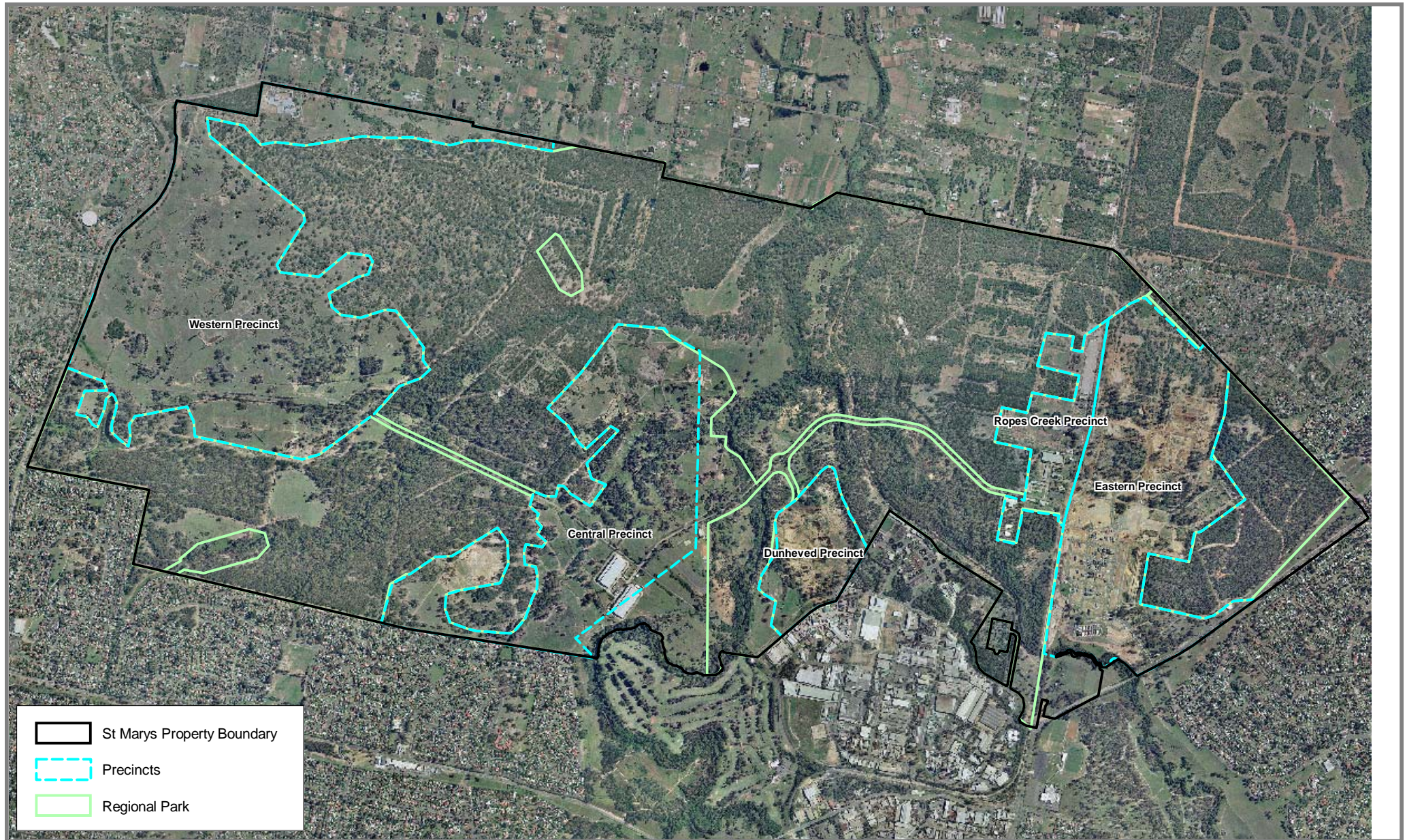


Figure 1.1 Aerial Photograph of the St Marys Property

1.3 Policy Context

Weed legislation provides guidelines aiding the development of weed management plans. Conservation legislation is also relevant to weed control programs because the management of weeds can affect, and is often an integral part of the conservation of threatened species and communities.

1.3.1 *Noxious Weeds Act 1993*

The *Noxious Weeds Act 1993* provides for the identification, classification and control of noxious weeds in New South Wales. Changes to the Act came into force in March 2006 via the *Noxious Weeds Amendment Act 2005*. Plants that are declared noxious weeds by the Minister are placed into the following weed control categories:

- Class 1 – State prohibited weeds
 - These are plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.
- Class 2 – Regionally prohibited weeds
 - These are plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.
- Class 3 – Regionally controlled weeds
 - These are plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.
- Class 4 – Locally controlled weeds
 - These are plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.
- Class 5 – Restricted plants
 - These are plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.

A noxious weed that is classified as a Class 1, 2 or 5 noxious weed is referred to in the Noxious Weed Act as a notifiable weed.

1.3.2 Commonwealth Legislation

Relevant Commonwealth legislation that would affect weed control on the SMP includes the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act regulates significant environmental impacts on species and communities listed as threatened under this Act. Care must be taken to minimise the environmental impacts associated with weed program activities. The EPBC Act can be triggered if environmental practices are considered likely to have a significant impact on listed species and communities.

1.3.3 NSW Legislation

The *Threatened Species Conservation Act 1995* (TSC Act) lists a number of species and ecological communities, which are protected under this Act, and should not be disturbed without a permit. This Act regulates significant environmental impacts on species listed under this Act. For proposed weed control actions, the significance of impacts on threatened species under this Act needs to be assessed, which may include application of Assessments of Significance - the so-called 'Seven Part Test'.

1.3.4 Sydney Regional Environment Plan 30

Sydney Regional Environmental Plan No. 30 sets out performance objectives and strategies to ensure desirable environmental outcomes on the SMP¹. SREP 30 outlines that a precinct plan must include information on the management of the potential impacts of development on the existing physical and environmental characteristics of the land, including significant native flora and fauna habitat and soil characteristics. The information is to include specific details of those characteristics and to explain how development should be planned and configured to minimise adverse impacts on areas of significance for biodiversity.

1.3.5 St Marys Environmental Planning Strategy 2000 (EPS)

The St Marys EPS requires that precinct plans for lands zoned urban or employment include a Weed Management Plan that:

1. *identifies weed control measures during and after development and targets noxious weeds such as privet, African olive, lantana and prickly pear;*
2. *requires land to be revegetated after disturbance or construction activities to reduce the likelihood of weed species growing on the site, consistent with approved soil and water management plans; and*
3. *requires any topsoils brought onto the site to be certified as being free of weeds before use.*

1.3.6 Penrith City Council Sustainability Blueprint

The Penrith Sustainability Blueprint has been prepared as a guide for planning and development of new release areas within the City of Penrith. The key aims are to:

1. *Provide the framework for delivering quality urban environments and sustainable outcomes in release area planning.*
2. *Reflect the 'triple bottom line approach' demonstrating best practice in economic, social and environmental sustainability, not only for current communities, but also for future generations.*
3. *Apply to all new urban release areas, including employment or residential land uses, or a mix of both.*

1.4 Glossary of Terms and Abbreviations

EPBC Act: *Environment Protection and Biodiversity Conservation Act 1999;*

PLGA: Penrith Local Government Area;

SMP: St Marys Property

SREP 30: Sydney Regional Environment Plan 30;

St Marys EPS: St Marys Environmental Planning Strategy 2000;

TSC Act: *Threatened Species Conservation Act 1995;*

WMP: Weed Management Plan; and

WONS: Weeds of National Significance.

1.5 Report Structure

The remainder of this WMP is set out as follows:

- Chapter 2: Provides the methodology for identification and recording of weeds on the Central Precinct and the SMP;
- Chapter 3: Describes the distribution and abundance of weeds on the Central Precinct;
- Chapter 4: Discusses general and species specific weed control measures; and
- Chapter 5: Provides a framework for monitoring and review.

Methods

This chapter explains the methodology for identifying and recording weed infestations and native vegetation. It includes a review of previous studies, an outline of procedures for field mapping with a Global Positioning System (GPS) and desktop mapping with a geographic information system (GIS).

2.1 Literature Review

A literature search was undertaken to obtain information regarding the distribution and abundance of native vegetation and weeds within the Central Precinct.

No detailed reports or maps of the distribution and abundance of weeds in the Central Precinct exist. In 2004 a report by ERM (ERM 2004) mapped significant weed infestations across the entire SMP. Past reports have been reviewed in the preparation of this plan²⁻⁸ including weed management plans, flora and fauna assessments, and vegetation maps and reports to provide a broad picture of the vegetation of the SMP.

2.2 Mapping and Field Assessment

Significant weeds in the SMP have been mapped on a number of occasions; in July 2002 significant weed infestations across the SMP were mapped by ERM, in 2004 by Cumberland Ecology within the Dunheved Precincts and at the southern border of the Ropes Creek Precinct and along the South Creek corridor and in 2006 by Cumberland Ecology in Ropes Creek Precinct. The Central Precinct was specifically surveyed by Cumberland Ecology in October 2007, and May 2008 for the target weed species previously identified. This included the use of aerial photographs and a Global Positioning System (GPS).

Field assessment of weeds in the Central Precinct was conducted by botanist David Thomas and ecologist Timothy Playford in 2007 and David Thomas in 2008. In 2007 several meander transects were examined throughout the Central Precinct. Weed species and their abundances were recorded. The projective foliage cover of weed species was noted for each vegetation community. In 2008 weed infestations of significant weed species in the Central Precinct were mapped.

Results

3.1 Native Vegetation

The native vegetation of the SMP, including locations of threatened species and communities is shown and discussed in a suite of ecological reports^{3,5,7,9-13}. Four endangered ecological communities, one endangered plant population and several threatened flora species occur on the SMP. The vegetation is predominantly Cumberland Plain Woodland and other communities that grow on the Cumberland Plain. Most of this area has experienced extensive clearing and remediation work and has also been subject to intensive grazing by cattle and kangaroos.

There are 5 broad plant communities record in the study area of the Central Precinct:

- Swamp Oak Floodplain Forest;
- Cumberland Plain Woodland;
- Shale-gravel Transition Forest;
- Native and exotic grasslands; and
- Freshwater Wetlands.

A large proportion of the Central Precinct contains grassland created by previous clearing of natural woodland and open forest. Remnant and regrowth woodland and forest is estimated to cover 20% of the Central Precinct. The grassland in the precinct comprises a mixture and mosaic of introduced and indigenous species. Weed invasion has resulted in the establishment of variable amounts of introduced species.

3.2 Weed Occurrence

3.2.1 Significant Weeds of the Central Precinct

Weeds are plants that are unwanted in a given situation and may be harmful, dangerous or economically detrimental¹⁴.

For the purposes of this report “significant” weed species are species that are described or listed as:

- Weeds of National Significance (WONS) (Appendix A);
- species listed under the *Noxious Weeds Act 1993* for Hawkesbury River County Council (Appendix B);
- having a high Australian Rating (5) according to the *Noxious Weeds Act 1993*; and
- are environmental weeds occurring in several survey areas throughout Central Precinct and identified as significant weeds for the SMP.

Weeds identified as significant on the SMP include perennial grasses, succulents, shrubs and trees and are listed in Table 3.1. Significant species found in the Central Precinct are shown in bold.

Table 3.1 SIGNIFICANT WEEDS IN THE SMP

Common Name	Scientific Name	WoNS	Class
PERENNIAL GRASSES			
Pampas Grass	<i>Cortaderia sp.</i>	-	3
African Love Grass	<i>Eragrostis curvula</i>	-	-
HERBACEOUS SCRAMBLER			
Bridal Creeper	<i>Asparagus asparagoides</i>	✓	5
HERBACEOUS WEEDS			
Noogoora Burr	<i>Xanthium spp.</i>	-	4
Crofton Weed	<i>Ageratina adenophora</i>	-	4
Mother-of-millions	<i>Bryophyllum delagoense</i>	-	3
Prickly Pear	<i>Opuntia stricta</i>	-	4
WOODY PERENNIALS			
African Olive	<i>Olea europea subsp. cuspidata</i>	-	-
African Boxthorn	<i>Lycium ferocissimum</i>	-	4
Blackberry	<i>Rubus fruticosus spp. agg.</i>	✓	4
Broad-leaved Privet	<i>Ligustrum lucidum</i>	-	4
Castor Oil Plant	<i>Ricinus communis</i>	-	-
Cotoneaster	<i>Cotoneaster</i>	-	-
Narrow-leaved Privet	<i>Ligustrum sinense</i>	-	4
Lantana	<i>Lantana camara</i>	✓	5

Significant weed species of the SMP in the Central Precinct include; African Love Grass (*Eragrostis curvula*), Narrow-leaved privet (*Ligustrum sinense*), Bridal Creeper (*Asparagus asparagoides*) and Pampas Grass (*Cortaderia selloana*). Other significant weed species occurring in the Central Precinct are Aligator Weed (*Alternanthera philpseroides*) and Paterson's Curse (*Echium plantagineum*). Both are listed as Noxious Weeds under the NSW Noxious Weeds Act for Hawkesbury River County Council. Aligator Weed is also listed as a WONS.

Other significant weeds occasionally occur in the Central Precinct and surrounding areas or may have been recorded in the SMP but not the study area. These include African Olive (*Olea europea* subsp. *africana*), African Boxthorn (*Lycium ferocissimum*) Lantana (*Lantana camara*), Broad-leaved Privet (*Ligustrum lucidum*), Prickly Pear (*Opuntia stricta*), Crofton Weed (*Ageratina adenophora*) and St John's Wort (*Hypericum perforatum*) should be eradicated if found in the future. These species occur in the vicinity of the

Profiles describing the ecological characteristics (appearance, life cycle and dispersal mechanisms) and general recommendations for control of significant weed species within the Central Precinct and SMP are provided in Appendix C.

3.2.2 Other Weeds

A further 35 weed species were detected in the Central Precinct during surveys. Weeds that were found to be very common in some of the survey transects in the Central Precinct include: *Briza subaristata*, a Fleabane (*Conyza* spp.), Couch (*Cynodon dactylon*) Blackberry Nightshade (*Solanum nigrum*), Fireweed (*Senecio madagascariensis*), and Flatweed (*Hypochaeris radicata*).

A full list of weed species detected in the Central Precinct is shown in Appendix D.

3.2.3 Distribution and Abundance

Weed distribution within the Central Precinct is strongly influenced by past and present land uses, with the greatest variety of weeds occurring in disturbed areas and areas associated with waterways. The relatively undisturbed forest vegetation that occurs within the adjacent Regional Park is significantly less weed invaded than the Central Precinct as it has been historically less disturbed.

Pasture improvement throughout existing grassland areas has resulted in the establishment of variable amounts of weed species. Exotic grassland formed a mosaic with native grassland that varied from mixtures to predominantly native or exotic vegetation. Patches of exotic grassland were usually dominated by African Love-grass (*Eragrostis curvula*), Couch (*Cynodon dactylon*) and *Briza subaristata*. Other common weed species included: Carpet Grass (*Axonopus affinis*), Paspalum (*Paspalum dilatatum*), *Conyza* sp., Fireweed (*Senecio madagascariensis*), Purpletop (*Verbena* sp.) and Flatweed (*Hypochaeris radicata*).

In areas containing Swamp Oak Floodplain Forest, vegetation cover underneath the canopy was sparse due to the dense layer of needles on the ground; however exotic understorey species tended to be dominant under dense, mature canopy cover. These included Bridal Creeper (*Asparagus asparagoides*), Couch (*Cynodon dactylon*) and some isolated Lantana (*Lantana camara*).

Along drainage depressions, channels and road verges, thickets of, and scattered Blackberry (*Rubus fruticosus*) and Narrow-leaved Privet (*Ligustrum sinense*) occur. The ground cover near the channel was mainly Couch (*Cynodon dactylon*), and other weed species included Fleabane (*Conyza* sp) and Bridal Creeper (*Asparagus asparagoides*).

The Cumberland Plain Woodland generally contained low levels of weeds, although several exotic ground covers were recorded including: Couch (*Cynodon dactylon*), various Asteraceae, Blackberry Nightshade (*Solanum nigrum*), *Senecio pterophorus*, Fleabane (*Conyza* sp.), Paddys Lucerne (*Sida rhombifolia*) and Scarlet Pimpernel (*Anagallis arvensis*).

To the south of the Central Precinct near the interface with existing residential development, significant weed invasion has occurred around a small creek that flows into the precinct from this area. In this localised area a wide variety of weeds are present, including garden escapes and environmental weeds. In this drain, Alligator Weed (*Alternanthera philpseroides*) was recorded (Photograph 3.1). This is a highly invasive weed that is listed as a noxious weed and a WONS. Also in this location are several large clumps of *Rubus fruticosus* (Blackberry) (Photograph 3.2).

The most significant infestations that were detected during field surveys were several very large thickets of Blackberry (*Rubus fruticosus*) recorded throughout the precinct, particularly on the side of the main east-west road, and near minor tracks. Very dense infestations of Blackberry (*Rubus fruticosus*) and Narrow-leaved Privet (*Ligustrum sinense*) were recorded along the creek in the south of the Central Precinct (Photograph 3.3). In this location, these two woody weeds completely dominated a large section of the creek bank. Weed propagules have the capacity to distribute throughout the environment through waterways, and therefore control of weeds in this creekline is likely to be important as part of overall weed management activities in the precinct.

Riparian corridors are proposed as part of the development of the Central Precinct. In order to improve the ecological function of these buffers, weed control activities should be undertaken, particularly in regards to invasive woody weeds such as Narrow-leaved Privet (*Ligustrum sinense*) and Blackberry (*Rubus fruticosus*).

Some dense patches of Blackberry (*Rubus fruticosus*) and Narrow-leaved Privet (*Ligustrum sinense*) occurred along the smaller drainage line in the middle of the precinct, and near the drain from residential development to the south. Woody weeds, mainly Narrow-leaved Privet are present in several locations throughout the precinct, generally as individuals or in localised clumps. Lantana was also recorded in several locations but was at the time of the survey, being severely affected by drought conditions.

The noxious *Ailanthus altissima* (Tree of Heaven) was recorded next to an existing track (Photograph 3.4). This infestation comprised of several mature specimens and numerous smaller saplings.



Photograph 3.1 Alligator Weed in the drainage line near residential development.



Photograph 3.2 Blackberry infestation



Photograph 3.3 Privet and Blackberry along creek.



Photograph 3.4 **Tree of Heaven**

3.2.4 Significant weeds of the SMP

Major weeds include those species that require the input of significant levels of resources to achieve control and are potential major threats to environmental values in the Central Precinct development area and may have potential to impact on the Regional Park. They include Blackberry, Narrow-leaved Privet, and African Love Grass:

Blackberry infestations in the Central Precinct occur in several very large thickets particularly on the side of the main east-west road, and near minor tracks. Smaller infestations also occur along the drainage line in the centre of the precinct. Large infestations of Blackberry and Narrow-leaved Privet were recorded along the creek in the south of the Central Precinct (see Figure 3.1). In this location, these two species completely dominated a large section of the creek bank. Elsewhere in the SMP Narrow-leaved Privet occurs as dense infestations on the banks of South Creek, and tends to be a major weed in these locations.

African Love Grass occurs in the Central Precinct as a large component of the grassland. This species occurs particularly in open disturbed areas and has also been found colonising the road verges on the edges of the Regional Park. African Love Grass is widespread throughout the SMP.

i. Other weeds

This category includes weeds that are either not widespread or require medium to low effort to control. Weeds that require minimal control are low to medium threats to environmental values of the Central Precinct development area and adjacent Regional Park. These species usually occur as isolated individuals or small patches and include: Bridal Creeper, Pampas Grass and Lantana. The other significant weeds on the SMP have the potential to occur or already occur in low abundance in the Central Precinct and would best be controlled while their abundance is low (see Appendix D for list of significant weed species in the SMP).

Non-significant weeds species occurring in small infestations should also be considered for control. See Appendix D for list of all weed species occurring the Central Precinct.

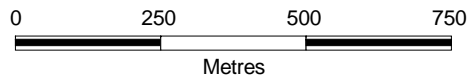
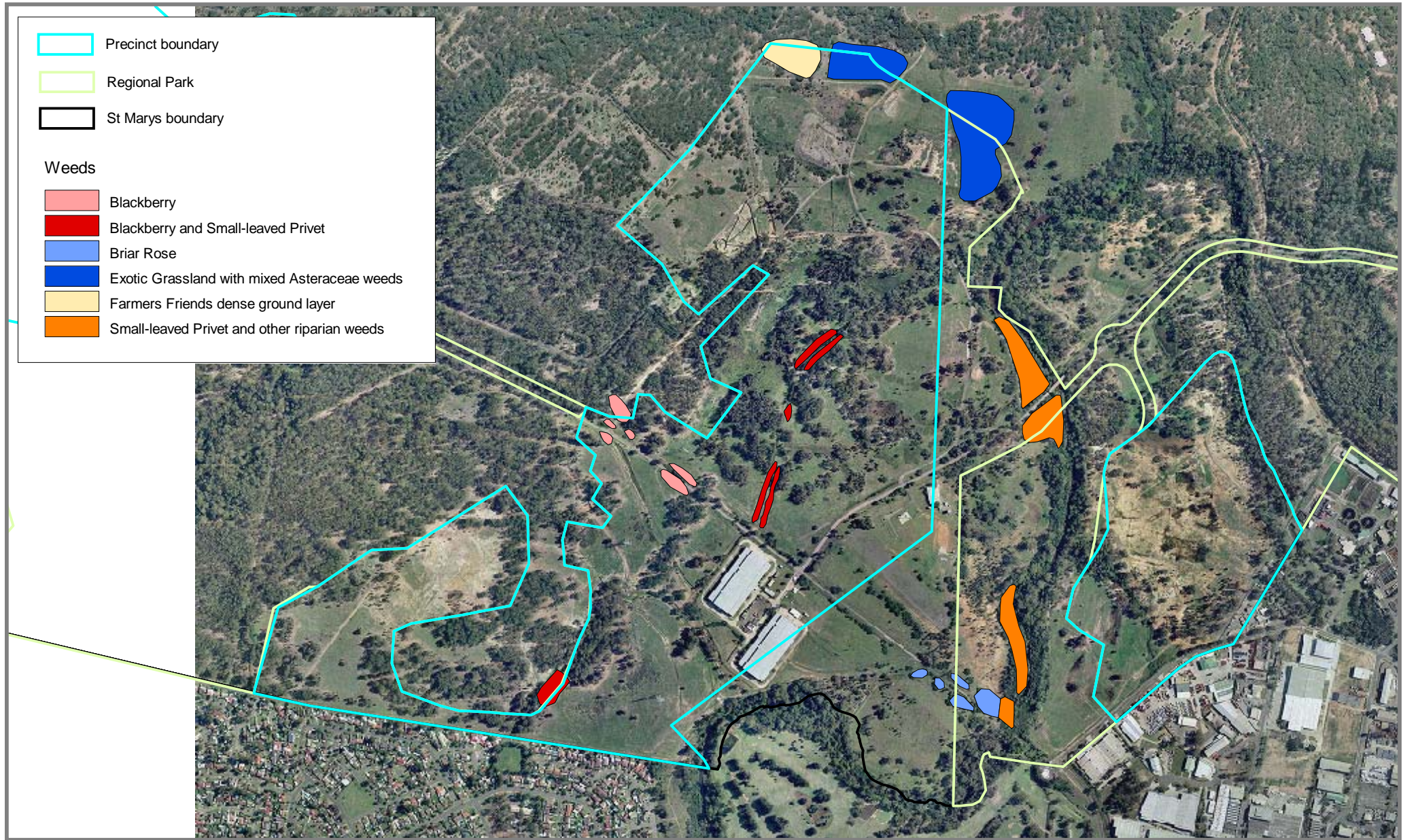


Figure 3.1 Major weed infestations in the Central Precinct

Weed Control Measures

4.1 Introduction

Generally, weeds are exotic plants that grow at the expense of a native plant and that produce large numbers of seeds or other propagules and so can reproduce and spread quickly. They typically benefit from disturbance to soils or native vegetation. Grazing, soil erosion, floods, fires, urban run-off, increased nutrients, sedimentation or mechanical soil disturbance can trigger major outbreaks of weeds. Weeds can:

- compete with native plants;
- reduce germination of native plants;
- suppress native tree and seedling growth;
- alter fire regimes;
- modify nutrient cycling within an ecosystem;
- change soil conditions;
- affect food and habitat opportunities for native fauna;
- provide harbour for feral animals; and
- reduce recreation potential of bushland.

Such outbreaks are often from seeds that have lain dormant in the soil until disturbance, providing the conditions necessary for germination.

Weeds can spread and establish by the following pathways:

- seeds and other propagules travelling on vehicles, people and animals from one place to another;
- invading open areas that have been disturbed by over grazing, earthworks and other activities that disturb the soil;
- establishing in areas with reduced tree cover (poorly competitive weeds); and

- dispersing from infested areas to weed free areas via wind or water.

There are a number of protocols that can be implemented to reduce the spread of weeds generally, particularly by minimising disturbance. Establishing and maintaining such protocols to prevent the establishment and spread of weeds will reduce the costs of weed control in the long term in the Central Precinct.

The following section outlines general control methods and guidelines to prevent weed spread and establishment and suppress and eradicate significant weeds during and after the development. It is recommended that the management of weeds on the Central Precinct will take up to 5 years (3 years for active management after which time the weed status is re-assessed followed by a 2 year maintenance program). This should be sufficient to control weeds which have a high resilience and take 2-3 years to suppress.

4.2 General Weed Control Measures

4.2.1 Preventing Weed Spread and Establishment

Prevention of a weed problem is the most cost-effective action possible¹⁵. Preventing weed spread and establishment will help to minimise the detrimental impacts that weeds may have on the Central Precinct. The prevention of weed spread and establishment will ensure that the impacts of a weed are contained in a known area and should reduce the distribution and abundance of weeds.

In order to carry out prevention strategies the ways in which specific weed species are spread and establish need to be identified. Appendix C outlines the life-cycles of significant weed species in the SMP.

To prevent weed transport during development by vehicles, personnel, wind and water, all personnel and contractors on Central Precinct should:

- Avoid working in or travelling through flowering or seeding infestations, such as African Love Grass, where possible. Seeds can disperse in the wind but can also spread in mud sticking to boots and machinery¹⁴. Machinery, equipment and footwear should be cleaned down before leaving the Central Precinct during clearing and earthworks;
- Stay on formed tracks wherever possible. During clearing and earthworks when this is not feasible, machinery, equipment and footwear should be cleaned down before leaving the Central Precinct;
- Where appropriate, establish a fixed clean down site and clean down all vehicles at regular intervals after coming in contact with weeds, and all vehicles that arrive from known weed-infested areas, with high pressure hoses or compressed air;

- Contain the water and materials from the clean down site and regularly inspect for weeds species;
- Maintain buffers to the Regional Park boundaries and along roads and tracks as per the St Marys Fire Management Plan¹⁶;
- Work from the clean to infested areas when spraying or slashing and start weed control from the outer edges of infestations working inwards. This is important for weeds such as Blackberry. When slashing African Love Grass ensure that the tractor and slasher are cleaned down to reduce the spread of seed.

To prevent weeds from infesting disturbed ground during and after development (which will help protect the adjacent Regional Park from weed invasion):

- Always re-establish vegetation as soon as possible and where practicable after construction earthworks in accordance with the *Water, Soils and Infrastructure Plan* and *Landscape and Open Space Masterplan* which will be prepared as part of the Central Precinct Plan;
- Monitor disturbed areas and all sediment and erosion control structures to ensure that they are functioning correctly and prescribe follow-up weed spraying to ensure that any germinating weed does not set seed;
- Weeds in the development area should be removed before any land is filled; and
- Any topsoil brought onto the site is to be certified as being free of weeds for use. This land should still be subject to assessment and where necessary weed management to ensure it has not contained weed seeds or weeds have not since established in these areas.

These weed prevention strategies comply with the objectives of the St Marys EPS.

4.2.2 Weed Suppression

Suppression of significant weeds involves reducing the overall density of weed species and preventing their spread by preventing seed set. This can involve the use of biological controls, minimisation of earth disturbance and encouragement of beneficial species such as native colonising plants that may aid the suppression of weed germination.

Both during and after construction, weed suppression and weed control by the developer or relevant authorities should concentrate on the edges of the Regional Park, including the edges of perimeter roads and any fire trails in Asset Protection Zones to prevent the spread of weeds into the Regional Park¹⁶.

Recommendations for the suppression of weeds include:

- Minimise soil disturbance and ensure that all disturbed areas that are not built upon immediately are revegetated as quickly as possible in accordance with *Water, Soils and Infrastructure Plans*;
- Opportunistically undertake follow-up control after disturbances such as fire or floods, because these can trigger major weed germination events; and
- Use weed-free fully composted mulch and topsoil when carrying out revegetation or landscaping and earth works to prevent competition from weeds species and reduce weed invasion of restoration areas. All topsoil to be brought onsite is to be certified weed free.

4.2.3 Control and Management

Total eradication of all the weeds in the Central Precinct is not feasible because of the tendency of weed re-colonisation, existing degree of soil disturbance and the possibility of recolonisation from other areas. It is more realistic to manage these weeds by lowering their densities, which will reduce their impact on adjacent native vegetation, flora and fauna habitats and help contain their spread. Significant weed species are the main target of this WMP, however, when it is not feasible to control all of the weeds with the same amount of effort. Priority species can be determined using the variables of weed threat and feasibility of control as seen in Table 4.1.

Table 4.1 DETERMINING WEED PRIORITIES

		Weed Threat	
		Low	High
Feasibility of Control	Hard	Lowest priority	2nd priority
	Easy	3rd priority	1st priority

In the Central Precinct, this can be achieved using a combination of methods such as herbicide application and the general measures outlined above. Weed control measures need to be carried out during and after development, and routinely in the long term, to ensure that the soil stored weed seed bank is reduced and to suppress weeds that may spread into the Central Precinct from adjacent land.

A combination of methods can be used to manage weeds in the short and long-term. Weed management methods and their optimal timing for each of the significant weed

species on the SMP are shown in the weed species profiles in Appendix C. Regeneration and establishment of native species in some areas will assist in weed control. Weed control of adjacent properties (ie the Regional Park Plan of Management) will also greatly assist weed control, because this will limit the number of propagules that may enter and establish from outside the Central Precinct.

This five year weed control plan will be implemented by Maryland Development Company (MDC). After five years MDC would look to hand over relevant weed control measures (ie. on public land) to council.

4.2.4 Guidelines and Education

i. Design

The design of the development will help minimise the spread and establishment of weeds in the Central Precinct, and the chances of weeds spreading into the Regional Park. Development will occur in the adjacent land to the Regional Park boundary. This will give users of the precinct a sense of ownership of the natural assets of the Regional Park so discouraging rubbish dumping and apathy regarding weed prevention practices.

ii. Guidelines

Landscaping plans prepared by MDC for both construction of infrastructure and buildings in the residential and employment zones should recommend the use of local native species where possible in landscaping and comply with the *Landscape and Open Space Handover and Maintenance Plan*.

It would also provide guidelines on preventing the spread of weeds and controlling weeds during construction.

iii. Education

As part of the overall weed management strategy, MDC will educate future residents of the potential impacts of weeds and their responsibilities to minimise these impacts. Information kits will be provided to all new residents.

4.3 Species Specific Control Measures

4.3.1 Introduction

Control of significant weeds in the Central Precinct requires application of species-specific measures to prevent spread and establishment of weeds in addition to the general weed control measures outlined above.

Control of weeds would be facilitated by development of the Central Precinct, as land clearing for the development will removed areas of weed infestation. Clearing and revegetation or development of the land will reduce the abundance of disturbed sites for weeds to colonise. However, weeds that do re-establish in these areas still need to be managed along with weeds occurring outside of the development footprint.

General suppression or control measures for each species are detailed in the weed profiles in Appendix C. Each species requires particular suppression or control measures such as spot spraying of herbicide at particular times, manual removal, cut stump application of herbicide and native plant regeneration. Weed management methods and their optimal timing for each of the significant weed species in the Central Precinct and the wider SMP are detailed in Appendix C. Not all weed management strategies for each significant species can be implemented across the Central Precinct at the same time. It is therefore necessary to have a rotation scheme to ensure that each weed is targeted in an appropriate season in relation to its life cycle.

When restoring areas of native vegetation infested with weeds, the rate of weed removal should be dictated by native plant regeneration or revegetation establishment¹⁷. A high amount of disturbance, such as constant manual control, does not create optimal conditions for native vegetation establishment. Once areas for weeding controls are defined, implementation of these strategies should be on a rotational basis, for example, where one area is targeted in the first month, and another targeted the next month, so as not to constantly disturb one area. Each area defined for weeding strategies will need to be revisited a few times each year, depending on follow-up methods and timing.

The following section outlines species-specific control measures for species or for groups of related species in the Central Precinct. A five-year program for weed control actions can be seen in Appendix E.

4.3.2 Specific Control Measures

Control measures for each species need to focus on different aspects of control. This can be related to the habitat of the weed, such as in gullies, native vegetation or cleared pastureland, as well the life-cycle and method of spread that is most likely on the Central Precinct.

All the measures and guidelines outlined in this chapter will be followed in relation to restricting the spread of species and seeds while undertaking control measures. Herbicide

guidelines should be followed, and any spraying should occur in appropriate wind conditions so that spray drift does not occur.

Herbicides registered in New South Wales for each species can be obtained by contacting NSW Agriculture or from the following website:

<http://www.dpi.nsw.gov.au/agriculture>

i. Perennial Grasses

- Species:** Pampas Grass, African Love Grass
- Control Priority:** *High* – due to threats to adjacent native vegetation and the potential for high future costs of control.
- Chemical Control:** Use of registered appropriate chemicals to control African Love Grass. Take particular care in spot-spraying African Love Grass to avoid impact on threatened non–target species i.e. *Grevillea juniperina* subsp. *juniperina*.
- Mechanical Control:** Cut flower heads of Pampas Grass.
- Biological Control:** None available.
- Oversowing:** Regenerate or oversow areas that have been temporarily disturbed for development, or where chemicals have been applied, with native grasses.
- Quarantine:** None.

ii. Herbaceous Weeds

- Species:** Prickly Pear, Bridal Creeper, Crofton Weed.
- Control Priority:** *Medium* – species can be highly invasive but threats minor at present due to low level of infestations.
- Chemical Control:** Chemical controls are not the most effective for Prickly Pear, however, spot-spraying has been used for the control of these species. Spot-spraying is an effective control for Bridal Creeper, providing follow-up treatment in consecutive years is conducted. Thoroughly spraying Crofton Weed during its peak growing period, during late summer or autumn, is an effective control measure for this weed¹⁴.
- Mechanical Control:** Physically remove and dispose responsibly of Prickly Pear. Care must be taken to collect and destroy all dislodged

segments and fruit. Care must be taken to remove the entire tuberous root system to minimise regeneration.

Ripping or ploughing an area of Crofton weed will control the weed if the area is suitable for this method¹⁴.

Biological Control: Biological controls for Prickly Pear are present on the SMP. Some biological controls may have an effect on Bridal Creeper, these being a chalcid wasp, a moth larva and a rust fungus. The trypetid gall fly can be used to control Crofton Weed¹⁴.

Oversowing: Regenerate or over sow areas with native grass seed such as *Microlaena* sp. or Kangaroo Grass (*Microlaena* sp for moist areas, Kangaroo Grass for dry areas). A high level of maintenance will be required to ensure that the native seed does not get out competed by weed germination. This method is best used in areas that have high levels of native resilience.

Quarantine: None.

iii. *Woody Perennials*

Species: Blackberry, Narrow-leaved Privet, Broad-leaved Privet, African Boxthorn, African Olive, Cotoneaster, Castor Oil Plant, Lantana.

Control Priority: *High* – for Blackberry due to threats to native vegetation and the potential for high future costs of control, and for African Olive due to widespread occurrence. Medium priority for other species due to low levels of infestations but high invasive/dispersal potential.

Chemical Control: Control all species (except Blackberry) by cut and paint with undiluted herbicide registered for this application or stem injection. Spot spray Blackberry, which occurs in dense infestations. Follow-up spray and cut stump applications to ensure that native species have a chance to grow in areas where these species have been removed.

Mechanical Control: Pull out small seedlings. Generally removal with tractors and machinery results in inappropriate disturbance level and will result in a high level weed germination and soil disturbance.

Biological Control: No biological controls are currently available.

Oversowing: None.

Quarantine: None.

Monitoring and Review

A vital component of a weed control strategy is follow-up work and monitoring.

The objective of monitoring is to measure the effectiveness of the proposed control measures in achieving the desired outcomes. Monitoring will also identify the rate and spread of weeds or the establishment of desirable vegetation, new threats to native vegetation, and factors that have arisen that will effect the site¹⁷. Monitoring will help to identify and address non-conformance and implement corrective actions within an appropriate time frame. It will also assist in determining cost effectiveness of weed control measures and allow for the refinement of weed control budgets.

Two types of monitoring for weeds will be undertaken; Short term 'follow-up' monitoring and long term monitoring.

5.1 Short Term Monitoring

Short term monitoring will be undertaken as a 'follow-up' after weed control operations to ensure that weeds present in targeted areas have actually been sprayed or removed, and to re-spray if necessary. Once weeds have been initially reduced in densities due to control activities they need to be regularly monitored, so that any outbreak or spread of weeds can be quickly suppressed. This will prevent weeds from re-establishing in the targeted area and ensure that the initial control effort is not wasted. Short term monitoring is also essential after areas that have been temporarily disturbed during construction are revegetated or landscaped.

This type of monitoring is essential for grassy weeds, which could remain hidden amongst the non-target vegetation during the initial control activities. Records should be kept detailing actions and dates of implementation of this WMP.

Times for follow-up monitoring are indicated within the implementation schedule.

5.2 Long Term Monitoring

The objective of the long-term monitoring program is to provide sufficient feedback on the success of the overall weed control strategies including suppression and prevention of

weed spread and establishment. It will also provide some information about the successful regeneration of native vegetation communities that contained weed species.

Long term monitoring involves a qualitative weed survey and mapping every year in the appropriate season for five years to coincide with the implementation schedule. Weed mapping will consist of a weed survey and subsequent compilation of weed maps that show the distribution and abundance of weeds using the same measures of abundance as used for this WMP. Comparison of annual maps will indicate whether the distribution and abundance of weeds has increased or decreased over the year, and allow future weed control measures to be tailored for specific objectives. This allows updating of the implementation schedule for the next year based on the significance of weed infestations and success of past control measures.

5.3 Review

An annual review of the WMP will be undertaken to assess its effectiveness during the first three years from the commencement of development. The reviews will be conducted in conjunction with Penrith City Council prior to handover of public space to local authorities. An additional two years of maintenance weed control will probably be required unless further active control and removal is required. At the time of handover a report detailing the results of annual mapping and comparisons of counts will be prepared. This report could also detail any necessary changes to weed control measures in order to maintain control of weeds in the Central Precinct development area. It should also review the direction of the strategy and indicate if the actions proposed are having the desired effect in relation to weed control.

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Appendix A

Weeds of National Significance

Table A.1 WEEDS OF NATIONAL SIGNIFICANCE (WONS)

Common Name	Scientific Name	Extent in Australia	Potential Distribution
Alligator Weed	<i>Alternanthera philoxeroides</i>	WA, NT, QLD, NSW, VIC, SA, TAS	Could further expand in current locations
Athel Pine	<i>Tamarix aphylla</i>	WA, NT, QLD, NSW, VIC, SA	Could further expand in current locations
Bitou bush / Boneseed	<i>Chrysanthemoides monilifera</i>	WA, QLD, NSW, VIC, SA, TAS	Could further expand in current locations
Blackberry	<i>Rubus fruticosus agg.</i>	WA, QLD, NSW, VIC, SA, TAS, ACT	Could further expand in current locations
Bridal Creeper	<i>Asparagus asparagoides</i>	WA, NSW, VIC, SA, TAS	Could further expand in current locations; plus QLD, ACT
Cabomba	<i>Cabomba caroliniana</i>	NT, QLD, NSW, VIC	Could further expand in current locations; plus WA, SA, TAS, ACT
Chilean Needle Grass	<i>Nassella neesiana</i>	NSW, VIC, SA, ACT	Could further expand in current locations; plus WA, QLD, TAS
Gorse	<i>Ulex europaeus</i>	WA, QLD, NSW, VIC, SA, TAS, ACT	Could further expand in current locations
Hymenachne	<i>Hymenachne amplexicaulis</i>	NT, QLD, SA	Could further expand in current locations; plus WA, NSW
Lantana	<i>Lantana camara</i>	WA, NT, QLD, NSW	Could further expand in current locations; plus VIC, SA, TAS
Mesquite	<i>Prosopis spp.</i>	WA, NT, QLD, NSW, VIC, SA	Could further expand in current locations
Mimosa	<i>Mimosa pigra</i>	NT	Could further expand in current locations; plus WA, QLD
Parkinsonia	<i>Parkinsonia aculeate</i>	WA, NT, QLD	Could further expand in current locations; plus NSW, VIC, SA
Parthenium weed	<i>Parthenium hysterophorus</i>	QLD, NSW, VIC	Could further expand in current locations; plus WA, NT, SA

Table A.1 WEEDS OF NATIONAL SIGNIFICANCE (WONS)

Common Name	Scientific Name	Extent in Australia	Potential Distribution
Pond Apple	<i>Annona glabra</i>	NT, QLD, NSW	Could further expand in current locations
Prickly Acacia	<i>Acacia nilotica ssp. indica</i>	QLD, NSW	Could further expand in current locations; plus WA, NT, SA
Rubber Vine	<i>Cryptostegia grandiflora</i>	WA, QLD	Could further expand in current locations; plus NT, NSW
Salvinia	<i>Salvinia molesta</i>	WA, NT, QLD, NSW, SA	Could further expand in current locations; plus VIC, TAS, ACT
Serrated Tussock	<i>Nassella trichotoma</i>	NSW, VIC, TAS, ACT	Could further expand in current locations; plus WA, QLD, SA
Willows except Weeping Willows, Pussy Willow and Sterile Pussy Willow	<i>Salix spp. except S. babylonica, S. X calodendron and S. X reichardtiji</i>	NSW, VIC, ACT	Could further expand in current locations; plus SA, TAS

Appendix B

Noxious Weeds for Hawkesbury River
County Council Local Control Authority

Table B.1 NOXIOUS WEEDS LISTED FOR THE HAWKESBURY RIVER COUNTY COUNCIL

Weed	Class	Legal requirements
African boxthorn [<i>Lycium ferocissimum</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
African feathergrass [<i>Pennisetum macrourum</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
African turnipweed [<i>Sisymbrium runcinatum</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
African turnipweed [<i>Sisymbrium thellungii</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Alligator weed [<i>Alternanthera philoxeroides</i>]	3	The plant must be fully and continuously suppressed and destroyed.
Anchored water hyacinth [<i>Eichhornia azurea</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Annual ragweed [<i>Ambrosia artemisiifolia</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Arrowhead [<i>Sagittaria montevidensis</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Artichoke thistle [<i>Cynara cardunculus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Athel pine [<i>Tamarix aphylla</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration
Bathurst/Noogoora/Californian/cockle burrs [<i>Xanthium</i> species]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Bear-skin fescue [<i>Festuca gautieri</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.

Table B.1 NOXIOUS WEEDS LISTED FOR THE HAWKESBURY RIVER COUNTY COUNCIL

Weed	Class	Legal requirements
		This is an All of NSW declaration.
Black knapweed [<i>Centaurea nigra</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant.
		This is an All of NSW declaration.
Blackberry [<i>Rubus fruticosus</i> aggregate species] except cultivars Black satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smoothstem, Thornfree	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.
		This is an All of NSW declaration.
Bridal creeper [<i>Asparagus asparagoides</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.
		This is an All of NSW declaration.
Broomrapes [<i>Orobanche</i> species] Includes all <i>Orobanche</i> species except the native <i>O. cernua</i> variety <i>australiana</i> and <i>O. minor</i>	1	The plant must be eradicated from the land and the land must be kept free of the plant.
		This is an All of NSW declaration.
Burr ragweed [<i>Ambrosia confertiflora</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.
		This is an All of NSW declaration.
Cabomba [<i>Cabomba caroliniana</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.
		This is an All of NSW declaration.
Cayenne snakeweed [<i>Stachytarpheta cayennensis</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.
		This is an All of NSW declaration.
Chilean needle grass [<i>Nassella neesiana</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.
		This is an All of NSW declaration.
Chinese violet [<i>Asystasia gangetica</i> subspecies <i>micrantha</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant.
		This is an All of NSW declaration.
Clockweed [<i>Gaura lindheimeri</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.
		This is an All of NSW declaration.

Table B.1 NOXIOUS WEEDS LISTED FOR THE HAWKESBURY RIVER COUNTY COUNCIL

Weed	Class	Legal requirements
Clockweed [<i>Gaura parviflora</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Cockle burrs [<i>Xanthium</i> species]		See Bathurst/Noogoora/Californian/cockle burrs.
Columbus grass [<i>Sorghum x alnum</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Corn sowthistle [<i>Sonchus arvensis</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Crofton weed [<i>Ageratina adenophora</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Dodder [<i>Cuscuta</i> species] Includes All <i>Cuscuta</i> species except the native species <i>C. australis</i> , <i>C. tasmanica</i> and <i>C. victoriana</i>	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
East Indian hygrophila [<i>Hygrophila polysperma</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Espartillo [<i>Achnatherum brachychaetum</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Eurasian water milfoil [<i>Myriophyllum spicatum</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Fine-bristled burr grass [<i>Cenchrus brownii</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Fountain grass [<i>Pennisetum setaceum</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Gallon's curse [<i>Cenchrus biflorus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.

Table B.1 NOXIOUS WEEDS LISTED FOR THE HAWKESBURY RIVER COUNTY COUNCIL

Weed	Class	Legal requirements
Giant Parramatta grass [Sporobolus fertilis]	3	The plant must be fully and continuously suppressed and destroyed.
Glaucous starthistle [Carthamus glaucus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Golden dodder [Cuscuta campestris]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Golden thistle [Scolymus hispanicus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Green cestrum [Cestrum parqui]	3	The plant must be fully and continuously suppressed and destroyed.
Harrisia cactus [Harrisia species]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed. This is an All of NSW declaration.
Hawkweed [Hieracium species]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Horsetail [Equisetum species]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Hygrophila [Hygrophila costata]	2	The plant must be eradicated from the land and the land must be kept free of the plant.
Hymenachne [Hymenachne amplexicaulis]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Italian bugloss [Echium species]		See Paterson's curse, Vipers bugloss, Italian bugloss.
Johnson grass [Sorghum halepense]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.

Table B.1 NOXIOUS WEEDS LISTED FOR THE HAWKESBURY RIVER COUNTY COUNCIL

Weed	Class	Legal requirements
Karoo thorn [Acacia karroo]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Kochia [Bassia scoparia] except Bassia scoparia subspecies trichophylla	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Lagarosiphon [Lagarosiphon major]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Lantana [Lantana species]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Long-leaf willow primrose [Ludwigia longifolia]	3	The plant must be fully and continuously suppressed and destroyed.
Long-leaf willow primrose [Ludwigia longifolia]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Ludwigia [Ludwigia peruviana]	3	The plant must be fully and continuously suppressed and destroyed.
Mexican feather grass [Nassella tenuissima]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Mexican poppy [Argemone mexicana]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Miconia [Miconia species]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Mimosa [Mimosa pigra]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Mossman River grass [Cenchrus echinatus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Mother-of-millions [Bryophyllum species and hybrids]	3	The plant must be fully and continuously suppressed and destroyed and the plant may not

Table B.1 NOXIOUS WEEDS LISTED FOR THE HAWKESBURY RIVER COUNTY COUNCIL

Weed	Class	Legal requirements
Onion grass [Romulea species] Includes all Romulea species and varieties except R. rosea var. australis	5	be sold, propagated or knowingly distributed. The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Oxalis [Oxalis species and varieties] Includes all Oxalis species and varieties except the native species O. chnoodes, O. exilis, O. perennans, O. radicata, O. rubens, and O. thompsoniae	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Pampas grass [Cortaderia species]	3	The plant must be fully and continuously suppressed and destroyed.
Parthenium weed [Parthenium hysterophorus]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Paterson's curse, Vipers bugloss, Italian bugloss [Echium species]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Pellitory [Parietaria judaica]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Pond apple [Annona glabra]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Prickly acacia [Acacia nilotica]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Prickly pear [Cylindropuntia species]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed. This is an All of NSW declaration.
Prickly pear [Opuntia species except O. ficus-indica]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold,

Table B.1 NOXIOUS WEEDS LISTED FOR THE HAWKESBURY RIVER COUNTY COUNCIL

Weed	Class	Legal requirements
		propagated or knowingly distributed.
Privet (Broad-leaf) [<i>Ligustrum lucidum</i>]	4	This is an All of NSW declaration. The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.
Privet (Narrow-leaf/Chinese) [<i>Ligustrum sinense</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.
Red rice [<i>Oryza rufipogon</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Rhus tree [<i>Toxicodendron succedaneum</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority. This is an All of NSW declaration.
Rubbervine [<i>Cryptostegia grandiflora</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Sagittaria [<i>Sagittaria platyphylla</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration
Salvinia [<i>Salvinia molesta</i>]	3	The plant must be fully and continuously suppressed and destroyed
Sand oat [<i>Avena strigosa</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Senegal tea plant [<i>Gymnocoronis spilanthoides</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Serrated tussock [<i>Nassella trichotoma</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold,

Table B.1 NOXIOUS WEEDS LISTED FOR THE HAWKESBURY RIVER COUNTY COUNCIL

Weed	Class	Legal requirements
		propagated or knowingly distributed.
Siam weed [Chromolaena odorata]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Smooth-stemmed turnip [Brassica barrelieri subspecies oxyrrhina]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Soldier thistle [Picnoman acarna]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Spiny burrgrass [Cenchrus incertus]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.
Spiny burrgrass [Cenchrus longispinus]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.
Spotted knapweed [Centaurea maculosa]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
St. John's wort [Hypericum perforatum]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Texas blueweed [Helianthus ciliaris]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Water caltrop [Trapa species]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration.
Water hyacinth [Eichhornia crassipes]	3	The plant must be fully and continuously suppressed and destroyed.
Water lettuce [Pistia stratiotes]	1	The plant must be eradicated from the land and the land must be kept free of the plant.

Table B.1 NOXIOUS WEEDS LISTED FOR THE HAWKESBURY RIVER COUNTY COUNCIL

Weed	Class	Legal requirements
Water soldier [Stratiotes aloides]	1	This is an All of NSW declaration. The plant must be eradicated from the land and the land must be kept free of the plant.
Willows [Salix species] Includes all Salix species except S. babylonica, S. x reichardtii, S. x calodendron	5	This is an All of NSW declaration. The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.
Witchweed [Striga species] Includes all Striga species except native species and Striga parviflora	1	This is an All of NSW declaration. The plant must be eradicated from the land and the land must be kept free of the plant.
Yellow burrhead [Limnocharis flava]	1	This is an All of NSW declaration. The plant must be eradicated from the land and the land must be kept free of the plant.
Yellow nutgrass [Cyperus esculentus]	5	This is an All of NSW declaration. The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.
		This is an All of NSW declaration.

Appendix C

Weed Species Profiles

C.1 African Boxthorn (*Lycium ferocissimum*)



NSW Department of Primary Industries

General¹⁴

African Boxthorn is native to the southern coast of Africa. It grows in most soil types in Australia, particularly lighter soils, for example, in dry creek beds.

Description¹⁴

Erect shrub to 5m high and 3m across.

Stems: Brown to grey, much-branched, with spines up to 15cm on main branches. Smaller

spines occur on branchlets.

Leaves: Glabrous, fleshy, to 3.5cm long, 2cm wide, ovate to elliptical on short stalks, clustered at the end of nodes.

Flowers: White with purple markings in the throat, 1cm in diameter, occur singly or in pairs, 5 petals.

Fruit: Orange-red, globular or ovoid berry, 1cm in diameter, smooth, shiny and drooping.

Seed: Light brown or yellow, numerous, ovoid or irregular, flattened, 2.5mm long, 1.5mm wide, small raised dots on the surface.

Root: Extensive deep branched taproot, producing new growth when broken.

Life Cycle and Dispersal¹⁴

Seeds germinate any time of year. Flower after 2 years, mainly in summer, but also throughout the year. Fruit eaten by birds and foxes, and are dispersed in droppings.

Control¹⁴

Mechanical Control: Can be pulled out with a tractor and chain, or cut with a chainsaw at the ground and painted with a glyphosate based product.

Chemical Control: Exposed surfaces sprayed or painted with registered chemical.

C.2 African Love Grass (*Eragrostis curvula*)



General¹⁴

African Love Grass originated in southern Africa. As a weed it is found in disturbed soils along roadsides, railway tracks, riverbanks and waste places.

Description¹⁴

A vigorous densely tufted perennial grass, 30 to 120 cm in height.

Stems: Slender or robust, sometimes bent at the lower nodes, 30 to 120 cm long.

Leaves: Vary from green to blue-green in colour, narrow blades, 25 to 35 cm long and 3 mm wide, narrowly tapered and often curled near tips, margins often folded or rolled

inwards; between the leaf blade and the sheath is a conspicuous ring or beard of hairs.

Inflorescence: Variable compact or loose and spreading panicle 6 to 30cm long, branches ascending, lowest branches may be in whorls; spikelets solitary, grey-green, 4- to 13-flowered, 4 to 10mm long, 1 to 1.5mm wide.

Seed: Creamy to dark orange or almost brown, 0.3 to 0.7 mm long.

Roots: Fibrous, primarily in the upper 50 cm of soil.

Life Cycle and Dispersal¹⁴

Seeds reproduce without fertilisation. Seeds germinate in autumn or spring if sufficient moisture is available. Flowering begins in early summer, with ripe seeds present from January to March. Seed can be spread short distances by wind and is also dispersed by animals, machinery, vehicles and in hay. It is readily spread during road construction in contaminated soils.

Control

Mechanical control: Small to medium plants should be removed by either crowning or digging out with a mattock. This method should be used when working near native vegetation.

Chemical control: African Love Grass can be treated by spraying with a registered chemical. Oversewing with a native perennial grass after spraying is advised.

C.3 African Olive (*Olea europaea* subsp. *africana*)



Adelaide Plains Animal and Plant Control Board

General¹⁸.

African Olives have been planted as ornamentals and for hedges. They have become a problem in some areas by becoming a naturalised and invasive weed species.

Description¹⁸

African Olives are much-branched evergreen trees or shrubs.

Leaves: Leaves are 6 to 10 cm in length and 1 to 2.5 cm wide, with a hooked apex. The underneath surface is a green/ yellowish brown colour.

Flowers: Flowers are bisexual and are coloured white.

Fruit: Fruit is a drupe.

Roots: Tap and lateral.

Life Cycle and Dispersal¹⁸

When the plant is disturbed, it coppices from the base. It is dispersed by birds, soil, and the nursery trade. The seeds are short lived.

Control

Manual Control: Small seedlings should be cut and painted with a registered herbicide. Hand pulling large amounts of seedlings causes undesirable amounts of soil disturbance.

Chemical Control: Larger and more mature plants should be cut and painted or scrape and painted with a registered herbicide.

C.4 Alligator Weed (*Alternanthera philxeroides*)



General¹⁴

Alligator weed is a native of South America. It thrives in shallow drainage ditches, canals, rivers, lakes, reservoirs, swamps, rice fields, and wet or occasionally inundated pastures.

Description¹⁴

An almost glabrous rhizomatous perennial herb, growing either as a terrestrial or rooted emergent, or occasionally as a free-floating aquatic plant. Reproduces from rhizomes and rarely, if at all, by seed.

Stems: Prostrate, semi-prostrate or ascending, simple or branched, hollow with pubescent grooves on opposite sides of the internodes, prostrate stems light green, yellow or brown; ascending stems dark green, 10 to 70cm long.

Leaves: Dark green; opposite, sessile, linear, 2 to 7 cm long, 5 to 40 mm wide, narrowing at apex, blade fleshy with waxy surface and conspicuous veins radiating from the midrib.

Flowers: Silvery-white, cylindrical or subglobular heads 1.2 to 1.4 cm diameter, borne on glabrous or slightly pubescent stalks 2 to 7cm long.

Fruit: Brownish, thin-skinned, bladder-like, flattened and indehiscent.

Seed: Ellipsoid, smooth.

Root: Short and filamentous in water, rising mainly from the nodes, longer and thicker in soil, often extending to below 50cm.

Life Cycle and Dispersal¹⁴

Reproduction in the field is entirely vegetative. Growth starts with development of node buds on old stems in early spring. Spread when pieces of cut stem are shifted away from the source.

Control

Mechanical control: On small infestations, removal by hand will give temporary relief. Must ensure all parts of the plant are removed, including the deep roots, and disposed of appropriately.

Chemical control: Repeated herbicide treatments can be used on terrestrial infestations¹⁹.

Biological control: The aquatic alligator weed flea beetle (*Agasicles hygrophila*) has had some success in controlling aquatic alligator weed ¹⁹.

C.5 Blackberry (*Rubus fruticosus*)



Keith Turnbull Research Institute

General¹⁴

Blackberry is native to Europe. It has been introduced to many countries around the world and is considered a noxious weed in most countries. It inhabits areas with more than 750 mm annual rainfall and occurs in gullies, along streams, roadsides and readily invades native bushland.

Description¹⁴

An erect shrub growing in thickets which can be several meters high.

Stems: Erect and arched or trailing, to 7 m long, green to reddish purple, smooth or finely hairy, round, ribbed or angled, with

numerous curved or straight prickles 3 to 12 mm long. Flowering shoots emerge from the first year canes in summer and after fruiting the cane dies back.

Leaves: Dark green above, and lighter green, often with whitish hairs below. Alternate, consisting of 3 or 5 toothed oval and ovate leaflets, with short prickles on leaf stalks and the under side of veins. Leaves normally shed in winter.

Flowers: White or pink, 2 to 3 cm diameter, formed in clusters at ends of short branches, 5 petals.

Fruit: A berry which changes colour from green to red to black as it ripens, 1 to 3 cm diameter, consisting of an aggregate of fleshy segments or drupelets each containing 1 seed.

Seed: Light to dark brown, somewhat triangular, 2 to 3 mm long, deeply and irregularly pitted.

Root: Most roots occur in top 20 cm of soil but a few are to 1 m deep.

Lifecycle and Dispersal¹⁴

Seed germinates in spring, and occasionally at other times. After several years thickets are usually 1 to 2.5 m high. Flowering commences in late November and extends to January, and fruit is produced from January to March. Plants may be deciduous through winter. Blackberry seed is spread for some distances by creeks and rivers. More importantly it is spread by birds and foxes which eat the fruit and can distribute seeds over a wide area. Tip rooting allows blackberry to take over large areas in only a short time.

Control

Mechanical Control: Effective control of established plants is achieved by physically removing the crowns and much of the root system by mattocking or through cultivation, or, on a larger scale, by bulldozing and ripping roots. Slashing or burning is often used, but neither is of more than temporary value because of extensive regrowth occurring from crowns and lateral roots.

¹⁴

Chemical control: Herbicide treatments are considered the most practical and cost effective, however must be repeated every three to four years. The preferred products for herbicide control of Blackberry are any registered herbicide used to control Blackberry. These products contain active ingredients that are registered for use in NSW. Only those herbicide products containing active ingredients that are registered for use in NSW should be used.

Biological control: A species of fungus, *Phragmidium violaceum*, the blackberry rust fungus, causes annual defoliation of blackberry plants during summer. It is specific to the genus *Rubus*. Although the fungus does not kill the plant it makes thickets less dense and allows other plants to invade land occupied by blackberry. The fungus was illegally introduced to Australia, and is now widespread. ¹⁴

C.6 Bridal Creeper (*Asparagus asparagoides*)



General¹⁴.

Bridal Creeper is native to South Africa. It occurs in open woodlands, in warm temperate regions, on fertile soils that have a light texture and are well-drained. It has been grown as an ornamental plant and is now a weed, colonising disturbed areas.

Description¹⁴.

Erect or climbing perennial herb, to 3m high.

Stems: Slender, branching, and twining, change direction each node, can be up to 3m long.

Leaves: Glossy green, broadly ovate, sharply pointed multi-nerved cladodes, and 1 to 4.5cm long and 5 to 16mm wide.

Flowers: Greenish-white, 8 to 9mm diameter, stalks bent near summit.

Fruit: Red sticky globose berry, 6 to 10 mm diameter.

Seed: Black, shiny, ovoid to globose, 3 to 4mm diameter.

Root: Short thick rhizome, tuberous roots.

Life Cycle and Dispersal¹⁴.

Germination in autumn to early winter, flowering commences in August or September. Plants become dormant in November, new growth begins in February or March. Fruit may remain on the plants for some time. Seeds usually fall close to the parent plant but the fruit can be eaten by birds. The plant spreads locally from tubers and severed rhizomes.

Control

Manual control: Dig out individual plants carefully, removing underground tuber, before they flower¹⁴. Physical removal is not effective unless all the rhizomes are dug up and destroyed²⁰.

Chemical control: Spot-spray for three consecutive years¹⁴.

Biological control: Three natural enemies of Bridal Creeper have been introduced into Australia. These are: the bridal creeper leafhopper (*Zygina* sp.), rust fungus (*Puccinia myrsiphylli*) and leaf beetle (*Crioceris* sp.). The leafhopper feed on the leaves which eventually leads to less vigorous growth and reduced new tuber production. The rust fungus

attacks the leaves and stems. The grubs of the beetle strips shoots and leaves that enable the plant to climb²⁰.

C.7 Broad-leaved Privet (*Ligustrum lucidum*)



General²¹.

Large-leaved Privet was introduced to Australia as a garden shrub from China and Japan. The species replaces mid canopy trees in forest and may completely dominate an area of forest or forest fragment in time if unhindered.

Description²¹.

Small to medium sized evergreen tree, to 10m high, sometimes a dense shrub.

Stems: Bark is thin, smooth and grey.

Leaves: Oval, glossy, 5-13cm long, 3-6cm wide, down-curving at the tip.

Flowers: Long panicles of small, cream-coloured fragrant flowers.

Fruit and seeds: Fruit up to 5-6mm diameter, bluish or purplish-black.

Roots: Has a tenacious woody root system.

Life cycle and dispersal

Flowers in spring and summer²². Fruit matures in July/August and is spread widely by birds and water.

Control

Manual Control: Can be removed by hand if small.

Chemical Control: Cut and paint plants below 50mm in diameter and drill and inject plants or scrape and paint above that and leave plants in-situ.

C.8 Crofton Weed (*Ageratina adenophora*)



General¹⁴

Crofton weed is a native to South America. Occurs in humid subtropics, usually in creek beds and clearings in forests. It is found as a weed along roadsides, in abandoned cultivations areas and overgrazed pastures.

Description¹⁴

A many-stemmed perennial herb that grows to 2m high, reproducing from seed and vegetatively from a short rootstock.

Stems: Purplish, numerous, erect, smooth, cylindrical, shortly-branched, glandular and hairy at first but become woody with age, may root at nodes if damaged.

Leaves: Dark green, opposite, trowel-shaped, 5 to 8cm long, 3 to 7.5cm wide, tapering towards the apex, 3-nerved, glabrous or slightly pubescent, toothed margins.

Flowers: White tubular florets grouped in heads 5 to 6mm diameter, heads occurring in clusters, to 10cm across, at ends of branches.

Seeds: Dark brown-black, slender, angular, 1.5 to 2mm long, pappus of 5-10 fine white hairs 4mm long.

Roots: Short, thick pale yellow root with numerous secondary roots extending laterally to a radius of 1m and downwards to 40cm.

Life Cycle and Dispersal¹⁴

Germination occurs between December and September, especially February-March. In mature plants, growth occurs in summer rains, usually January. Flowering occurs during September. Seeds are shed October-January. Seeds are dispersed by wind and water.

Control¹⁴.

Mechanical control: Crofton weed can be ripped, slashed or ploughed, followed by oversowing the area with grasses.

Chemical control: Can be sprayed when growing actively. Use a registered chemical as per label instructions.

Biological control: the Trypetid Gall Fly has been introduced to control Crofton Weed but its success is dependent on parasitism by native insects. Other organisms also can harm the plants but need to be used in combination to successfully control the weed.

C.9 Lantana (*Lantana camara*)



General¹⁴.

Lantana is a plant native to the warmer regions of the world thriving in both dry and humid climates. It exists as a weed along roadsides, creekbanks, fence lines, and in waste places. It is a common component of weedy pastures, parklands and arable fields.

Description¹⁴.

Much branched, forming thicket-forming shrubs up to 3 m high with prickly stems. It has odorous leaves and bright multicoloured flowers.

Stems: Branched, woody, brittle, arching sprawling or scrambling, to 5 m long. Diameter ranges from 2-4 mm when young to 5 cm when mature. Coloured grey to brown with small prickles.

Leaves: Yellow-green to dark green, opposite, normally shortly and roughly hairy, ovate, 2 to 10 cm long and 2 to 7 cm wide, bluntly pointed apex, variably toothed. It has a strong odour when crushed.

Flowers: White, cream, yellow, orange, pink purple or a mixture of these colours, flat topped slightly rounded head, 2 to 3 cm across on stiff, finely hairy stalks.

Fruit: Green at first but ripening to a glossy purple-black, a 1-seeded berry (drupe) 5 to 8 mm, grouped in clusters of 1 to 20.

Seed: Pale straw-coloured, hard and stony, ovoid, 2 to 4 mm long.

Root: A robust, woody stockroot with numerous shallow laterals which sucker if damaged or broken.

Lifecycle and Dispersal¹⁴.

Seeds may germinate at any time of year. When branches intertwine with branches of others thickets begin to form. Flowering occurs in early summer through to March or April from the second growth season. Lantana is spread by birds eating the fruit and also through the nursery trade. It increases the size and density of existing thickets by suckering and seedling growth within and along the edges.

Control¹⁴.

Mechanical Control: Plants should be removed with a tractor and chain, and burnt before flowering, especially removing lateral roots. Slashing or burning without follow up only results in an increase in weed density. Regrowth after clearing should be spot sprayed.

Chemical control: Spot spraying regrowth with herbicides is effective. Cut and paint and scrape and paint with herbicides.

C.10 Narrow-leaved Privet (*Ligustrum sinense*)



General²²

The Narrow-leaved Privet is a native of China and a member of the olive family (Oleaceae). It is often cultivated as a hedge and has become a problem in some areas as a naturalised invasive woody weed on rainforest edges and fence lines of cleared areas.

Description²².

Shrub up to 3 metres in height.

Stems: Young branches and new growth have hairs.

Leaves: Leaves are elliptic to ovate, 2.5 cm long, 1.5-2.5cm wide

Fruit: Berries are black and round in shape.

Flowers: White, small fragrant, white

Life Cycle and Dispersal²².

Flowers in late winter to spring. Fruit are spread widely by birds and water

Control

Manual Control: Can be removed by hand if small.

Chemical Control: Cut and paint plants below 50mm in diameter and drill and inject plants or scrape and paint above that and leave plants in-situ.

C.11 Noogoora Burr (*Xanthium* sp.)



General¹⁴

Noogoora Burr originated from North America. Occurs as weeds of cultivation, grazing land and undeveloped areas subject to summer rainfall, flooding or irrigation.

Description¹⁴

Erect annual herb to 2.5m high.

Stems: Blotched or streaked with purple, somewhat zig-zagged, covered with short coarse upwards pointing hairs.

Leaves: Darker green on upper; lower leaves opposite, upper alternate, to 15cm diameter, dissected into 3 or 5 large lobes, coarsely toothed; rough textured with minute bristles.

Flowers: Inconspicuous, clusters of both male and female flowers.

Fruit: Brown hard woody ellipsoid burr, numerous hooked spines, in clusters of 2 to 13.

Seed: Brown or black, 2 in each burr, 6 to 10mm long, one larger than the other.

Root: Stout taproot and extensive lateral roots.

Life Cycle and Dispersal¹⁴.

Germinate after spring and summer rains. Plants die in autumn but most remain standing, bearing mature burrs for months. Burrs have hooked spines while attach to wool, skin and tails of other animals and other fibrous material.

Control

Manual control: If infestations are small, hand pulling and hoeing before flowering is effective

C.12 Pampas Grass (*Cortaderia selloana*)



General¹⁴

This species is a native of the South American Pampas, the prairie areas of this continent. In Australia it occurs in subhumid and semi-arid tropical regions in open sunny places that receive added moisture. It is found in damp places, along streams, depressions, margins of mangrove swamps and in disturbed areas associated with roads, pipeline cuts, and walking trails in bushland and in wasteland.

Description¹⁴

Pampas Grass is a large tussock-forming grass and grows to about 6 metres. Leaves develop from the base and grow to about 2 metres. Individual plants are either female or bisexual, reproducing by seed and vegetatively.

Stems: Grey-green to yellow-green, erect, 2 to 6 m high, to 3 cm diameter, hollow

Leaves: Bluish-green above, dark green below, leaf sheath smooth or slightly hairy, without a waxy covering or distinct midrib, hanging down in a spiral from when dead; 2 m long and 3.5cm wide, tapering to a fine point. Margins are finely serrated and the upper part recurved through 180 degrees but not touching the ground.

Flowers: White, pink or mauve plume-like terminal panicle, 30 to 90 cm long, spikelets 2 to 5-flowered.

Seeds: Pale straw-coloured, narrowly elliptical 2 mm long, 0.6 mm wide, enclosed within flowering glumes.

Root: Fibrous, rising from short robust rhizomes but extending to 4m radially and to 3.5m deep.

Lifecycle and Dispersal¹⁴

Seeds germinate in spring. The inflorescence grows in spring but flowers do not emerge till late summer, the bisexual head a week or two before the female heads. Flowering begins in March and continues till May.

The seed-bearing florets of the female plant are particularly hairy and readily dispersed by wind, often being carried for up to 25 km. The almost hairless florets of the bisexual plant

tend to fall close to the parent plant. Seeding regeneration is rare and vegetative spread is common. Grubbed crowns that are dumped in tips and waste places can re-establish if moisture is available. Major dispersal has always been by humans in the course of trade.

Control¹⁴

Mechanical Control: The prevention of seeding by cutting flower heads as soon as they appear is a preferred strategy. Plants can be cut at the base and poisoned. Grub and remove plants especially when they are young and immediately burn all plant material. Before grubbing, carefully cut and remove the aerial growth of larger plants, which can be quite abrasive. Remove all rhizomes and the crown by grubbing when the soil is moist.

Chemical control: Good control can be obtained using herbicides such as glyphosate and hexazinone. Only those herbicide products containing active ingredients that are registered for use in the relevant state should be used.

C.13 Prickly Pear (*Opuntia stricta*)



General¹⁴

Prickly Pear originates from North America Central and tropical America. Before the advent of controls this plant was the most serious weed in Australia and capable of growing in most parts of the continent.

Description¹⁴

An erect succulent shrub, which can grow up to 2m in height, reproducing by seed and from branch segments.

Stems: Fleshy, leaf-like joints, which carry minute scarred leaves on their surfaces²³. Often a dull or bluish green in colour, glabrous, consisting of a series of fleshy segments each up to 30 cm long, 15 cm wide and 1 to 2 cm thick; each areole contains tufts of short, very finely barbed bristles and occasionally 1 or 2 spines.

Leaves: Small scale-like, produced beneath the areoles, only on young segments and are shed as the segments mature.

Flowers: Petaloids lemon yellow with greenish or pink markings on the back, 6 to 8cm diameter, sessile, possess a fleshy base, which becomes fruit.

Fruit: Skin reddish purple, flesh reddish, somewhat pear-shaped, 4 to 6cm long.

Seed: Yellow or pale brown, rounded, 5mm diameter, numerous.

Roots: Fibrous and shallow.

Life Cycle and Dispersal¹⁴

Germinate all year round. Local dispersal occurs around existing clumps, when segments or fruit drop to the ground and take root. Segments and fruit can also become attached and carried on wool and hides of animals, footwear and tyres of vehicles. Flood waters can also aid dispersal. However, the major method of dispersal is through human movement of plant parts. The droppings of birds and foxes can also contain viable seeds.

Control¹⁴

Mechanical control: Physical removal and burning of plants is effective, however, care must be taken to collect and destroy all segments and fruit. If mechanical control is

undertaken, as much of the root system should be removed as possible by grubbing or cultivation.

Chemical: Chemical control has not always been effective however a registered chemical could be used. For a small number of these plants, manual removal is recommended.

Biological: The most well known form of biological control is the Argentine Moth (*Cactoblastis cactorum*)²³. This insect was introduced in 1925 and by 1932 the majority of prickly pear was killed in the worst affected areas.

Another insect that is also responsible for the demise of the prickly pear is the cochineal insect (*Dactylopius opuntiae*). These insects are specific to individual species of prickly pear or they attack only a limited number of prickly pear species. These species feed on the sap of the plant and inject a toxin. Another plant pathogen that attacks the prickly pear is the bacterial soft rot²⁴.

Appendix D

Weed Species

Table D.1 WEEDS SPECIES RECORDED IN THE CENTRAL PRECINCT

Scientific Name	Common Name	WONS	NSW Noxious Weeds Act for Hawkesbury River County Council	NSW Noxious Weed Act Class	Significant Weed in SMP
<i>Ailanthus altissima</i>	Tree of Heaven			4	
<i>Alternanthera philpseroides</i>	Aligator Weed	✓	✓	3	
<i>Anagallis arvensis</i>	Buttercup				
<i>Araujia sericifera</i>	Moth Vine			4	
<i>Asparagus asparagoides</i>	Bridal Veil Creeper	✓	✓	5	✓
<i>Asparagus densiflorus</i>	Climbing Asparagus			4	
<i>Asparagus plumosus</i>	Fern Asparagus			4	
<i>Axonopus affinis</i>	Carpet Grass				
<i>Bidens pilosa</i>	Farmers Friends				
<i>Briza subaristata</i>					
<i>Centaurium sp</i>					
<i>Ciclosperma leptophylla</i>	Slender Celery				
<i>Cirsium vulgare</i>	Spear Thistle				
<i>Conyza sp.</i>	a Fleabane				
<i>Cortaderia selloana</i>	Pampas Grass		✓	3	✓
<i>Cynodon dactylon</i>	Couch				
<i>Echium plantagineum</i>	Patersons Curse		✓	4	
<i>Eragrostis curvula</i>	African Love-grass			4	✓
<i>Gnaphalium sp</i>	a Cudweed				
<i>Heliotropium amplexicaule</i>	Blue Heliotrope			4	
<i>Hypochaeris radicata</i>	Flatweed				
<i>Lactuca seriola</i>	Red-flowered Mallow				
<i>Lantana camara</i>	Lantana		✓	5	✓
<i>Ligustrum sinense</i>	Narrow-leaved Privet		✓	4	✓
<i>Linum monogynum</i>					
<i>Lolium perenne</i>	Perennial Rye				
<i>Malus sp</i>	Apple				
<i>Modiola caroliniana</i>	Red-flowered Mallow				
<i>Nothoscordum borbonicum</i>	Onion Weed				

Table D.1 WEEDS SPECIES RECORDED IN THE CENTRAL PRECINCT

Scientific Name	Common Name	WONS	NSW Noxious Weeds Act for Hawkesbury River County Council	NSW Noxious Weed Act Class	Significant Weed in SMP
<i>Paspalum dilatatum</i>	Paspalum				
<i>Plantago lanceolata</i>	Scarlet Pimpernel				
	Blackberry				
<i>Richardia stellaria</i>	Nightshade				
<i>Romulea rosea</i>	Nut Grass				
<i>Rubus fruticosus</i>	Blackberry	✓	✓	4	✓
<i>Senecio madagascariensis</i>	Fireweed			4	
<i>Senecio pterophorus</i>					
<i>Sida rhombifolia</i>	Paddys Lucerne				
	Small-flowered				
<i>Solanum nigrum</i>	Purpletop				
<i>Solanum pseudocapsicum</i>	Jerusalem Cherry				
<i>Sonchus oleraceus</i>	Sow Thistle				
<i>Trifolium spp</i>	Clover				
<i>Verbena bonariensis</i>	Purpletop				
<i>Xanthium sp</i>	Noogoora Burrs		✓	4	✓

Appendix E

Implementation Schedule

E.1 Year 1

E.1.1 Identify target species and areas

- i.* Species of concern
 - Alligator Weed (*Alternanthera philpseroides*)
 - Bridal Creeper (*Asparagus asparagoides*)
 - Lantana (*Lantana camara*)
 - Blackberry (*Rubus fruticosus*)
 - Noogoora Burr (*Xanthium* sp.)
 - Pampas Grass (*Cortaderia sellona*)
 - Paterson's Curse (*Echium plantagineum*)

- ii.* Areas of concern

Areas mapped in Figure 3.1.

E.1.2 Objectives

- a) Prevent the spread of weeds resulting from construction activities
- b) Contain and reduce current significant weed infestations
- c) Prevent the spread of weeds into the Regional Park
- d) Enhance areas marked for regional open space by removing weeds and establishing native species.
- e) Community education.

E.1.3 Implementation

The strategies for implementing objectives (a) to (e) above are found in the sections of this WMP as outlined in the corresponding points (a) to (e) below.

- a) Implement strategies outlined in sections 4.2.1 and 4.2.2;

- b) Implement strategies outlined in section 4.3.2 and the weed profiles;
- c) Implement strategies outlined in sections 4.2.1, 4.2.2 and 4.3.2 and the weed profiles;
- d) Implement strategies outlined in sections 4.2.1, 4.2.2 and 4.3.2 and the weed profiles; and
- e) Develop information kits to be provided to new residents.

E.1.4 Monitoring and review

- Short-term monitoring outlined in section 5.1
- Long-term monitoring outlined in section 5.2
- Review of the WMP outlined in section 5.3

E.2 Year 2

E.2.1 Identify target species and areas

i. Species of concern

As for year 1: Significant species not on this list that were detected during monitoring need to be added.

ii. Areas of concern

As for year 1: Any new areas of infestations detected during previous year.

E.2.2 Objectives

As for year 1: Add or remove objectives based on previous year's end of year review.

E.2.3 Implementation

As for year 1: Add or remove implementation strategies based on the current year's objectives.

E.2.4 Monitoring and review

As for year 1.

E.3 Year 3

E.3.1 Identify target species and areas

i. Species of concern

As for year 1: Significant species not on this list that were detected during monitoring need to be added.

ii. Areas of concern

As for year 1: Any new areas of infestations detected during previous year.

E.3.2 Objectives

Same as year 1. Add or remove objectives based on previous year's end of year review.

E.3.3 Implementation

As for year 1: Add or remove implementation strategies based on the current year's objectives.

E.3.4 Monitoring and review

As for year 1.

E.4 Year 4

Ongoing maintenance unless active control is required (see years 1-3 for schedule).

E.5 Year 5

Ongoing maintenance unless active control is required (see years 1-3 for schedule).