FINAL REPORT

ROOKWOOD NECROPOLIS BUSHLAND MANAGEMENT PLAN 2014 - 2019

Prepared for

The Rookwood Necropolis Trust

15 June 2015

Prepared by

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CERTIFICATION

I, Judith Rawling Managing Director of UBM Ecological Consultants Pty Ltd hereby state that the Bushland Plan of Management for Rookwood Necropolis has been prepared in accordance with the requirements of the project brief provided by the Rookwood Necropolis Trust.

This Report has also been prepared in consideration of the schedules and requirements of *the* NSW *Threatened Species Conservation Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The UBM project team charged with preparing this Report were:

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Draft Report V1 – 15 August 2014
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Final Report – 15 June 2015

Front Cover:
Photograph 1 – Threatened flora species found in Rookwood Necropolis
Photograph 2 – Vegetation Conservation Area 19 showing graves sites in the foreground
Photograph 3 – VCAs in Rookwood Necropolis (UBM 2014)

DEFINITIONS & TERMS

Bushland PoM – 1st Bushland Plan of Management for Rookwood Necropolis prepared by Urban Bushland Management Consultants (2003)

BMP- Bushland Management Plan (draft August 2014) – the current report

CPW– Cumberland Plain Woodland (CEEC) – a community listed as 'critically endangered' under the NSW *Threatened Species Conservation Act 1999* and the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*

CRCIF – Cooks River Castlereagh Ironbark Forest – a community listed as 'endangered' under the NSW *Threatened Species Conservation Act 1999* (also described by OEH as Castlereagh Ironbark Forest)

CSPW – Cumberland Shale Plains Woodland (Tozer *et al.* 2010) – part of the Cumberland Plain Woodland CEEC listed under the NSW *Threatened Species Conservation Act 1999,* and as Cumberland Shale Plain Woodland and Shale Gravel Transition Forest under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*

CTLA – Carolyn Tallents Landscape Architect, project manager

DECCW – former NSW Department of Environment, Climate Change and Water (now the Office of Environment & Heritage under the Department of Premier and Cabinet)

Direct Impacts are those that directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat.

Indirect Impacts occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas.

DPI – NSW Department of Primary Industries, incorporating a number of other government departments, including Agriculture and Lands

Ecological Community – an assemblage of species with 6 types of properties, composition; structure; habitat; distribution; interactions between their component species, and ecological processes and function (Keith 2009); and occupying a particular area at a particular time.

EEC / Endangered Ecological Community – a community that is likely to become extinct unless the circumstances and factors threatening its survival cease to operate, and is listed under State and/or Commonwealth threatened species legislation

EVNT – Critically Endangered, Endangered, Vulnerable, Threatened and/or Near-threatened flora and/or fauna species listed under the *EPBC Act* and/or *TSC Act* and referred to within this document.

CEEC – Critically Endangered Ecological Community – a community considered by the NSW Scientific Committee to be facing an extremely high risk of extinct in the wild in the immediate future

EPBC Act – Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*

EP&A Act – NSW *Environmental Planning & Assessment Act 1979*

Habitat – an area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community, and including any biotic or abiotic components present.

LGA – Local Government Area; here Auburn and Strathfield Council areas

Locality – generally, an area within 1-2 kilometres of the Study Area

Noxious Weed – a species gazetted for the LGA under the *Noxious Weeds Act 1995* (amended 2000)

NPWS – National Parks & Wildlife Unit of Office of Environment & Heritage

OEH – Office of Environment & Heritage under the NSW Department of Premier and Cabinet (formerly DECCW, DECC, DEC and prior, NPWS)

PMP – Property Management Plan for Rookwood Necropolis prepared by Hassall & Gillespie (2002).

Rookwood Necropolis Plan of Management – prepared by the Department of Primary Industries (Catchment & Lands) February 2014.

SCIVI – Southeast NSW Native Vegetation Classification and Mapping by Tozer *et al.* for the NSW Department of Environment, Climate Change & Water (DECCW 2006, published 2010)

SEWPAC – Commonwealth Department of Sustainability, Environment, Water, Population and Communities (formerly DEWHA)

SGTF – Shale Gravel Transition Forest, an intermediate form between CRCIF and CPW, listed with Cumberland Plain Shale Woodlands as a CEEC under the Commonwealth *EPBC Act*

SMCMA – Sydney Metropolitan Catchment Management Authority

Study Area – for the purposes of this Report, the Study Area comprised the 14 dedicated Vegetation Conservation Areas at Rookwood

Study Region – an area approximately 10 kilometres in diameter, centred on the Study Area.

Threatened Species/Threatened Entity – a flora or fauna species, population or plant community listed under State and/or Commonwealth threatened species legislation.

TSC Act – NSW *Threatened Species Conservation Act 1995*

UBM – UBM Ecological Consultants Pty Ltd: formerly trading as Urban Bushland Management Consultants ('UBMC')

VCAs – Vegetation Conservation Areas: the 14 dedicated bushland remnants in Rookwood Necropolis, identified under the Property Management Plan (2002), and grouped into four (4) main 'Clusters': the Northern Cluster; Western Cluster, Southern Cluster and Central Cluster.

Vegetation /Plant Community – described as an assemblage of native flora species known to occur in association with each other as a result of topography, soil landscape and rainfall.

WoNS – Weed of National Significance

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1 INTRODUCTION

1.1 Background Information

Rookwood Necropolis comprises 286 ha of land in the inner-western suburbs of Sydney (*see Figure 1.1)*. The Necropolis occupies the entire suburb of Rookwood, gazetted on 5th February 1993, and is one of the largest and oldest cemeteries in Australia (first burial 1867). Despite its long use as a burial ground, Rookwood Necropolis ('the Necropolis') retains significant stands of remnant native vegetation, and provides important habitat for local flora and fauna.

The Necropolis is known to support two (2) endangered ecological communities and a number of species listed as Endangered, Vulnerable, Near-threatened and/or Threatened ('EVNT') under the NSW *Threatened Species Conservation Act 1995* (*TSC Act*) and/or Commonwealth *Environment Protection of Biodiversity Conservation Act 1999* (*EPBC Act*).

Rookwood Necropolis is Crown Land under the care and control of the NSW Department of Primary Industries (incorporating the former Department of Lands). Since 1996, the remnant native vegetation (bushland) within the Necropolis has been managed for its natural conservation values by the Rookwood Necropolis Trustees[1] ('RNT').

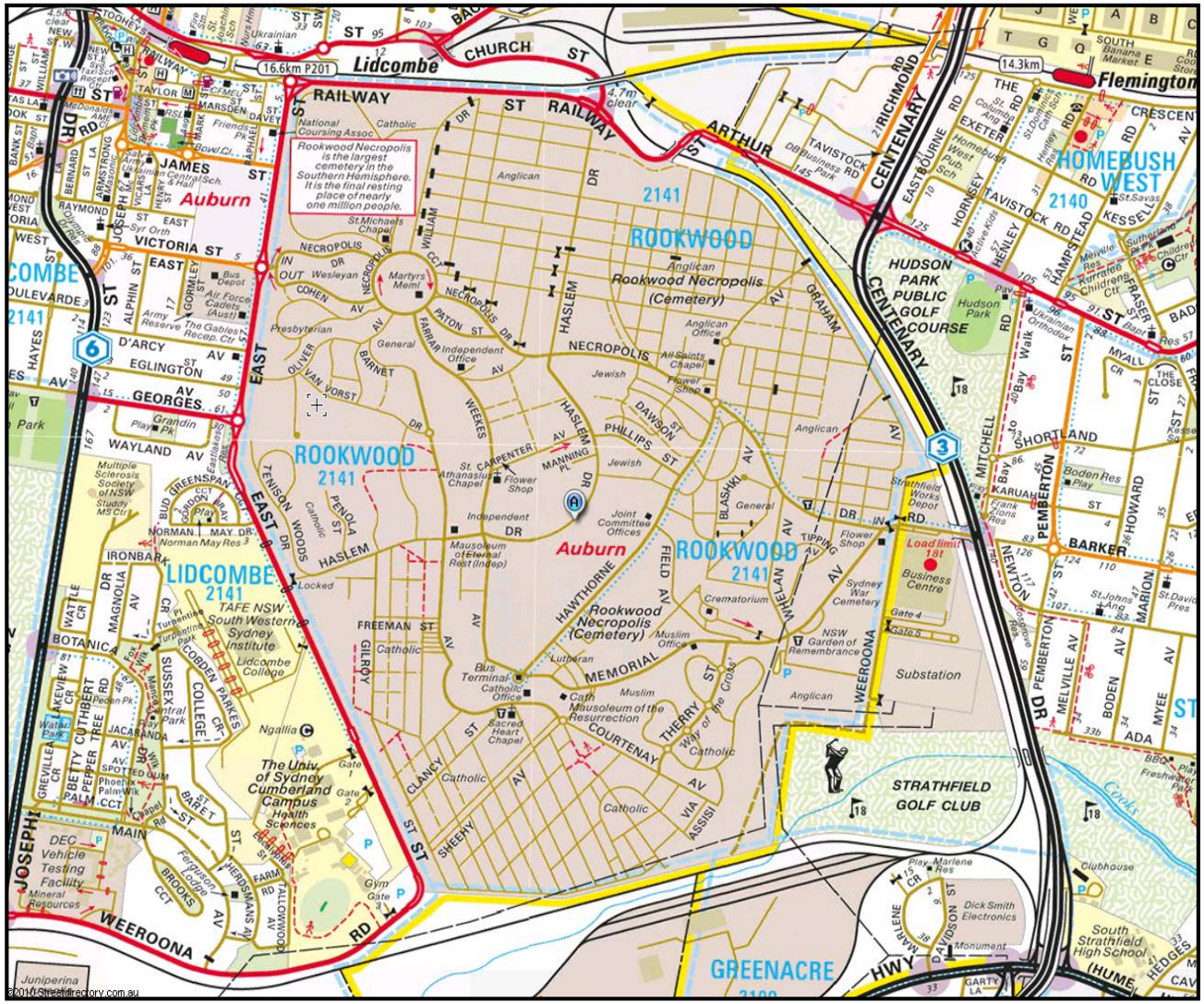
In 2002, a Property Management Plan ('the PMP') was prepared for the then-Department of Land and Water Conservation ('Lands') by Hassall/Gillespie to provide for the protection of high conservation value native vegetation within the Cemetery. The PMP was prepared under the requirements of the NSW *TSC Act* with the aim of providing for "the ongoing operation of the Necropolis and the protection of high conservation value native vegetation, while at the same time maximising the Cemetery's capacity for burial". The PMP also considered relevant environmental, social and economic issues and set the long term strategic direction for the management of the Necropolis bushland.

Since the adoption of the PMP, the management of the native flora and fauna at Rookwood has been adapted to comply with the requirements of the PMP. Accordingly in 2003, a Bushland Plan of Management ('the Bushland PoM') was prepared (UBMC 2003) to guide on-ground bushland management works in the Necropolis. The PMP expired at the end of 2012, and the *Property Management Plan 10-year Review* ('the 10—Year Review') was prepared by Project Managers DEM/Landscan in November 2013. The Review considered the outcomes of the bushland management program against the performance measures set out in the PMP and in included a number of recommendations for on-going bushland management. A new PMP is currently in preparation and is expected to be completed in early 2015. A new Bushland Management Plan (hereafter the 'BMP') has also been commissioned as part of the new PMP.

[1] Prior to July 2009, the RNT was known as the Joint Committee of Necropolis Trustees – JCNT (see *Section 1.3*)

Figure 1-1: Rookwood Necropolis within a Regional Context

(Source: http://www.street-directory.com.au/)



1.2 Governance

In 1867, the *Rookwood Necropolis Act* was established which subdivided land within the Necropolis along denominational lines according to the census of 1861. The management of lands outside the denominational boundaries – i.e. unallocated lands and common infrastructure - was undertaken by the Joint Committee of Necropolis Trusts ('JCNT').

In 2009, the *Rookwood Necropolis Act* was repealed and the JCNT was abolished. In its place the *Crown Lands Act* 1989 was amended to create the Rookwood Necropolis Trust ('RNT'), to which the Minster of Lands appointed trustees with specialist knowledge of cemetery management.

From 2013, the Necropolis has been managed by the RNT under the two (2) Trust model. The largest Trust is allocated to the Catholic Cemeteries Board, and the Anglican, Jewish, Muslim and Independent Trusts were dissolved and reformed as the Rookwood General Cemeteries Reserve Trust. Subsequently, a Memorandum of Understanding between the two (2) Trusts was drawn up to cover all matters relating to the management and administration of the common property within the Necropolis.

Under direction from the Minster of Primary Industries a new *Plan of Management for Rookwood Necropolis* ('the PoM') was prepared under Section 92(6b) of the *Crown Lands Act (DPI 2014).* The PoM guides all activities within the Necropolis, inducing financial, social, heritage, ecological and operational aspects[2]. The PoM is designed as a living document that can be amended regularly during its lifetime; subject to the constraints set out in Part 5 of the *Cemeteries and Crematoria Act 2013*.

A number of supporting documents and plans for Rookwood Necropolis are already in place, and the remainder will be developed over time. Of these, the most relevant to the management of the natural heritage values of the Necropolis is the new PoM (DPI 2014), which incorporates the Bushland Plan of Management, Threatened Species Census Reports and regular Audits (see *Table 1-1*).

The new Property Management Plan (CTLA) will replace the first PMP (2002) and inform the new Bushland Plan of Management (this Report).

A Chronology of previous investigations, reports and management plans for the Necropolis has been included in *Appendix 2* of this Report.

[2] **Note**: in the context of Rookwood reports the Rookwood PoM (DPI 2014) is not to be confused with the Bushland PoM (UBM 2003) which guides bushland management activities at Rookwood.

Table 1-1: Rookwood Related Management Plans: defined in Plan of Management (DPI 2014)*

Related Management Plans	To include
Property Management Plan Management of the Endangered Ecological Communities and Threatened/Vulnerable species/populations	Bushland Plan of Management (2003 last PoM) Threatened Plan Census - Annual Audits - every 2 years and final at 10 years
Master Plan To guide the planning within the Cemetery	Significant Tree Register Tree Management Policy Signage Policy
Conservation Management Plan	Significant Buildings/Monuments Register and Interpretation Plan Archaeology Appraisal of Former Buildings Archaeology Appraisal of Significant graves Aboriginal Archaeology Study
Environmental Management Plan	Sustainability, energy, waste
Traffic Study	Road hierarchy Road Conditions
Infrastructure Management Plan	Infrastructure Condition, future investment
Canal Study	Conditions, heritage status, maintenance
Information Plan	External and internal information set
Disaster Management Plan	Contingencies and Policies

*from 10-Year Audit DEM/Landscan

1.3 Legislative Framework

Rookwood Necropolis sits within a complex set of planning and legislative documents, with the main relevant Acts being: *Crown Lands Act 1989; Heritage Act 1977; Environmental Planning and Assessment Act 1979*; *Threatened Species Conservation Act 1995* (TSC Act); Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), and the *Public Health Regulation 2012*.

Acts that are specific to flora and fauna management at Rookwood include those listed above, as well as the *Noxious Weeds Act 1993* (*Amended 2005*), and the *Rural Fires Act 1997/Amendment 2002.*

2 SITE DESCRIPTION

2.1 Location & Setting

At 286 ha in size Rookwood Cemetery (officially Rookwood Necropolis) is the largest necropolis in the Southern Hemisphere. The Necropolis is located in the suburb of Rookwood, close to the Lidcombe railway station on the Main Western Railway Line, 17 kilometres west of the Sydney CBD. Most of the Necropolis is located within the Auburn Local Government Area, with a small area in the southern sector located in Bankstown (see *Figure 1.1*).

With the exception of the Strathfield Golf Course, which is located on its south-eastern boundary, the Necropolis is surrounded by major roads and by established residential and light industrial development. The Chullora Railway Yards are located on the southern boundary.

The Necropolis boundary is about 7.2 km in length, and most of this boundary has a direct frontage to a public road. It is protected by perimeter fencing, with access controlled by two (2) entrance gates at Weroona Road and East Street on the eastern and western boundaries respectively (Plan of Management, DPI 2014).

Table 2-1: Site Definition for Rookwood Necropolis

Title Information	Rookwood Necropolis
Zoning	Zoned 5 (a) Special Uses Cemetery (*Bankstown LEP 2002 & Auburn LEP 2002*)
Total Area	286 ha (~ 21 hectares of remnant bushland)
Topographic Map	Parramatta River 9130-3N and Botany Bay 9130-3S 1:25000 Map Series
Elevation	20 to 49 metres ASL. Highest point is south end of Weekes Avenue: lowest points @ canal exits.
Grid Reference	-33° 52' 29.0706"S, 151° 3' 23.148"E (centre of Rookwood Necropolis)
Ownership	Crown Land owned by the NSW Government. Managed by the NSW Department of Primary Industries
Current Management	The Rookwood Necropolis Trustees, by agreement with the Minister of Primary Industries

2.2 Physical Environment

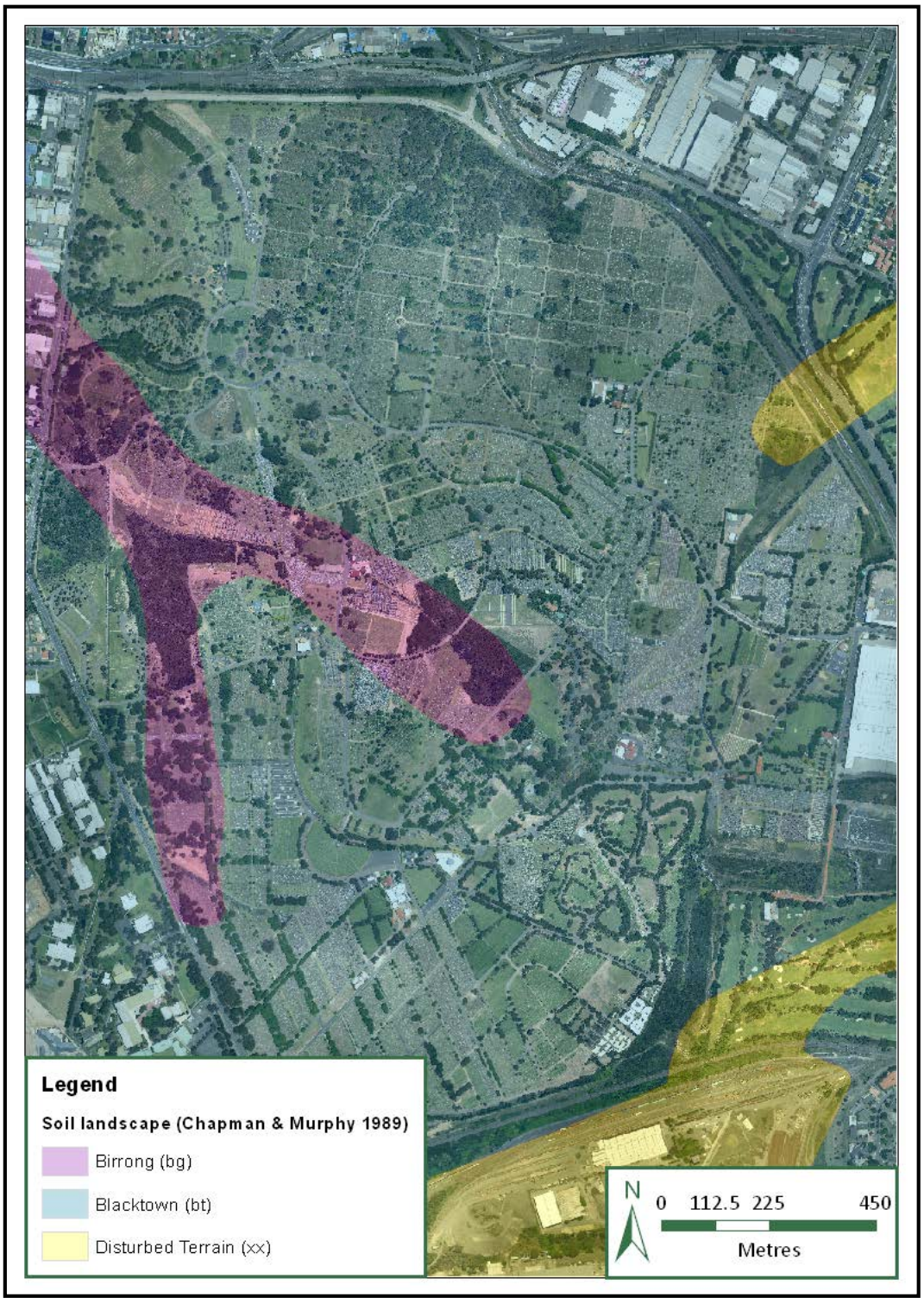
The physical characteristics of Rookwood Necropolis and environs are set out in *Table 2-3*.

Table 2-2: Physical Characteristics Described for Rookwood Necropolis and Environs

Feature	Description
Topography	Undulating country, ranging from 20 - 49 m ASL. Highest point south end of Weekes Avenue: lowest points at canal exits.
Geology	Comprising Ashfield Shale (northern 1/3rd of cemetery) and Bringelly Shale (southern 2/3rds), which are sub-groups of the Wianamatta Group Shales (Herbert 1983). Local geology tends to soft, easily erodable shales Potts Hill Sandstone occurs on the western side of Rookwood, in the headwaters of the Haslams Creek system, where the vegetation contains a number of characteristic sandstone species.
Soils & Soil Landscape	Two (2) soil landscapes occur - Blacktown and Birrong (Chapman & Murphy 1989) (see *Figure 2.1*). Blacktown SL has broad rounded crests and ridges with gently inclined slopes on Wianamatta Group shales. Blacktown soils are usually of low fertility, and exhibit poor drainage. The lower slopes of the Blacktown SL adjoin and occasionally overlap the Birrong SL, which occurs on level to gently undulating alluvial floodplains (along Haslams Creek). Birrong soils are subject to localised flooding, seasonal water logging, and have low fertility. In some areas, disturbance and erosion of the topsoil has lead to extensive exposure of the subsoil. Soils have high clay content, and in wet seasons, the soils become saturated, and water runs off or pools on the surface. Ironstone gravels are often visible on the surface (Smith & Smith 1999).
Local Hydrology	There are three (3) main catchment areas: Cooks River to the south and southeast, Duck River to the west, and Powells Creek to the north and northeast. North of the highest point, the land drains via the Duck River and Powells Creek catchments to the Parramatta River (see *Figure 1.1*). South of the highest point, the land drains to the Cooks River. Within the Necropolis, the drainage lines have been converted to brick-lined canals. These drainage canals are heritage features.
Climate	A Mediterranean climate characterised by mild winters and warm summers. Occupying an intermediate position in the spectrum of climatic change from the coast to Penrith, although the rainfall is towards the lower end of the spectrum. Mean annual rainfall at nearby Lidcombe is 816 mm, occurring throughout the year, with average 60% falling from January to June. Temperatures at Bankstown range from an average daily maximum of 18°C in July to 28°C in January and an average daily minimum of 3°C in July to 18°C in February (ABM 2014).

*source UBM 2013

Figure 2-1: Soil Landscape Unit (Chapman & Murphy 1989)



2.3 Biological Environment

Information presented in this section of the BMP has been sourced from the most recent ecological studies report entitled *Biodiversity Studies: Flora & Fauna Investigations for Native Bushland at Rookwood Necropolis* (UBM October 2013). Data and figures have also been sourced from the Rookwood Necropolis 10-Year Review (DEM/Landscan 2013)**.**

As this BMP is required to be a 'stand-alone' document, information and relevant data have also been sourced from a range of previous reports and investigations. All such information has been appropriately referenced.

2.3.1 Plant Communities

Most of the indigenous vegetation on the Cumberland Plain west of Sydney City was cleared in the 19th century to make way for grazing and other forms of agriculture, and more recently for industry and housing. Owing to its early designation as a burial ground (1867), vegetation clearing within the Necropolis has altered at a much slower rate than that experienced in the surrounding area. As a result, Rookwood still retains many small but significant pockets of remnant bushland.

The remnant and regrowth native plant communities within the Necropolis have been researched, surveyed and described by a number of workers (see *Appendix 2*). The plant community in the Locality, as represented at Rookwood and nearby Chullora, was formerly described as 'Transition Forest' by Benson *et al*. (1989), and grouped together with a number of other plant associations under the generic name of 'Cumberland Plain Woodland'.

In 1997, the plant community extant at Rookwood was re-classified by the Scientific Committee established under the *TSC Act* as 'Cooks River Clay Plain Scrub-forest'. Subsequently, a report by consultants Smith & Smith (1999) described the dominant plant community at Rookwood as 'Cooks River Clay Plain Scrub-forest'. In May 2002, Cooks River Clay Plain Scrub-Forest was again reclassified by the NSW Scientific Committee and is now known as 'Cooks River/Castlereagh Ironbark Forest' (hereafter abbreviated to 'CRCIF'). The Final Determination for CRCIF has been included as *Appendix 1.*

Small fragmented stands of Cumberland Shale Plains Woodland ('CSPW') - a component of the Cumberland Plain Woodland - once occurred at Rookwood, although these areas have gradually been reduced in size, while others have been incorporated into burial land (see *Figure 2.2*). Cumberland Plain Woodland ('CPW') is listed as a Critically Endangered Ecological Community ('CEEC') under the NSW *TSC Act*, while under the Commonwealth *EPBC Act* CSPW is similarly listed together with Shale Gravel Transition Forest as a CEEC[3].

[3] Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest gazetted as a CEEC in December 2009

More recent vegetation mapping by Tozer *et al.* (SCIVI 2010) and then by the Office of Environment & Heritage (OEH)[4] for the Sydney Metropolitan Catchment Area (2009/2013) have mapped the dominant vegetation community in the Necropolis as Castlereagh Ironbark Forest (see *Figure 2.2).*

NOTE: for the purposes of nomenclature, Castlereagh Ironbark Forest is considered to be equivalent to the EEC Cooks River/Castlereagh Ironbark Forest.

A number of other plant communities/associations occur at Rookwood. These include areas of:

- Degraded *Casuarina glauca* (Swamp Oak) Forest;
- Managed *Themeda australis* (Kangaroo Grass) Grassland;
- Artificial *Corymbia citriodora* (Lemon-scented Gum) Woodland; and
- Artificial *Eucalyptus saligna* (Sydney Blue Gum) Woodland.

Areas of managed (introduced) grassland, landscaped road verges and maintained garden beds also occur within the Necropolis, but the management of these areas is not prescribed in the BMP unless current management practices in these areas are likely to impact on remnant native bushland.

Remnant native vegetation at Rookwood (dominated by CRCIF and its variants) has been grouped into 14 separate Vegetation Conservation Areas, and for the past 10 years these VCAs have been the focus of the bushland management program. See *Section 4* of this BMP for details and management recommendations.

The current distribution of plant communities within Rookwood Necropolis is shown on *Figure 2.2* (OEH 2013) and *Figure 2.3* (UBM 2013).

[4] OEH was formerly known as DEC, DECC, DECCW, and prior, NPWS

Figure 2.2: Mapped Vegetation Communities (OEH 2013)

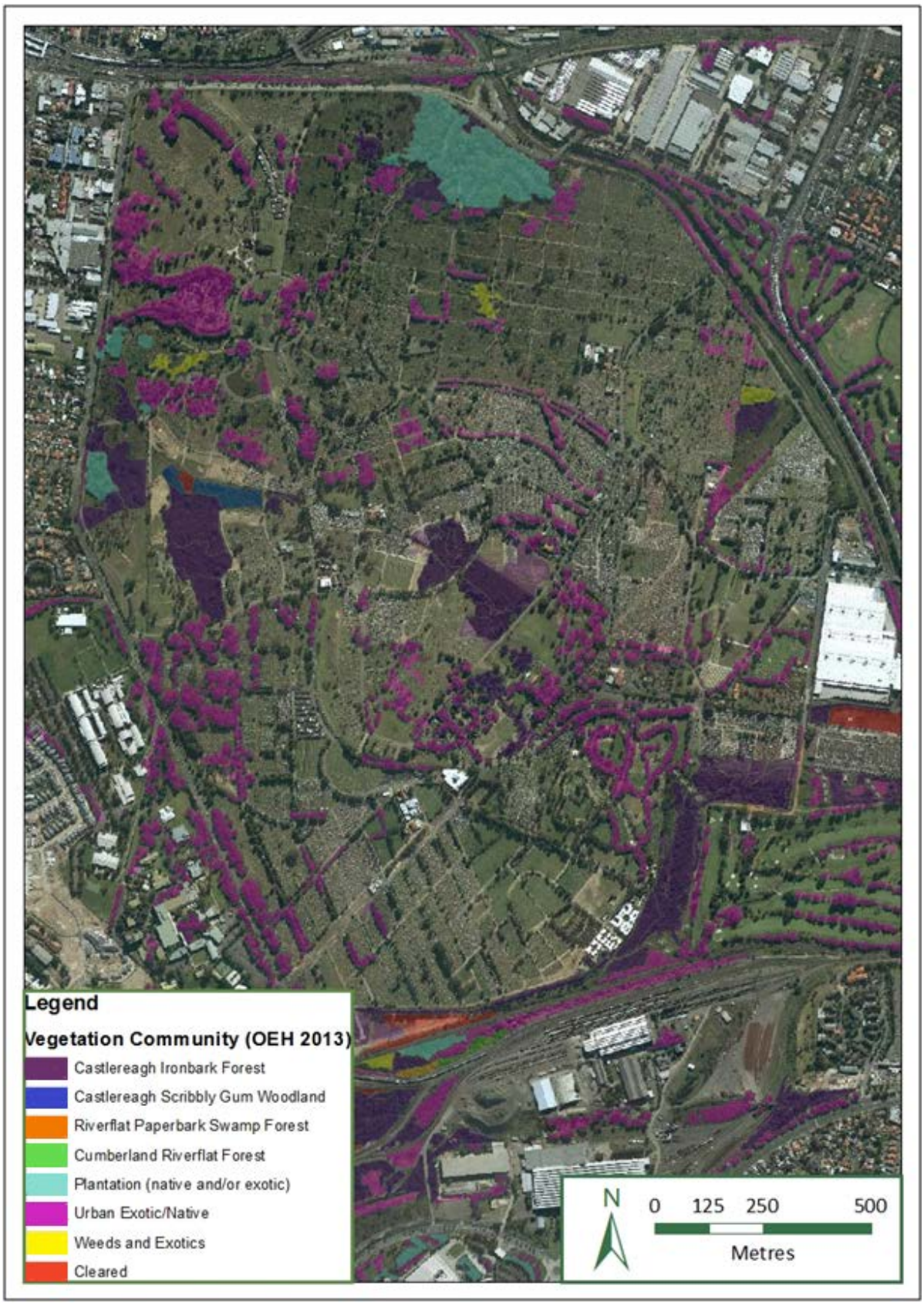
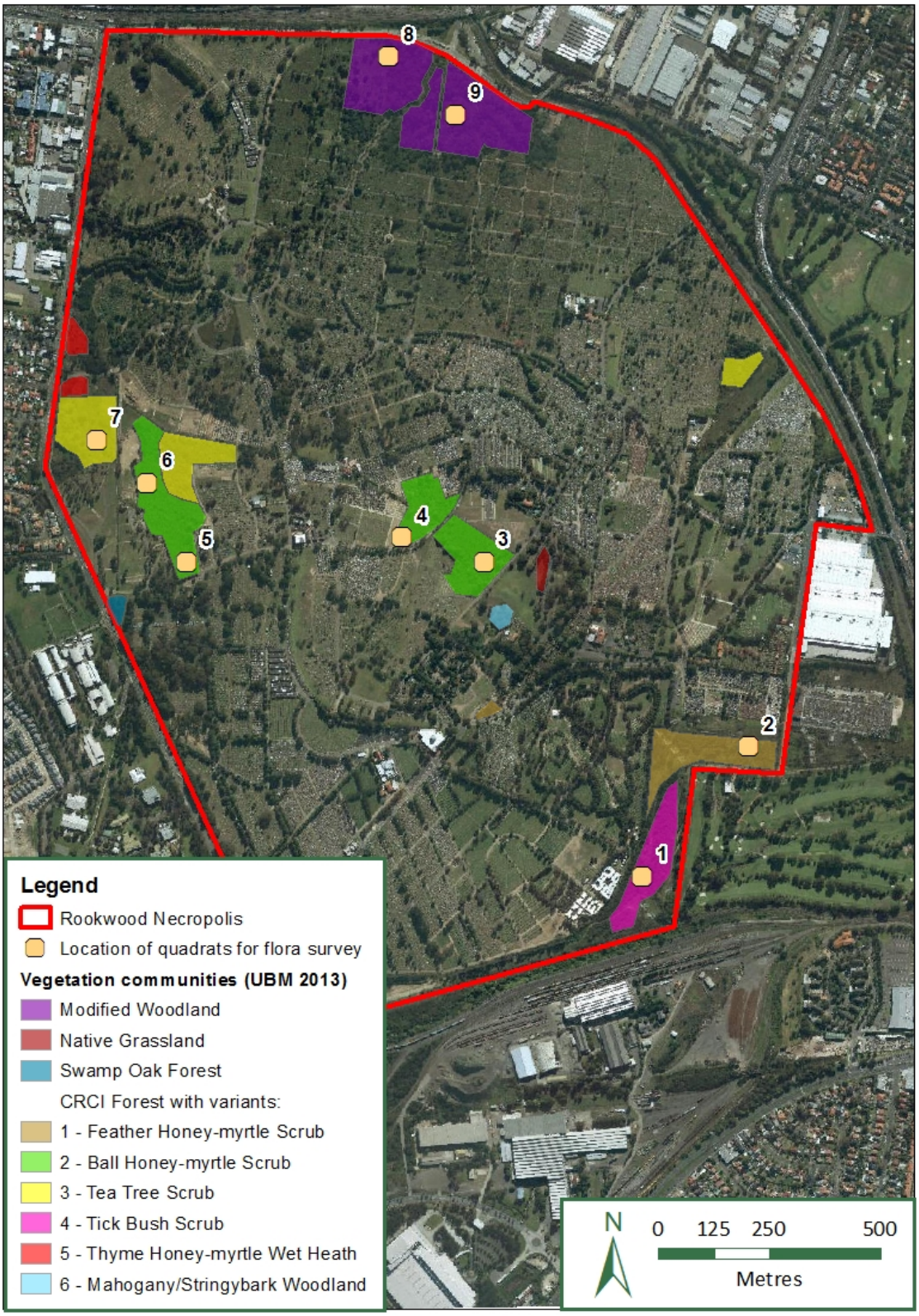


Figure 2-2: Plant communities & community variants mapped at Rookwood (UBM 2013) with locations of quadrats established for flora surveys (see *Appendix 2*)

*many of the grassland areas occurring are fragmented and small in size: therefore they have not been mapped



2.3.2 Indigenous Flora Species

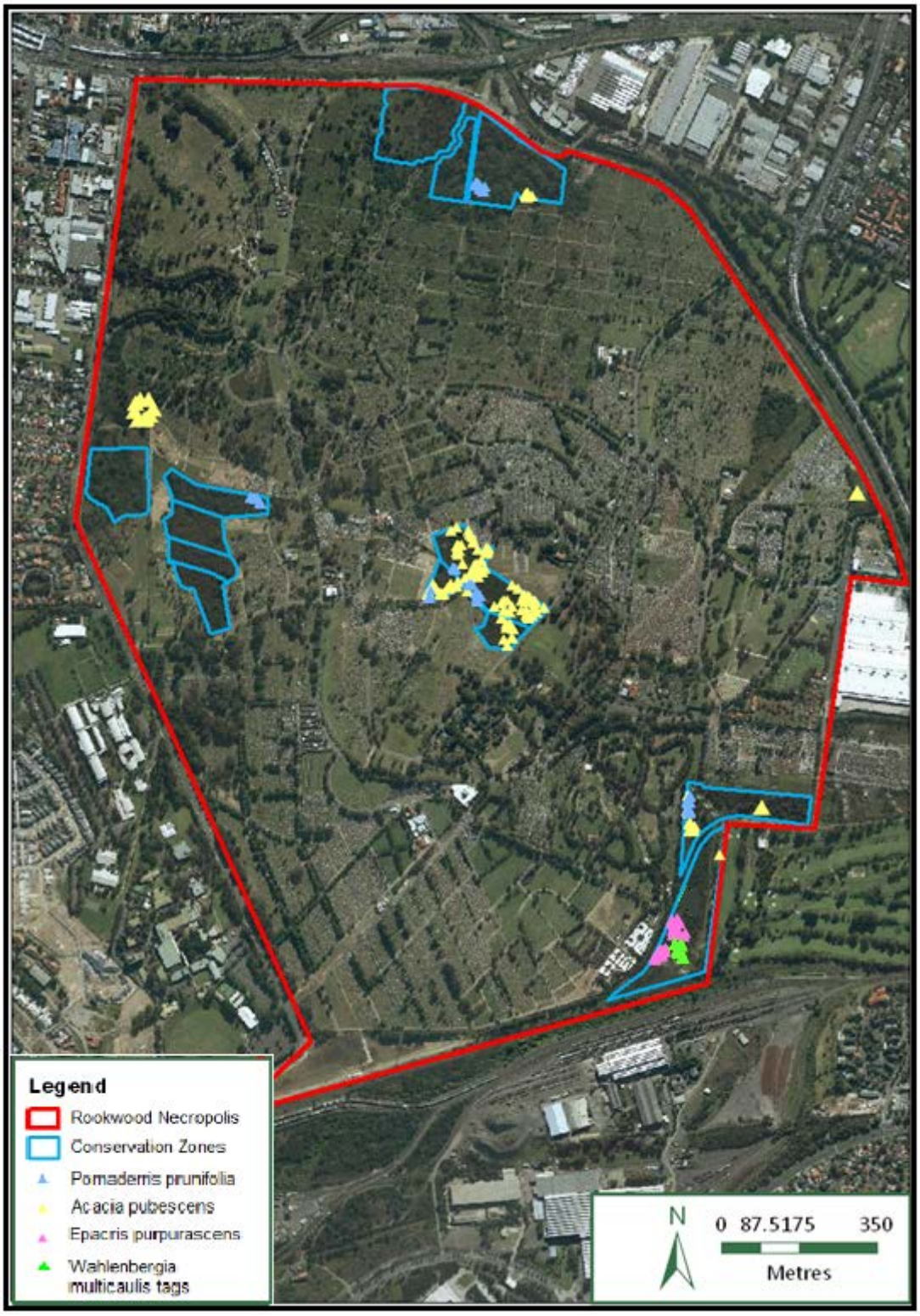
The *Biodiversity Studies Report* (UBM October 2013) recorded a total of 349 flora species for the Necropolis bushland. Of these, 211 species were considered to be locally indigenous species (~60.5%) and 138 (~39.5%) were horticultural introductions or weeds[5].

Four (4) EVNT species are known to occur within the Necropolis: *Wahlenbergia multicaulis* (Tadgell's Bluebell) – a threatened population; *Epacris purpurascens* var. *purpurascens* – a threatened species; *Acacia pubescens* (Downy Wattle) – a threatened species, and *Pomaderris prunifolia* – a threatened population.

For the past 10 years, these four (4) EVNT species have been the focus of the annual threatened plant census report prepared by UBM. Based on these annual surveys, it is noted that no new threatened species have been observed at Rookwood since the 1999 survey. The mapped locations of these threatened species at Rookwood are shown on *Figure 2.3.*

[5] Versus 237 indigenous and 164 introductions or weeds recorded by Smith & Smith 1999.

Figure 2-3: Location of Threatened Species & Populations within the Necropolis (2014)



2.3.3 Non-indigenous Species and Horticultural Introductions

As would be expected for a site which has a long history as a burial ground, and where a number of tree plantings and other landscaping programs have been on-going since Victorian times, Rookwood supports a highly varied and culturally significant landscape.

Of the 349 flora species recorded as part of the Biodiversity Study (2013), 138 species or 39.5% of the vegetation comprised introduced or non-indigenous species. Not all of these introduced plants can be described as weeds. Many large trees were originally planted as 'avenue trees' or 'specimen trees', while others small trees, shrubs and garden ornamentals have been made as grave plantings. It is however, acknowledged that some of these introduced ornamentals have spread into the remnant bushland, and in these locations they must be regarded as 'environmental weeds' and progressively removed from the VCAs.

Noxious Weeds

At least 17 plants declared as 'noxious weeds' in Auburn and Bankstown LGAs were recorded in Study Area (*Table 2-3*). These noxious weeds are generally concentrated in areas of disturbance (e.g. perimeters, tracks and trails, depots and stockpile sites) and along drainage lines, but can also be found dotted throughout good quality bushland where weed seed has been distributed by birds, foxes and other animals.

The bushland management program has to date included at least two (2) noxious weed sweeps through the Necropolis each year, so that any woody weeds that do occur are usually regenerating seedlings or young saplings. Blackberry is the most persistent woody weed; and it may be found as small to medium sized patches in a number of locations, especially on boggy soil. Herbaceous scramblers such as *Asparagus asparagoides* (Bridal Veil Creeper) are commonly found in the ground cover stratum. *Eichhornia crassipes* (Water Hyacinth) is restricted to a single pond on The Serpentine. *Opuntia* species (Prickly Pear) was found in Area 25, under the power lines.

Under the *Noxious Weeds Act 1993* (as Amended 2005) all landowners (whether private or public authorities) are required to control all noxious weeds on their own land, and to prevent their spread to adjoining properties. Actions required for each weed class are provided in *Table 2-3.*

NOTE: *Asparagus asparagoides*, *Eichhornia crassipes*, *Lantana camara* and *Rubus fruticosus* (aggregate) have all been declared as Weeds of National Significance ('WoNS').

Table 2-3: Noxious Weeds listed for Auburn/Bankstown LGAs and recorded at Rookwood

Scientific Name	Common Name	Class (*NW Act 1993*)	Status (Other)
Asparagus asparagoides	Bridal Veil Creeper	4	WoNS
Asparagus aethiopicus	Fern Asparagus	4	
Cestrum parqui	Green Cestrum	3	
Chrysanthemoides monilifera var. *monilifera*	Boneseed	4	
Cortaderia selloana	Pampas Grass	3	
Eichhornia crassipes	Water Hyacinth	2	WoNS
Hypericum perforatum	St John's Wort	4	
Lantana camara	Lantana	5	WoNS
Lantana montividensis	Scrambling Lantana	4	
Ligustrum lucidum	Large-leaved Privet	4	
Ligustrum sinense	Small-leaved Privet	4	
Ludwigia longifolia	Long-leaf Willow Primrose	3	
Ludwigia peruviana	Cape Primrose	3	
Olea europaea var. *cuspidata*	African Olive	4	
Opuntia sp.	Prickly Pear	4	
Parietaria judaica	Asthma weed, Pellitory	4	
Ricinus communis	Castor Oil Plant	4	
Rubus fruticosus (aggregate)	Blackberry	4	WoNS

Actions Required For Noxious Weed Classes

1 The plant must be eradicated from the land and the land must be kept free of the plant
2 The plant must be eradicated from the land and the land must be kept free of the plant
3 The plant must be fully and continuously suppressed and destroyed
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.
5 The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.

Environmental Weeds

Several dozen environmental (or bushland) weeds occur in the Necropolis Bushland. Some of these species have a legal designation as a 'noxious plant' in the local government area(s), while others are simply recognised as 'undesirable' in a bushland habitat.

Many of the 'weeds' occurring in the Necropolis Bushland are horticultural specimens originating from early landscape plantings in the burial grounds. *Watsonia angustifolia* (Pink Bugle Lily) is one such example. Introduced trees have been used as 'avenue plantings' and as themed plantings throughout the burial grounds. These trees create a signatory landscape features unique to Rookwood.

Ornamental trees naturalised in the Necropolis Bushland include *Corymbia citriodora* (Lemon-scented Gum) – a native of Western Australia - and *Cinnamomum camphora* (Camphor laurel). Other trees and large shrubs which have naturalised to a lesser degree include *Lophostemon confertus* (Queensland Brush

Box), *Pinus radiata* (Monterey Pine), *Rhapholepis indica* (Indian Hawthorn), and *Phoenix canariensis* (Canary Island Palm). *Eucalyptus saligna* (Sydney Blue Gum) - which is not indigenous to the Cumberland Plain - has been planted in Conservation Area 18 and now forms the dominant canopy stratum.

Introduced garden plants have also spread widely from the burial grounds. The most damaging and widespread of these is *Watsonia angustifolia* (Pink Bugle Lily); with other herbaceous species such as the garden ornamentals *Freesia refracta* and *Coreopsis lanceolata* (Coreopsis) are spread over a large area. The control of introduced grasses such as *Pennisetum clandestinum* (Kikuyu), *Paspalum dilatatum* (Paspalum) and *Eragrostis curvula* (African Love Grass) is on on-going problem, especially on edges sites.

It is also worth noting that some of Rookwood's most invasive environmental weeds are not declared as noxious weeds in Auburn or Bankstown, but they are so declared in a number of other Sydney local government areas. These include *Olea europaea* subsp*. cuspidata* (African Olive), *Tradescantia fluminensis* (Wandering Jew) and Watsonia. Inconsistency in noxious weed declarations throughout a physiographic unit or Region is a discrepancy in the *Noxious Weeds Act* which is currently being addressed.

In view of the environmental damage caused by both declared noxious and recognised environmental weeds, the BMP has listed a range of species for control and where possible, eradication in bushland areas (see *Appendix 3*).

Bushland condition (weed) maps were developed for each of the 14 VCAs and included in the *Biodiversity Studies Report* (UBM 2013). These maps are replicated in *Appendix 5* and *6* of the BMP.

A list of target or keystone weeds (both noxious and environmental weeds are included in *Appendix 4.*

2.4 Threatened Entities

2.4.1 Ecological Communities and Flora

Plant Community

The dominant plant community is CRCIF, which is listed as an 'Endangered Ecological Community' under the Schedules of the NSW *TSC Act* (Scientific Committee July 2002). Formerly widespread in Western Sydney, the community has now been reduced to 859 ha, or about 7.2% of its original distribution, with a further 3.6% remaining as scattered trees.

No examples of this community are reserved in dedicated conservation reserves, with most remnants being managed by local councils and/or private landowners. Some 11.4 ha of CRCIF remain within the

Necropolis, with an unquantified area containing degraded or scattered remnants (Smith & Smith 1999). Good quality CRCIF remnants at Rookwood represent about 1.304% of the total known community[6].

State and Nationally Significant Flora Species

Plant species of special conservation significance recorded at Rookwood include four (4) species listed under the *TSC Act* - *Acacia pubescens, Pomaderris prunifolia, Epacris purpurascens* var. *purpurascens* and *Wahlenbergia multicaulis*.

Regionally Significant Species

In addition to the above-named species, flora species recorded at Rookwood includes a further 95 species that are considered to be 'inadequately conserved' in Western Sydney, based on the assessments of the *Western Sydney Urban Bushland Biodiversity Survey* (James/NPWS 1997, James *et al.* 1999). These are species that are not known to occur in more than two (2) dedicated conservation reserves in Western Sydney, or adjacent sandstone areas.

Twenty-seven (27) flora species recorded at Rookwood are considered to have special conservation significance at regional level in Western Sydney. These are species identified as 'regionally significant' by James/NPWS 1997, James *et al*. 1999, plus other species from Rookwood that have not been recorded elsewhere in Western Sydney.

Two (2) significant flora species previously (1999) recorded at Rookwood - *Gonocarpus longifolius* and *Bothriochloa biloba*), have not located again, despite targeted searches.

2.4.2 Fauna Species

Early surveys at Rookwood recorded the presence of three (3) EVNT fauna species listed under the Schedules of the NSW *TSC Act:* the Common Bentwing-bat (*Miniopterus schreibersii*); Regent Honeyeater (*Xanthomyza phrygia*), and Green and Golden Bell Frog (*Litoria aurea*). Of these, only the Common Bentwing-bat (*Miniopterus schreibersii*) was recorded again during a subsequent survey (UBM 2013).

Of those species recorded in recent years:

- The Grey-headed Flying-fox (*Pteropus poliocephalus*), a seasonal visitor, is listed as 'vulnerable' under the *EPBC* and *TSC Act*s;
- The Eastern Bentwing Bat (*Miniopterus orianae oceanensis*) and Scarlet Robin (*Petroica multicolor*) are listed as 'vulnerable' under the *TSC Act;*
- The Rufous Fantail (*Rhipidura rufifrons*) and Clamorous Reed-warbler (*Acrocephalus stentoreus*) are listed as a 'migratory' species under the *EPBC Act*; and

[6] Calculated from figures provided by the NPWS July 2002

- The Peregrine Falcon (*Falco peregrinus*), Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*) and Smooth Toadlet (*Uperoleia laevigata*) are considered to be regionally significant within the Auburn Local Government Area

Although previously recorded and identified as "resident" animals (Smith and Smith 1999), species such as the Brown Quail, Jacky Winter, Richard's Pipit and House Sparrow are presumed to be locally extinct at Rookwood. If present, these readily identifiable birds should have been observed but despite targeted searches over different seasons, they were not located (UBM 2013).

The lack of detection of a number of the previously identified "resident" birds is considered to reflect the changes exhibited by the Study Area's fauna habitats over the last 14 years, particularly the extent and structure of those that are present. Portions of the Necropolis were noted to exhibit the removal of exotic shrub and ground covers species, clearing of vegetation and habitat reduction. These impacts not only remove habitat available to those birds previously recorded, but also provide greater opportunities for predation and competition with exotic species.

Since the completion of the Smith and Smith 1999 investigations, there has been a 22% reduction in the number of "resident" species previously detected (35 as opposed to 45 identified during the 1999 study). Seven (7) of the previously identified "resident" birds not recorded during subsequent surveys in 2013 are those that forage and nest within the ground cover and lower canopy layers. The loss and/or opening up of these layers for routine management purposes are considered to have caused the displacement and possible local extinction of these birds. This loss of habitat and reduction in faunal diversity is cause for concern.

2.5 Fauna Habitat Available within the Necropolis Bushland

One of the major objectives of any bushland management plan is the retention and enhancement of a habitat for native fauna. Wherever possible a variety of habitat types should be retained or created.

Four (4) habitat types available to native fauna were identified within the grounds of the Rookwood Necropolis, these being:

- A modified environment - which dominates the grounds of the Necropolis and includes those areas that are landscaped and regularly (*e.g.* lawns, gardens);
- Tall woodland – generally restricted in distribution and comprising (planted) trees with a mixed native/introduced understorey (*e.g.* VCAs 19 and 20);
- A low woodland/heathland - observed within the remaining parcels of remnant vegetation and comprising a predominantly native tree canopy and understorey (*e.g*. remaining VCAs); and
- An aquatic environment – comprising a series of brick-lined canals lines and the occasional pond, the latter supporting emergent and floating native and exotic aquatic vegetation.

For the purposes of the BMP, an assessment of fauna habitat values and recommendations to restore or enhance existing habitat has been presented in *Appendix 8.*

2.6 Wildlife Corridors

Due to extensive urban and light industrial development in the vicinity of Rookwood Necropolis there are limited opportunities for the dispersal of fauna in the Region (*Figure 2.4*). Flighted fauna, including birds and bats, are able to navigate across roads and residential/industrial properties from the Necropolis to other areas supporting native vegetation. Construction of roads and railway lines has resulted in large physical barriers to the dispersal of ground and arboreal fauna. Larger terrestrial fauna may attempt to cross these barriers, but are unlikely to be successful on numerous occasions.

The Cooks River flows in an easterly direction near the southern boundary of Rookwood Necropolis and into the Strathfield Golf Club. This riparian corridor may provide some dispersal opportunities; however, beyond the Golf Club the River is channelled and passes through residential properties.

Further from Rookwood Necropolis are Duck River, Sydney Olympic Park and Homebush Bay. These areas are likely to be utilised only by highly mobile species or those that that may only occasionally forage within the Study Area (*e.g.* the Grey-headed Flying-fox) (see *Figure 2.4*).

Given the large size of Rookwood Necropolis it is very likely that numerous species are permanent residents and rely exclusively on the resources available within the Study Area for survival. The most likely locations are the intact stands of CRCIF and the eucalypt woodlands.

Figure 2-4: Fauna habitat resources available in the Locality and potential flight corridors

A summary of flora and fauna conservation significance for Rookwood Necropolis is provided in *Table 2-4*.

Table 2-4: EVNT Flora and Fauna Species, Populations and Threatened Ecological Communities

Description	Species and/or Community	Conservation Status	
		EPBC Act	TSC Act
EVNT Flora Species	*Wahlenbergia multicaulis*	-	EP
EVNT Flora Species	*Epacris purpurascens* var. *purpurascens*	-	V
EVNT Flora Population	*Pomaderris prunifolia*	-	EP
EVNT Flora Species	*Acacia pubescens*	V	V
Endangered Ecological Community (CEEC)	Cooks River Castlereagh Ironbark Forest (CRCIF)	N/A	EEC
Critically Endangered Ecological Community (CEEC)	Cumberland Plains Woodland (* with Shale Gravel Transition Forest)	CEEC*	CEEC
EVNT Fauna Species	Grey-headed Flying Fox (*Pteropus poliocephalus*)	V	V
EVNT Fauna Species	Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*), Scarlet Robin (*Petroica boodang*)	-	V

Note: The PMP 2002 did not recognise any areas of Cumberland Plain Woodland at Rookwood. Subsequent assessment by various authors, (Tozer 2010 and Biosis 2014), identifies VCAs 19 and 20 as CPW. UBM 2013 Biodiversity Studies Report mapped this area as 'modified woodland', as this area did not meet the specific criteria for listing.

3 THE BUSHLAND PLAN OF MANAGEMENT

3.1 Overview

The first "Plan of Management for Indigenous Vegetation" was prepared by QEM in 1995; followed by the ''Indigenous Vegetation Management Plan'' (Landscan, 1996). Subsequently in October 2003, UBMC[7] prepared the "Bushland Plan of Management for Rookwood Necropolis" ('the Bushland PoM') to provide a framework for the implementation of the 1st PMP (Hassall 2002).

Active bushland management works has been carried out by professional bush regeneration contractors for several decades: in the late 1990s by the National Trust (NSW); from 1999 to 2009 by UBM Projects, and since 2009 by Ecohort Contractors.

Under the PMP (2002), Annual Bush Regeneration Progress Reports were prepared and submitted to the RNT and to OEH, which oversees the protection and management of EVNT entities in NSW. In November 2013, a 10-Year Review was prepared (DEM/Landscan/UBM 2013) which summarised the bushland management activities undertaken, and assessed the efficacy of the actions and strategies prescribed by the Bushland PoM

Among the recommendations of the 10-Year Review was a recommendation to prepare a new BMP to prescribe bushland management strategies for the next five (5) year period (2014-2019). The outcomes of the previous 10-year bushland management program have been assessed against the performance indicators of the PMP (2002), and the recommendations of the 10-Year Review. These recommendations have been incorporated into the new BMP.

3.2 Requirement for a New Bushland Management Plan

The first PMP (2002) expired at the end of 2012 and the new PMP requires the preparation of a new BMP which will set out management strategies, tasks and actions for the bushland management program over the next five (5)-year period.

The RNT has appointed UBM Ecological Consultants ('UBM') to prepare a new BMP. UBM has supervised bush regeneration activities since February 1996 and authored the previous Bushland PoM (2003). The new BMP has been prepared in consultation with Carolyn Tallents Landscan Landscape Architect, Principal Consultants to the RNT and responsible for the coordination of bushland management within the Necropolis. The new BMP (2015) has been prepared under the requirements of the NSW *TSC Act* and the Commonwealth *EPBC Act* and is subject to approval by the threatened species unit of OEH.

[7] now UBM Ecological Consultants - UBM

3.3 Objectives & Scope of Work

The BMP identifies specific strategies and actions to implement recommendations of the new PMP (Carolyn Tallents Landscape Architect – CTLA) for the conservation and management of the remnant bushland and EVNT entities within the Necropolis.

Prior to preparing the new BMP, a thorough review of the efficacy of the strategies and actions was carried out. Outcomes were reviewed against the performance indicators set out in the PMP (2002) and a series of recommendations were made to inform the new BMP. Outcomes and recommendations are fully detailed in the 10-Year Audit (DEM/Landscan November 2013).

Specific goals and objectives of the BMP are stated as follows:

- To implement the broad goals and objectives set out in the new PMP (CTLA);
- To comply with the requirements of environmental legislation, specifically the NSW *TSC Act* and *Noxious Weeds Act*; and the Commonwealth *EPBC Act.*
- To promote biodiversity conservation, and to maintain and enhance a variety of habitat types for use by native flora and fauna;
- To utilise horticultural intervention (*i.e.* bush regeneration methods) to ensure that the current indigenous plant species composition is maintained and enhanced;
- To maintain an up-to-date awareness of the conservation status of all future development areas within Rookwood and to modify the requirements of the BMP accordingly;
- To continue to promote research to increase the management options for Rookwood's indigenous vegetation;
- To encourage the development of sustainable management systems for application by the RNT; and
- To review the BMP every five (5) years after the date of acceptance of the Plan, and where appropriate, to revise goals, objectives and work strategies.

3.4 Activities of the Bushland Management Plan

3.4.1 Vegetation Conservation Areas

Given that Rookwood Necropolis was established as a burial ground in 1867, most of the Necropolis has been cleared of its original native vegetation and some areas have been cleared a number of times. However four (4) relatively large groups or 'Clusters' of native bushland remain *in situ* – these being predominantly regrowth forms which have regenerated over old burial grounds. The combined area of these Clusters is approximately 21 hectares (*see Table 3-2*).

These are described as the Vegetation Conservation Areas ('the VCAs'). The numbering, size and locations of these VCAs within the Necropolis are confirmed under the current BMP

Each of the VCAs represents a stand of remnant Cooks River Castlereagh Ironbark Forest ('CRCIF')[8] or one of its 'variants'. CRCIF is identified (*TSC Act*) as an 'Endangered Ecological Community ('EEC') requiring protection. An exception to this is the Northern Cluster which is considered by some authors to support remnants of the Critically Endangered (*TSC Act* and *EPBC Act*) Cumberland Plain Woodland, although the vegetation in this area has been greatly altered over time, and it is not possible to identify the pre-existing plant community with any certainty.

These bushland clusters have been numbered to provide a convenient method of identification - *Vis*:

- Northern Cluster – Comprises Two (2) contiguous Areas: Area 19 And 20;
- Western Cluster – Area 18 and contiguous Areas 7, 8, 27 and 28;
- Central Cluster – Areas 11/12 and 9/21/10 south; and
- Southern Cluster – Areas 6 and 25.

Small areas of open grassland also occur, especially in the north-eastern section of the Necropolis site, but these were generally too small and too scattered to map accurately.

Table 3-1: Size of Vegetation Conservation Areas

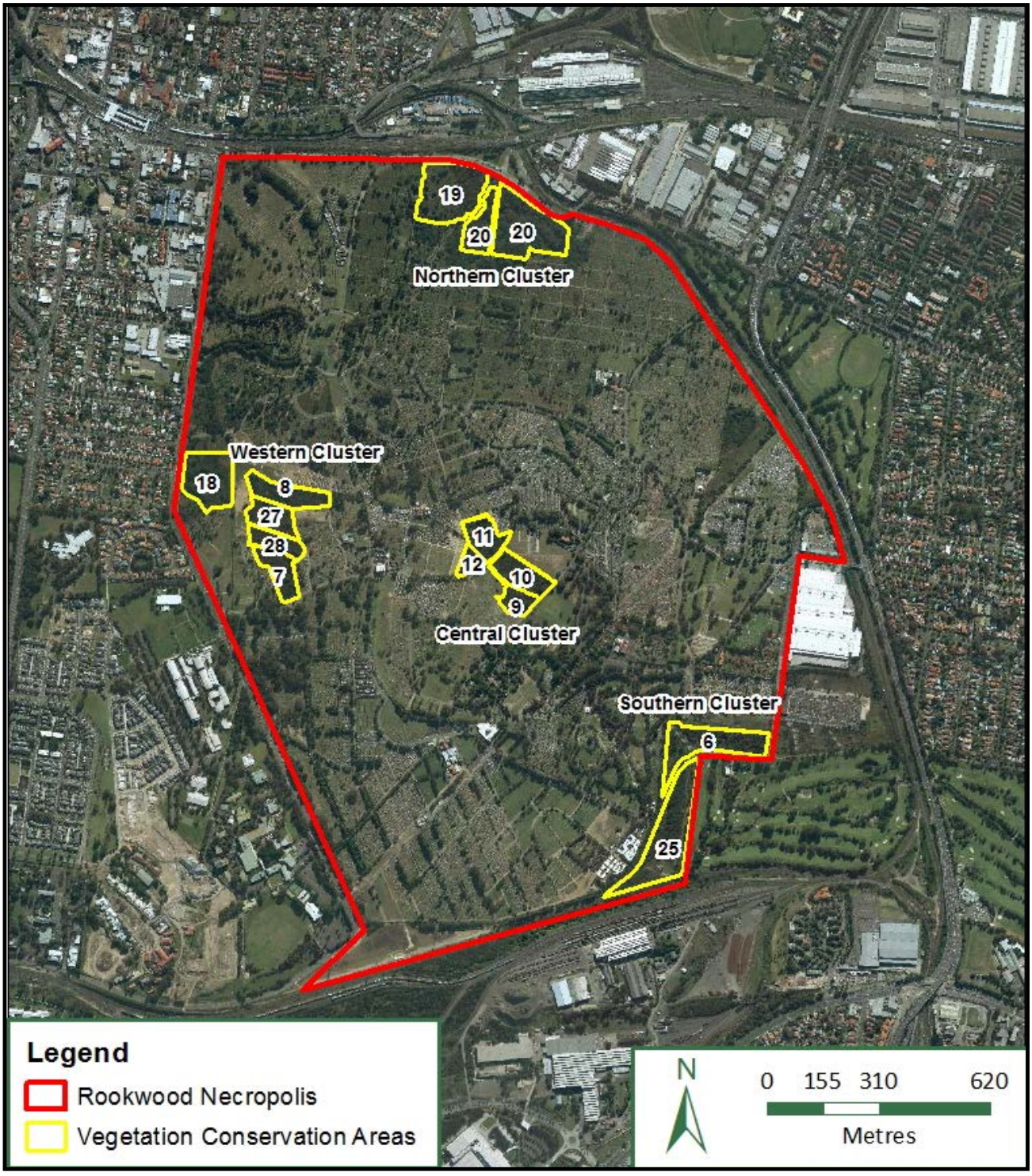
CLUSTER	CONSERVATION AREA	AREA (m^2)
Northern	19	25,130
	20	38,242
Western	7, 8, 27 & 28	40,920
	18	18,880
Central	9	6,176
	10	11,350
	11	9,359
	12	4,076
Southern	6	23,500
	25	30,004
	Total	207,637 **(~21 hectares)**

For details on the floristic integrity and biodiversity values of each VCA, please refer to the *Biodiversity Studies Report (*UBM 2013).

A summary of conservation values, management issues and recommendations for each of the 14 VCAs are set out in *Section* 4 of this BMP.

[8] CRCIF was previously listed as Cooks River Clay Plain Scrub Forest (CRCPSF)

Figure 3-1: Vegetation Conservation Areas at Rookwood



3.4.2 Threatened Species Management

Census Monitoring

The first PMP (2002) required the annual monitoring of 'threatened' species and population management'. Baseline data for *Acacia pubescens* and *Epacris purpurascens* var. *purpurascens* was provided in the flora survey carried out by P & J Smith in 1999. Additional data for *Wahlenbergia multicaulis*, *Gonocarpus longifolius*[9] and any *Pomaderris prunifolia* individuals located outside of the original population (the latter found only in Area 5 prior to its more recent translocation to other VCAs), was a requirement of the 2002 PMP.

The first Threatened Species Census carried out in 2003. An annual census has been carried out by UBM over the last 10 years of the PMP, with the last census in 2012. The outcomes are summarised in the 10-Year Review (DEM/Landscan 2013).

The 10-Year Review (November 2013) has recommended that monitoring/ census of threatened species at Rookwood be undertaken only every five (5) years, with the exception of *Wahlenbergia multicaulis* which will continue to be monitored annually. This schedule has been approved by the Office of Environment & Heritage (OEH).

Maintenance of Suitable Habitat

At least two (2) of the threatened species (*Acacia pubescens* and *Epacris purpurascens* var. *purpurascens*) which occur at Rookwood are 'pioneer' or early successional species – *i.e.* they respond to disturbance, and only occur on disturbed soils in open sunny sites where these is little competition from other plants.

In order to maintain suitable habitat for these threatened species, it has been necessary to arrest the overall bushland recovery process by culling native trees and shrubs and removing new seedlings as these would eventually over-shadow and/or out compete these early pioneers. Unless culling is undertaken, and suitable habitat conditions are maintained, it is likely that these threatened species will be lost from the above-ground biomass.

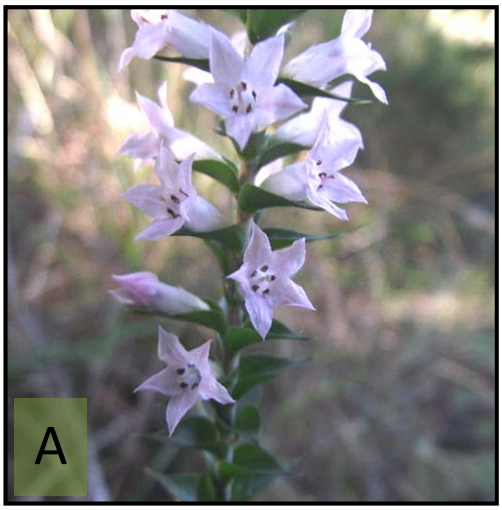
Native species that are regularly culled to maintain threatened species habitat include Ball Honey-myrtle (*Melaleuca nodosa*), Swamp Paperbark (*M. decora)*, Dagger Hakea (*Hakea sericea*), Parramatta Green Wattle (*Acacia parramattensis*) and Green Wattle (*Acacia decurrens*).

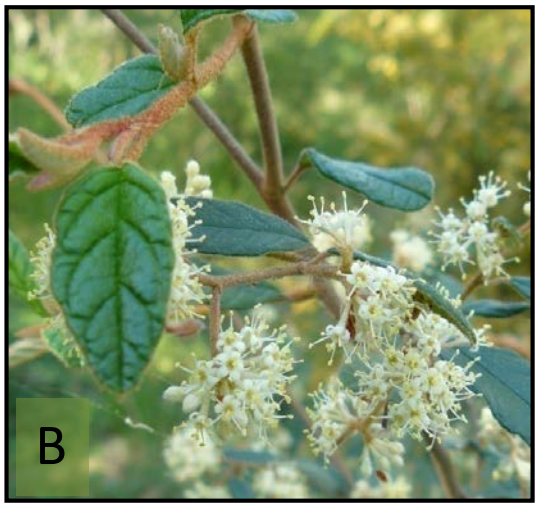
While it is true that if the natural regenerative process was allowed to proceed unchecked, plants would die off and possibly remain as seed or root material in the soil seed bank, the performance indicators of the PMP (2002) required the *above-ground biomass* of these threatened species to be maintained – in fact, to increase in number and area.

[9] *Gonocarpus longifolius*, nationally 'rare' (Leigh and Briggs) has not been seen at Rookwood since 1994 and is believed to be locally extinct.

The requirement to maintain/expand existing above-ground biomass for these pioneer species is not compatible with the natural bush regeneration process as regenerating trees and shrubs will eventually over-shade and out-compete smaller native plants. This successional process can only be arrested by culling native trees and shrubs to maintain the open sunny habitat suitable for these early successional species. This is time consuming and requires the expenditure of scarce resources. However, if such habitat is to be maintained for these selected species, then it will be necessary to continue manipulating structural elements of the habitat in which these species occur (see *Section 2.3.1*).

Plates: Top Row: *Epacris purpurascens* var. *Purpurascens* (LHS) and *Pomaderris prunifolia* (RHS). Bottom Row: *Wahlenbergia multicaulis* (Tadgell's Bluebell) (LHS); and *Acacia pubescens* (Downy Wattle) (RHS).





Source: Plates A, B and D; UBM Ecological Consultants and Plate C www.wildseedtasmania.com.au.

3.4.3 Increasing Biodiversity

In the absence of fire, the Central and Western Clusters have formed dense shrubberies, comprising mature and senescing *Melaleuca nodosa* and *Acacia* spp. Although some native species have established on edge sites where higher light levels are available, species diversity is acknowledged to be low overall. Native ground covers in the core areas are particularly sparse, but exotic ground covers like *Asparagus aethiopicus* (Fern Asparagus) which tolerates low light levels create an on-going maintenance problem. The core or interior areas are maintained by regular targeted 'weed sweeps'.

Trials to increase species diversity by culling native shrubs and small trees have been carried out on a relatively small scale in previous years. Results have been promising, so it is proposed to continue with this approach, with culling/clearing carried out in a mosaic fashion through each of the relevant VCAs. Quadrats (recommended @ 20 x 20 metres) will be marked out, cleared and edge sites or gaps will be planted. Monitoring to assess outcomes will be included in the Bush Regeneration Contractor's annual report. The amount of clearing completed will depend on the resources available for this work.[10]

3.4.4 Noxious and Environmental Weed Control

The bushland regeneration program at Rookwood has traditionally included noxious weed 'sweeps' throughout the entire Cemetery, targeting species listed in the Auburn/Strathfield and Bankstown Local Government Areas and gazetted under the NSW *Noxious Weeds Act 1993/2005* (see *Section 2.3.3*).

Target species include: *Lantana camara, Ligustrum* spp (Privets); *Cestrum parqui* (Green Cestrum), *Chrysanthemoides monilifera ssp monilifera* (Boneseed), *Asparagus* spp., *Opuntia* sp. (Prickly Pear) and the woody aquatic *Ludwigia peruviana* (Cape primrose). However from the 2014-2015 working year, noxious weed sweeps will be confined to the VCAs; and noxious weed control in other parts of the Necropolis will revert to the grounds staff employed by the Cemetery Trusts.

Keystone environmental weeds are also treated within the VCAs. These include species that are not declared as noxious plants in either Strathfield or Auburn Local Government Areas but are so-declared elsewhere in the Sydney Region and are therefore considered to be a threat to native bushland. These include (but are not exclusive to): *Olea europaea* subsp. *cuspidata* (African Olive); *Cinnamomum camphora* (Camphor laurel), *Rhapholepis indica* (Indian Hawthorn) and *Genista monspessulana* (English Broom).

Bushland condition (weed) maps were developed for each of the 14 VCAs in late 2013 as part of the *Biodiversity Studies Report* (UBM 2013). These maps are replicated in *Appendix 5 and Appendix 6*. A list of target or keystone weeds (both noxious and environmental) is also included as *Appendix 7.*

[10] Culling of dead/dying Acacia in Area 7 has already commenced, with a view to replanting suitable shrubs and ground covers in the cooler winter months. Suitable plant material has been propagated from material on site and is available from the Rookwood Nursery.

3.4.5 Cultural Plantings

The Rookwood Necropolis Plan of Management (DPI 2014) describes Rookwood as a place with a long and layered history which is reflected in a variety of physical and intangible elements. Rookwood Necropolis is acknowledged as a place of outstanding cultural and environmental heritage significance. Not only does it contain habitat for rare and endangered native plant species but it also comprises a unique environment of social, genealogical, landscape and architectural significance. The scale of design, design features, use of plants, 'gardenesque' layout, high quality and diversity of structures, monuments and detailing of the oldest sections of the Necropolis represent a rare surviving example of mid to late 19th century planning, design, layout and ideals for a major public cemetery. The choices of plants in the older sections of the Necropolis demonstrate Victorian and Edwardian era funerary etiquette and fashion by way of plant symbolism (DPI 2014).

Many of these early plantings have spread unchecked and have naturalised in the Necropolis bushland. They are therefore regarded as 'weeds' when they occur in the VCAs, and saplings and seedlings are removed as part of the bushland management program. These include non-indigenous native species such as *Corymbia citriodora* (Lemon-scented Gum), *Acacia saligna* (Sickle-wattle), *Lophostemon confertus* (Queensland Brush Box) and *Eucalyptus saligna* (Sydney Blue Gum) as well as (exotic) horticultural plantings such as *Cinnamomum camphora* (Camphor laurel), *Agave americium* (Century Plant) and *Pinus radiata* (Monterey Pine). The need for their on-going control in bushland areas continues to contribute to higher than normal maintenance costs, but it is stressed that there is no suggestion that any of these cultural plantings should be removed from the Necropolis *per se.*

3.4.6 Fauna Species and Habitat Management

*The Biodiversity Studies Repor*t (UBM 2013) identified a 22% loss in the number of resident species previously identified at Rookwoo*d (*(35 as opposed to 45 species identified during the 1999 Smith & Smith study). Seven (7) of the previously identified 'resident' birds not recorded in 2013 are those that forage and nest within the ground cover and lower canopy layers (see *Section 2.4.2*). The loss and/or opening up of these layers as part of routine maintenance activities in the intervening 14 years are considered to have caused the displacement and possible local extinction of these birds.

A number of recommendations set out in the *Biodiversity Studies Report* (UBM 2013) are designed to arrest or reverse this trend, and to improve fauna habitat in the Necropolis generally. The most important of these are:

1. Declare a moratorium on further clearing of CRCIF and other bushland remnants, especially those known to provide good habitat for native flora and fauna. The bushland within the Necropolis has already been significantly reduced since the 1999 Smith & Smith Report.
2. Restore connectivity between remnants wherever possible through selected indigenous planting and landscaping (*e.g.* along canals/roadsides). Those remnants remaining in the four (4) main 'Clusters' are already isolated from one another and this limits the movement of genetic material (pollen/seed) between remnants and movement for native fauna other than for highly mobile birds and arboreal species

3. Reduce tracking and creating of new tracks, and avoid opening up new areas within the remnants, thus encouraging the spread of weeds and facilitating the movement of feral animals (foxes, hares, rabbits, cats). Tracks leading into bushland also encourage illegal dumping.

Appendix 8 of this BMP provides an assessment of existing fauna habitat values at Rookwood; identifies those species likely to utilise these habitats, and provides a series of recommendations for enhancement and modification.

3.4.7 Fire Management and Ecological Burning

A *Fire Management Plan* was developed for the Necropolis by Bushfire Environmental Services in 2004. Despite the adoption of this Plan, for various reasons attempts to use fire as a management tool at Rookwood have not been successful.

The *Angophora bakeri* Woodland in Conservation Area 28 was burnt some years ago (vandalism) and has been monitored since that time. The site continues to recover well and there is a good diversity of native ground covers present, indicating that the controlled use of fire would be a very useful tool to stimulate natural regeneration and increase biodiversity values.

In November 2007, a number of ecological burns were conducted in Conservation Area 19. This burn was conducted with the assistance of the NSW Rural Fire Brigades in accordance with the *Fire Management Plan* developed for the Necropolis (BES 2004). Monitoring of the quadrats located in the burnt sections of Area 19 was undertaken about eight (8) months apart (December 2007 and August 2008). No monitoring was undertaken in 2009-2010 or in 2010-2011 pending action by the NSW Bushfire Brigades to resume the burning schedule. In 2012, a small trial burn by Ecohort Contractors using a hand-held 'flame thrower' was carried out in Areas 19 and 20 but this burn proved to be too small and too cool to achieve the described results.

Despite every effort since 2007, it has not been possible to get the NSW Fire Brigades to commit to conducting follow-up burns at Rookwood. Enquiries made to other potential contractors both in the Sydney District and further afield have also been unsuccessful because of problem related to compliance with the clean air regulations. Because no further burns have taken place, monitoring of these early burn plots has been suspended.

Although the use of fire is a valuable management tool and would be relatively inexpensive to implement, unless alternative arrangements can be made to undertake regular ecological burns as recommended under the *Fire Management Plan* 2004, this part of the bushland management program may have to be abandoned.

3.4.8 Salvage, Plant Propagation and Planting

Plant material has been salvaged from areas proposed for clearing and burial as part of the bushland management program. This provides an opportunity to conserve local genetic material and it also reduces costs by providing plant material for bushland restoration. Other areas undergoing routine maintenance

(*e.g.* digging for drains or roadwork) are also identified for salvage. The decision to salvage native plant material before areas are cleared for other purposes is a good example of the cooperative effort established between the various Trust managers, their grounds staff, and the bush regeneration contractors. Over the past decade successful transplants have included native grasses and other herbaceous species, with most of these placed into Area 6 South or into other degraded sites.

Indigenous seed collection was carried out by the bush regeneration team at Rookwood over the first eight (8) years of the PMP under license from OEH, and this was undertaken on a collaborative basis. Seeds were stored and propagated by the Rookwood horticulturalist for use on site, as required. However, over the last two (2) years these activities have not been possible because the horticulturalist position was not filled after the previous occupant left.

Future plans to collect seed and propagate tubestock for use in degraded sites within the VCAs (and elsewhere, as required) will depend on available resources. However, in the current 2014-2015 working year, the bush regeneration team will continue to collect suitable indigenous seed on an *ad hoc* basis and arrangements will then be made to provide local seed to the Strathfield Community Nursery to grow on as tubestock. Supply will depend on money being available to grow tubestock to order.

Salvage and transplanting of native grasses and other ground covers as opportunities arise is an inexpensive way to provide local plant material for the rehabilitation of degraded sites and to reinforce edge sites. The BMP recommends that salvage continue as part of the bushland management program.

3.4.9 Translocation of Indigenous Species within the Necropolis

Efforts to translocate and therefore to preserve local genetic plant material have been on-going at Rookwood for the past several decades. Bushland management works have routinely incorporated seed collection and propagation of tubestock for rehabilitation planting, but have also included the translocation of small herbs and native grasses. Several attempts have been made to transplant orchids but these have generally not been successful.

Cumberland Plain Woodland

The first translocation at Rookwood was carried out circa 1999 when backhoe-sized divots of what was then described as Cumberland Plain Woodland (CPW)[11] were translocated from an area on Haslem Drive proposed for clearing. These were placed in a pre-prepared recipient site and monitored over a period of two (2) years. The activity was successful in translocating native grasses, herbs, and small shrubs.

The donor site was located in the General Cemetery area and was subsequently identified in the PMP (2002) as a Vegetation Area to be released. The recipient site bordering the paupers' cemetery has not been maintained since 2002 due to its reduced conservation status. However, it has not been buried so that genetic material from the critically endangered CPW has been conserved. This approach has

[11] Now reclassified and included in the CRCIF ecological community

significant merit for the conservation of genetic material and the BMP recommends that other opportunities for the translocation of species or groups of species should be explored as opportunities arise.

Pomaderris prunifolia

The PMP (2002) has as one of its requirements the successful establishment in dedicated VCAs of *Pomaderris prunifolia* – a 'Vulnerable' population under the TSC Act and known to occur only in VCA 5 - a narrow strip of land between the Roman Catholic and Muslim Cemeteries since released for burial. Translocation was undertaken between 2003 and 2009, with the final recipient site being Area 6 (south) in the southern part of the Necropolis. Seed collected from the original transplants was used to propagate tubestock, which was then planted into a number of other VCAs.

In total, 48 advanced *Pomaderris prunifolia* were planted during the 2011-2012 working year, thus meeting the PMP requirement to propagate and/or translocate this species into other suitable sites within the Necropolis bushland. The *Pomaderris prunifolia* were planted into Areas 8, 10, 11, 12 and 20. Plant losses have been minimal, with only three (3) specimens known to have died. *Figure 3-2* provides an overview of *Pomaderris prunifolia* advanced tubestock and saplings planted out by the Bush Regeneration Contractors

There are no more *Pomaderris prunifolia* seedlings available for planting. Surplus plants were provided to Bankstown City Council to supplement an existing population in The Crest Reserve and to Mt Annan Botanic Garden.

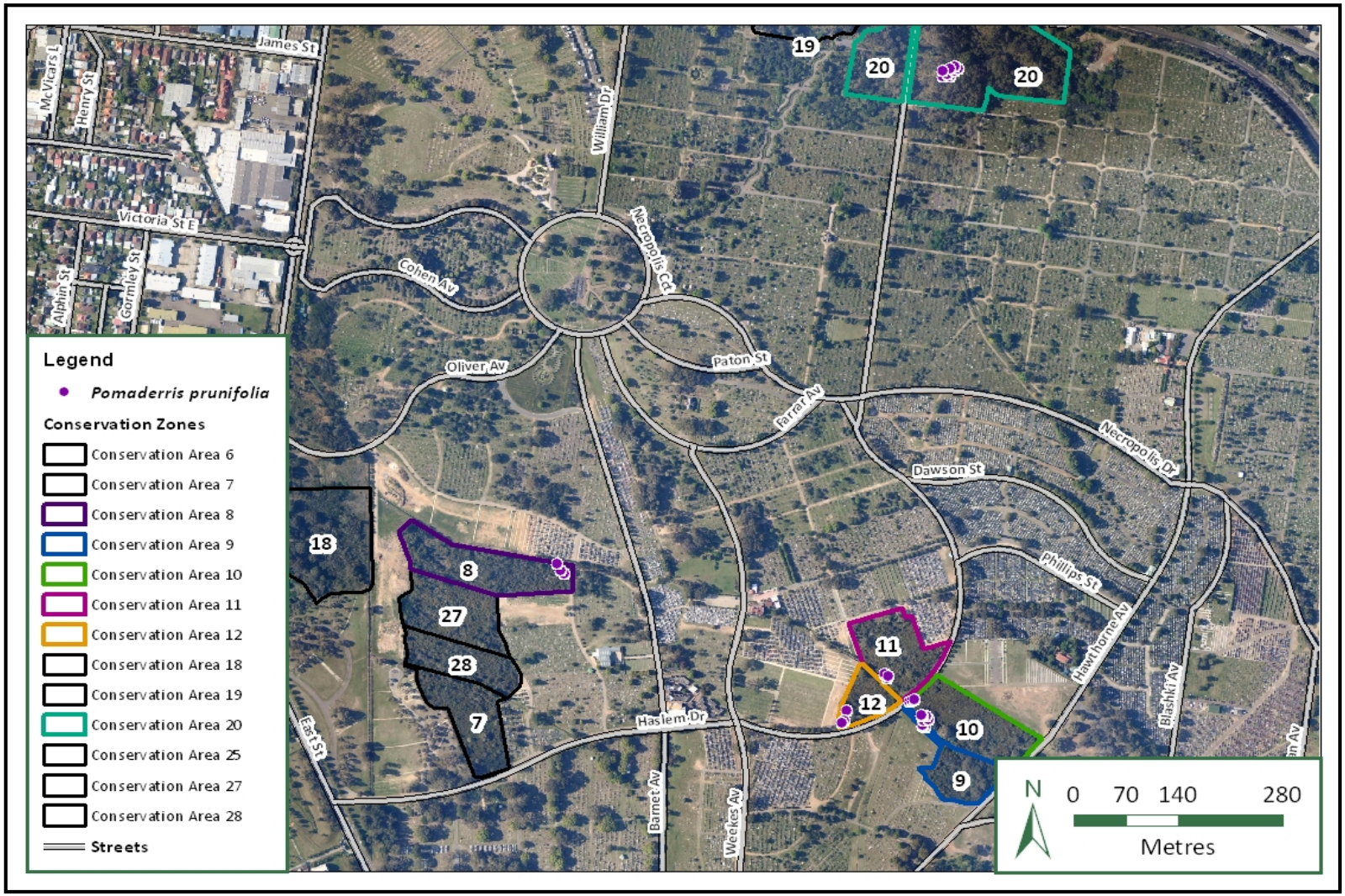
The BMP recommends the on-going monitoring and management of the translocated *Pomaderris prunifolia* for the next five (5) years. Routine maintenance to all transplants (weeding, disease control) will be required, particularly as this species seems to be subject to attack by red spider mite. A translocation history at Rookwood has been provided in *Table 3-2.*

Table 3-2: Translocation History

Year	Species Translocated	Donor Site	Recipient Site	Current Status	Comments
1999	Cumberland Plain Woodland species	General Cemetery area on Haslem Drive	Pauper Cemetery off Necropolis Drive (near Strathfield Gates	Abandoned after two (2) years with no further monitoring Currently overgrown with weeds but many original plants still surviving.	The activity was very successful in translocating native grasses, herbs, and small shrubs.
1996-present	Orchids, various grasses	General Cemetery (non-VCA)	Area 6 (south) and other sites	Not monitored	
2003- 2004*	*Pomaderris prunifolia* – 4 juveniles plus topsoil and leaf litter	Area 5	Area 4	N/A	Two (2) mature plants occurred in Area 5. Establishing of translocated plants one or more VCAs was a condition of the PMP (2002
2009	Four (4) juvenile *Pomaderris prunifolia,* plus topsoil and leaf litter	Area 4	Area 6 (south)	Six (6) plants established, flowering and seeding	Two (2) seedlings from soil seed bank (now established). Areas 6 (south) source of seed material. Some of original transplants are senescing: one is dead
2010	*Pomaderris prunifolia* – seed collected from transplants in Area 6 (South)				Tubestock propagated by Strathfield Community Nursery
2011-2012	*Pomaderris prunifolia*: 48 saplings grown from seed collected from original transplants		VCAs 8, 10, 11, 12 and 20.		

* The *Pomaderris prunifolia* translocation program is described in the 2008-2009 and 2009-2010 Bush Regeneration Annual Reports.

Figure 3-2: Location of *Pomaderris prunifolia* var. *prunifolia* in Conservation Areas



3.4.10 Management of Buffers and Edge Sites

An interface (or buffer) zone is usually a narrow strip of land between the bushland and development or another adjoining land use. Interface zones will vary in width, depending on adjoining land uses. The interface zone may be topsoiled and turfed and include edged and mulched garden beds, footpaths or parking areas, however, the interface zone is always vulnerable to the impacts of development. Such impacts include weed invasion and colonization by introduced garden plants and turf grasses; overland runoff (often containing fertilisers and other pollutants), tracking and damage to vegetation by walkers, incursion or 'mower creep'; rubbish dumping and disposal of lawn clippings.

Interface zones are often by default considered to be *de facto* bushland, and the land manager goes to lengths to exclude access, but management regimes for interface or buffer zones should be different to those applied to conservation areas. For example, in some situations it may be appropriate to under-scrub or mow this area as a bushfire protection measure, to maintain it as open parkland by removing selected shrubs or small trees, or it may be landscaped with non-invasive 'fire retardant' species (at least those which are marginally less flammable). Whatever landscape treatment is adopted, it must be recognised that the interface zone will have a high edge to core ratio, thus presenting an extended front (or edge) to the impacts of urbanisation. A higher level of site maintenance will therefore be required.

At Rookwood, each of the four (4) VCA Clusters has a high 'edge to core' ratio and each is particularly vulnerable to external impacts. Where VCAs are internally separated by canals, road or tracks this significantly increases edge impacts. Consequently all such areas will require a higher level of maintenance than the internal or 'core' bushland.

In general, garden beds and lawns should not be located next to bushland without some form of hard edge or buffer being installed (*e.g.* footpath or cement edges). The erection of a permanent barrier at the interface (*e.g.* cement edges, bollards/treated logs) to provide a 'spray' or 'mowing edge' between gardens/lawns and bushland is strongly recommended. Edges and Interface zones should be maintained and garden debris (*e.g.* lawn clippings) should never be disposed of in bushland.

Canals should also be managed as 'edge sites' and special attention given to weed control in these usually open sites. In some locations, bushland has regenerated up to the canal edges. In these locations regular monitoring to see if tree/shrub roots are exposing the brick-lined canals to damage.

NOTE: that where perimeter fences have been installed along edge sites, this often makes mowing/slashing difficult, providing inadequate grass control. These issues will have to be resolved with appropriate edge design solutions.

To reduce edge impacts, consider planting the first 2-3 metres of the interface zone with a dense cover of small shrubs (<1 metre in height) and low ground covers using hardy native grasses/sedges: this is the preferred treatment for track edges rather than applying frequent herbicide applications.

Where edges are paved or gravelled, they should be graded so that water *drains away* from bushland, and runoff is directed into a spoon (or catch) drain. Path edges are best managed by a dense planting of low-growing native grasses or sedges which will serve to intercept water flowing from the paved surface. Dense ground cover planting will also serve to suppress weed growth.

The land use and length of edges around a VCA area increases its maintenance requirements, particularly where they are adjacent to exotic grasses (lawns) or exotic planting areas (gardens). VCA's are best consolidated into large interrupted areas with a low edge to core ratio, thus creating a shape which provides a minimal edge to core ratio (rounded or oval shapes are best). The new Property Management Plan (draft 2015) recommends that the maintenance levels required for the VCA's can be reduced in the following ways:

- Reduce irregular shapes by consolidating small or isolated remnants; avoid pedestrian tracks or roads through core bushland, and attempt to connect adjacent VCA's by selective planting in gaps or by negotiating a potential 'trade-off' area to unconnected areas;
- Manage edge conditions to reduce seed/silt spread by overland runoff - *e.g*. install silt fencing, weed matting downslope of garden areas, and/or plant buffer zones or buffers outside the VCA;
- Provide a hard paved edge or barrier where lawns are planted adjacent to of a VCA – *e.g.* a concrete edge to exclude grass runners or root barriers to exclude unwanted woody plants;
- Ensuring water flow and overland runoff from hard surfaces and developments higher in the catchment are not directed into in bushland in a VCA;
- Wherever possible maintain pre- development drainage regimes - (development may constitute new roads, pathways, burial areas, building and watered planting areas); and
- Control and remove unauthorised dumping of materials as they are identified - including garden waste, rubble and building material, and monumental mason debris. Design potential dumping areas out of the Cemetery by limiting vehicular access to areas that are sensitive or vulnerable to external impacts.
- Maintain stockpile sites by covering with black plastic (or similar) or periodically over-spraying with a selective herbicide to control weeds and prevent their spread.

3.5 Tracking and Fragmentation

There are a number of informal roads and tracks throughout the Cemetery; some of these running parallel, into, and through core bushland. Where vehicles can gain access these tracks allow for rubbish dumping and other inappropriate activities. Attempts have been made to shut some tracks and restrict vehicle access, and some of the VCAs have been fenced, but rubbish dumping continues in many parts of the Cemetery. Perimeter and edge sites are particularly badly impacted by illegal dumping. Weed debris generated by weekend workers and unwanted vegetation stockpiled by maintenance staff also adds to the visual pollution.

The retention (or otherwise) of existing tracks will be decided in consultation between the Project Manager and the RNT and is expected to form part of the Rookwood Necropolis Landscape Master Plan (in preparation). It is recognised that recreational opportunities may be provided by installing tracks or boardwalks through bushland. However, one of the basic tenants of bushland management is to avoid fragmenting large stands of vegetation and wherever possible to reduce edge effects; which increase exponentially wherever roads or tracks are installed.

Also, it must be recognised that creating new tracks through bushland will increase maintenance costs as weeds will be brought in by walkers and/or will invade by wind and/or water along these pathways. If tracks or boardwalks are considered desirable from a recreational viewpoint, then additional resources will have to be allocated for maintenance; for both the tracks and boardwalks and for vegetation management.

3.5.1 Control of Runoff and Drainage Issues

Rookwood Necropolis is situated on a gently undulating rise to the south of the Parramatta River (maximum height 47 metres ASL). Drainage lines create minor incisions in the local landscape, although at Rookwood most of these been canalised in a series of brick-lined drains. The north-western side of the Necropolis drains to Haslams Creek, with slopes of 3 - 4%, while the eastern side drains to Powells Creek. Both creeks drain to the Parramatta River. The southern part of the Necropolis drains to Freshwater Creek, which flows into the Cooks River. The base of the rise on the southern side has slopes of less than 1%, and the low grade and clayey soils result in long periods of water logging.

The often-boggy nature southern slopes and swales has encouraged the formation of dense Melaleuca thickets, and where such areas have been maintained as open grassland, thickets of Blackberry and other moisture tolerant weeds are common occurrences. Such boggy areas will always require a higher level of maintenance to control weeds than other, better-drained areas. For example, yearly treatment to control Blackberry regrowth (a noxious weed) should be standard land management practice.

Overland flow also has major implications for weed dispersal, particularly for the spread of Watsonia as the small 'cormlets' are carried large distances in runoff water. In some parts of the Necropolis (*e.g.* western slopes) virtual 'rivers' of *Watsonia bulbillifera* (Watsonia) flow downslope, suggesting that a gravelled buffer zone or other form of (maintained) physical barrier would be effective in trapping propagules before they reach bushland.

It is however noted that seasonal flowering of Watsonia is one of the significant visual attractions at Rookwood. This Plan does not propose to remove Watsonia or other flowering bulbs from the formal burial area; but rather to restrict their entry into the Vegetation Conservation Areas where they serve to choke out and displace the native ground covers.

3.5.2 Other Issues

Wind-blow Rubbish and Contractor's Debris

The major rubbish problem is wind-blow debris from burial areas, mainly comprising flower wrappings, paper and other small pieces articles. In some locations, visitors to the Necropolis throw dead flowers and their containers into bushland. These problems are on-going.

While this rubbish may not actually damage the bush, it looks unsightly, and the practice should be strongly discouraged. Further, there is some evidence that pieces of plastic ingested by birds, small reptiles and other animals may be responsible for injury or death.

Similarly, unprotected edge sites encourage the disposal of garden debris and other unwanted material into the bushland. Such practices, widely acknowledged to be 'damaging' to the bushland, are a constant problem, particularly when new grounds staff are employed. There is a need for a formal Protocol to be agreed between the Trusts, and for periodic training sessions for all grounds staff.

A formal Memorandum of Understanding was signed in early 2014 between the RNT and other key stakeholders in the Necropolis. This MoU provides for the management and maintenance of areas outside the designed Vegetation Conservation Area, but it is understood that to date, for a variety of reasons, this has not been successful.

Cooperative Management with Trust Grounds Staff

In combination with the items previously mentioned there will be economies of scale and sharing of expertise if complete cooperation and coordination between individual Trust managers occurs. This may extent to sharing equipment, purchase and sharing of mulching materials or use of brush matting to restore an area. However, shared information on the control of noxious and environmental weeds will be critical to managing unwanted vegetation (weeds) throughout the Necropolis.

Under the MoU (2014), management of the VCAs will continue to be the responsibility of the professional bush regeneration contractors, while control of noxious weeds will devolve onto the individual Trusts. Control of noxious weeds is a legal responsibility under the NSW *Noxious Weeds Act* (see Table 2-3 of the BMP)

Regular managers' meetings which allow for discussion of all of the issues discussed in this BMP should be scheduled at least quarterly.

Control of Feral Animals and Pest *Species*

Populations of introduced fauna (rabbits, hares, foxes domestic dogs and feral cats) are known to inhabit or frequent the Necropolis Bushland. Control measures are required to protect native fauna, particularly ground-dwelling animals and small birds which are particularly vulnerable to predators.

Rabbits and hares also have a major impact on the bush regeneration and revegetation programs, often destroying large numbers of seedlings and juvenile plants within a short time. Herbivory substantially increases both planting and establishment costs, and retards the bushland rehabilitation program.

Control programs for feral animals and pest species should be established by the RNT as a standard item, and resources allocated in the annual budget to allow for the implementation of these control programs. It is understood that the last feral animal control program (rabbits and hares) was carried out some years ago and has not been repeated.

4 BUSHLAND MANAGEMENT – THE VCAS

Profiles for the fourteen (14) VCAs have been created to outline the key features of each area, highlight the site specific management issues relating to each conservation area and propose recommendations to minimise and/or mitigate these issues.

For each VCA, the following has been provided:

- Maps showing the location of the VCA within the Necropolis and the condition of bushland;
- Site details, including reference to other reports and management plans;
- A table providing site-specific management considerations;
- A summary of recommendations for future management; and
- Selected Plates.

It is envisaged that *Section 4* could be detached from the larger report and provided to the bush regeneration contractor implementing the BMP as a guide to on-ground works[12]. It may also provide useful information for other workers/contractors undertaking work within the Necropolis.

NOTE: Cooks River Castlereagh Ironbark Forest described by Tozer *et al*. (2010) equates to Castlereagh Ironbark Forest described by OEH (2013).

[12] Note this does not replace the 'works program' or 'action plan' required to be prepared at the commencement of each working year by the bush regeneration contractor employed to implement the BMP.

4.1 Vegetation Conservation Area 19

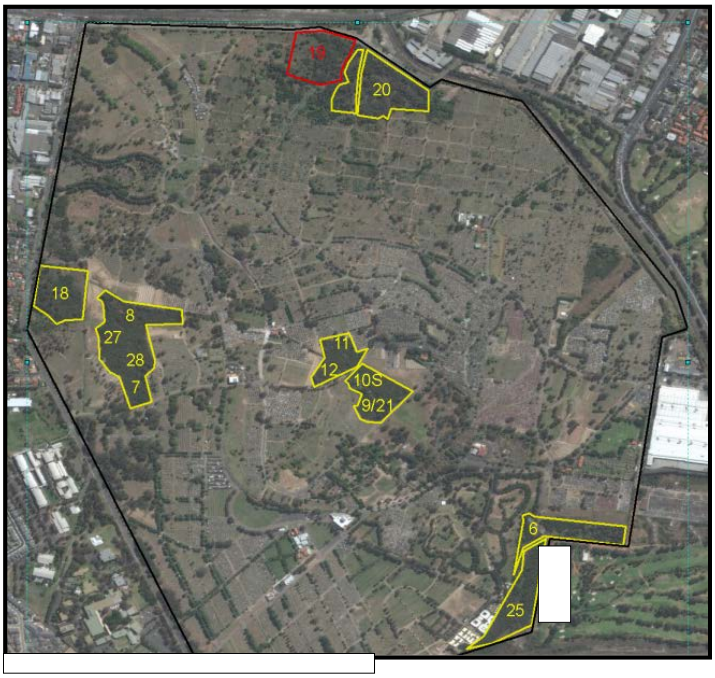


Table 4-3: Management Considerations for VCA 19

Zone Location/Cluster:	**VCA 19 (Northern Cluster)**
Management Unit (Plan of Management, DPI 2014):	3
Size of Zone (m^2):	14,834
Vegetation Community:	Plantation/Weeds and/or Exotics (OEH 2013) Modified Woodland. Applebox-Tea Tree-Hakea Scrub. Possibly remnant/degraded Cumberland Plain Woodland and/or Shale Gravel Transition Forest (UBM 2013). Also described as Artificial *Themeda australis* grassland as it is understood to have been planted some years ago.

Condition of Site:	**General Comments:**	All of Area 19 has been buried Adjacent to northern boundary. Bordered by Area 20 to the east, graves to the south and west and Railway Street to the north. Consists largely of open grassland dominated by Kangaroo Grass with scattered scrubs and sub-canopy species volunteering from nearby woodland.
	Bushland Condition Assessment:	See Map
Water bodies and drainage lines:		Brick lined canal – The Serpentine
Threatened Species Considerations:		None
Fauna Habitat:		For details of fauna habitat and resources available in VCA 19 refer to *Appendix 8.*
Noxious Weeds:		*Asparagus* spp., *Chrysanthemoides monilifera* var. *monilifera, Lantana montevidensis, Rubus fruticosus, Cestrum parqui*
Environmental Weeds/Garden Escapes:		*Agapanthus* sp, *Agave* sp (canal edges), *Freesia refracta, Watsonia bulbillifera, Coreopsis lanceolata*, *Corymbia citriodora*, *Cinnamomum camphora* (saplings), *Vinca major*, *Pennisetum clandestinum* & *Eragrostis curvula*.
Horticultural Plantings		Majority of canopy trees are very old planted specimens and include *Lophostemon confertus*, *Corymbia citriodora*, *C. maculata*, and various eucalypts including *E. cladocalyx* & *E. microcorys* (see *Appendix 3*, T 8).

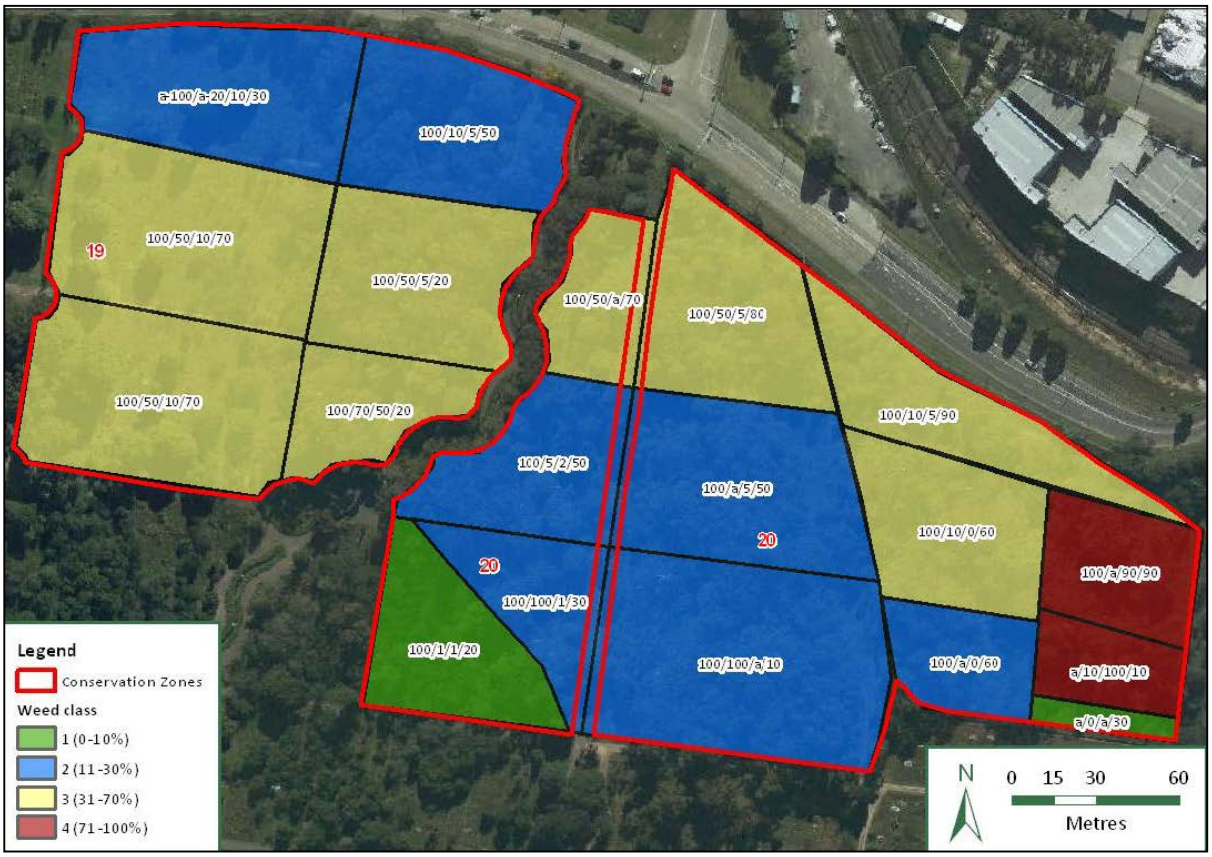
Table 4-4: Overview of Management Recommendations for VCA 19

Priority of Implementation	Management Recommendations	Refer to Section
1	Maintain diversity of habitats (open grassland: tall/low woodland)	3.3.3
2	Continue to cull *Acacia parramattensis* & *Corymbia citriodora* to create additional habitat and encourage the growth of native shrubs and ground covers.	3.3.2/3
3	Encourage diversity of native ground covers: recommend mosaic weeding with 20 x 20 metre quadrats and monitor results	3.3.3

4	Secondary/target weeding of noxious and environmental weeds (as above) with special attention to edge sites (mainly exotic grasses)	3.3.4
5	Potential to plant native tubestock on edges sites and to transplant native ground covers (grasses and forbs) into sites where gaps are created by the removal of exotic ground covers.	3.3.8
6	Periodically check aquatic habitats (ponds/canals) for native wildlife	3.3.6
7	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
8	Maintain photo-points (yearly photographs required)	Section 5.4
9	Maintain historic cultural plantings (tree canopy) but remove new seedlings as required	

Figure 4-3: Condition of Bushland (weed) map – Areas 19 & 20

(Source: Biodiversity Studies, UBM 2013)



4.2 Vegetation Conservation Area 20

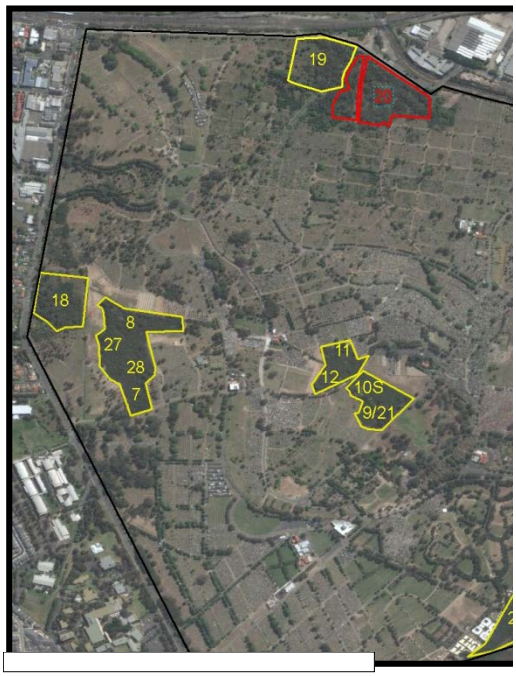


Table 4-5: Management Considerations for VCA 20

Zone Location/Cluster:		**VCA 20 (Northern Cluster)**
Management Unit (Plan of Management, DPI 2014):		3/4
Size of Zone (m^2):		47,762
Vegetation Community:		Plantation/Weeds & Exotics (OEH 2013) Modified Woodland. Applebox-Tea Tree-Hakea Scrub Possibly remnant/degraded Cumberland Plain Woodland and/or Shale Gravel Transition Forest (UBM 2013). Also described as Artificial *Eucalyptus citriodora* Woodland.
Condition of Site:	**General Comments:**	Adjacent to northern boundary. Bordered by gravesites to the south; stockpile and dumping

		area to the east, Area 19 to the west and Railway Street to the north. Open woodland dominated by Lemon-scented Gum. Understorey dominated by Watsonia in the southeast corner adjacent to stand of *Acacia pubescens*. Track running east-west is a source of weed infestation/access for dumping.
	Bushland Condition Assessment:	See map
Water bodies and drainage lines:		Brick-lined canal – Anglican East Branch
Threatened Species Considerations:		*Acacia pubescens* a species listed as Vulnerable (*EPBC Act* and *TSC Act*) and *Pomaderris prunifolia* (a Vulnerable population under *TSC Act* (translocated from seed propagated from plants in Area 5)
Fauna Habitat:		For details of fauna habitat and resources available in VCA 20 refer to *Appendix 8.*
Noxious Weeds:		*Rubus fruticosus, Ligustrum sinense, Lantana montevidensis, Asparagus spp.*
Environmental Weeds/Garden Escapes:		*Crocosmia x crocosmiiflora*, *Wisteria sinense* and *Coreopsis lanceolata*, *Vinca major*, *Freesia refracta*
Horticultural Plantings		*Araucaria bidwillii.* Majority of canopy trees are planted specimens, including, *Lophostemon confertus*, *Corymbia citriodora*, *C. maculata*, and various eucalypts including *E. globulus*, *E. cladocalyx* and *E. microcorys* (see *Appendix 3*, T9).

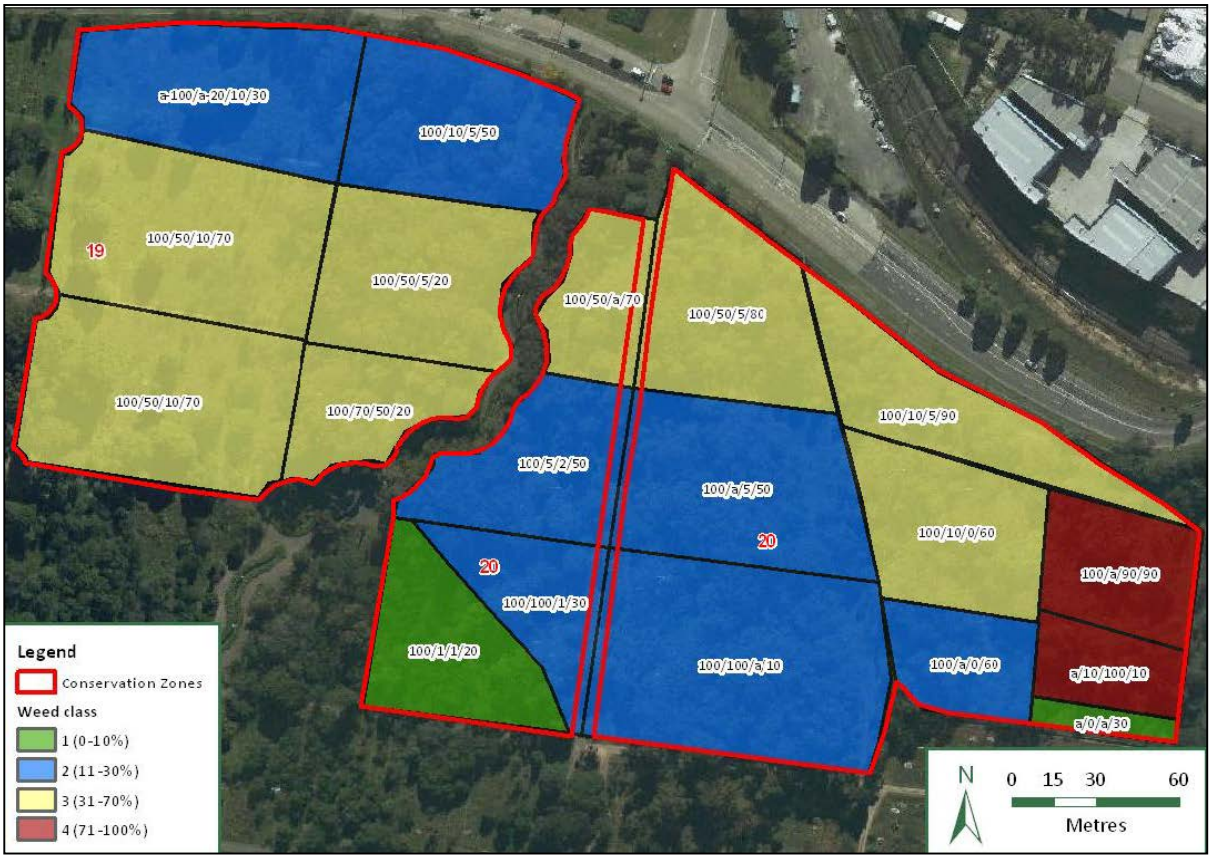
Table 4-6: Overview of Management Recommendations for VCA 20

Priority of Implementation	Management Recommendations	Refer to Section
1	Continue culling of *Corymbia citriodora* (set target 10-15% pa): clear in mosaic fashion using 20 x 20 m quadrats	3.3.2/3
2	Maintain plantings of *Pomaderris prunifolia*	3.3.8
3	Secondary/target weeding, targeting noxious and environmental weeds (e.g. *Coreopsis lanceolata, Freesia refracta*, *Crocosmia x crocosmiiflora*)	3.3.4
4	Spot spray exotic grasses on edges sites (*Pennisetum clandestinum*, *Eragrostis curvula*): if tubestock available plant out edge sites	3.3.10

5	Monitor large stand of *Acacia pubescens* and GPS any new specimens/outliers observed	3.3.2
6	Revegetation: plant new canopy trees (replacement *for C. citriodora*) and other natives (estimated 880 tubestock required)	3.3.8
7	Potential to transplant native ground covers (grasses and forbs) into sites where exotic ground covers are removed	3.3.8
8	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
9	Maintain photo-points (yearly photographs required)	Section 5.4
9	Maintain historic cultural plantings (tree canopy) but remove new seedlings as required	

Figure 3-4: Condition of Bushland (weed) map – Areas 19 & 20

(Source: Biodiversity Studies, UBM 2013)



4.3 Vegetation Conservation Area 18

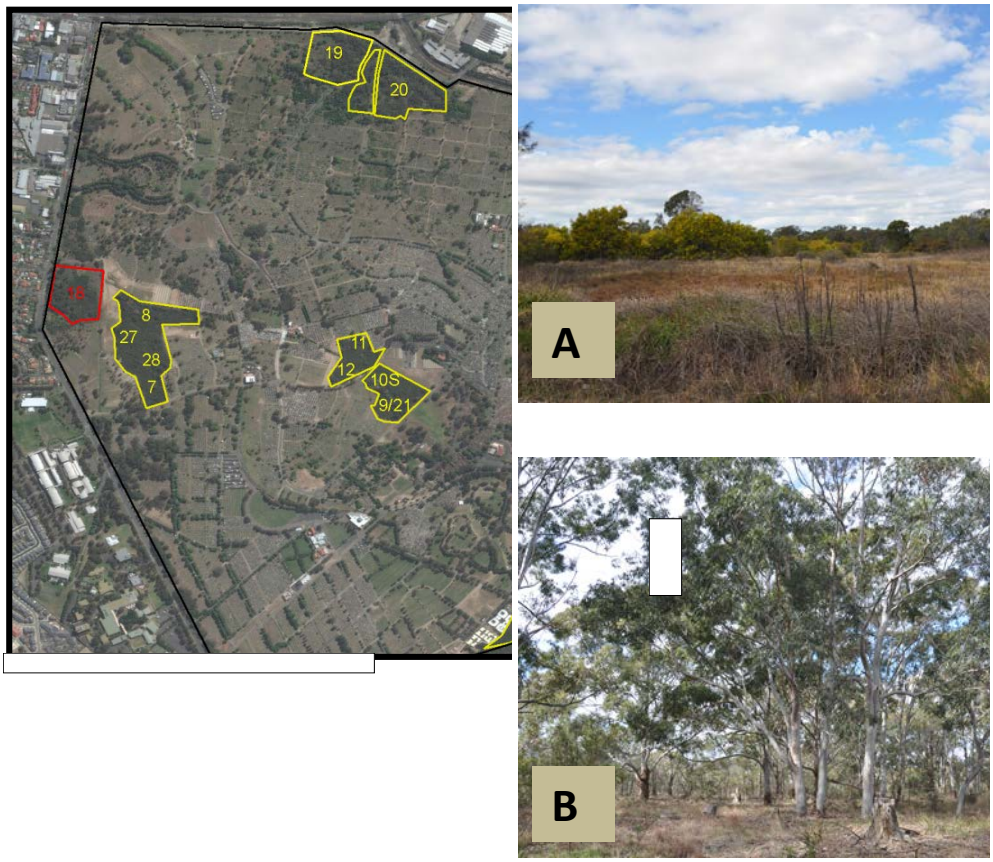


Table 4-7: Management Considerations for VCA 18

Zone Location/Cluster:	**VCA 18 (Western Cluster)**
Management Unit (Plan of Management, DPI 2014):	11
Size of Zone (m^2):	18,880
Vegetation Community:	Castlereagh Ironbark Forest: Weeds and Exotics (OEH 2013)

		Tea Tree Scrub: Applebox-Tea Tree-Hakea Sc rub T6-9 (UBM 2013) Possibly degraded Cumberland Plain Woodland
Condition of Site:	**General Comments:**	Adjacent to western boundary. Area bordered by canal to the east, Areas 16 and 17 (future gravesites) to the north, a buffer zone, and gravesites to the south and an access trail to the west. The western section consists largely of woodland dominated by Sydney Blue gum. The eastern side adjacent to the canal is heavily infested with Watsonia. Gravesites are present within the conservation area.
	Bushland Condition Assessment:	See Map
Water bodies and drainage lines:		College Branch of canal to south and east
Threatened Species Considerations:		Two (2) EVNT flora species, *Acacia pubescens,* listed as Vulnerable (*EPBC Act* and *TSC Act*) and *Epacris purpurascens* var. *purpurascens* listed as Vulnerable (*TSC Act*)
Fauna Habitat:		For details of fauna habitat and resources available in VCA 18 refer to *Appendix 8.*
Noxious Weeds:		*Asparagus* spp*, Lantana montevidensis, Rubus fruticosus, Cestrum parqui*
Environmental Weeds/Garden Escapes:		*Eucalyptus saligna, Pinus radiata, Coreopsis lanceolata*, *Watsonia angustifolia, Polygala myrtifolia, Ipomoea indica*, *Genista monspessulana* and exotic grasses
Horticultural Plantings		*Araucaria bidwillii, Corymbia citriodora, E. robusta* and *Syncarpia glomulifera* (*Appendix 3*, T7)

Table 4-8: Overview of Management Recommendations for VCA 18

Priority of Implementation	Management Recommendations	Refer to Section
1	Progressively cull *E. saligna* and replace with local native canopy trees	3.3.2/3

2	Aim to increase species diversity by mosaic clearing and replanting with appropriate tubestock: maintain plantings	3.3.3
3	Target weeding of noxious and environmental weeds (as above)	3.3.4
4	Continue with Watsonia herbicide trials: document and report	3.3.4
5	Monitor stand of *Acacia pubescens* and report new plants/outliers	3.3.2
6	Focus edge treatments on eradication of exotic grasses: replace with divots of native grasses where available	3.3.10
7.	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
8	Maintain photo-points (yearly photographs required)	Section 5.4
9	Consider excising some of the most degraded area (see yellow on Figure 4-3) and swapping for nearby land containing *Acacia pubescens*.	

**In the absence of fire, a more aggressive approach to bush regeneration in the Western Cluster is required to increase biodiversity in all strata.*

Figure 4-5: Condition of Bushland (weed) map – Area 18

(Source: Biodiversity Studies, UBM 2013)

4.4 Vegetation Conservation Area 8

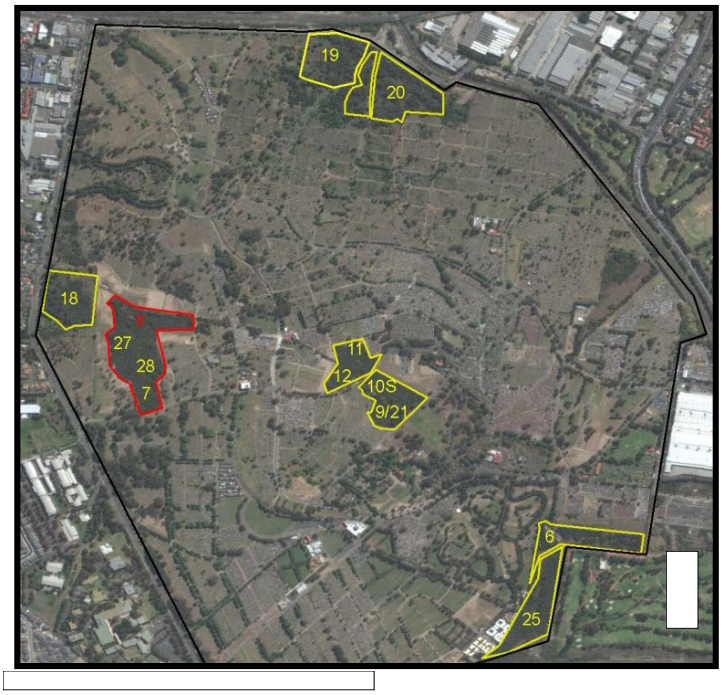


Table 4-9: Management Considerations for VCA 8

Zone Location/Cluster:	**VCA 8 (Western Cluster)**

Management Unit (Plan of Management, DPI 2014):		11
Size of Zone (m^2):		10,185
Vegetation Community:		Castlereagh Ironbark Forest & Castlereagh Scribbly Gum Woodland (OEH 2013) Ball Honey-myrtle Scrub T3-6 (part) (UBM 2013) and Applebox-Tea Tree-Hakea Scrub T6-9 (UBM 2013)
Condition of Site:	**General Comments:**	Western side of Rookwood north of Haslem Drive. Bordered by canal and Area 23 to the north, Area 27 to the south, gravesites to the southeast and east and a cleared area to the west. The vegetation shows a marked sandstone influence and consists of low open forest dominated by Melaleuca species. Casuarina stand on the northern boundary suggests poor drainage. Internal tracks (now serving as drainage swales) promote spread of Watsonia bulbs in runoff water: consider closure and rehabilitation
	Bushland Condition Assessment:	See Map
Water Bodies and Drainage Lines:		Western Cluster is bordered by three (3) canals: Crematorium, Barnet and Rookwood Main Branches
Threatened Species Considerations:		*Pomaderris prunifolia* (a Vulnerable population under *TSC Act*(planted from seed propagated from Area 5)
Fauna Habitat:		For details of fauna habitat and resources available in VCA 8 refer to *Appendix 8.*
Noxious Weeds:		*Asparagus* spp, *Chrysanthemoides monilifera* var. *monilifera, Cortaderia selloana, Lantana montevidensis, Lantana camara, Rubus fruticosus.*
Environmental Weeds/Garden Escapes:		*Watsonia bulbillifera*, *Acacia saligna* (seedlings), *Polygala myrtifolia* and *Coreopsis lanceolata*.
Horticultural Plantings		*Corymbia citriodora* and *Eucalyptus scoparia (Appendix 3,* T6*)*

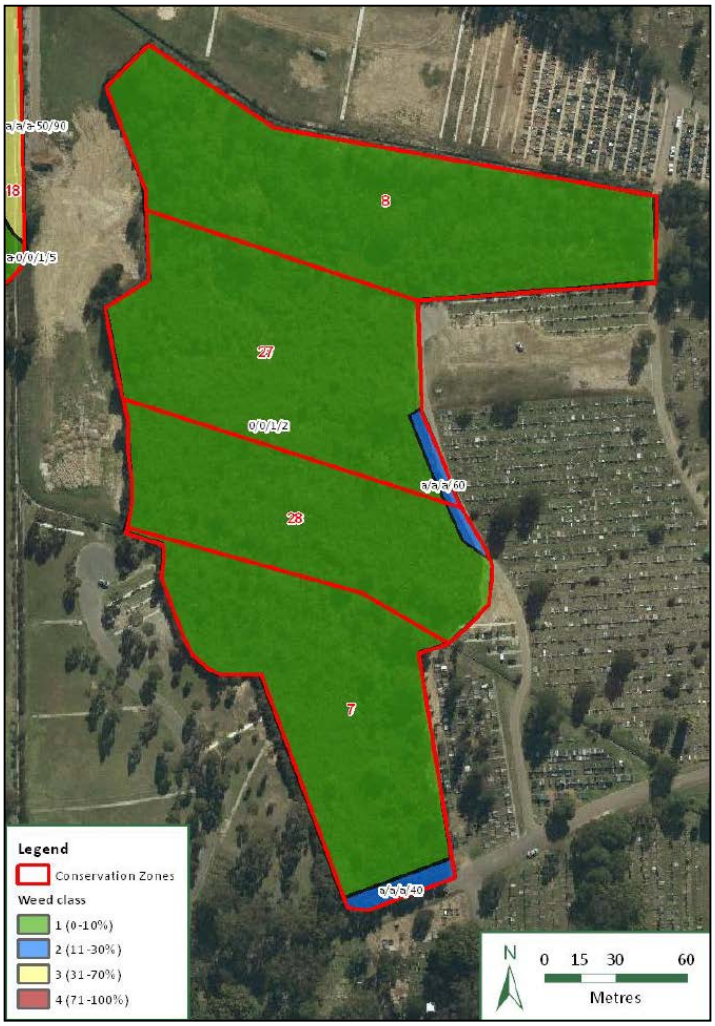
Table 4-10: Overview of Management Recommendations for VCA 8

Priority of Implementation	Management Recommendations	Refer to Section
1	Increase biodiversity by culling *Melaleuca nodosa* thickets: mosaic clearing pattern advised: potential target 10-15% clearing pa. Suggest clearing in 20 x 20 m quadrats.	3.3
2	Continue to cull *Pittosporum undulatum* to create light windows:	3.3.3
3	Secondary/target weeding of noxious and environmental weeds	3.3.4
4	Attention to edge sites: spray exotic grasses on a regular basis: replace with divots of native grasses where available (selected tubestock may be purchased from Strathfield Community Nursery)	3.3.8
5	Monitor and maintain planted *Pomaderris prunifolia*	3.3.2/9
6	Plant native tubestock into cleared sites to increase biodiversity: emphasis on ground covers	3.3.4/8
7	Consider closing some tracks and rehabilitate	3.4
8	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
9	Maintain photo-points (yearly photographs required	Section 5.4

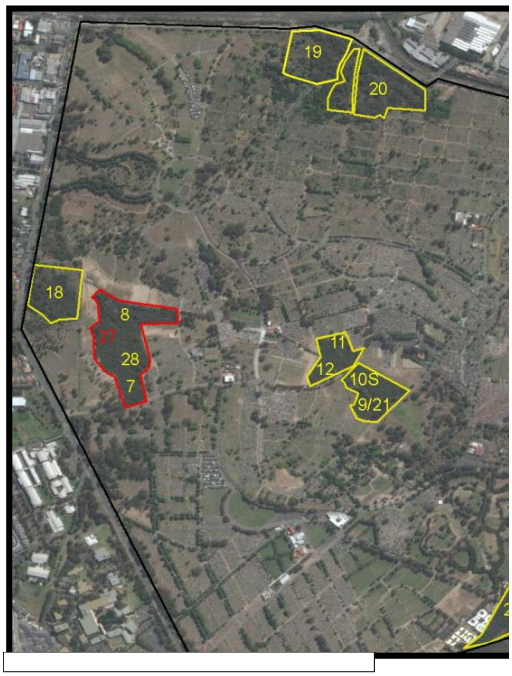
**In the absence of fire, a more aggressive approach to bush regeneration in Western Cluster is required to increase biodiversity in all strata.*

Figure 4-6: Condition of Bushland (weed) map – Area 8 (27/28/7)

(Source: Biodiversity Studies, UBM 2013)


a/a/≥50/90
18
≥0/0/1/5
8
27
0/0/1/2
28
a/a/a/60
7
a/a/a/40
Legend
Conservation Zones
Weed class
1 (0-10%)
2 (11-30%)
3 (31-70%)
4 (71-100%)
N
0 15 30 60
Metres

4.5 Vegetation Conservation Area 27



A

B

Table 4-11: Management Considerations for VCA 27

Zone Location/Cluster:	VCA 27 (Western Cluster)
Management Unit (Plan of Management, DPI 2014):	11
Size of Zone (m^2):	6,303
Vegetation Community:	Castlereagh Ironbark Forest (OEH 2013)

		Ball Honey-myrtle Scrub T6 (part) and Applebox-Tea Tree-Hakes Scrub T6 (part) (UBM 2013)
Condition of Site:	**General Comments:**	Western side of Rookwood north of Haslem Drive. Area bordered by Area 8 to the north, Area 7 to the south, gravesites to the east and a cleared area to the west. Dense shrubbery dominated by Melaleuca species. Similar to VCA 28
	Bushland Condition Assessment:	See Map
Water Bodies and Drainage Lines:		Western Cluster is bordered by three (3) canals: Crematorium, Barnet and Rookwood Main Branches
Threatened Species Considerations:		None
Fauna Habitat:		For details of fauna habitat and resources available in VCA 27 refer to *Appendix 8.*
Noxious Weeds:		*Asparagus* spp.*, Chrysanthemoides monilifera* subsp *monilifera, Rubus fruticosus*
Environmental Weeds/Garden Escapes:		*Watsonia bulbillifera*, *Acacia saligna, Osteospermum sp.*, *Polygala myrtifolia* and *Coreopsis lanceolata*.
Horticultural Plantings		*Corymbia citriodora* and *Eucalyptus scoparia (Appendix 3,* T6)

Table 4-12: Overview of Management Recommendations for VCA 27

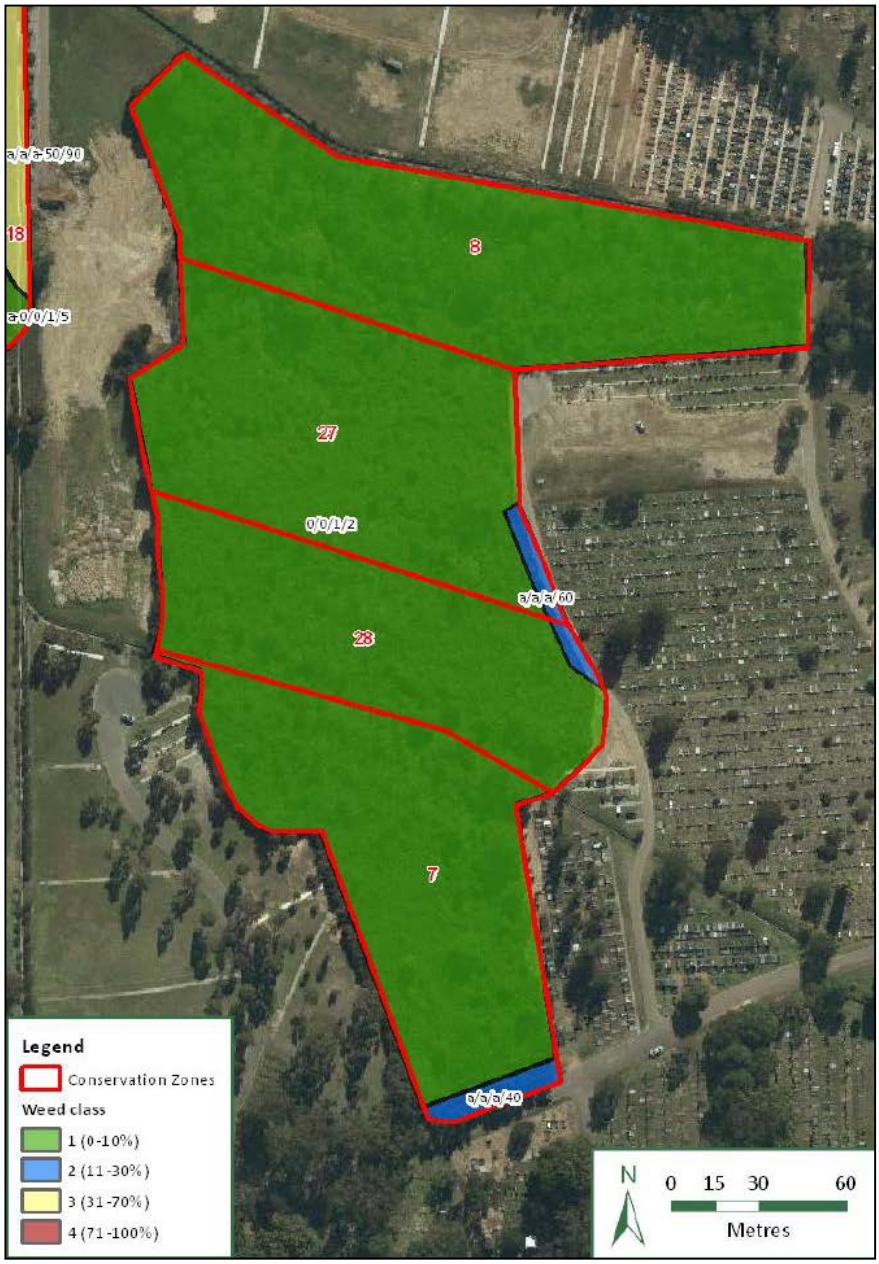
Priority of Implementation	Management Recommendations	Refer to Section
1	Increase biodiversity by culling *Melaleuca nodosa* thickets: mosaic clearing pattern advised: potential target 10-15% clearing pa. Suggest clearing in 20 x 20 m quadrats.	3.3.3
2	Cull *Pittosporum undulatum* to create light windows: numbers TBD	3.3.3
3	Secondary/Target weeding of noxious and environmental weeds	3.3.4
4	Plant native tubestock into cleared sites to increase biodiversity	3.3.8
5	Potential to transplant native ground covers into cleared sites	3.3.8
6	Attention to edge sites: spray exotic grasses on a regular basis: replace with divots of native grasses where available	3.3.10
7.	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10

8	Maintain photo-points (yearly photographs required	Section 5.4

**In the absence of fire, a more aggressive approach to bush regeneration in the Western Cluster is required to increase biodiversity in all strata.*

Figure 4-7: Condition of Bushland (weed) map – Area 27 (8/28/7)

(Source: Biodiversity Studies, UBM 2013)



4.6 Vegetation Conservation Area 28

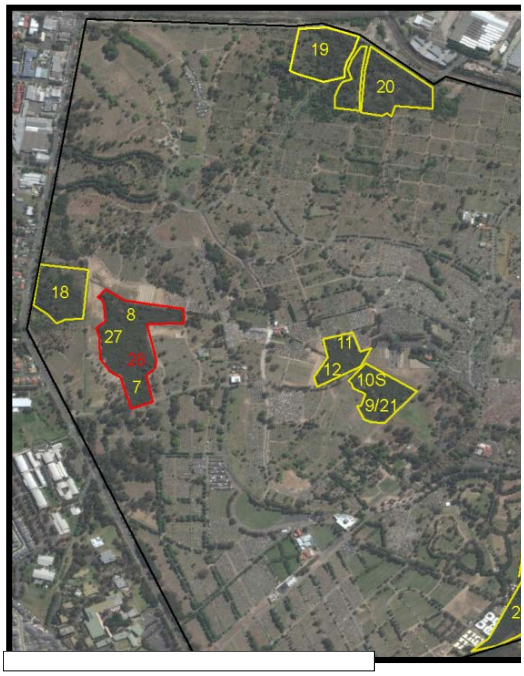


Table 4-13: Management Considerations for VCA 28

Zone Location/Cluster:		**VCA 28 (Western Cluster)**
Management Unit (Plan of Management, DPI 2014):		11
Size of Zone (m^2):		11,391
Vegetation Community:		Castlereagh Ironbark Forest (OEH 2013) Ball Honey-myrtle Scrub T6 (part) and Applebox-Tea Tree-Hakea Scrub T6 (part) (UBM 2013)
Condition of Site:	**General Comments:**	Western side of Rookwood north of Haslem Drive. Area bordered by Area 27 to the north, a canal and area 7 to the south, gravesites to the east and a

		cleared area to the west. Dense scrub dominated by Melaleuca species. Similar to VCA 27 and other sites in Central Cluster.
	Bushland Condition Assessment:	See Map
Water bodies and drainage lines:		Western Cluster is bordered by three (3) canals: Crematorium, Barnet and Rookwood Main Branches
Threatened Species Considerations:		None
Fauna Habitat:		For details of fauna habitat and resources available in VCA 28 refer to *Appendix 8.*
Noxious Weeds:		*Asparagus* spp*., Chrysanthemoides monilifera* subsp *monilifera, Rubus fruticosus, Opuntia* sp.
Environmental Weeds/Garden Escapes:		*Watsonia bulbillifera*, *Osteospermum* spp*, Polygala myrtifolia* and *Coreopsis lanceolata*.
Horticultural Plantings		*Corymbia citriodora* and *Eucalyptus scoparia (Appendix 3,* T6)

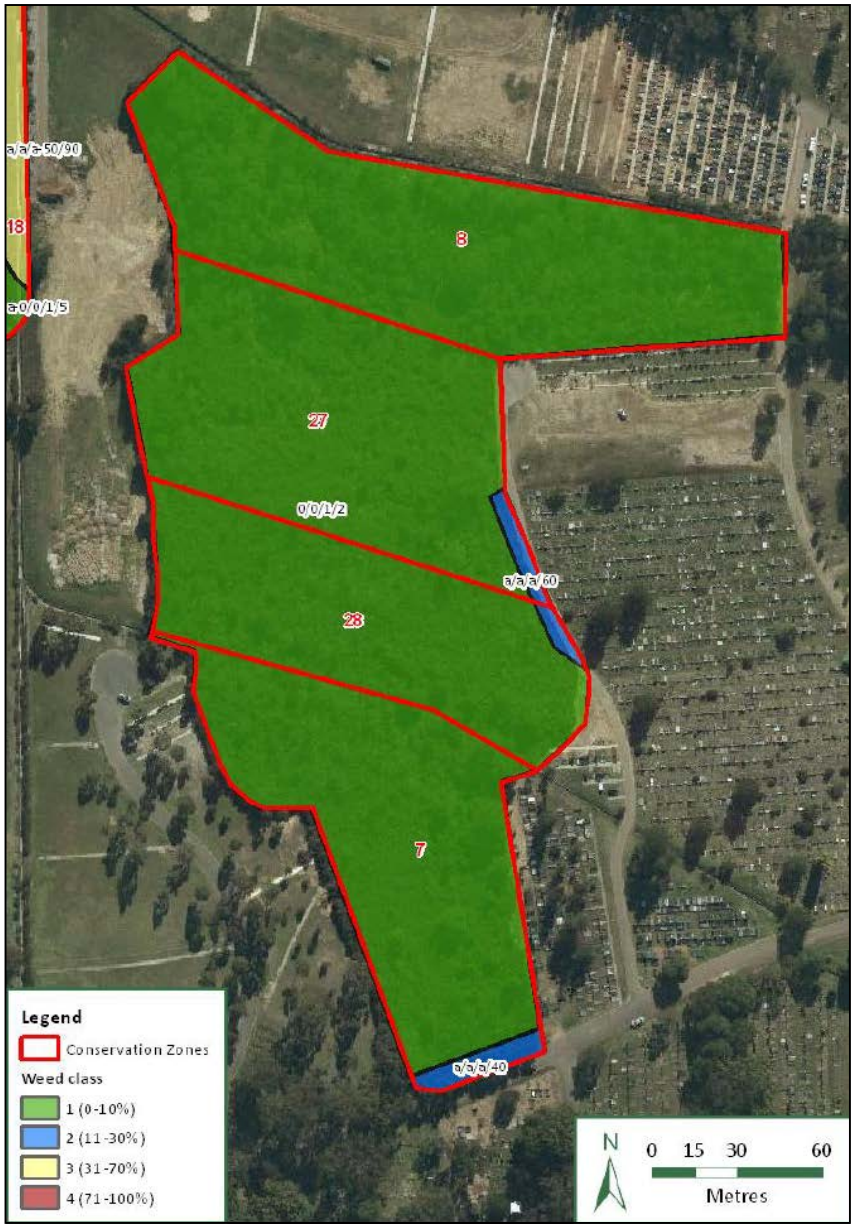
Table 4-14: Overview of Management Recommendations for VCA 28

Priority of Implementation	Management Recommendations	Refer to Section
1	Increase biodiversity by culling Melaleuca thickets: mosaic clearing pattern advised: potential target 10-15% clearing pa, Suggest clearing in 20 x 20 m quadrats.	3.3.3
2	Cull *Pittosporum undulatum* to create light windows: numbers TBD	3.3.3
3	Secondary/Target weeding of noxious and environmental weeds	3.3.4
4	Plant native tubestock into cleared/degraded sites to increase biodiversity	3.3.3/8
5	Potential to transplant native ground covers into cleared sites	3.3.8
6	Attention to edge sites: spray exotic grasses on a regular basis: replace with divots of native grasses where available	3.3.10
7.	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
8	Maintain photo-points (yearly photographs required	Section 5.4

**In the absence of fire, a more aggressive approach to bush regeneration in the Western Cluster is required to increase biodiversity in all strata.*

Figure 4-8: Condition of Bushland (weed) map – Area 28 (8/27/7)

(Source: Biodiversity Studies, UBM 2013)



4.7 Vegetation Conservation Area 7

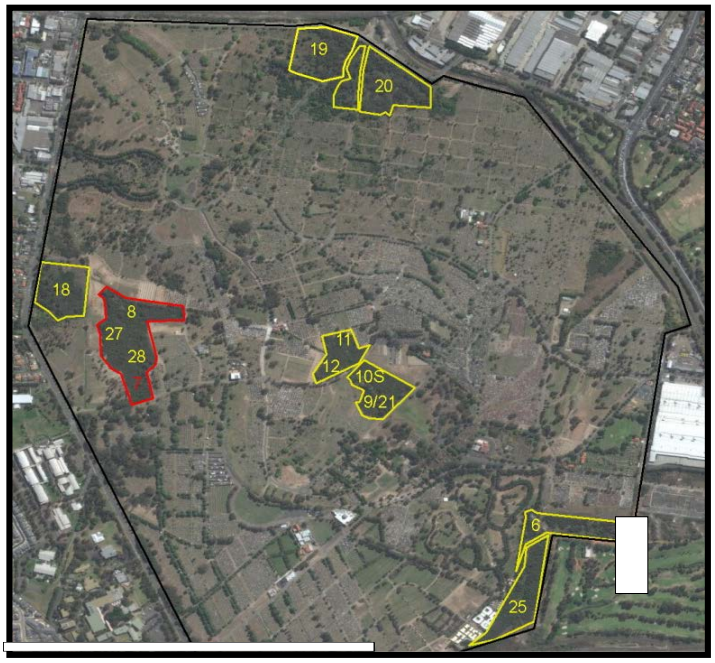


Table 4-15: Management Considerations for VCA 7

Zone Location/Cluster:		**VCA 7 (Western Cluster)**
Management Unit (Plan of Management, DPI 2014):		11
Size of Zone (m^2):		11,752
Vegetation Community:		Castlereagh Ironbark Forest (OEH 2013) Ball Honey-myrtle Scrub T6 (part) and Applebox-Tea Tree-Hakea Scrub T6 (part) (UBM 2013)
Condition of Site:	**General Comments:**	Western side of Rookwood north of Haslem Drive. Bordered by canal and Area 28 to the north,

		gravesites to the east and west and by Haslem Drive to the South. The majority of the area is dense shrub dominated by *Melaleuca* spp. Weed infestations exist largely on the southern and eastern boundaries as well as along the track in the eastern sections.
	Bushland Condition Assessment:	See Map
Water bodies and drainage lines:		Western Cluster is bordered by three (3) canals: Crematorium, Barnet and Rookwood Main Branches
Threatened Species Considerations:		One (1) EVNT flora species, *Epacris purpurascens* var. *purpurascens* listed as Vulnerable (*TSC Act*),
Fauna Habitat:		For details of fauna habitat and resources available in VCA 7 refer to *Appendix 8.*
Noxious Weeds:		*Asparagus* spp, *Chrysanthemoides monilifera* subsp *monilifera, Lantana montevidensis*.
Environmental Weeds/Garden Escapes:		*Watsonia bulbillifera*, *Coreopsis lanceolata*, *Pennisetum clandestinum*, *Corymbia citriodora* and *Pinus radiata*
Horticultural Plantings		*Corymbia citriodora*, *Eucalyptus microcorys, E. scoparia, Lophostemon confertus* (see *Appendix 3*, T5)

Table 4-16: Overview of Management Recommendations for VCA 7

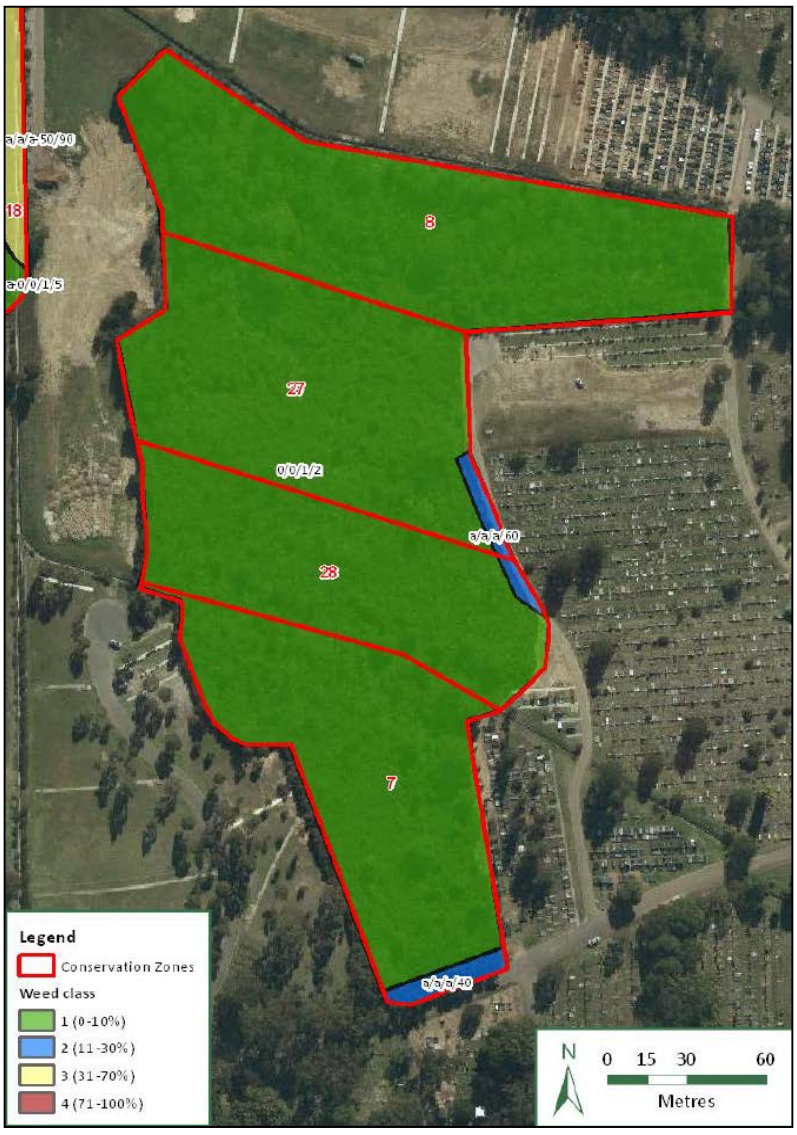
Priority of Implementation	Management Recommendations	Refer to Section
1	Increase biodiversity by culling *Melaleuca nodosa* thickets: mosaic clearing pattern advised: potential target 10-15% clearing pa Suggest clearing in 20 x 20 m quadrats.	3.3.2/3
2	Cull *Pittosporum undulatum* to create light windows	3.3.3
3	Continue to cull surplus *Acacia parramattensis* and *A. decurrens* from op (southern) end and *Melaleuca nodosa* from northern end.: aim to increase floristic diversity by creating more open habitat	3.3.2/3
3	Secondary/target weeding of noxious and environmental weeds	3.3.3
4	Cull dead/dying Acacia at southern end (exposed to road users) and remove debris off-site	3.3.3
5	Plant native tubestock into cleared edge sites to increase biodiversity	3.3.3/8

6	Potential to transplant native ground covers into cleared sites (transplant or purchase tubestock)	3.3.8
7	Attention to edge sites in public view: spray exotic grasses on a regular basis: replace with divots of native grasses where available	3.3.10
8	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
9	Bush Regeneration in Progress signage recommended	
10	Maintain photo-points (yearly photographs required)	5.4

**In the absence of fire, a more aggressive approach to bush regeneration in the Western Cluster is required to increase biodiversity in all strata.*

Figure 4-9: Condition of Bushland (weed) map – Area 7 (8/27/28)

(Source: Biodiversity Studies, UBM 2013)



4.8 Vegetation Conservation Area 11

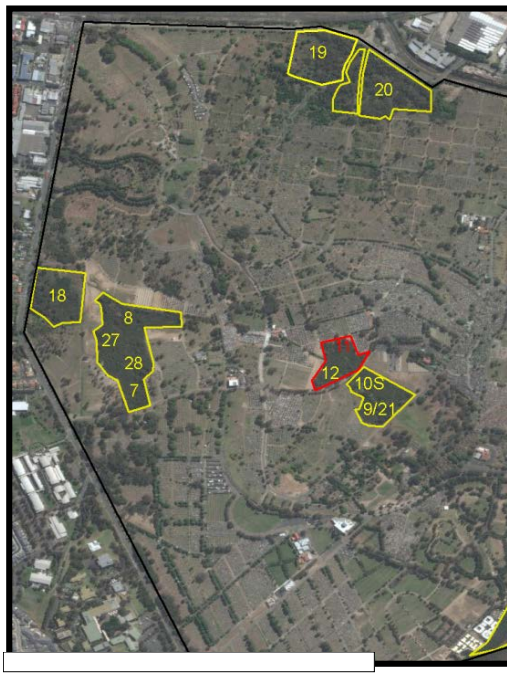


Table 4-17: Management Considerations for VCA 11

Zone Location/Cluster:		**VCA 11 (Central Cluster)**
Management Unit (Plan of Management, DPI 2014):		13B
Size of Zone (m^2):		10,935
Vegetation Community:		Castlereagh Ironbark Forest (OEH 2013) Ball Honey-myrtle Scrub T4 (UBM 2013)
Condition of Site:	**General Comments:**	Part of VCA 11/12 group Debris stockpiled
	Bushland Condition Assessment:	See Map
Water Bodies and Drainage Lines:		Central Cluster is crossed by the Crematorium Branch of canal with Methodist Branch to the south

	VCA 11 and 12 separated by canal
Threatened Species Considerations:	*Pomaderris prunifolia* (a Vulnerable population under *TSC Act*(planted from seed propagated from Area 5)
Fauna Habitat:	For details of fauna habitat and resources available in VCA 11 refer to *Appendix 8.*
Noxious Weeds:	*Lantana camara, Bryophyllum* spp (seedlings), *Chrysanthemoides monilifera* var. *monilifera, Asparagus* spp, , *Cestrum parqui*
Environmental Weeds/Garden Escapes:	*Watsonia bulbillifera, Coreopsis lanceolata, Genista monspessulana*, exotic grasses.
Horticultural Plantings	N/A (see *Appendix 3*, T4)

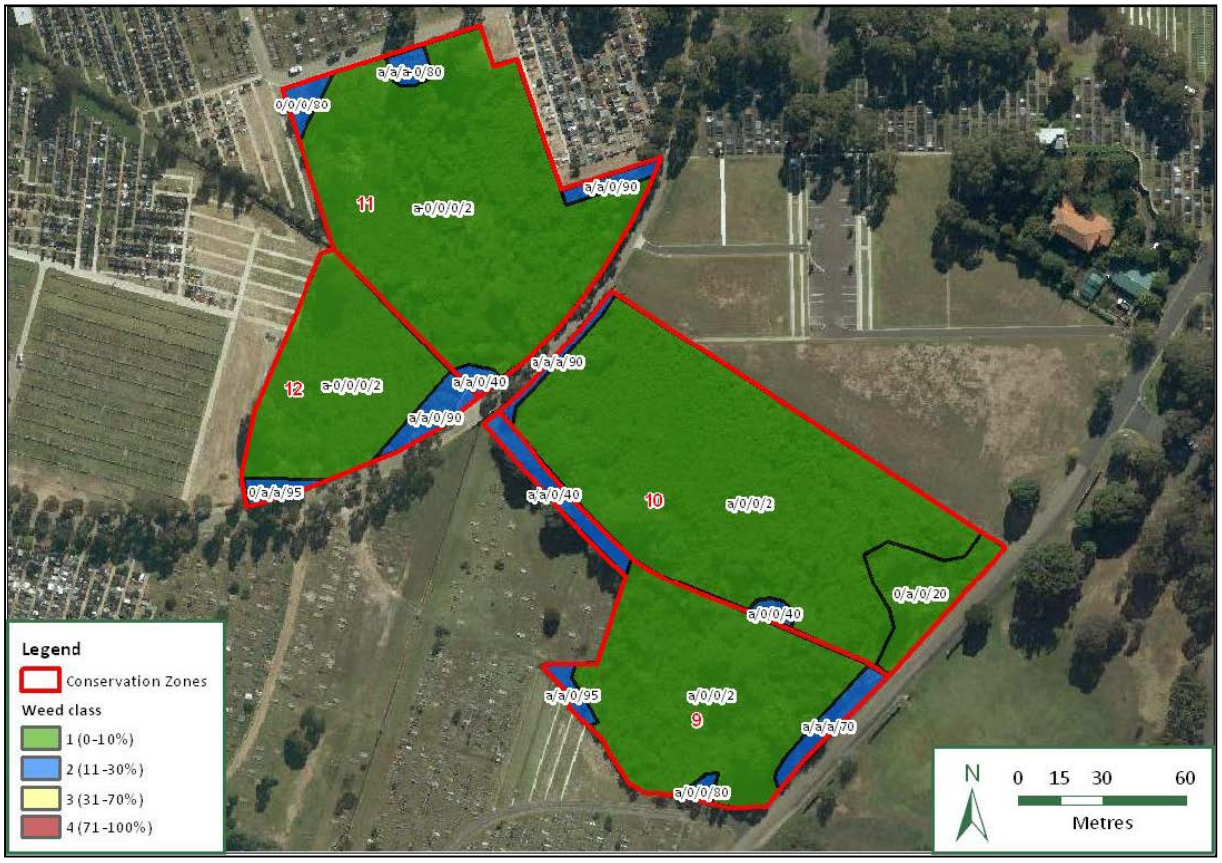
Table 4-18: Overview of Management Recommendations for VCA 11

Priority of Implementation	Management Recommendations (as for VCAs in Central Cluster)	Refer to Section
1	Increase biodiversity by culling *Melaleuca nodosa* thickets: mosaic clearing pattern advised: potential target 10-15% clearing pa. Suggest clearing in 20 x 20 m quadrats.	3.3.2/3
2	Cull *Pittosporum undulatum* to create light windows: numbers TBD	3.3.3
3	Maintain plantings of *Pomaderris prunifolia*	3.3.2
4	Secondary/target weeding of noxious and environmental weeds	3.3.4
5	Plant native tubestock to increase biodiversity	3.3.8
6	Potential to transplant native ground covers into cleared sites	3.3.8
7	Remove old stockpile debris and dumped rubbish (a/r)	Section 3.4
8	Attention to edge sites: spray exotic grasses on a regular basis: replace with divots of native grasses where available	3.3.10
9	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
10	Maintain photo-points (yearly photographs required	Section 5.4

**In the absence of fire, a more aggressive approach to bush regeneration in the Central Cluster is required to increase biodiversity in all strata.*

Figure 4-10: Condition of Bushland (weed) map – Area 11 (9/10/12)

(Source: Biodiversity Studies, UBM 2013)



4.9 Vegetation Conservation Area 12

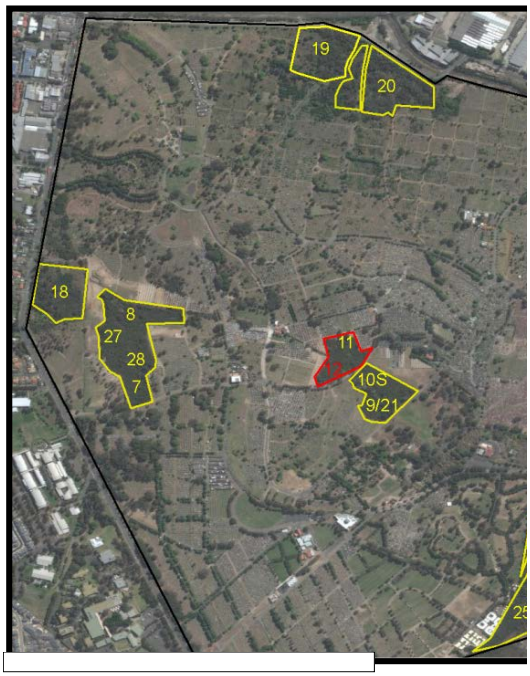


Table 4-19: Management Considerations for VCA 12

Zone Location/Cluster:		**VCA 12 (Central Cluster)**
Management Unit (Plan of Management, DPI 2014):		13B
Size of Zone (m^2):		4,318
Vegetation Community:		Castlereagh Ironbark Forest (OEH 2013) Ball Honey-myrtle Scrub T 4 (UBM 2013)
Condition of Site:	**General Comments:**	Generally as for adjacent VCA 9, 10S, 11 and 12
	Bushland Condition Assessment:	See Map
Water bodies and drainage lines:		Central Cluster is crossed by the Crematorium Branch canal with Methodist Branch to the south

Threatened Species Considerations:	*Acacia pubescens (a* Vulnerable species under *EPBC* and *TSC Acts*) *Pomaderris prunifolia* (a Vulnerable population under the *TSC Act* (planted)
Fauna Habitat:	For details of fauna habitat and resources available in VCA 12 refer to *Appendix 8.*
Noxious Weeds:	*Lantana camara*, *Chrysanthemoides monilifera* var. *monilifera, Asparagus* spp, *Cestrum parqui*
Environmental Weeds/Garden Escapes:	*Freesia refracta, Watsonia bulbillifera, Coreopsis lanceolata, Genista monspessulana* and *Corymbia citriodora* – western edge.
Horticultural Plantings:	Not Applicable (see *Appendix 3,* T4)

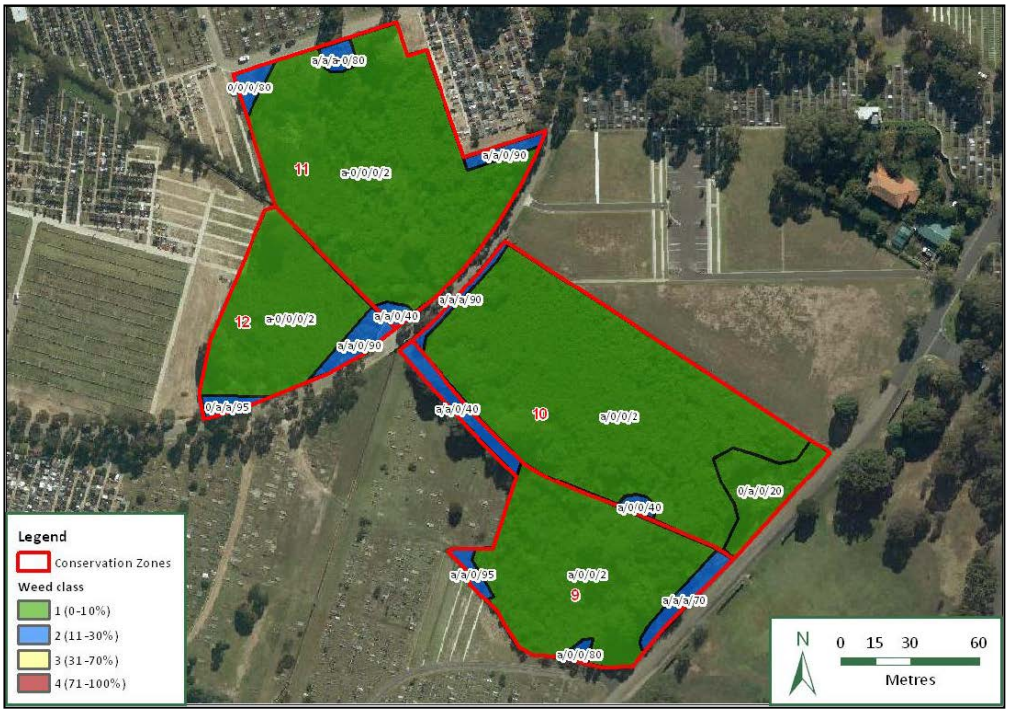
Table 4-20: Overview of Management Recommendations for VCA 12

Priority of Implementation	Management Recommendations (as for VCAs in Central Cluster)	Refer to Section
1	Increase biodiversity by culling *Melaleuca nodosa* thickets: mosaic clearing pattern advised: potential target 10-15% clearing pa Suggest clearing in 20 x 20 m quadrats.	3.3.2/3
2	Cull *Pittosporum undulatum* to create light windows: numbers TBD	3.3.3
3	Maintain plantings of *Pomaderris prunifolia*	3.3.2
4	Secondary/Target weeding of noxious and environmental weeds	3.3.4
5	Plant native tubestock to increase biodiversity	3.3.3/7
6	Remove old stockpiled debris and dumped rubbish (a/r)	3.4
7	Attention to edge sites (Haslem Drive and canal): spray exotic grasses on a regular basis: replace with divots of native grasses where available	3.3.10
8	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
9	Maintain photo-points (yearly photographs required	Section 5.4

**In the absence of fire, a more aggressive approach to bush regeneration in the Central Cluster is required to increase biodiversity in all strata.*

Figure 4-11: Condition of Bushland (weed) map – Area 12 (9/10/11)

(Source: Biodiversity Studies, UBM 2013)



4.10 Vegetation Conservation Area 10

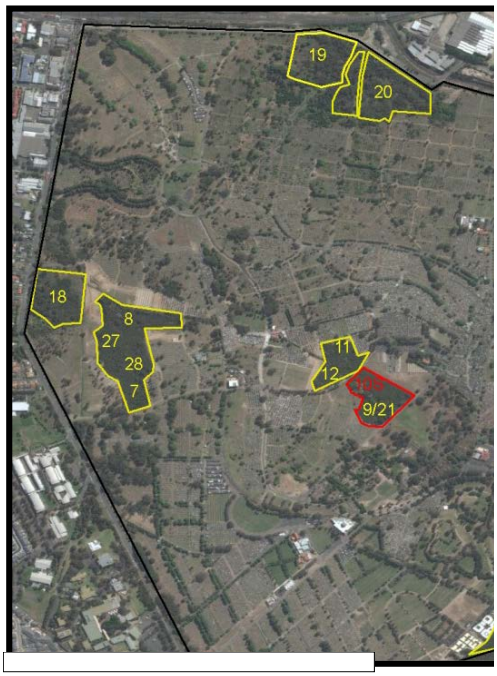


Table 4-21: Management Considerations for VCA 10

Zone Location/Cluster:		**VCA 10 (Central Cluster)**
Management Unit (Plan of Management, DPI 2014):		13C
Size of Zone (m^2):		2,074
Vegetation Community:		Castlereagh Ironbark Forest (OEH 2013) Ball Honey-myrtle Scrub T3 – T 6 (part) (UBM 2013)
Condition of Site:	**General Comments:**	Generally as for adjacent VCA 9, 10S, 11 and 12
	Bushland Condition Assessment:	See Map

Water Bodies and Drainage Lines:	Central Cluster is crossed by the Crematorium Branch canal with Methodist Branch to the south VCAs 9 and 10 are separated by a brick-lined canal
Threatened Species Considerations:	*Acacia pubescens (a* Vulnerable species under *EPBC* and *TSC Acts*). *Pomaderris prunifolia* (a Vulnerable population under the *TSC Act* (planted)
Fauna Habitat:	For details of fauna habitat and resources available in VCA 10S refer to *Appendix 8.*
Noxious Weeds:	*Lantana camara, Asparagus* spp*. Chrysanthemoides monilifera* var. *monilifera*
Environmental Weeds/Garden Escapes:	*Acacia saligna, Watsonia bulbillifera, Coreopsis lanceolata* and *Pennisetum clandestinum.*
Horticultural Plantings	*Eucalyptus 70lobules, Acacia binervia , Lophostemon confertus* (see *Appendix 3, T3)*

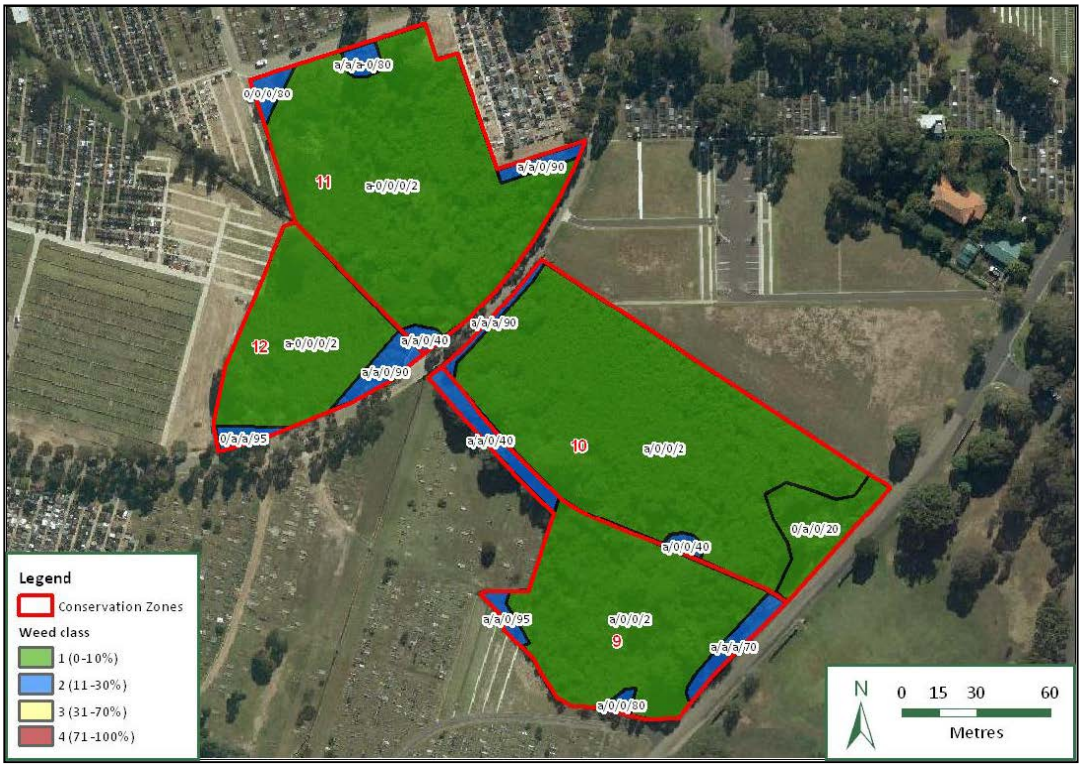
Table 4-22: Overview of Management Recommendations for VCA 10

Priority of Implementation	Management Recommendations (as for VCAs in Central Cluster)	Refer to Section
1	Increase biodiversity by culling *Melaleuca nodosa* thickets: mosaic clearing pattern advised: potential target 10-15% clearing pa Suggest clearing in 20 x 20 m quadrats.	3.3.2/3
2	Secondary/target weeding of noxious and environmental weeds	3.3.4
3	Maintain plantings of *Pomaderris prunifolia*	3.3.2
4	Monitor stand of *Acacia pubescens* and report new plants/outliers	3.3.2
5	Plant native tubestock to increase biodiversity	3.3.3/7
6	Attention to edge sites (Haslem Drive and canal): spray exotic grasses on a regular basis: replace with divots of native grasses where available	3.3.10
7	Remove old stockpiled debris and dumped rubbish (a/r)	Section 3.4
8	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
9	Replace damaged silt fence on northeast boundary if this is still required	
10	Maintain photo-points (yearly photographs required	Section 5.4

**In the absence of fire, a more aggressive approach to bush regeneration in the Central Cluster is required to increase biodiversity in all strata.*

Figure 4-12 Condition of Bushland (weed) map – Area 10S (9/10/12)

(Source: Biodiversity Studies, UBM 2013)



4.11 Vegetation Conservation Area 9

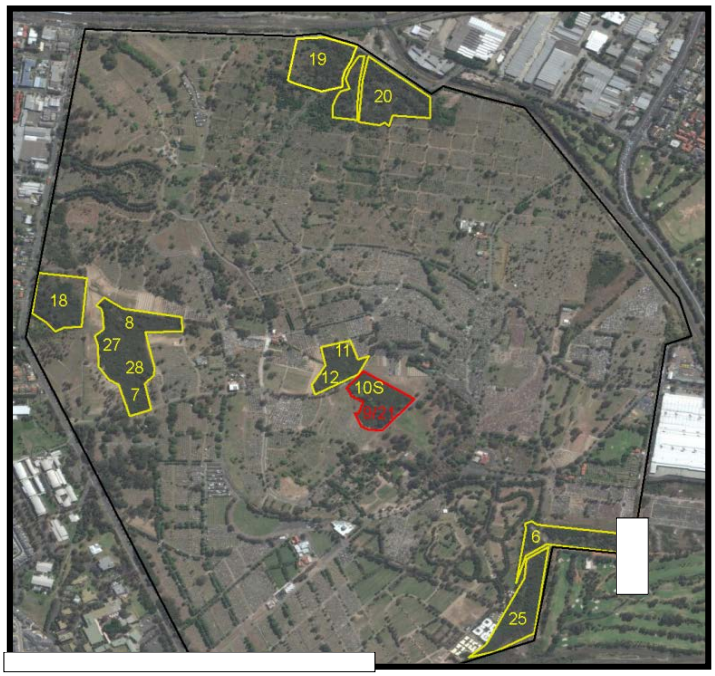


Table 4-23: Management Considerations for VCA 9

Zone Location/Cluster:	**VCA 9 (Central Cluster)**
Management Unit (Plan of Management, DPI 2014):	13C
Size of Zone (m^2):	6,402
Vegetation Community:	Castlereagh Ironbark Forest (OEH 2013) Ball Honey-myrtle Scrub T3 – T 6 (part) (UBM 2013)
General Comments	Generally as for adjacent VCA 10S, 11 and 12
Condition of Site:	See Map
Water bodies and drainage lines:	Central Cluster is crossed by the Crematorium Branch of canal with Methodist Branch to the south
Threatened Species Considerations:	One (1) EVNT flora species, *Acacia pubescens,* listed as Vulnerable (*EPBC* and *TSC Acts*)

Fauna Habitat:	For details of fauna habitat and resources available in VCA 9 refer to *Appendix 8.*
Noxious Weeds:	*Lantana camara, Asparagus spp, Chrysanthemoides monilifera* var. *monilifera*
Environmental Weeds/Garden Escapes:	*Freesia refracta, Coreopsis lanceolata,* and *Watsonia bulbillifera, Rhapholepis indica.*
Horticultural Plantings:	*Eucalyptus globulus, Acacia binervia , Lophostemon confertus* (see *Appendix 3, T3)*

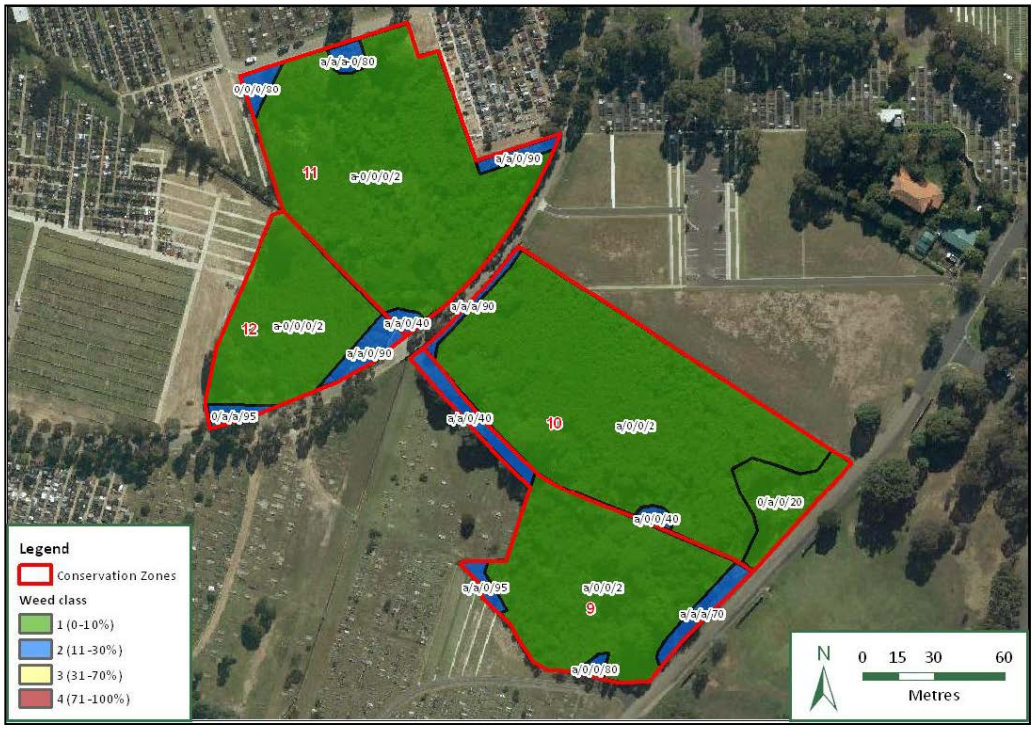
Table 4-24: Overview of Management Recommendations for VCA 9

Priority of Implementation	Management Recommendations (as for VCAs in Central Cluster)	Refer to Section
1	Increase biodiversity by culling *Melaleuca nodosa* thickets: mosaic clearing pattern advised: potential target 10-15% clearing pa Suggest clearing in 20 x 20 m quadrats.	3.3.2/3
2	Secondary/target weeding of noxious and environmental weeds	3.3.4
3	Monitor stand of *Acacia pubescens* and report new plants/outliers	3.3.2
4	Plant native tubestock to increase biodiversity	3.3.3
5	Potential to transplant native ground covers into cleared sites	3.3.7
6	Remove old stockpiled debris and dumped rubbish (a/r)	Section 3.4
7	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
8	Maintain photo-points (yearly photographs required)	Section 5.4

**In the absence of fire, a more aggressive approach to bush regeneration in the Central Cluster is required to increase biodiversity in all strata.*

Figure 4-13: Condition of Bushland (weed) map – Area 9 (10/11/12)

(Source: Biodiversity Studies, UBM 2013)



4.12 Vegetation Conservation Area 6 (south)

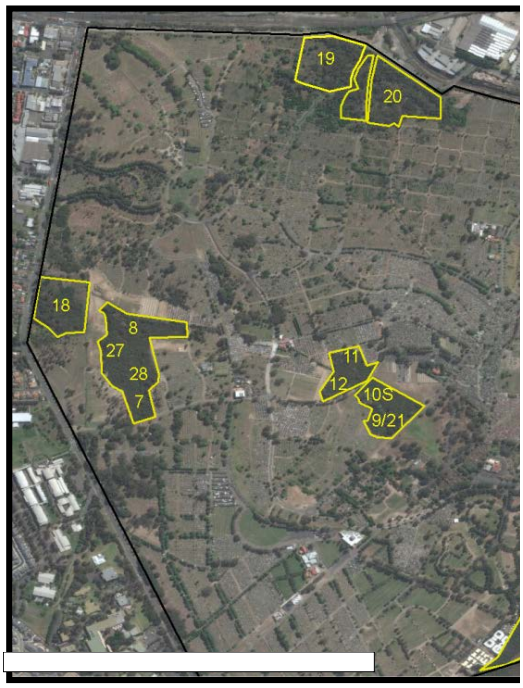


Table 4-25: Management Considerations for VCA 6(south)

Zone Location/Cluster:	**VCA 6s (Southern Cluster)**
Management Unit (Plan of Management, DPI 2014):	22
Size of Zone (m^2):	23,500
Vegetation Community:	Castlereagh Ironbark Forest (0EH 2013) Feather Honey-myrtle Scrub T2 (UBM 2013)
General Comments	Borders Ausgrid site: periodic clearing under wires undertaken with some damage to VCA 6(south) Long grasses around transplants and planting a major maintenance issue
Condition of Site:	See Map

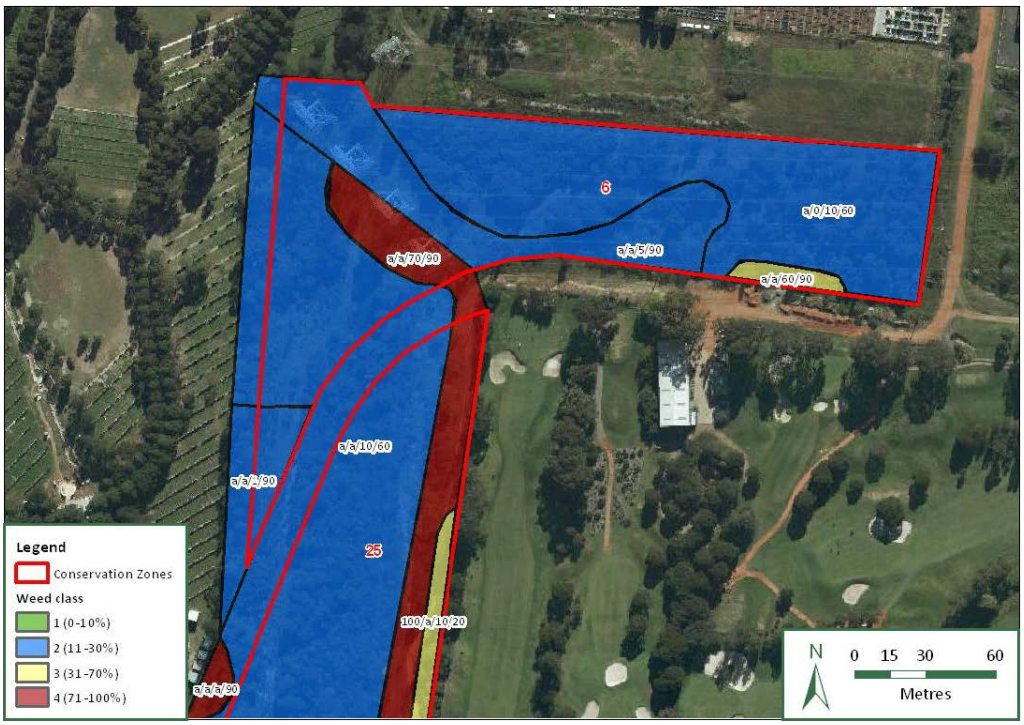
Water Bodies and Drainage Lines:	Not applicable
Threatened Species Considerations:	Two (2) EVNT flora species occur within Area 6(south) - *Acacia pubescens (*Vulnerable species under *EPBC Act* and *TSC Act*), and - *Pomaderris prunifolia* (a Vulnerable population under the *TSC Act* (translocated from Area 5)
Fauna Habitat:	For details of fauna habitat and resources available in VCA 6s refer to *Appendix 8.*
Noxious Weeds:	*Rubus fruticosus* (southern fenceline), *Asparagus asparagoides, Ligustrum sp, Chrysanthemoides monilifera* var. *monilifera, Cestrum parqui*
Environmental Weeds/Garden Escapes:	*Coreopsis lanceolata, Pennisetum clandestinum* & other exotic grasses, *Rhapholepis indica*
Horticultural Plantings	*Corymbia citriodora, Allocasuarina littoralis*, *Pinus radiata, Pomaderris prunifolia* (see *Appendix 3, T2*) *numerous local natives planted by bush regenerators

Table 4-26: Overview of Management Recommendations for VCA 6S

Priority of Implementation	Management Recommendations	Refer to Section
1	Monitor translocated *Pomaderris prunifolia*: report death and/or new seedlings	3.3.2
2	Cull overhanging trees/shrubs to create more open conditions: remove dead and senescent vegetation off-site. Remove whole shrubs/trees where appropriate, rather than just overhanging branches.	3.3.2/3
3	Hand weed exotic ground covers to free native plantings: consider slashing or mowing (if possible) to contain exotic grasses	3.3.7
4	Attention to weedy boundary sites (RC Trust and Ausgrid): liaison will be required to protect VCA from future incursions	3.3.10
5	Wind-blown rubbish: remove and bag as required.	Section 3.4
6	Reinstate silt fence to catch wind-blown rubbish and clean periodically	
7	Maintain photo-points (yearly photographs required)	Section 5.4

Figure 4-14: Condition of Bushland (weed) map – Area 6 (south)

(Source: Biodiversity Studies, UBM 2013)



4.13 Vegetation Conservation Area 25

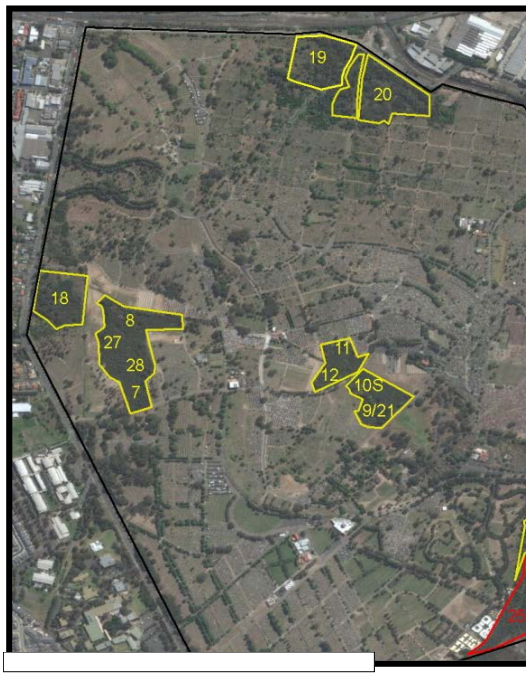


Table 4-27: Management Considerations for VCA 25

Zone Location/Cluster:		**VCA 25 (Southern Cluster)**
Management Unit (Plan of Management, DPI 2014):		24
Size of Zone (m^2):		24, 038
Vegetation Community:		Castlereagh Ironbark Forest (OEH 2013) Tick Bush-Ball Honey-myrtle Scrub - T1 (UBM 2013)
Condition of Site:	**General Comments:**	Adjacent to Area 6(south)
	Bushland Condition Assessment:	See Map

Water Bodies and Drainage Lines:	Freshwater Creek branch of canal flows through the centre of Area 25. Drainage line flows to the Cooks River. Overland flow from adjacent burial ground.
Threatened Species Considerations:	The following EVNT Flora species were identified in Area 25: - *Acacia pubescens* (a Vulnerable species under both the *EPBC* and the *TSC Acts*); - *Epacris purpurascens* var. *purpurascens* (a Vulnerable species under the *TSC Act*); and - *Wahlenbergia multicaulis* (a Vulnerable species under the *TSC Act*).
Fauna Habitat:	For details of fauna habitat and resources available in VCA 25 refer to *Appendix 8.*
Noxious Weeds:	*Rubus fruticosus*, *Ludwigia peruviana*, *L. Longifolia*, *Chrysanthemoides monilifera* var. *monilifera, Ligustrum sinense, Opuntia* sp.
Environmental Weeds/Garden Escapes:	*Senna pendula, Pennisetum clandestinum, Coreopsis lanceolata, Ageratina adenophora, Lonicera japonica*
Horticultural Plantings	*Cupressus* sp. (see *Appendix 3, T1*)

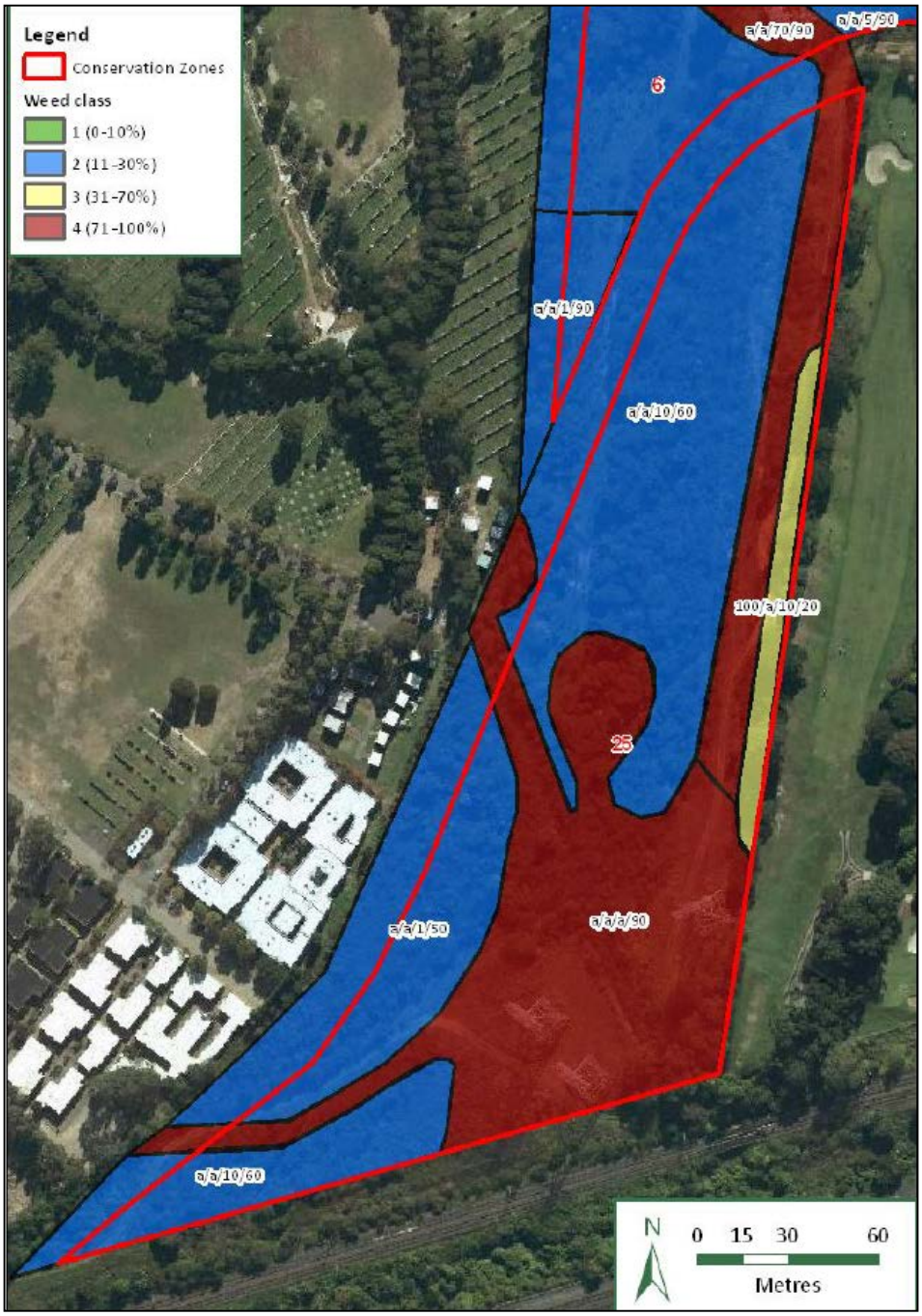
Table 4-28: Overview of Management Recommendations for VCA 25

Priority of Implementation	Management Recommendations	Refer to Section
1	Maintain/improve habitat for threatened *Epacris purpurascens* var. *purpurascens*: continue to cull senescent Melaleuca to create more open conditions. Increase cleared areas in 2014-2015	3.3.2/3
2	Monitor regrowth of Epacris seedlings: report new seedlings: GPS	3.3.2
3	Regular control to aquatic weed *Ludwigia peruviana* in drainage line (note drainage work pending): bag seed heads and remove to landfill site (do not stockpile)	3.3.4
4	Overland flow from adjacent burial ground imports weeds and rubbish and scours soil and silts over native understorey species. Recommend remedial drainage works (water sensitive urban design would be appropriate). At a minimum, geofabric should be erected along the lower part of the boundary fence and a grassed swale constructed.	
4	Secondary/target weeding of noxious and environmental weeds	3.3.4
5	Attention to weedy boundary sites adjacent (RC Trust and Ausgrid: liaison will be necessary to protect VCA	3.3.10

6	Consider slashing/mowing areas of long grass smothering native ground covers	3.3.4
7	Maintain canal edges and monitor for root damage on brick-lined canals**.**	3.3.10
8	Maintain photo-points (yearly photographs required)	Section 5.4

Figure 4-15: Condition of Bushland (weed) map – Area 25

(Source: Biodiversity Studies, UBM 2013)


Legend
Conservation Zones
Weed class
1 (0-10%)
2 (11-30%)
3 (31-70%)
4 (71-100%)
a/a/70/90
a/a/5/90
6
a/a/1/90
a/a/10/60
100/a/10/20
25
a/a/a/90
a/a/1/50
a/a/10/60
N
0 15 30 60
Metres

5 IMPLEMENTATION & REVIEW

5.1 Policy & Performance

Performance 'on the ground' will be measured against a series of *Performance Indicators* ('PIs'). A sample of PI's designed to assess the efficacy of the bushland regeneration program at Rookwood is included in *Section 5.6*.

It is recommended that only fully qualified and experienced Bush Regeneration Contractors be employed to implement the recommendations of this BMP (see *Section 5.5*).

5.2 Staging of Works Program & Review

Recognising that bushland regeneration (weed control, planting, and maintenance) in the CPA will extend over some time, this BMP is designed to cover an initial five (5) year period (2014-2019). After this time, BMP should be reviewed and outcomes of the program assessed using the Performance Indicators outlined in *Section 5.6.*

A Final Report should be prepared at this time and submitted to the RNT. The Final Report should summarise all activities undertaken over lifetime of the VMP, and a*n* assessment should be made about the progress of works and identifying the goals and objectives achieved.

5.3 Works Program

5.3.1 Licences & Permits Required

It should be recognised that survey, research, or on-ground works which impact or potentially impact on a threatened species, population or ecological community or their habitats (listed under the *TSC Act*) or on any protected species listed under the *National Parks & Wildlife Act* (1974) may only be carried out by suitably qualified workers holding a current Section 132C Scientific Licence from the NSW Office of Environment & Heritage ('OEH'). Such works may include collecting, picking, or otherwise damaging native flora, bush regeneration, weed control and seed collection.

It is the responsibility of the Project Manager and RNT to ensure that the Bush Regeneration Contractor engaged to work in remnant bushland is suitably qualified and appropriately licensed (see *Section 5.5*).

5.3.2 Site Maintenance

A regular maintenance program will be required for each VCA after the completion of initial works (*i.e.* primary weeding/planting). A significant proportion of the bushland in the VCAs is either on a maintenance regime or is expected to reach this status within the next 3-5 years, depending on

resources being available for on-ground works. This does not however, include those areas which have been identified for mosaic clearing to encourage a greater diversity of native species.

Routine actions embedded within the maintenance program are:

- Regular weeding to remove competitive exotic plant species and control invasive natives;
- Care of planted areas (including watering, disease control, application of native plant fertilisers and replacement of lost or failed plants);
- Maintenance of plant bags and stakes (with removal once plants overtop the bags); and
- Rubbish removal and care of edges and buffer zones.

Monitoring, evaluation and reporting are integral parts of the site maintenance program.

5.4 Monitoring & Assessment

A simple monitoring program is essential to assessing the success of the bushland restoration and rehabilitation program. The Project Ecologist should oversee the program and monitor progress of works. Monitoring should be carried out yearly by the Project Ecologist in cooperation with the bush regeneration contractor and the outcomes included in the Annual Bush Regeneration Progress Reports

Monitoring procedures should be simple and straightforward, as well as inexpensive to implement. Assessments should preferably be quantitative in nature (although photo-points will also form part of the monitoring process) and these must be measured against the Performance Indicators set out in *Section 5.6.* Should monitoring and periodic review indicate that the performance measures are not being met in a timely fashion, the strategies set out in the BMP should be reviewed and amended as necessary. Reports should provide findings in a manner that is readily interpreted by all parties.

For Rookwood, annual monitoring of the transplanted *Pomaderris prunifolia* will also be required (see *Section 3.3.2*), and monitoring to assess the condition of other threatened species (*Epacris purpurascens* var. *purpurascens*, *Acacia pubescens* and *Wahlenbergia multicaulis*) should also be carried out annually, although a formal census report is not required.

NOTE: Permanent photo-points have been established in the VCAs for some years, and new photographs should continue to be taken annually. Results are presented in the Annual Bush Regeneration Progress Reports. These actions have been included in the Bush Regeneration Contractor's reporting schedule and within this budget.

A *generic* guide to monitoring progress of work in bushland rehabilitation projects has been included as *Appendix 8.* This guideline also includes a simple monitoring methodology.

5.5 Management Responsibility & Reporting

The responsibility for implementation of the BMP will devolve upon the Project Manager (CTLA) and the Project Ecologist (UBM).

The Bush Regeneration Contractor will have responsibility for daily management and maintenance of all on-site works but will at all times, work under the supervision of the Project Manager and Project Ecologist.

The Bush Regeneration Contractor is required to report on a monthly basis during the period of on-ground works (Monthly Progress Reports). The Project Ecologist will inspect the site works on a regular basis (minimum eight (8) times P/A) and provide feedback to the Contractor (as required).

An Annual Summary of Works must be prepared by the Bush Regeneration Contractor and provided to the Project Ecologist for assessment. The Summary of Works must be forwarded to the Project Ecologist within four (4) weeks of completion of contract works.

5.6 Performance Indicators & Milestones

The PMP (2002) states that the overall objective of monitoring is to measure the effectiveness of the proposed strategies in the conservation and management of threatened species and plant communities. Regular inspections will be required by experts in the ecology/regeneration of CRCIF and the threatened species that occur on site. These objectives remain unchanged under the new PMP (pending).

5.6.1 Cooks River/Castlereagh Ironbark Forest

The monitoring program for CRCIF will provide feedback about:

- Successional changes within CRCIF;
- The utilisation of CRCIF by native fauna, especially birds, bats and herpetofauna;
- The effectiveness of recreated/translocated CRCIF and other native vegetation;
- Distribution and abundance of weeds; and
- Relative abundance of feral animals.

Such monitoring data will help to identify and address non-conformance and implement contingency measures within an appropriate time frame. Contingency measures will be implemented when any problems are detected that threaten the long-term viability of CRCIF or the threatened species known to occur at Rookwood.

Monitoring will explain any changes in the diversity and abundance of plant species, particularly threatened species, and the floristics and structure of CRCIF. The Project Ecologist in consultation with the bush regeneration contractors will assess the efficacy of the works program as part of the annual

report, but under the new PMP (in preparation) formal monitoring of threatened species is only required every five (5) years.

5.6.2 Threatened Species and Population Management

Many of the recommendations listed above will be equally applicable to the management of threatened species and populations at Rookwood. Monitoring will be carried out concurrently with monitoring the recovery and health of the CRCIF community (*i.e*. every three (3) to five (5) years).

Ongoing monitoring of all threatened flora species and populations in the designated VCAs should be a key priority. This should target information including:

- Population size;
- The number of adult/mature plants;
- Number of seedlings/new plants;
- Health/condition of the population;
- Threats to the species/population; and
- Any changes since the previous monitoring period.

Similarly monitoring and opportunistic sightings by bush regeneration personnel and grounds staff at Rookwood may re-locate fauna species which have previously been recorded but have not been sighted for some years. These include the Regent Honeyeater (last sighted in 1987) and the Green and Golden Bell Frog (last sighed in 1960s) (UBMC 2003a).

5.6.3 Contingency Actions

Contingency actions will need to be implemented when monitoring indicates a non-conformance with the PMP. The specific type of action will relate to the type of management issue/problem causing non-conformance with proposed management outcomes.

These actions will be determined by the Project Ecologist, in consultation with the bush regeneration contractor employed to implement the BMP, with input from the RNT and Threatened Species Unit of OEH. Contingency actions will be aimed at redressing any problems identified through monitoring, so that mitigation measures and revegetation strategies identified in this PMP are successful.

The following scenarios could trigger contingency measures:

- If the bushland management program fails to re-establish a diverse native plant community in the designated VCAs over the lifetime of the BMP;
- If weeds and feral animal populations increase in such abundance as to threaten the long-term viability of rehabilitation works; and
- If noxious weeds occurring outside the designed VCAs are not fully contained and threaten the integrity of the rehabilitated bushland.

Contingency measure should:

- Determine the reason(s) for failure of rehabilitation strategies;
- Assess habitat suitability of rehabilitation areas and attempt to improve micro-habitat features and/or linkages; and
- Assess proposed measures for introduced species control and improve effectiveness of such measures.

5.6.4 Long-term Performance Measures

Long-term (5-10 years) performance measures designed to assess the efficacy of conservation measures will include:

- Decreasing human intervention/management over time which could be demonstrated by reduced maintenance and labour costs;
- No net loss of core CRCIF vegetation that have been identified for conservation (VCAs);
- No loss of any species identified for conservation, with an increase in population size of selected indicator species (principally but not exclusively threatened species).

Table 5-1 below indicated the preferred conservation outcomes together with performance measures that will be monitored in order to ensure that they are achieved.

Table 5-1: Outcomes and Performance Measures

Conservation Item	Preferred Outcome	Performance Measures
Endangered Plant Community		
Cooks River Castlereagh Ironbark Forest (CRCIF) *formerly Cooks River Clay Plain Scrub Forest	Stabilisation of vegetation in the VCAs, with a reduction in number/extent of target weeds Increase in floristic diversity within homogenous stands of CRCIF, with reinstatement of structural integrity Increase in number of native ground cover species in all VCAs	No further clearance of CRCIF and no reduction in size/extent of the 14 designated VCAs Selected VCAs managed to encourage natural regeneration, particularly of ground cover species Increased floristic diversity in all VCAs, measured by quadrat monitoring (see Baseline Monitoring Data UBM 2013) Reduced time spent in on-ground works (excluding routine maintenance)
	Reconstruction of CRCIF in denuded or degraded sites where natural regeneration proves unsuccessful (i.e. indigenous planting) Plant material for reconstruction to be derived from locally-occurring CRCIF species only	Increased % cover of CRCIF in degraded sites in VCAs as compared to cover in 2014 (see Baseline Monitoring Data UBM 2013) Reduction in number and extent of degraded sites within selected VCAs Reduced time spent in on-ground works (excluding routine maintenance)

Vegetation structure	Regeneration of tree/shrub and ground cover strata within degraded areas of CRCIF in VCAs	Reinstatement of structural integrity: increased % cover in all strata measured by quadrat monitoring (see Baseline Monitoring Data UBM (2013)
VCAs 19 and 20 – indeterminate woodland	Retention of introduced tree plantings in this historic woodland, which provides significant fauna habitat Culling of unwanted tree seedlings and shrubs which volunteer into the woodland Increase in number of native ground covers in both VCAs (replacing exotic species)	Old canopy trees retained and managed to retain health Retention of open woodland habitat by culling unwanted tree seedlings and shrubs Increase in number and extend of native ground covers (see Baseline Monitoring Data UBM 2013)
Community Continuity	Connectivity/continuity between VCA Clusters improved: selected indigenous planting of CRCIF species along roads/canals and boundaries	Increased connectivity between CRCIF remnants compared to existing cover in 10 -Year Review (2013) Increase in number of trees/large shrubs in linkages to provide passage for urban-tolerant fauna
Threatened Flora Species	**Preferred Outcome**	**Performance Measures**
Acacia pubescens	Maintain existing populations within VCAs, with clearance of individuals in other parts of the Necropolis subject to Assessment of Significant Impacts (7-part Test) Expansion of existing populations within VCAs monitored (i.e. clonal growth) and presence of other populations elsewhere identified (see *Figure 2.3)*	Population retained within VCAs and in old burial sites. New stands/populations in VCAs and in other parts of the Necropolis identified and mapped

	To increase habitat available for the natural regeneration of this species through weed control and culling of selected native species (as required)	Increase in population size and density, as measured by quadrats (see Baseline Monitoring Data UBM 2013) New individuals/populations in all areas identified, quantified and mapped
Wahlenbergia multicaulis	To maintain the existing population in VCA 25, with loss of individuals (as mapped Smith & Smith 2013)	Population retained within VCA 25 and expansion into suitable sites (if applicable)
	To increase the habitat available for natural regeneration of this species through weed control and slashing in areas of long grass to create open habitat conditions	Population expands into other conservation areas.
Pomaderris prunifolia	As per the PMP (2002) Pomaderris established in suitable sites within the VCAs from genetic material salvaged from Area 5	Population of transplants is maintained with seedling recruitment and natural regeneration occurring in suitable sites Monitoring of population numbers to determine plant survival and recruitment
Epacris purpurascens	To maintain the existing population in VCA 25, with no clearance or loss of individuals To increase habitat available for the natural regeneration of this species through weed control and culling of selected native species (a/r)	Suitable habitat created by culling shading Melaleuca Population maintained: new individuals recruited
EVNT Fauna Species	**Preferred Outcome**	**Performance Measures**
General Fauna	Maintain and increase (where possible) the indigenous fauna diversity and abundance	

(Including both arboreal and terrestrial mammals, herpetofauna and birds)	Maintain and increase by indigenous planting (where possible) the variety and use of habitats by indigenous fauna in VCAs No removal of mature native vegetation, including hollow-bearing trees and ground debris in VCAs, providing potential fauna habitat	No significant reduction in avian visitors and/or numbers to sites and/or the number and diversity of, arboreal mammals, herpetofauna and small terrestrial mammal species (see Baseline Monitoring Data Smith & Smith 1999 and UBM 2013) No reduction in habitat availability and diversity with the modification and/or regeneration of native bushland within each VCA (i.e. retain diversity of fauna habitats) Bird survey undertaken every five (5) years, showing continuous site use of common species (identified from baseline surveys UBM 2013) Current level of usage by native fauna and abundance/species and diversity of avian species is retained
Common Bent-Wing Bat (*Miniopterus schreibersii oceanensis*)	Maintenance and encouraged growth of continuous canopy structures throughout all VCAs to encourage the continued foraging resources of this microbat species Increased habitat availability by selected indigenous planting of CRCIF species along roads/canals and boundaries	On-going monitoring of microbat species diversity and abundance (*i.e*. number of visits per season) over forested VCAs and general suitable habitat throughout the Necropolis to show ongoing species presence (see Baseline Monitoring Data Smith & Smith 1999 and UBM 2013) Improved corridors and linkages within the Necropolis (as for Connectivity)

Grey-headed Flying Fox (*Pteropus poliocephalus*)	Maintenance and support of VCAs that contain flowering Eucalypts, Melaleucas and/or Banksia species that are used as foraging resources for this species Increase resources in fauna habitat by planting flowering native species in local landscaping (as for Connectivity)	On-going monitoring of Flying fox abundance (*i.e*. number of visits per season) over forested VCAs and general suitable habitat throughout the Necropolis to show ongoing species presence (see Baseline Monitoring Data Smith & Smith 1999 and UBM 2013) Increased availability of fauna habitat and resources in local landscaping (as for Connectivity
Glossy Black Cockatoo (*Calyptorhynchus lathami*)	Maintenance and planting of *Allocasuarina* and/or *Casuarina* species, particularly within the Western Cluster, to provide foraging resources for this species	Monitoring of available feed trees observed within the Western Cluster (VCAs 27 & 28); checking for orts (remains of seed cones) at the base of feed trees, and recording all observations of individuals flying over and/or using the site to show ongoing species presence Targeted searches for this species as part of regular bird surveys continuous and/or seasonal site usage it maintained and current usage is not deteriorating (see Baseline Monitoring Data Smith & Smith 1999 and UBM 2013*)* Increased availability of suitable fauna habitat & resources in local landscaping (as for Connectivity)

Regionally Significant Species including the Yellow-rumped thornbill (*Acanthiza chrysorrhoa*), Zebra Finch (*Taeniopygia guttata*) and Brown Quail (*Coturnix ypsilophora*).	Maintain habitat in VCAs, such as those that occur in the western and central clusters that contain dense shrub cover and flowering natives for both shelter and foraging resources for small avian species Maintain areas of long grass in VCA 19, VCA 20 and VCA 18 that potentially provide sheltering and foraging habitat for the Brown Quail	Ongoing monitoring of targeted avian species throughout all VCAs through annual or biannual bird surveys to show ongoing species presence Interpretive signage erected to explain importance of providing suitable habit for this and other native fauna.
Overall Condition of CRCIF	**Preferred Outcome**	**Performance Measures**
General Condition	Diversity of native flora and fauna habitats maintained & enhanced	No reduction in habitat diversity within VCAs, measured by quadrat monitoring
	Reduction in key threatening processes such as herbivory by rabbits/hares, predation by foxes and feral cats, weed invasion	Reduced levels of herbivory by rabbits, hares and foxes
	Use of fire as a management tool adopted at Rookwood	Reinstatement of optimal fire regime

See *Appendix 10* for a list of Key Threatening Processes which occur, or have to the potential to occur at Rookwood.

6 REFERENCES

Bannerman , S.M. and Hazelton, P.A. (1989). *Soil Landscapes of the Penrith 1:100000 Sheet*. Soil Conservation Service of NSW, Sydney.

Benson, D.H. & McDougall, L. (1991). *Rare Bushland Plants of Western Sydney*. Royal Botanic Gardens, Sydney.

Botanic Gardens Trust (2011). PlantNET - The Plant Information Network System of Botanic Gardens Trust, Sydney, Australia (version 2.0) http://plantnet.rbgsyd.nsw.gov.au

Bushfire & Environmental Services (2004). Rookwood Necropolis Fire Management Plan. Unpublished report prepared for the Joint Committee of Necropolis Trusts.

Catterall, C. P., Green, P. J. & Jones, N. (1991). *Nature Conservation 2: The Role of Corridors*. (D.A. Saunders and R.J. Hobbs, eds). Surry Beatty and Sons, Chipping Norton, NSW.

Churchill, S. (2008). *Australian Bats*. Reed New Holland, Frenchs Forest.

Cilliers, S. (2010). In *Urban Biodiversity and Design* Ed. Muller, N, Werner, P. & Kelcey, G. Wiley-Blackwell Publishing United Kingdom

Claridge, A.W., Paull, D.J. and Barry, S.C. (2010) Detection of medium-sized ground-dwelling mammals using infrared digital cameras: an alternative way forward? *Australian Mammology* 32(2) 165-171.

Cogger, H., (1992). *Reptiles and Amphibians of Australia.* Reed Books, Chatswood.

Cropper, S. (1993). *Management of Endangered Plants*. CSIRO, Melbourne.

Department of Environment, Climate Change and Water (DECCW) (2011). Cumberland Plain Recovery Plan. NSW Department of Environment, Climate Change and Water.

Department of Environment, Climate Change and Water (2009b). *The Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area*. Prepared by DECCW for the Sydney Catchment Management Authority (in progress).

Department of Environment, Climate Change and Water (DECCW) (2010a). *Atlas of NSW Wildlife Database*. http://wildlifeatlas.npws.gov.au. [Accessed March 2013].

Department of Environment, Climate Change and Water (DECCW) (2010b). *Threatened species information*. http://www.threatenedspecies.environment.nsw.gov.au/index.aspx [Accessed March 2013].

Department of Primary Industries – Catchment & Lands (February 2014). Rookwood Necropolis Plan of Management. DPI Orange NSW

Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) (2010). *Environment Protection and Biodiversity Conservation Act Online Databases.* http://www.environment.gov.au/epbc/db/index.html [Accessed March 2013].

Ecohort Contractors and Consultants (2009-2010, 2010-2011 & 2011-212). Monthly Progress Reports prepared for the Rookwood Necropolis Trust.

Frith, H.J. (Ed) (2007). *Complete book of Australian birds*. Readers Digest, Surry Hills, NSW.

Harden, G.J. (1993 – 2004). *Flora of NSW. Volumes 1 – 4.* University of NSW Press, Sydney.

Hassall & Associates/Gillespie Economics. (2002). *Property Management Plan for Rookwood Necropolis*. Prepared for the Joint Committee of Necropolis Trustees.

Herbert, C. (1983). *Sydney 1:100 000 Geological Sheet 9130, 1st edition***.** Geological Survey of New South Wales, Sydney.

Jacobs, S.W.L., Wheeler JD.J.B., Whalley, R.D.B. (2008). *Grasses of New South Wales.* 4th Edition. University of New England Press, Armidale

James, T., McDougall, L., & Benson, D. (1999). *Rare Bushland Plants of Western Sydney.* Royal Botanic Gardens Sydney.

NSW Department of Industry and Investment (formerly Primary Industries) (2013). *Noxious Weeds Declarations* online at http://ww.dpi.nsw.gov.au/agriculture [Accessed April 2013]

NSW National Parks and Wildlife Service (NPWS) (1997). *Western Sydney Urban Bushland Biodiversity Study*. National Parks and Wildlife Service, Hurstville, NSW.

NSW National Parks and Wildlife Service (NPWS) (2004). Endangered Ecological Community Information – Cooks River Castlereagh Ironbark Forest @enviroment.nsw.gov.au

NSW Scientific Committee (2009). *Final Determination for Cumberland Plain Woodland* www.nationalparks.nsw.gov.au/npws.nsf [Accessed March 2013]

NSW Scientific Committee (2013). *Threatened Species Final and Preliminary Determinations*.ttp://www.npws.nsw.gov.au/news/tscdets/index.html [Accessed July 2013].

Office of Environment and Heritage (2013) *The Native Vegetation of the Sydney Metropolitan Area. Volume 1: Technical Report.* Version 2.0. Office of Environment and Heritage, Department of Premier and Cabinet, Sydney.

Office of Environment and Heritage (2013). Scarlet Robin Petroica boodang (Lesson 1838) - vulnerable species listing. http://www.environment.nsw.gov.au/determinations/scarletrobinFD.html [Accessed July 2013].

Pellow B.J., Henwood M, Carolin, R.C. (2009). *Flora of the Sydney Region*. 5th Edition. Sydney University Press, Sydney.

Simpson, K. and Day, N. (2004) *Field guide to the birds of Australia*. 7th Edition. Penguin Books Australia, Victoria.

Slater, P., Slater P & Slater, R. (2003). The *Slater Field Guide to Australian Birds.* New Holland, Sydney.

Smith, P. & Smith J. (1999). Flora and Fauna Survey of Rookwood Necropolis. Unpublished report prepared for the Joint Committee of Necropolis Trustees.

Smith, P. & Smith, J., (2003-2012). Survey of Rookwood Vegetation Conservation Areas for *Wahlenbergia multicaulis*. Unpublished annual reports prepared for the Joint Committee of Necropolis Trustees & Rookwood Necropolis Trust

Specht, R.L. (1981). Major Vegetation Formations in Australia, in: *Ecological Biogeography of Australia* (A. Keast [Ed.]) Dr. W. Junk bv. Publishers, The Hague, pp. 163-297.

Stewart, D. (2003). *Australian Frog Calls – Subtropical East.* Nature Sounds.

Stewart, D. & Plowright, H. (2002). *A Field Guide to Australian Birdsong.* Boca, Nunawading, Victoria.

Strahan, R. (Ed) (2008). *The Mammals of Australia, 3rd Edition*. Reed Books, Chatswood.

Tozer, M. G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C. (2010). 'Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tableland in *Cunninghamia* 11(3).

Triggs, B., (2004). *Tracks, Scats and Other Traces: A Field Guide to Australian Mammals*. Oxford University Press, Melbourne.

UBMC (2003). *Bushland Plan of Management for Rookwood Necropolis: NPWS Issue, October 2003*. Unpublished report prepared for the Joint Committee of Necropolis Trustees and the NSW NPWS

UBMC/UBM (2004 to 2013). Rookwood Necropolis Bush Regeneration Program. Annual Progress Reports. Unpublished reports prepared for the Joint Committee of Necropolis Trustees/Rookwood Necropolis Trust

UBMC (June 2005). Final Report Translocation of *Pomaderris prunifolia.* Unpublished report prepared for the Joint Committee of Necropolis Trustees and DECC.

UBM Ecological Consultants (2008 - 2013). Annual Threatened Flora Species Census Reports for Rookwood Necropolis. Unpublished reports prepared for the Joint Committee of Necropolis Trustees/Rookwood Necropolis Trust

UBM Ecological Consultants (December 2008). *Translocation Management for Pomaderris prunifolia in Area 4 at Rookwood Necropolis.* Unpublished report prepared for the NSW Department of Lands

UBM Ecological Consultants (July 2009 - 2013). Bush Regeneration Annual Reports. Unpublished reports prepared for the Rookwood Necropolis Trust.

UBM Projects (2006/2007, 2007/2008). Rookwood Necropolis Bush Regeneration Annual Reports Unpublished reports Prepared for the Joint Committee of Necropolis Trustee

Van Dyck, S. and Strahan, R. (Eds) (2008). *The mammals of Australia (3rd edition)*. Reed New Holland, Sydney, NSW.

7 APPENDICES

Appendix 1: Final Determination Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion – endangered ecological community listing

NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, as an ENDANGERED ECOLOGICAL COMMUNITY on Part 3 of Schedule 1 of the Act, and to omit reference to the Cooks River Clay Plain Scrub Forest as an Endangered Ecological Community. Listing of Endangered Ecological Communities is provided for by Part 2 of the Act. The Scientific Committee has found that:

1. Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion is the name given to the ecological community characterised by the species assemblage listed in paragraph 2. All sites are within the Sydney Basin Bioregion.

2. Cooks River/Castlereagh Ironbark Forest is characterised by the following assemblage:

- *Acacia binervia*
- *Acacia falcata*
- *Angophora bakeri*
- *Angophora floribunda*
- *Aristida ramosa*
- *Aristida vagans*
- *Astroloma humifusum*
- *Austrodanthonia setacea*
- *Austrodanthonia tenuior*
- *Austrostipa pubescens*
- *Austrostipa rudis*
- *Billardieria scandens*
- *Boronia polygalifolia*
- *Bursaria spinosa*
- *Calotis cuneifolia*
- *Cassinia arcuata*
- *Cassytha glabella* form *glabella*
- *Cheilanthes sieberi* subsp. *sieberi*
- *Dianella revoluta*
- *Dichelachne micrantha*
- *Dillwynia parviflora*
- *Dillwynia sieberi*
- *Einadia nutans*
- *Einadia trigonos*
- *Entolasia stricta*
- *Eragrostis brownii*
- *Eucalyptus capitellata*
- *Eucalyptus fibrosa*
- *Eucalyptus longifolia*
- *Eucalyptus moluccana*
- *Eucalyptus resinifera*
- *Exocarpos cupressiformis*
- *Glycine clandestina*
- *Gonocarpus tetragynus*
- *Goodenia belledifolia*
- *Goodenia hederacea* subsp. *hederacea*
- *Goodenia paniculata*
- *Hakea sericea*
- *Hibbertia empetrifolia*
- *Hibbertia serpyllifolia*
- *Kunzea ambigua*
- *Laxmannia gracilis*
- *Laxmannia gracilis*
- *Lepidosperma laterale*
- *Leptospermum trinervium*
- *Leucopogon juniperinus*
- *Lissanthe strigosa*
- *Lomandra longifolia*
- *Lomandra multiflora* subsp. *multiflora*
- *Melaleuca decora*
- *Melaleuca decora*
- *Melaleuca nodosa*
- *Microlaena stipoides*
- *Microtis parviflora*
- *Notelaea longifolia*
- *Opercularia diphylla*
- *Orthoceras strictum*
- *Ozothamnus diosmifolius*
- *Ozothamnus diosmifolius*
- *Panicum simile*
- *Paspalidium distans*
- *Podolobium ilicifolium*
- *Pomax umbellata*
- *Poranthera microphylla*
- *Pratia purpurascens*
- *Pultenaea villosa*
- *Rhytidosporum procumbens*
- *Stackhousia viminea*
- *Syncarpia glomulifera*
- *Thelymitra pauciflora*
- *Themeda australis*
- *Vernonia cinerea* var. *cinerea*
- *Wahlenbergia gracilis*
- *Xanthorrhoea media*

3. The total species list of flora and fauna of the community is considerably larger than that given in 2 (above), with many species present in only one or two sites or in very small quantity. The community includes invertebrates, many of which are poorly known, as well as vertebrates. In any particular site not all of the assemblage listed above may be present. At any one time, some species may only be present as seeds in the soil seed bank with no above-ground individuals present. Invertebrate species may be restricted to sediments or canopy trees and shrubs for example. The species composition of the site will be influenced by the size of the site and by its recent disturbance history. The number of species and the above-ground composition of species will change with time since fire, and may also change in response to changes in fire frequency.

4. Cooks River/Castlereagh Ironbark Forest is predominantly of open-forest to low woodland structure usually with trees of Eucalyptus fibrosa and Melaleuca decora, sometimes with Eucalyptus longifolia. A relatively dense shrub stratum is typical, commonly with Melaleuca nodosa and Lissanthe strigosa, and to a lesser extent Melaleuca decora. A variety of shrub species may occur, including Acacia pubescens, Dillwynia tenuifolia, Daviesia ulicifolia, Pultenaea villosa and Grevillea juniperina. Commonly occurring species in the ground stratum include Entolasia stricta, Lepidosperma laterale, Opercularia diphylla, Dianella revoluta, Themeda australis, Microlaena stipoides and Pratia purpurascens.

5. Cooks River/Castlereagh Ironbark Forest usually occurs on clay soils on Tertiary alluvium, or on shale soils on Wianamatta Shale including the Birrong Soil Landscape and associated shale lowlands.

6. Cooks River/Castlereagh Ironbark Forest is described in NSW NPWS (2000a&b) which lists diagnostic plant species for the community. These species provide a guide to identification of the community, but care should be taken in the application and interpretation of diagnostic plant species because of sampling limitations; the reduction in species diversity in degraded sites; and the fact that some species may only be present at a site at some times as a soil seedbank or as dormant bud/tubers.

7. Cooks River/Castlereagh Ironbark Forest is or has been known to occur in the Auburn, Bankstown, Blacktown, Canterbury, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Strathfield local government areas, but may occur elsewhere in the Sydney Basin Bioregion.

8. It occurred extensively in the Castlereagh area, Holsworthy-Voyager Point area, Kemps Creek area and the upper Cooks River valley, Duck River and associated shale lowlands in the Canterbury-Auburn-Strathfield-Bankstown-Parramatta-Holroyd area.

9. Cooks River/Castlereagh Ironbark Forest may grade into Castlereagh Swamp Woodland in poorly-drained depressions or into Castlereagh Scribbly Gum Woodland where the soil is sandier. Where the Tertiary alluvium is shallow, the community may grade into Shale Gravel Transition Forest.

10. Disturbed Cooks River/Castlereagh Ironbark Forest remnants are considered to form part of the community including remnants where the vegetation would respond to assisted natural regeneration such as where the natural soil and associated seedbank is still at least partially intact.

11. Cooks River/Castlereagh Ironbark Forest has been extensively cleared for urban and rural developments. About 7% of the original distribution is estimated to remain (NSW NPWS 2000a). There has been very extensive clearing and major fragmentation and isolation of remnants in the Canterbury-Auburn-Strathfield-Bankstown-Parramatta-Holroyd area. Much of the remaining area of Cooks River/Castlereagh Ironbark Forest elsewhere has been disturbed by clearing, tracks, weed invasion and soil disturbance. Continuing threats to the community include invasion by exotic species, illegal dumping, water pollution, unauthorised access, fragmentation and clearing for urban, rural-residential, recreational and industrial development.

12. Cooks River/Castlereagh Ironbark Forest has been reported from Agnes Banks Nature Reserve, Castlereagh Nature Reserve and Windsor Downs Nature Reserve. The area of the community in these reserves is about 1.7% of the original distribution.

13. The eastern occurrences of this community, in the Canterbury-Auburn-Strathfield- Bankstown-Parramatta-Holroyd area, are currently listed as the Cooks River Clay Plain Scrub Forest Endangered Ecological Community. The present determination recognises that similar areas in Western Sydney, previously not recognised as part of the community, should be included as part of the listed Endangered Ecological Community.

14. In view of the originally restricted distribution of this community, its inadequate representation within conservation reserves, the extensive disturbance and fragmentation and weed invasion that has occurred and the ongoing development and use threats, the Scientific Committee is of the opinion that Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate and that the community is eligible for listing as an endangered ecological community.

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References

NSW NPWS (2000a). Native vegetation maps of the Cumberland Plain, western Sydney - Interpretation guidelines. NSW National Parks & Wildlife Service, January 2000.

NSW NPWS (2000b). The native vegetation of the Cumberland Plain, Western Sydney - Technical report. NSW National Parks & Wildlife Service, April 2000

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Appendix 2: Chronology of Previous Studies, Reports and Management Plans

Author / Date	Title
Price, G.A. 1979	The vegetation of Duck River and Rookwood Cemetery, Auburn. Unpublished report (copy held in library, Royal Botanic Gardens Sydney)
Smith, P. & J. Smith (1988)	Flora and fauna survey of Rookwood Necropolis. Report prepared for Joint Committee of Necropolis Trustees, Rookwood Necropolis
Mt King Ecological Surveys (1992)	Ecological Survey of West Rookwood – Flora and Fauna Survey
Quality Environmental Management (1993)	Vegetation survey, Lot 486 and environs, Rookwood Necropolis. Report prepared for Catholic Cemetery Trust
Conservation & Land Management (gazetted 1993)	Plan of Management for Rookwood Necropolis Vol 1- VIII
Benson, D. and J. Howell. (1994)	The natural vegetation of the Sydney, 1:100 000 map sheet. Cunninghamiana 3: 679-788.
Quality Environmental Management. (1994a)	Endemic Plant Assessment, Rookwood Necropolis, Stage 1 - Status report. (1994). Report prepared for Joint Committee of Necropolis Trustees, Rookwood Necropolis
Quality Environmental Management (1994b)	Endemic Plant Assessment Rookwood Necropolis, Stage 2 - Management Strategies (1994). Report prepared for Joint Committee of Necropolis Trustees, Rookwood Necropolis
Quality Environmental Management (1995)	Plan of Management for Rookwood Necropolis
Landscan Pty Ltd (1996)	Rookwood Necropolis Indigenous Vegetation Management Plan
Smith, P. & Smith J. December (1999)	Flora and Fauna Survey of Rookwood Necropolis
ERM Mitchell McCotter (2002a)	Draft Property Management Plan for Rookwood Necropolis
ERM Mitchell McCotter (2002b)	Anglican and General Trusts, Rookwood Necropolis Property Management Plan, Final Draft, June 2002.
Hassall & Associates/Gillespie Economics (August 2002).	Property Management Plan for Rookwood Necropolis

DEM/Landscan Pty Ltd (various dates)	Annual Reports to the JCNT
Urban Bushland Management / UBM Projects (1996-2002)	Progress and Annual Reports for Bush Regeneration Program and various Supplementary Investigations
National Trust of Australia (NSW) (1996-1999)	Annual Reports, Bush Regeneration Program
DEM/Landscan (August 2013)	Rookwood Property Management Plan 10-year Review (the 10-year Audit)
UBM Ecological Consultants (2002-2013)	Bush Regeneration Annual Reports
UBM Ecological Consultants (2003-2012)	Threatened Species Census Reports
UBM Ecological Consultants (August 2013)	Biodiversity Studies: flora and fauna investigations for native bushland at Rookwood Necropolis
Department of Primary Industries (2014)	Rookwood Necropolis Plan of Management

Appendix 3: List of Flora Species Recorded at Rookwood Necropolis (UBM 2013)

Plant Community: Cooks River Castlereagh Ironbark Forest (CRCIF)

Variants:
Tick Bush-Ball Honey-myrtle Scrub - T1
Feather Honey-myrtle Scrub - T2
Ball Honey-myrtle Scrub - T3, T4, T5, T6 (part)
Apple-Tea Tree-Hakea scrub - T6 (part), T7, T8, T9
Melaleuca thymifolia Wet Heath - T10 (unsurveyed - misc. spp.)

KEY
* = introduced species
adj = occurs adjacent to Quadrat

Estimated cover abundance in Quadrat
1 = rare
2 = occasional
3 = common but less than 5%
4 = very common
5 = 5-25%
6 = 26-50%
7 = 51-75%

Number	Conservation Area	Length (M)	Quadrat (20m X 20m)	Conservation Area
1	25	400	1	25
2	6	400	2	6
3	9/10/21	150	3	9/21/10
4	11/12	150	4	11/12
5	7	150	5	7
6	8/27/28	250	6	8/27/28
7	18	250	7	18
8	19	400	8	19
9	20	400	9	20
10	17, 18	100		

Locations of quadrats to allow for replication

Q1 - 56 320657 6249216 GDA 1994
Q2 - 56 320898 6249509
Q3 - 56 320300 6249925
Q4 - 56 320116 6249981
Q8 - 56 320085 6251065
Q9 - 56 320237 6250934

	Family & Scientific Name	Common Name	Transect No.										Quadrat No.								
			T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
	CANOPY TREES																				
	Araucariaceae																				
*	*Araucaria bidwillii*	Bunya Pine							x		x										

	Pinaceae														
*	*Pinus radiata*	Monterey Pine		x											
	Casuarinaceae														
	Casuarina glauca	Swamp Oak					x	x							
	Myrtaceae														
	Angophora floribunda	Rough-barked Apple						x	x	x	x				
*	*Corymbia citriodora*	Lemon-scented Gum					x			x	x				5
*	*Corymbia maculata*	Spotted Gum		x						x	x				
*	*Eucalyptus botryoides*	Bangalay									x				
*	*Eucalyptus cladocalyx*	Sugar Gum								x					
*	*Eucalyptus crebra*	Narrow-leaved Ironbark				x	x								
	Eucalyptus fibrosa	Broad-leaved Ironbark		x	x										
	Eucalyptus globoidea	White Stringybark			x							5			
*	*Eucalyptus globulus*	Tasmanian Blue Gum									x				
*	*Eucalyptus melliodora*	Yellow Box								x	x				
*	*Eucalyptus microcorys*	Tallowwood					x			x	x			5	
	Eucalyptus moluccana	Grey Box				pl									
	Eucalyptus paniculata	Grey Ironbark									pl				
	Eucalyptus resinifera	Red Mahogany			x		x	x	x						
*	*Eucalyptus scoparia*	Wallangarra Gum					x								
	Eucalyptus tereticornis	Forest Red Gum			x	x	x	x	x				5		
*	*Eucalyptus* sp.										x				
*	*Lophostemon confertus*	Brush Box					x			x	x				
	SMALL TREES														
	Cupressaceae														
*	*Cupressus* sp.	Cedars	x												
	Casuarinaceae														

	Allocasuarina littoralis	Black She-oak		**x/pl**				**x**		**pl**	**pl**										
	Allocasuarina torulosa	Forest Oak									**pl**										
	Casuarina glauca	Swamp Oak	**x**	**pl**	**x**				**x**												
	Fabaceae																				
	Acacia binervia	Coast Myall			**pl**																
	Acacia decurrens	Green Wattle	**x**	**x**	**x**	**x**	**x**	**x**			**x**							**1**			
	Acacia parramattensis	Parramatta Wattle				**x**			**x**	**x**	**x**								**1**	**1**	
	Lauraceae																				
*	*Cinnamomum camphora*	Camphor Laurel									**x**										
	Myrtaceae																				
	Angophora bakeri	Narrow-leaved Apple					**x**	**x**	**x**									**5**	**2**		
	Angophora floribunda	Rough-barked Apple					**x**		**x**												
*	*Corymbia citriodora*	Lemon-scented Gum									**x**										**5**
*	*Eucalyptus cladocalyx*	Sugar Gum									**x**										
	Eucalyptus longifolia	Woollybutt			**x**																
*	*Eucalyptus microcorys*	Tallowwood					**x**														
	Eucalyptus oblonga	a Stringybark		**x**																	
	Eucalyptus resinifera (live stump)	Red Mahogany												**1**							
*	*Eucalyptus robusta*	Swamp Mahogany							**x**												
*	*Eucalyptus saligna*	Blue Gum							**x**												
*	*Eucalyptus sideroxylon*	Mugga Ironbark								**x**	**x**										
	Eucalyptus tereticornis	Forest Red Gum				**x**					**pl**					**1**	**1**		**adj**		
	Melaleuca decora	Feather Honey-myrtle	**x**	**x**		**x**	**x**	**x**	**x**			**x**		**5**	**1**		**5**				
	Melaleuca nodosa	Ball Honey-myrtle	**x**			**x**							**5**		**6**	**1**					
*	*Melaleuca quinquenervia*	Broad-leaved Paperbark																			
	Melaleuca styphelioides	Prickly Paperbark		**pl**																	
	Syncarpia glomulifera	Turpentine			**x**				**adj**												

	Pittosporaceae																		
	Pittosporum undulatum	Sweet Pittosporum	x						x		2								
	Proteaceae																		
*	*Grevillea robusta*	Silky Oak							x										
	Rhamnaceae																		
*	*Alphitonia excelsa*	Red Ash					x												
	Santalaceae																		
	Exocarpos cupressiformis	Cherry Ballart																	
	Sterculiaceae																		
	Brachychiton populneus	Kurrajong																	
	Ulmaceae																		
*	*Ulmus parvifolia*	Small-leaved Elm							x										
	SHRUBS																		
	Araucariaceae																		
*	*Araucaria bidwillii*	saplings						x	x										1
	Pinaceae																		
*	*Pinus radiata*	saplings					x												
	Anacardiaceae																		
*	*Pistacia chinensis*	Pistachio saplings		x							1								
	Araliaceae																		
	Astroloma latifolium	Broad-leaved Sneeze-bush																	
	Polyscias sambucifolius	Elderberry Panax	x	x	x	x	x	x	x	x			1			2			
	Asteraceae																		
	Cassinia arcuata	Sifton Bush	x	x	x	x	x	x	x	x	x		2	1			3		
	Olearia microphylla	A daisy bush			x	x	x				x		2		2				
	Olearia viscidula	A daisy bush															8		
	Ozothamnus diosmifolius	White Dogwood				x		x					1	1					

	Casuarinaceae																			
	Allocasuarina littoralis	saplings						x												
	Casuarina glauca	saplings					x	x												
	Celastraceae																			
	Maytenus silvestris	Narrow-leaved Orangebark		x																
	Dilleniaceae																			
	Hibbertia aspera	Rough Golden Guinea Flower	x	x	x	x	x	x	x				1	1	2	2				
	Hibbertia pedunculata		x		x				x											
	Epacridaceae																			
	Astroloma humifusum	Cranberry Heath	x																	
	Epacris purpurascens var. *purpurascens*	Port Jackson Heath	x										2							
	Leucopogon juniperinus	Prickly Beard-heath	x	x	x	x	x	x	x				1	2						
	Lissanthe strigosa	Peach Heath			x	x	x	x	x			x			adj	2	2	3	3		
	Monotoca scoparia	Monotoca								x											
	Euphorbiaceae																			
	Breynia oblongifolia	Dwarfs Apples	x		x					x			1		1					
	Glochidion ferdinandi var *ferdinandi*	Cheese Tree	x			x		x												
	Glochidion ferdinandi var *pubens*	Hairy Cheese Tree	x																	
	Homalanthus populifolius	Bleeding Heart	x							x			2							
*	*Sapium sebiferum*	Chinese Tallow Tree	x																	
	Fabaceae																			
	Bossiaea prostrata	Creeping Bossiaea			x			x	x									3	3	1
	Daviesia ulicifolia	Gorse Bitter Pea			x			x	x	pl	x								1	1
	Dillwynia parvifolia	Small-flowered Pea			x	x	x	x	x						1	2	2	2			
	Dillwynia sieberi	Prickly Parrot Pea	x	x	x									2						
	Gompholobium minus	Small-flowered Wedge-pea																1		

*	*Indigofera* sp.	Sarsaparilla									x	x											
	Mirbelia rubiifolia								x														
	Pultenaea retusa	Notched Bush-pea					x				x												
	Pultenaea villosa	Hairy Pultenaea	x	x	x	x	x	x	x	x	pl			5	5		2		2				
	Acacia binervia	saplings			x																		
	Acacia brownii	Brown's Wattle								pl										1			
	Acacia decurrens	saplings								x						1	1						
	Acacia falcata	Sickle Wattle	x				x				pl					1				2	1		
	Acacia longifolia	Sydney Golden Wattle	x	x/pl	x			x					3	3									
	Acacia longissima	Narrow-leaf Wattle			x					pl										1			
	Acacia myrtifolia	Myrtle-leaved Wattle					x			x	x							1	1	2			
	Acacia parramattensis	saplings		x	x	x											1		1	1	adj		
	Acacia pubescens	Downy Wattle	x	x	x	x				x	pl				3	2							
*	*Acacia saligna*	Golden Wreath Wattle		x			x																
*	*Acacia spectabilis*	Mudgee Wattle						x															
	Acacia stricta	Hop Wattle								pl	x										1 pl		
	Acacia suaveolens	Sweet-scented Wattle								pl	pl												
	Acacia sp.	Wattles									pl												
*	*Senna pendula* var *glabrata*	Senna/Cassia	x								x		1										
	Malaceae																						
*	*Cotoneaster glauca*	Cotoneaster					x								1								
*	*Cotoneaster pannosa*	Silver-leaf Cotoneaster						x															
*	*Rhapholepis indica*	Indian Hawthorn			x	x	x	x	x														
	Meliaceae																						
*	*Melia azedarach*	saplings									x												
	Moraceae																						
*	*Morus alba*	White Mulberry	x																				

	Myrsinaceae																					
	Myrsine variabilis	Variable Muttonwood		**x**																		
	Myrtaceae																					
	Angophora bakeri	saplings				**x**		**x**			**x**		**3**					**3**	**3**	**1?**		
*	*Angophora costata*	saplings								**x**												
	Angophora floribunda	saplings																		**1**		
	Callistemon linearis	Narrow-leaf Bottlebrush	**x**	**x**		**x**		**x**			**x**					**1**	**2**					
	Callistemon ?rigida	Stiff Bottlebrush				**x**	**x**															
*	*Corymbia citriodora*	saplings																		**2**	**3**	
*	*Eucalyptus crebra*	saplings				**x**																
*	*Eucalyptus microcorys*	saplings										**1**										
	Eucalyptus tereticornis	saplings		**x/pl**		**x**	**x**	**x**														
	Eucalyptus sp.	saplings		**x**																		
	Kunzea ambigua	Tick Bush	**x**	**x**	**x**				**x**			**7**							**2**			
*	*Leptospermum juniperinum*	Swamp Tea Tree								**x**												
	Leptospermum polygalifolium	Yellow Tea Tree	**x**	**pl**	**x**	**x**						**1**										
	Leptospermum trinervium	Paperbark Tea Tree			**x**	**x**	**x**	**x**	**x**	**x**	**x**				**2**			**5**	**5**			
*	*Lophostemon confertus*	saplings								**x**												
*	*Melaleuca armillaris*	Bracelet Honey-myrtle	**x**		**x**							**1**										
	Melaleuca decora	saplings		**x**	**x**						**pl**											
	Melaleuca ericifolia	Swamp Paperbark		**pl**				**x**			**pl**											
	Melaleuca erubescens	Rosy Honey-myrtle	**adj**	**x**		**pl**		**x**		**pl**	**pl**											
	Melaleuca nodosa	saplings	**x**	**x/pl**	**x**	**x**	**x**	**x**	**x**		**pl**		**5**	**5**	**3**	**7**	**8**	**5**				
*	*Melaleuca quinquenervia*	saplings	**x**																			
	Melaleuca thymifolia	Thyme Honey-myrtle				**x**	**x**	**x**	**pl**	**pl**	**x**							**adj**				
	Syncarpia glomulifera	saplings							**pl**	**pl**												
	Ochnaceae																					

*	*Ochna serrulata*	Mickey Mouse Plant	x	x	x		x	x					2	1								
	Oleaceae																					
*	*Ligustrum lucidum*	Large-leaved Privet saplings	x						x				1									
*	*Ligustrum sinense*	Small-levaed Privet saplings	x										2									
	Notelaea longifolia	Large Mock Olive	x	x	x								1									
*	*Olea europaea* spp *cuspidata*	Olive saplings									x											
	Onagraceae																					
*	*Ludwigia peruviana*	Cape Primrose	x																			
	Pittosporaceae																					
	Bursaria spinosa	Blackthorn	x	x	x	x	x	x	x		x	x	3	3	3	3			1			
	Pittosporum revolutum	Yellow Pittosporum																				
	Pittosporum undulatum	Sweet Pittosporum	x	x	x	x	x	x	x	x	x	2			2	1	1	2		1		
	Rhytidosporum procumbens						x	x														
	Polygalaceae																					
*	*Polygala virgatus*	Purple Pea-flower	x						x													
	Proteaceae																					
	Banksia spinulosa	Hairpin Banksia						x	x													
	Hakea sericea	Silky Hakea	x	x/pl	x	x	x	x	x					2	1	3	5	5				
	Lomatia silaifolia	Crinkle Bush								x												
	Persoonia laurina																1					
	Petrophile pulchella	Conesticks									pl											
	Rhamnaceae																					
*	*Alphitonia excelsa*	saplings			x	x	x	x														
	Pomaderris elliptica										pl											
	Pomaderris intermedia																					
	Pomaderris prunifolia			pl	pl	pl		pl			pl											
	Rosaceae																					

*	*Rosa* sp.	Rose (hybrids)					x	x		x										
	Rutaceae																			
*	*Murraya paniculata*	Orange Jessamine																	adj	
	Zieria smithii	Stinkbush																		
	Santalaceae																			
	Exocarpos cupressiformis	saplings			x															
	Sapindaceae																			
	Dodonaea triquetra	Common Hopbush																		
	Solanaceae																			
*	*Cestrum parqui*	Yellow Cestrum			x	x				x	1								adj	
*	*Solanum mauritianum*	Tobacco Tree	x								1									
	Sterculiaceae																			
*	*Brachychiton acerifolius*	saplings							x											
	Verbenaceae																			
	Clerodendrum tomentosum	Hairy Clerodendrum																		
*	*Lantana camara*	Lantana	x	x						x			1							
*	*Lantana montevidensis*	Creeping Lantana			x	x	x		x		x		1							
	Arecaceae																			
*	*Livistona australis*	Cabbage Palm																		
*	*Phoenix canariensis*	Canary Island Date Palm		x					x	x										
	Xanthorrhoeaceae																			
	Xanthorrhoea concava	a grass tree					x		x								1	3		
	Xanthorrhoea minor	a grass tree																	3	
	HERBS - FERNS																			
	Sinopteridaceae																			
	Cheilanthes sieberi	Rock Fern	x	x	x	x	x	x	x	x	x		2	4	3	2	1		3	
	HERBS - DICOTS																			

	Cupressaceae																					
*	*Cupressus* sp.	seedling				x																
	Acanthaceae																					
	Pseuderanthemum variabile	Pastel Flower																				
	Apiaceae																					
	Centella asiatica	Pennywort	x	x	x	x	x	x	x	x	x	x	3	2	2							
	Hydrocotyle peduncularis	Hydrocotyle			x			x					1									
	Asclepiadaceae																					
*	*Gomphocarpus fruticosus*	Milkweed	x				x					x										
	Asteraceae																					
*	*Ageratina adenophora*	Crofton Weed	x	x							x			2								
*	*Aster subulatus*	Wild Aster	x		x	x					x	x										
*	*Bidens pilosa*	Farmers Friends	x	x	x	x	x	x	x	x	x			2			2					
	Calotis cuneifolia	Blue Burr-daisy		x	adj										1							
	Chrysocephalum apiculatum	Yellow Buttons			x	x	x	x		x					1			1	1	3		
*	*Cirsium vulgare*	Spear Thistle	x	x							x											1
*	*Conyza bonariensis*	a Fleabane	x		x	x	x	x			x		1	2								2
*	*Coreopsis lanceolata*	Black-eyed Susan	x	x	x		x	x	x	x	x			2	3				2	4	1	
*	*Crepis crepidioides*	Thickhead			x																	
	Euchiton sphaericum													1								
*	*Gnaphalium americanum*	Cudweed	x	x		x	x															
*	*Gnaphalium* sp.							x														
*	*Hypochaeris radicata*	Flatweed	x		x	x	x		x		x		2		1					1		
	Senecio hispidulus var *hispidulus*	Rough-leaf Senecio			x	x		x	x		x		1									
*	*Senecio madagascariensis*	Fireweed				x				x												
	Sigesbeckia orientalis	Indian Scurvy Weed								x												
	Solenogyne bellioides									x	x											

*	*Sonchus oleraceus*	Sow Thistle				x	x												1		
*	*Taraxacum officinale*	Dandelion			x																
	Vernonia cinerea	Blue Veronica						x		x										1	1
	Campanulaceae																				
	Wahlenbergia gracilis	Small Bluebell						x		x											
	Wahlenbergia multicaulis	Tadgels Bluebell	x	x										1							
	Wahlenbergia sp.	A Bluebell					x	x													
	Chenopodiaceae																				
	Einadia hastata	Saloop	x	x	x						x										2
	Einadia nutans ssp *linifolia*										x										
	Clusiaceae																				
	Hypericum gramineum							x	x			x			2			1			
*	*Hypericum perforatum*	St Johns Wort	x																		
	Convolvulaceae																				
	Dichondra repens	Kidney Plant	x	x	x	x		x		x				4							
	Euphorbiaceae																				
	Chamaesyce sp.				x	x															
*	*Euphorbia peplus*	Petty Spurge				x															
	Poranthera microphylla		x																		
	Fabaceae																				
	Desmodium varians	Tick Trefoil																			adj
	Zornia dyctiocarpa																				adj
*	*Trifolium repens*	White Clover			x	x															
	Gentianaceae																				
*	*Centaurium* sp.	Milkmaids																			
	Goodeniaceae																				
	Goodenia hederacea	Variable Goodenia	x		x		x	x	x			x			1			1	1		

	Goodenia paniculata		x					x																
	Haloragaceae																							
	Gonocarpus tetragyna	Raspwort	x							x	x	x									2	3		
	Lauraceae																							
*	*Cinnamomum camphora*	seedlings								x														
	Lobeliaceae																							
	Pratia purpurascens	Whiteroot	x	x	x	x	x	x	x	x	x	x	2	2		2								5
	Malaceae																							
*	*Cotoneaster glauca*	seedlings						x																
*	*Rhaphiolepis indica*	seedlings						x				x												
	Malvaceae																							
*	*Modiola caroliniana*	Mallow		x							x													
*	*Sida rhombifolia*	Paddys Lucerne	x			x	x			x	x													
	Ochnaceae																							
*	*Ochna serrulata*	seedlings			x		x		x	x			1			1								
	Oleaceae																							
*	*Ligustrum sinense*	seedlings											3											
	Onagraceae																							
*	*Epilobium* sp.	Willow Weed	x																					
	Oxalidaceae																							
*	*Oxalis carnea*	Oxalis				x																		
	Oxalis perennans			x	x	x	x			x	x						1			1		2		
*	*Oxalis* sp.			x						x	x													
	Plantaginaceae																							
*	*Plantago lanceolata*	Lambs Tongue	x	x	x	x	x	x		x	x		1	3										
	Polygonaceae																							
	Persicaria decipiens	Spotted Knotweed	x																					

	Rumex brownii			**x**																
*	*Rumex crispus*	Swamp Dock									**x**									
	Portulaccaceae																			
*	*Portulacca* sp.	Pigface								**x**										
	Rubiaceae																			
	Opercularia aspera						**x**									**2**				
	Opercularia diphylla					**x**	**x**	**x**						**1**	**2**		**2**			
*	*Richardia stellaria*									**x**										
	Pomax umbellata	Pomax			**x**										**1**					
	Scrophulariaceae																			
	Veronica plebeia	Trailing Speedwell																**1**		
	Solanaceae																			
*	*Solanum chenopodioides*		**x**			**x**					**x**									
*	*Solanum nigrum*	Blackberry Nightshade	**x**	**x**									**1**		**1**			**2**		**2**
	Stackhousiaceae																			
	Stackhousia viminea							**x**	**x**			**x**								**1**
	Stylidiaceae																			
	Stylidium gramineum	Trigger Plant						**x**												
	Ulmaceae																			
*	*Celtis* sp.	seedlings			**x**															
	Verbenaceae																			
*	*Verbena officinale*	Small-flowered Purpletop	**x**	**x**	**x**															
*	*Verbena prostrata*									**x**	**x**								**4**	**2**
*	*Verbena* sp. (*rigida/bonariensis*)				**x**			**x**		**x**	**x**									
	HERBS - MONOCOTS																			
	Agavaceae																			
*	*Agave* sp.										**x**									

*	*Doryanthes excelsa*	Spear Lily									x																
	Amaranthaceae																										
*	*Agapanthus* sp	Agapanthus		x							x																
*	*Aspidistra elatior*	Aspidistra				x																					
	Anthericaceae																										
*	*Chlorophytum comosum*	Spider Lily									x																
	Laxmannia gracilis						x	x																			
	Arecaceae																										
*	*Arecastrum romanzoffianum*	seedling				x						x															1
	Asparagaceae																										
*	*Asparagus aethiopicus* var. *densiflorus*	Asparagus 'fern'	x	x	x	x	x	x	x	x	x	x	2		2												2
	Commelinaceae																										
	Commelina cyanea	Blue Wandering Jew	x	x					x	x	x			1													
*	*Tradescantia fluminensis*	Wandering Jew								x																	
	Cyperaceae																										
	Carex inversa									x				1													adj
	Cyathochaeta diandra								x											5	5						
*	*Cyperus eragrostis*	Umbrella Sedge	x	x	x																						
	Cyperus gracilis																										adj
	Fimbristylis dichotoma				x							x															
	Lepidosperma gunnii						x	x											1	2							
	Lepidosperma laterale	Broad Sword-sedge	x		x	x			x	x		x	1	2	2	2						2					
	?Ptilothrix deusta													2													
	Schoenus sp	Black Bog-sedge	x												1												
	Hypoxidaceae																										
	Hypoxis hygrometrica ssp *hygrometrica*							x																			

	Iridaceae																						
*	*Crocosmia crocosmiiflora*	Montbretia										x								2?			2
*	*Freesia reflexa cv*	Freesia			x	x	x	x	x	x	x	x			3	2	2						3
	Patersonia sericea	Purple Flag																1					
	Juncaceae																						
*	*Juncus cognatus*			x																			
	Juncus sp.	A sedge	x	x	x																		
	Lomandraceae																						
	Lomandra filiformis ssp. *filiformis*	Wattle Mat-rush		x	x										3	1	1						
	Lomandra longifolia	Spiny-headed Mat-rush	x	x	pl	x	x		x	x	x			1		1	2	2	3	5			
	Lomandra multiflora	Many-flowered Mat-rush			x	x	x	x		x	x			2			1		1	1	2		
	Phormiaceae																						
	Dianella caerulea var *producta*	Rough Flax-lily		x/pl						x				1									
	Dianella longifolia		x		x		x	x	x		x	x	1	2	2		2		3	2	1		
	Dianella revoluta	Paroo Lily		x	x	x		x	x						3	2				2	2		
	Poaceae																						
*	*Andropogon virginicus*	Whisky Grass	x									x											
	Anisopogon avenaceus	Oats Spear Grass					x																
	Aristida ramosa	Three-awned Grass							x														
	Aristida vagans				x	x	x								3	2	2			1	2		
	Aristida warburgii					x	x								2			2					
	Aristida sp.																			1			
	Austrodanthonia bipartita	a Wallaby Grass			x?																		
	Austrodanthonia racemosa var *racemosa*	a Wallaby Grass					x			x													1
	Austrodanthonia tenuior	a Wallaby Grass						x		x													2
	Austrodanthonia sp.	a Wallaby Grass		x			x	x					1										
	Austrostipa pubescens	a Spear Grass					x											2					

	Austrostipa rudis ssp *rudis*	a Spear Grass															2					
*	*Axonopus affinis*	Carpet Grass	x		x							1										
	Bothriochloa macra	Red Leg Grass	x		x	x	x	x													adj	adj
*	*Briza maxima*	Quaking Grass		x						x	x											1
*	*Briza subaristata*		x	x	x	x		x		x	x				1						2	2
	Chloris truncata	Windmill Grass				adj	x	x														
	Cymbopogon refracta	Barb-wire Grass			x		x	x		x												2
*	*Cynodon dactylon*	Couch	x	x	x	x		x	x	x	x		2							1		5
	Dichelachne micrantha	Short-haired Plume Grass	x						x	x	x			1							adj	1
	Echinopogon caespitosus	Hedgehog Grass	x							x					1							
*	*Ehrharta erecta*	Veldt Grass	x	x	x	x				x											1	
	Elymus scaber									x												
	Entolasia marginata	Margined Panic										1										
	Entolasia stricta	Wiry Panic	x	x	x	x	x	x	x	x		x	5	2	3	5	5	5	5	3	2	
	Eragrostis brownii	Browns Love-grass						x	x													
*	*Eragrostis curvula*	African Love-grass		x						x	x											2
	Eragrostis leptostachya	Paddock Love-grass					x			x					4			1		1		
	Eragrostis sp.	A Love-grass					x															
	Eriochloa pseudoaccrotricha									x												
	Hemarthria uncinata		x									x										
	Imperata cylindrica	Blady Grass		x	x	x		x	x	x	x	x			adj			1		2		
	Lachnogrostis avenaceus	Blown Grass	x	x																		
	Microlaena stipoides	Weeping Meadow-grass	x	x	x	x	x			x	x	x	3	5	5	4	5	4	3	1	3	
	Notodanthonia longifolia	a Wallaby Grass			x																	
	Oplismenus aemulus	Basket Grass				x								1								
	Panicum simile	Two-flowered Panic Grass						x						1			1					
	Paspalidium distans	Water Couch	x		x	x	x	x	x	x			3	1			2				adj	2

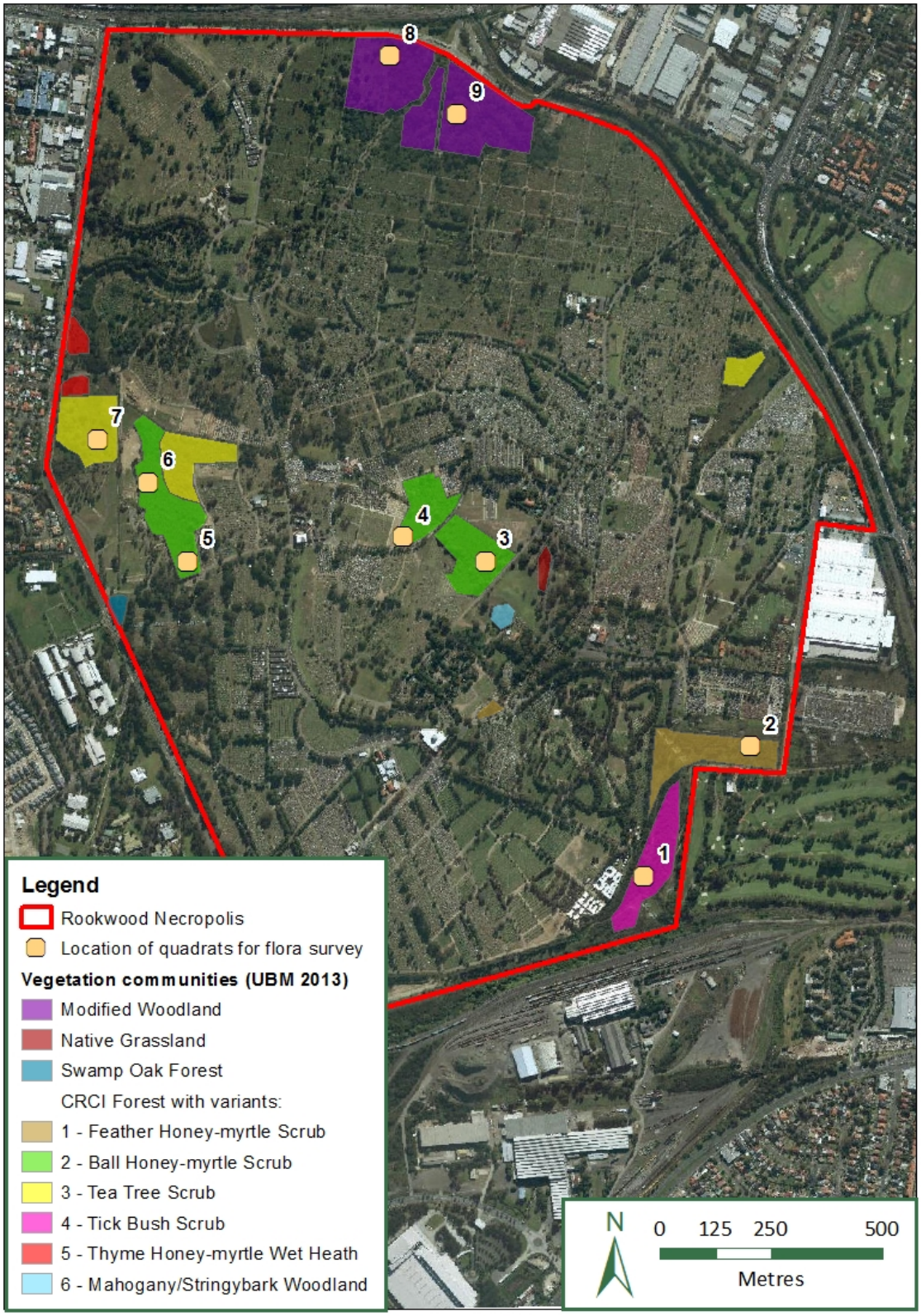
*	*Paspalum dilatatum*	Paspalum	x	x	x	x	x	x	x	x	x	x	2	2					1			
*	*Paspalum urvillei*	Vasey Grass	x	x		x																
*	*Pennisetum clandestinum*	Kikuyu Grass		x	x	x		x		x	x											
	Poa labillardieri																	1				
	Poa ?sieberiana				x				x	x	x						2		2			
*	*Setaria gracilis*	Slender Pigeon Grass	x	x		x				x	x		2	2								
	Sporobolus creber	Rats Tail Grass			x	x	x	x												adj		
*	*Sporobolus indica* var *capensis*	Parramatta Grass		x	x																	
*	*Sporobolus indica* var *major*	Giant Parramatta Grass		x		x				x												
*	*Stenotaphrum secundatum*	Buffalo Grass		x																		
	Themeda australis	Kangaroo Grass	x		x	x	x	x	x	x	x		2	6	2	3	2	5	5	6	5	
	Typhaceae																					
	Typha orientalis	Cumbungi	x																			
	VINES																					
	Apocynaceae																					
	Parsonsia straminea	Common Silkpod																				
*	*Vinca major*	Periwinkle		x						x												
	Asclepiadaceae																					
*	*Araujia sericifera*	Moth Vine		x					x	x												
	Tylophora barbata	Purple Tylophora																				
	Bignoniaceae																					
	Pandorea pandorana	Wonga Wonga Vine												1								
	Caprifoliaceae																					
*	*Lonicera japonica*	Japanese Honeysuckle	x																			
	Convolvulaceae																					
	Convolvulus erubescens	Blushing Bindweed						x	x	x												
*	*Ipomoea indica*	Morning Glory							x													

	Polymera calycina																			
	Fabaceae																			
	Glycine clandestina	Love-creeper	x		x	x	x	x	x	x		2		2	2	2	2	2	2	1
	Glycine microphylla		x	x	x	x		x					2	2	1					
	Glycine tabacina			x						x									1	
	Hardenbergia violacea	Purple Coral Pea	x		x		x	x	x	x								2	1	adj
	Kennedia rubicunda	Dusky Coral Pea			x															
*	*Vicia sativa*	Common Vetch																		1
*	*Wisteria chinensis*	Wisteria								x										
	Lauraceae																			
	Cassytha glabella	Devils Twine			x	x	x	x	x					1			1			
	Cassytha pubescens	Devils Twine	x	x	x	x	x						2	1		2				
	Menispermaceae																			
	Sarcopetalum harveyanum	Pearl Vine																		
	Passifloraceae																			
*	*Passiflora filimentosa*	A Passionfruit								x										
	Pittosporaceae																			
	Billardiera scandens	Common Appleberry			x		x							2						
	Ranunculaceae																			
	Clematis glycinoides	Travellers Joy																		
	Rosaceae																			
*	*Rubus fruticosus* agg.	Blackberry	x										1					1		
	Asparagaceae																			
*	*Asparagus asparagoides*	Bridal Veil Creeper		x	x	x		x				2	2							
*	*Asparagus plumosus*	Climbing Asparagus							x		x									
	Luzuriagaceae																			
	Eustrephus latifolius	Wombat Berry																		

MISTLETOES																	
Loranthaceae																	
Amyema gaudichaudii	Paperbark Mistletoe		**x**		**x**		**x**		**x**		**x**				**1**		
Dendrophthoe vittelina		**x**			**x**				**x**		**x**					**1**	**1**

Figure A: Plant communities & variants (coloured) mapped at Rookwood (2013) with locations of quadrats (numbered 1-9) established for flora surveys

***many of the grassland areas occurring are fragmented and small in size: therefore they have not been mapped**



Appendix 4: Target Weed Species for Rookwood Necropolis (VCAs only)

WoNS = Weeds of National Significance
Keystone/Primary Target = Weeds of Environmental Significance/Ecosystem Modifier
Secondary Target = control as time and resources allow
N = noxious plant in Auburn and/or Bankstown LGAs
Life Form: CT=canopy tree, SM=small tree, S=shrub, H=herb, V/S=herbaceous vine/scrambler

Family	Scientific Name	Common Name	Life Form	Noxious	Wons	Keystone	Secondary
Fabaceae	*Acacia saligna*	Golden Wreath Wattle	ST			√	
Polygonaceae	*Acetosa sagittata*	Turkey Rhubarb	V/S			√	
Liliaceae	*Agapanthus orientalis*	Agapanthus	H				√
Asteraceae	*Ageratina adenophora*	Crofton Weed	H			√	
Basellaceae	*Anredera cordifolia*	Madeira Vine	V/S	N4		√	
Asclepiadaceae	*Araujia sericifera*	White Moth Vine	V/S				√
Asparagaceae	*Asparagus densiflorus* var. *aethiopicus*	Asparagus 'fern'	V/S	N4		√	
Asparagaceae	*Asparagus asparagoides*	Bridal Creeper, Florist's Smilax	V/S	N4	√	√	
Asparagaceae	*Asparagus plumosus*	Climbing Asparagus	V/S	N4		√	
Crassulaceae	*Bryophyllum* spp.	Mother of Millions		N4		√	
Cannabaceae	*Celtis sinense*	Hackberry	ST	N4		√	
Lauraceae	*Cinnamomum camphora (1)*	Camphor laurel	C			√	
Asteraceae	*Chrysanthemoides monilifera* var. *monilifera*	Boneseed	S	N1		√	
Malaceae	*Cotoneaster* spp.	Cotoneaster	S			√	
Poaceae	*Cortaderia selloana*	Pampas Grass	H	N3		√	
Asteraceae	*Coreopsis lanceolata*	Black-eyed Susan					
Myrtaceae	*Corymbia citriodora* (1)	Lemon-scented Gum	CT			√	

Iridaceae	*Crocosmia x crocosmiiflora*	Montbretia	H			√		
Myrtaceae	*Eucalyptus microcorys (1)*	Tallowwood	CT					√
Fabaceae	*Genista monspessulana*	Cape Broom	S	N3		√		
Myrtaceae	*Lophostemon confertus (1)*	Qld. Brush Box	CT					√
Poaceae	*Ehrharta* spp.	Veldt Grasses	H					√
Pontederiaceae	*Eichhornia crassipes*	Water Hyacinth	H	N2	√	√		
Poaceae	*Eragrostis curvula*	African Lovegrass	H			√		
Proteaceae	*Grevillea robusta* (1)	Silky Oak	CT					√
Clusiaceae	*Hypericum perforatum*	St John's Wort	H	N4		√		
Convolvulaceae	*Ipomoea indica*	Morning Glory	V/S	N4		√		
Verbenaceae	*Lantana camara*	Lantana	S	N4	√	√		
	Lantana montevidensis	Creeping Lantana	S	N4		√		
Oleaceae	*Ligustrum lucidum*	Large-leaved Privet	ST	N4		√		
	Ligustrum sinense	Small-leaved Privet	S	N4		√		
Caprifoliaceae	*Lonicera japonica*	Japanese Honeysuckle	V/S			√		
Onagraceae	*Ludwigia peruviana*	Cape Primrose	S	N3		√		
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	S			√		
Oleaceae	*Olea europaea* var. *cuspidata*	Common/African Olive	SM	N4		√		
Cactaceae	*Opuntia* spp.	Prickly Pears	H	N4		√		
Urticaceae	*Parietaria judaica*	Asthma weed, Pellitory	H	N4		√		
Poaceae	*Paspalum dilatatum*	Paspalum	H					√
	Paspalum urvillei	Vasey Grass	H					√
	Pennisetum clandestinum	Kikuyu Grass	H					√
Fabaceae	*Polygala virgata*	Purple Pea-flower				√		
Rosaceae	*Rhapholepis indica* (1)	Indian Hawthorn	S			√		
Euphorbiaceae	*Ricinus communis*	Castor Oil Plant	S	N4		√		

Arecaceae	*Phoenix canariensis* (1)	Phoenix Palm	ST			√		
Rosaceae	*Rubus fruticosus* sp. agg.	Blackberry complex	S	N4	√	√		
Asteraceae	*Senecio madagascariensis*	Fireweed	H				√	
Fabaceae	*Senna pendula*	Cassia	S			√		
Poaceae	*Setaria* spp.	Pigeon Grasses	H				√	
Solanaceae	*Solanum mauritianum*	Wild Tobacco Tree	S				√	
	Solanum nigrum	Blackberry Nightshade	H				√	
Anacardiacae	*Toxicodendron succedaneum*	Rhus Tree	ST	N4		√		
Commeliaceae	*Tradescantia fluminensis*	Wandering Jew	V/S			√		
Apocynaceae	*Vinca major*	Blue Periwinkle	V/S			√		
Iridaceae	*Watsonia bulbillifera*	Watsonia	H			√		

(1) Seedlings to be removed from Conservation Areas

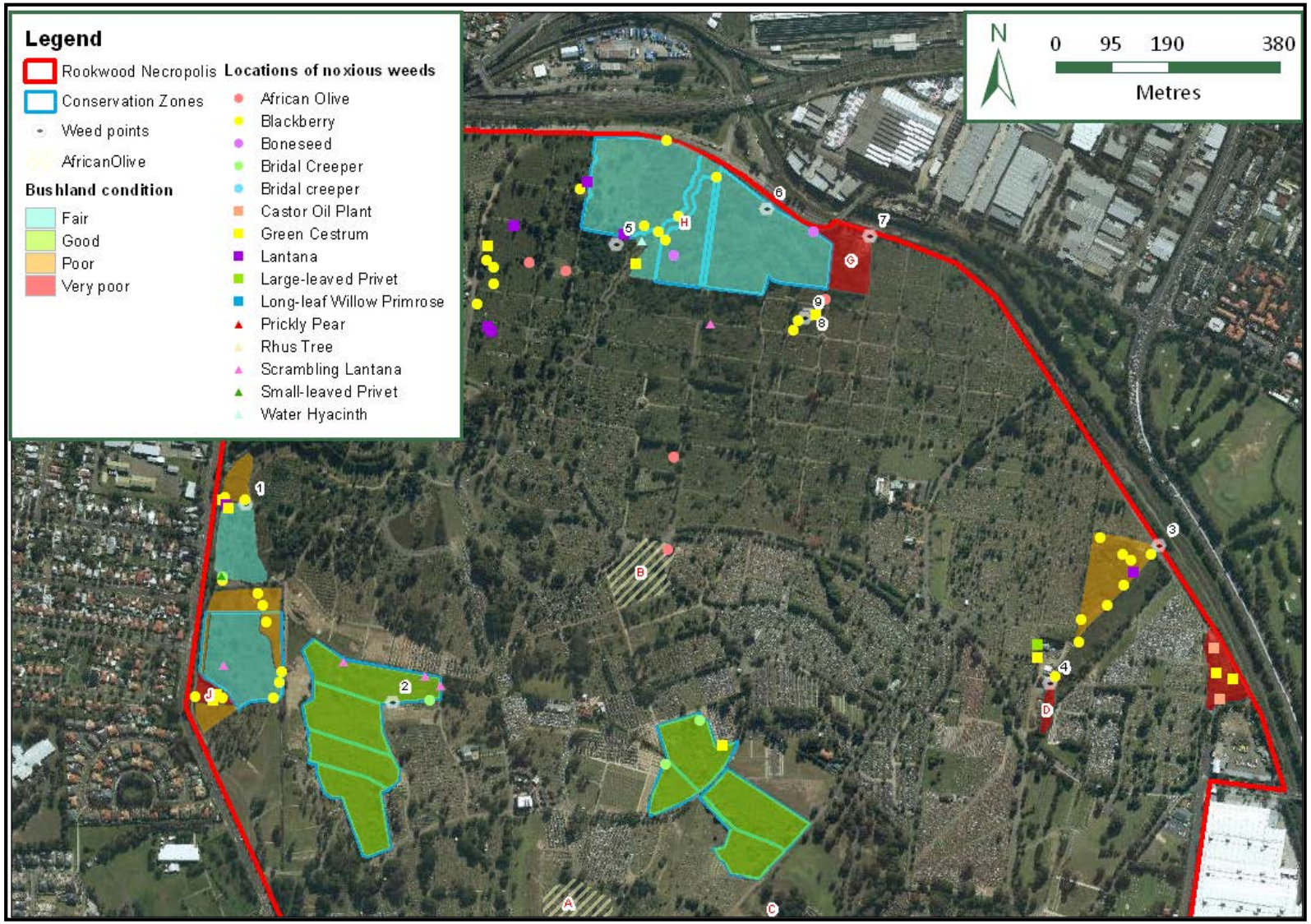
Actions Required For Noxious Weed Classes

1 The plant must be eradicated from the land and the land must be kept free of the plant
2 The plant must be eradicated from the land and the land must be kept free of the plant
3 The plant must be fully and continuously suppressed and destroyed
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.
5 The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.

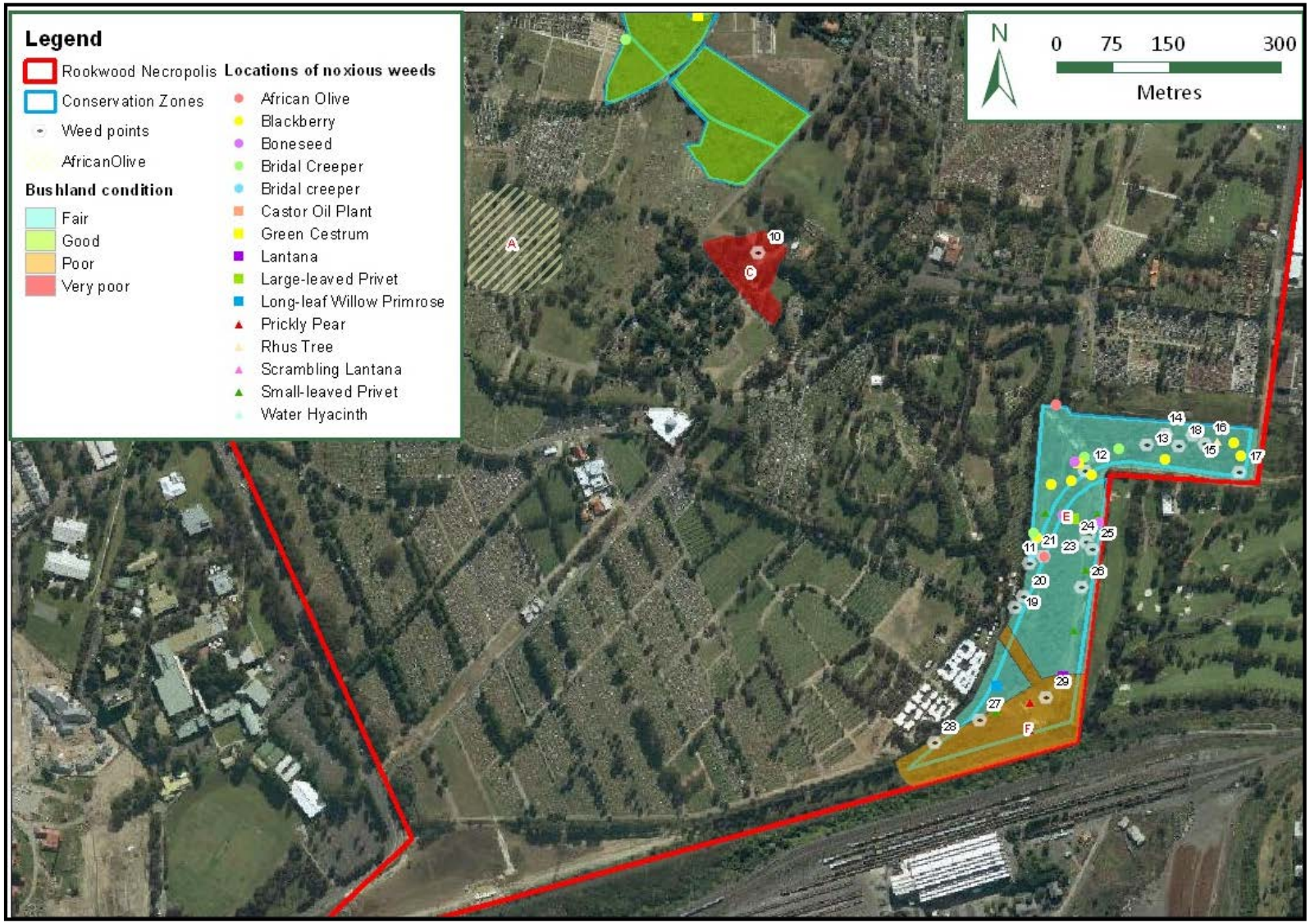
NOTE: Non-indigenous species selected as ''target weeds'' have been chosen where i) they are noxious plants, ii) they are known to naturalise widely in bushland, and iii) they occur in two or more quadrats/transects, as identified in the field survey undertaken for the Biodiversity Survey (UBM 2013). See *Appendix 3* of BMP.

NOTE ALSO: Some of the herbaceous species present at Rookwood have not been listed because it is considered that they do not pose a threat to bushland and resources will not allow for treatment at this time.

Appendix 5: Condition of Bushland Map for Necropolis Bushland with location of noxious weeds – NORTH



Appendix 6: Condition of Bushland Map for Necropolis Bushland with location of noxious weeds – SOUTH



Appendix 7: List of weeds at each Weed polygon or Weed point (with maps in *5A & 5B above*)

Description		Major Weeds
Weed Polygon	Weed Point	
A		Scattered African Olive
B		Scattered African Olive
C		Asparagus fern, Balloon Vine, Castor Oil Plant, Lantana, Madeira Vine, Wandering Jew, Winter Senna plus various herbs and grasses
D		Asthma weed, Castor Oil Plant, Green cestrum
E		Scattered Bridal Creeper and Blackberry throughout
F		Cape Primrose, Crofton Weed, Large-leaved Privet, Long-leaf Willow Primrose, Small-leaved Privet abundant in drainage line and low-lying areas
G		Blackberry, Castor Oil Plant, Green Cestrum, Golden Wreath Wattle, Honeysuckle, Lantana, Madeira Vine, Passionfruit
H		Scattered Scrambling Lantana throughout
J		Golden Wreath Wattle, Green Cestrum, Kikuyu, Morning Glory, Tecoma
	1	Blackberry, Green cestrum, Lantana
	2	Blackberry, Bridal Creeper, Pampas grass
	3	Green cestrum Lantana
	4	Asthma weed, Castor Oil Plant, Green cestrum
	5	Boneseed, Lantana
	6	Bridal Creeper, Lantana
	7	Castor Oil Plant, Lantana
	8	African Olive, Blackberry
	9	Blackberry, Lantana
	10	see Polygon C
	11	Blackberry, Green Cestrum, Lantana, Small-leaved Privet
	12	Blackberry, Boneseed
	13	Bridal Creeper, Lantana
	14	Blackberry, Bridal Creeper
	15	Bridal Creeper, Large-leaved Privet, Small-leaved Privet,
	16	Blackberry, Bridal Creeper
	17	Blackberry, Boneseed, Bridal Creeper, Large-leaved Privet,
	18	Blackberry, Small-leaved Privet
	19	Green Cestrum, Small-leaved Privet
	20	Green Cestrum, Lantana, Small-leaved Privet
	21	Blackberry, Boneseed
	22	Blackberry, Large-leaved Privet
	23	African Olive, Blackberry
	24	Blackberry, Boneseed
	25	Blackberry, Green Cestrum, Small-leaved Privet,
	26	African Olive, Blackberry, Lantana
	27	Blackberry, Bridal creeper, Lantana, Small-leaved Privet
	28	Cape Primrose, Green Cestrum
	29	Bridal Creeper, Cape Primrose

Appendix 8: Fauna Habitat and Resources at Rookwood Necropolis (UBM August 2014)

Cluster Type	Vegetation Conservation Area (VCA)	Habitat Type	Description of key fauna resources and/or habitat values	EVNT Fauna known to inhabit VCA	Recommendations for Enhancement/Modification
Northern	VCA 19 & VCA 20	Open woodland and modified *Themeda australis* grasslands	There a number of arboreal tree hollows present within the introduced *Eucalyptus* spp. that inhabit these VCAs, these are suitable for occupancy by arboreal mammals and a variety of native avian species (including owls, parrots and other hollow-nesting species). Foraging habitat is present when the Lemon-scented Gum (*Eucalyptus citriodora*), Tallowood (*Eucalyptus microcorys*) and Red Ironbark (*Eucalyptus sideroxylon*) are in flower (May – November, however this may vary), providing nectar for arboreal mammals (including gliders and possums) and the Grey-headed Flying Fox (*Pteropus poliocephalus*) as well as a variety of native bird species including Musk Lorikeet, Rainbow Lorikeet, Red Wattlebird, White-plumed Honeyeater and Yellow-faced Honeyeater (observed feeding during field activities). The tall canopy also provides foraging habitat for local microbat species such as Gould's Wattled Bat (*Chalinolobus gouldii*) and the Common Bentwing Bat (*Miniopterus australis*), previously observed within these VCAs. The grassland and clumped shrubs, as well as large woody debris, provide shelter and seed for small granivores, a variety of herpetofauna and the regionally significant Brown Quail (*Coturnix ypsilophora*). As these VCAs have a canal running through the region and a small pond/fountain, there is potential to support amphibian species that may inhabit the long grass and dense vegetation surrounding these water sources. Grave sites containing fallen stones and debris also provide suitable habitat for herpetofauna within this Cluster. It is also noted that during previous occasions (Smith & Smith 1999 and UBM 2013) the greatest density of native bird species occurred within these two VCAs.	• Grey-headed Flying Fox (*Pteropus poliocephalus*), listed as Vulnerable, under the *EPBC Act* and *TSC Act*. • Common Bentwing Bat (*Miniopterus australis*) listed as Vulnerable, under the *TSC Act*. • Brown Quail (*Coturnix ypsilophora*) listed as Regionally Significant Species (NPWS 2007).	***Recommendations specific to the Northern Clusters:*** • In accordance with past recommendations (Smith & Smith 1999), the artificial open woodland, consisting of *E. saligna* and *E. citriodora*, should be maintained as it provides foraging habitat for the Grey-headed flying fox and arboreal mammals. All mature and flowering Eucalypts provide a viable food source for the aforementioned fauna groups; • Woody debris and fallen trees should be left intact and remain within these VCAs as they provide shelter and foraging habitat for small birds, small terrestrial mammals and herpetofauna. Mulching should be avoided where ever possible; and • Grasses, such as the *Themeda australis* grassland within VCA 19 and VCA 20, should be allowed to seed and grow, providing feed for small ground-feeding and granivorous birds. Dense ground cover and tall grasses should also be encouraged as these provide shelter for a variety of avian and herpetofauna species including the regionally significant Brown Quail.

Western	VCA 8, VCA 27, VCA 28 & VCA 7	Closed scrub and woodland dominated by stands of *Melaleuca* spp. and *Allocasuarina* spp.	Broad-leaved Paperbark (*Melaleuca quinquenervia*) that occurs within this Cluster has been previously noted (by Smith & Smith 1999) as foraging habitat for both the Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*) and the Zebra Finch (*Taeniopygia guttata*). It is noted that the greatest diversity of native bird species (according to Smith & Smith 1999) occurs within these remnant patches of Cooks River Castlereagh Ironbark Forest (CRCIF). This is due to the dense shrub layer and low canopy height (averaging 2 – 6 meters) associated with this vegetation community providing shelter and foraging habitat for a variety of native bird species. The ground layer within these VCAs varies from patches of bare earth (mainly beneath clumped stands of *Melaleuca* spp.) to large areas of dense tall native grasses. These patches of tall grasses are generally found on the edges of the VCAs and near the canal, providing shelter for amphibians and other herpetofauna and foraging habitat for small granivores and insectivores. Stands of *Casuarina* spp. and *Allocasuarina* spp., within VCA 27 and 28, are known to serve as feed trees for the Glossy Black Cockatoo (*Calyptorhynchus lathami*) (pers. com.) Ecohort team members). There were no hollow-bearing trees in the Western Cluster and only a few scattered canopy trees however the native shrubs provide suitable foraging resources for gliders, small possums and other arboreal nectar feeders. **NB: A number of bee (hives) boxes housing the European Honeybee (*Apis melifera*) have been installed, within Roman Catholic land, on the western boundary of this Cluster.**	• Common Bentwing Bat (*Miniopterus australis*) listed as Vulnerable under the *TSC Act*. • Yellow-rumped thornbill (*Acanthiza chrysorrhoa*) listed as Regionally Significant (NPWS 2007). • Zebra Finch (*Taeniopygia guttata*) listed as Regionally Significant (NPWS 2007). • Glossy Black Cockatoo (*Calyptorhynchus lathami*) listed as Vulnerable under the *TSC Act*.	***Recommendations specific to the Western and Central Clusters:*** • Measures taken to rehabilitate bushland should consolidate patches of bushland and minimise the number of tracks and access points passing through bushland patches. In so doing this reduces the size of the surrounding boundary and hence the risk of invasion by predators; and • Any *Casuarina* spp. and/or *Allocasuarina* spp. that are identified as a feed tree should remain undisturbed. The retention of these trees is important for the foraging habitat of this species; and • The bee hives, housing the European Honeybees, should be considered for removal from the area adjacent to this cluster of VCAs as these bees compete with native bees for local resources and often occupy hollows in native trees after a swarming event. However, as they also provide pollination for flowering plants, including threatened flora species within the local VCAs, there are benefits to having these bees in this area. ***Recommendations for VCA 18*** • In VCA 18 (particularly), where weed ingress is obvious within the grasslands, further maintenance and weeding should be a priority to increase the resources provided to small avian species that feed in the native grasslands.
Western	VCA 18	Three distinct habitat types including open grassland, Closed Casuarina forest and Open Eucalypt woodland define this VCA.	The open grasslands to the south east of VCA 18 provide suitable foraging resources for a variety of ground dwelling birds including a variety of finches and wrens. Woody debris and decaying vegetation within this area also provides groundcover and shelter for native herpetofauna and terrestrial mammals. It is likely that Brown Quail use this grassland for shelter and cover. The Closed Casuarina forest, in the north western section of VCA 18, provides shelter for a number of avian species and possibly provides a source of feed trees to the native Glossy Black Cockatoo (observed in VCAs 27 and 28). This area also has a large amount of litter and ground debris within tall grass that provides	• Grey-headed Flying Fox (*Pteropus poliocephalus*) listed as Vulnerable under the *EPBC Act* and *TSC Act*. • Common Bentwing Bat (*Miniopterus australis*) listed as Vulnerable under the *TSC Act*.	

			shelter and potential retreat sites for native herpetofauna such as snakes and lizards. Grave sites containing fallen stones and debris also provide suitable habitat for herpetofauna within this cluster. The Open Eucalypt Woodland, in the south eastern section of VCA 18, contains large hollow-bearing *Eucalyptus* spp. With exfoliating bark that pose potential habitat for microbat and arboreal mammal species alike. When these Eucalypts are in flower, they are also likely feed trees for local Grey-headed Flying Fox. This VCA has a canal running through the region that provides potential to support amphibian species that may inhabit the long grass and dense vegetation (mainly Acacia and Melaleuca shrubs) either side of the canal.	• Brown Quail (*Coturnix ypsilophora*) listed as Regionally Significant Species (NPWS 2007).	
Central	VCA 11, VCA 12, VCA 10S & VCA 9	Closed scrub and woodland dominated by *Melaleuca* spp.	Broad-leaved Paperbark (*Melaleuca quinquenervia*) that occurs within this Cluster has been previously noted (by Smith & Smith 1999) as foraging habitat for both the Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*) and the Zebra Finch (*Taeniopygia guttata*). It is noted that the greatest diversity of native bird species (according to Smith & Smith 1999) occurs within these VCAs *i.e.* remnant patches of Cooks River Castlereagh Ironbark Forest (CRCIF). This is due to the dense shrub layer and low canopy height associated with this vegetation community providing shelter and foraging habitat for a variety of native bird species. These VCAs were similar to the Western Cluster and maintained a dense shrub layer (averaging 2 – 5 m in height) with a patchy groundcover that provided patches of shelter and refuge for both terrestrial mammals and herpetofauna. The intersection of canals at VCA 11 provided a semi-permanent watercourse surrounded by tall grasses suitable for the occurrence of amphibian species. Litter and woody debris also provided a good degree of ground cover for herpetofauna and small terrestrial mammals within this region.	• Common Bentwing Bat (*Miniopterus australis*) listed as Vulnerable, under the *TSC Act*. • Yellow-rumped thornbill (*Acanthiza chrysorrhoa*) listed as Regionally Significant (NPWS 2007). • Zebra Finch (*Taeniopygia guttata*) listed as Regionally Significant (NPWS 2007).	
Southern	VCA 6 & VCA 25	Modified open woodland (with areas of open canopy and sparse shrub layer)	These VCAs had a scattered canopy with a moderate shrub layer composed of *Grevillea* spp., *Acacia* spp., *Hakea* spp., *Banksia* spp. and *Melaleuca* spp. This shrub layer dominated the	• Common Bentwing Bat (*Miniopterus australis*) listed as Vulnerable, under the *TSC Act*.	***Recommendations specific to the Southern Clusters:*** • Measures taken to rehabilitate bushland should consolidate patches of bushland and minimise the number of tracks and

		vegetation present and encouraged nectivores such as lorikeets and honey-eaters to dominate this area. The ground cover is dominated by dense native and introduced grass species and a lot of rubbish/litter and other debris. This provides suitable habitat for herpetofauna and terrestrial mammals (including pest species such as the Black Rat). There were no hollow-bearing trees in VCA 6 or 25 and few canopy trees however the native shrubs provide suitable foraging resources for gliders, small possums and other arboreal nectar feeders.	access points passing through bushland patches. In so doing this reduces the size of the surrounding boundary and hence the risk of invasion by predators. This should be a primary consideration when work is being conducted on the powerline easement bordering VCA 6; and • Diversity of plant species within these VCAs should be maintained and encouraged to provide a range of resources to a variety of avian species and encourage fauna species diversity.
General recommendations for enhancement/modification for all VCAs	These recommendations apply to the enhancement/modification of all of the above VCAs and should be considered and applied for each site individually. • The value for fauna conservation within areas surrounding VCAs should be increased by planting both isolated and clumped trees and shrubs (including species such as *Acacia* spp., *Banksia* spp., *Grevillea* spp. and/or *Hakea* spp.) that are ideally flowering plants and native to the region. Plantings should also be linked where possible, providing linkages to other VCAs and vegetated areas. This will provide shelter and foraging habitat for small to medium sized nectivores and other avian species, herpetofauna and terrestrial mammals that are moving between habitats throughout the necropolis. This will encourage and maintain connectivity and corridors for all wildlife present within the Necropolis. • Where possible both introduced and native grasses and ground layer plants should be allowed to grow, rather than mowed, providing a source of shelter and seed for granivores, insectivores, small birds and native herpetofauna. In all VCAs dense ground cover provides shelter for the regionally significant Brown Quail. • Dead trees and natural debris (branches, rocks and trunks) are a valuable source of shelter and potential breeding habitat for a number of herpetofauna species and ground dwelling mammals. Where possible this ground debris should be retained. • If mature trees are lopped for safety reasons, branches with hollows should be placed within VCAs to supplement the loss of arboreal hollows. Where any hollow-bearing (habitat) tree is removed a nest box(s) should be installed within the surrounding canopy to replace the hollow(s) that have been removed. Nest boxes should be a suitable size and build to replace the fauna genera specific function of the hollow removed. These should also be installed by a suitable Ecologist, Arborist and/or Environmental Representative. • Many herpetofauna including reptiles (such as skinks and geckoes) and some amphibian species (during times of heavy rainfall) shelter beneath various cemetery stones and debris within the Necropolis (Smith & Smith 1999). If this debris is removed or cleared then alternative sheltering opportunities should be re-instated in the form of tiles, logs and/or timber. • Where possible create wetlands/ponds that would provide habitat for amphibian species (identified in previous fauna surveys by both Smith & Smith 1999 and UBM 2013) moving between wet patches of VCAs and provide a semi-permanent water source for other native fauna. • Design a control/management program for feral pests, targeting foxes, rabbits, hares black rats and feral cats, which will likely result in a decrease in predation of native fauna species within the VCAs.	

References used for Table:

Smith P. & Smith J. (1999). *Flora and Fauna Survey of Rookwood Necropolis.* Unpublished report prepared for the Joint Committee of Necropolis Trustees.

UBM Ecological Consultants (2013). *Biodiversity Studies: Flora & Fauna Investigations for Native Bushland at Rookwood Necropolis*, Unpublished report prepared for the Joint Committee of Rookwood Necropolis Trustees.

NPWS (1997). *Urban Bushland Biodiversity Survey* (UBBS). National Parks and Wildlife Service, Hurstville.

Appendix 9: A Generic Guide to Monitoring Bush Regeneration Management

The setting up of a simple monitoring program at the outset of the restoration project is of high importance. Monitoring will provide an objective measurement of progress and record the slow and often subtle changes. A monitoring program will enable the project manager and bush regeneration contractor to assess the performance indicators listed in this report.

As many changes are not readily visible in the short-term, it is recommended that monitoring events be carried out every six (6) months. However data should be collected over a number of years so that trends can be determined. A simple generic guide to monitoring the progress of bushland rehabilitation projects has been included below.

NOTE that a site-specific monitoring program should be designed for each bush regeneration and rehabilitation site *prior to* commencement of work.

Establishing Permanent Transects and Quadrats

This method is the traditional way to measure changes in vegetation community structure and diversity. The simplest way to record changes is to count the numbers and types of seedlings regenerating in a measured plot over a period of time.

In the absence of more specific guidelines in Recovery Plans, for all Management Units, at least one permanent quadrat will be established (as per Threatened Species Survey & Assessment Guidelines NPWS). Sampling is to occur on at least once a year (but monthly for the first six (6) months after treatment).

In addition to the NPWS guidelines, information recorded will include indigenous plant species including the number of naturally regenerating seedlings and cover (using the Braun- Blanquette method).

Baseline data will be collected in each quadrat before the commencement of any ecological restoration works. Sampling will allow for comparison between areas with different soil seedbank treatments, including areas that have not been treated.

Recording of all ecological restoration works will use standard NPWS/DEC recording sheets, and will include hours of weed control performed per bushland management zone or sub-zones.

Choosing the Plot Size

This is often the hardest decision to make: the area has to be large enough to take in the major life forms and small enough to be manageable. In grassland a plot of one (1) m^2 is adequate to gain a representative sample; for shrubs – three (3) m^2 is adequate, but in a treed area, plots of 10 m^2 or larger may be necessary.

Assembling Flora Lists

The assembly of flora lists is basic to all bushland projects. The purpose of the bush regeneration project is not to accumulate an ever-increasing list of new species, but rather to record the diversity

and abundance of the existing vegetation community and to monitor any changes that take place as the project proceeds.

Flora lists should be updated regularly and the location(s) of any unusual, rare or threatened species should be marked on the base map and the relevant authorities should be informed (eg. National Herbarium, DECC/NPWS).

In addition to the information recorded in permanent quadrats, comprehensive lists of plant species will be maintained and updated for each management zone. This will be performed as per Threatened Species Survey & Assessment Guidelines NPWS.

Assembling Fauna Lists

The recording of fauna follows the same guidelines as for flora and is of equal importance. In the first instance a simple list of fauna sighted (or evidence of) can be used.

Ultimately, comprehensive (both exotic and native) fauna lists will be compiled and maintained. Data will be collected as per NPWS Wildlife Atlas Format.

Assembling a List of Flowering and Fruiting Times

For the native species, a long-term project will be useful since this project calls for local seed collection and propagation.

Adapting weed-clearing activities to coincide with natural seeding times and germination patterns of desirable natives is advised, as clearing weed growth increases germination sites and increases seedling survival chances.

For each indigenous plant species, the flowering and fruiting period will be recorded each year as a week of year figure (*i.e.* 1 to 52). This is to monitor for pollination and seed set.

Keeping a record of flowering and fruiting times for local weed species can make weed control easier. For example, if it is known that Pampas Grass flowers and as the seed ripens locally between March and May; plan to treat Pampas Grass well before that time. If berry-fruited weeds like Cotoneaster, Lantana or Privet are present, remove the plants before the berries are ripe and attractive to birds.

It is recommended that quantitative measurement be used within each management zone in order to provide information relating to:

- Type and % cover of weed species before and after bush regeneration work;
- Type and % cover of native plant species before and after weed removal; and
- Type and % cover of native plants species regenerating after regeneration.

Monitoring Soil Seed Bank Trials

These trials will allow the testing of a range of strategies designed to stimulate native plant regeneration.

Quadrats will be monitored every three (3) months for 12 months. Results will be quantified by measuring % cover using Braun-Blanquet (see Moore & Chapman 1986), visual analysis and photographs taken from a series of fixed photo-points.

Threatening Processes

All Threatening Processes operating within the Habitat areas, including those listed as Key Threatening Processes under the State relevant legislation (*TSC Act*) must be noted; and relevant data collected.

Monitoring of any Threatening Processes that occur will be consistent with the relevant Threat Abatement Plans.

Photographs

Taking photographs is an easy way to record changes in vegetation structure. A photograph captures the subtle changes that are often missed when working closely on a site over time. Photographs are useful in recording sequence shots at various stages in the project to illustrate the techniques used and the results obtained, and are also valuable teaching tools.

Photography in the bushland environment is not particularly easy for amateurs, as plants cast shadows and without the correct lens filters, everything looks 'green'. Obtain professional advice about ASA ratings and take photographs early in the morning or when conditions are overcast.

A number of permanent photo-points will be selected and marked with a short wooden stake. The location of these photo-points will be recorded on a base map. Photographs will be taken from the same spot every six (6) months.

Other Monitoring Variables

Other useful variables recommended include:

Temperatures - these can be recorded using a wet-dry bulb thermometer. Data may be graphed to show that as the canopy re-forms (regardless of height above the ground) fluctuations of temperature become less extreme. Changes in temperature can be related to the type and numbers of native plants regenerating.

Recording sites (marked and recorded on a base map) can be selected and regular soil temperature readings taken with the bulb just under the soil surface (*e.g.* 2-4 mm) and air temperature readings taken about two (2) metres above the ground.

Light readings - these may be taken using a light meter, first at ground level, and again at a height of two (2) m. Relate the light intensity to the type and number of native plants regenerating and/or to those already growing on the site.

The lowering of the light levels in a rainforest/closed forest (by reforming the canopy) promotes the regeneration of rainforest canopy species, but reducing light levels in dry sclerophyll woodland or heath decreases the diversity and numbers of indigenous species and promotes the growth of wet gully species and frequently of exotic moisture-loving weeds.

Light readings can be taken in correlation with the soil temperature readings set out above. Readings should be taken both in clearings or light gaps and under the tree canopy.

The health of the litter layer - this can be recorded by observing the cyclical build-up and breakdown of the fallen leaves, the appearance of the soil (whether compacted or friable), the presence of small animals in the litter layer and the production of soil fungi, as indicated by fruiting bodies on the surface and thread-like mycelia in the soil. Simple measurements such as the depth of litter or percentage of groundcover are important. This information will provide clues to other processes occurring on the site over time.

Rainfall readings - these can be obtained from the local meteorological station or taken on site. Determine the local rainfall pattern. Avoid weeding in hot weather when the soil is hard or in the wet season when the ground is so boggy that mud is churned up. Very dry periods are reflected in the survival rate of seedlings, so if tubestock planting is planned, defer planting until regular rains are expected.

APPENDIX 10: List of Key Threatening Processes (KTPs)

This page shows all currently listed key threatening processes in NSW. There are currently 37 key threatening processes listed under the *Threatened Species Conservation Act 1995*. KTP which occur or which may potentially occur at Rookwood are listed in the right hand column.

Key Threatening Process	Yes/No
Aggressive exclusion of birds by noisy miners (*Manorina melanocephala*)	y
Alteration of habitat following subsidence due to longwall mining	n
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	y
Anthropogenic climate change	y
Bushrock removal	n
Clearing of native vegetation	y
Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*)	y
Competition and habitat degradation by feral goats (*Capra hircus*)	n
Competition from feral honey bees (*Apis mellifera*)	Y?
Death or injury to marine species following capture in shark control programs on ocean beaches	n
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	n
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners	y
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	n
Herbivory and environmental degradation caused by feral deer	n
Importation of red imported fire ants (*Solenopsis invicta*)	n
Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	n
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	y
Infection of native plants by *Phytophthora cinnamomi*	y
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	y
Introduction of the large earth bumblebee (*Bombus terrestris*)	n
Invasion and establishment of exotic vines and scramblers	y
Invasion and establishment of Scotch broom (*Cytisus scoparius*)	y
Invasion and establishment of the cane toad (*Bufo marinus*)	n
Invasion of native plant communities by African Olive *Olea europaea* L. subsp. *cuspidata*	y
Invasion, establishment and spread of *Lantana camara*	y
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)	y

Invasion of native plant communities by exotic perennial grasses	y
Invasion of the yellow crazy ant (*Anoplolepis gracilipes* (Fr. Smith)) into NSW	n
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	y
Loss of hollow-bearing trees	y
Loss or degradation (or both) of sites used for hill-topping by butterflies	n
Predation and hybridisation of feral dogs (*Canis lupus familiaris*)	n
Predation by the European red fox (*Vulpes vulpes*)	y
Predation by the feral cat (*Felis catus*)	y
Predation by *Gambusia holbrooki* Girard, 1859 (plague minnow or mosquito fish)	y
Predation by the ship rat (*Rattus rattus*) on Lord Howe Island	n
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)	n
Removal of dead wood and dead trees	y