

Rookwood Necropolis



Property Management Plan

2015

Carolyn Tallents Landscape Architect and
Judie Rawling UBM Consultants

June 2015



Authors

Carolyn Tallents Landscape Architect
40 Dulconghi St
Crescent Head 2440
t: 0417 267 836

Judith Rawling
UBM Ecological Consultants Pty Ltd
'St Clements'
1238 Bells Line of Road
Kurrajong Heights
t/f: (02) 4567 7979

Issue Register

Date of Issue	Reason for Issue	Prepared by	Checked by	Signed
17 Feb 15	A Preliminary Draft issue	CT/JR	JR/CT	
23 Feb 15	Preliminary Issue for Board Meeting	CT/JR	JR/CT	
26 Feb 15	Preliminary for OEH input	CT/JR	JR/CT	
17 April 15	Revised following OEH Input	CT	CT	
4 May 15	Revision following OEH input	JR	CT	
16 June 15	OEH for pre issue review	CT/JR	CT	
26 June 15	Formal OEH submission	CT	JR/CT	

Contents

1	Introduction and Background	5
1.1	Purpose of this document- Why a PMP is required.....	5
1.2	The Site- Definition and Extent	5
1.3	Legislative Requirements	5
1.4	Previous PMP	6
1.5	Scope of New PMP	7
1.6	How to use this document	7
1.7	Extent of Cleared areas and Vegetation Conservation Areas in 2015	8
2	Ecology at Rookwood.....	11
2.1	Plant communities at Rookwood.....	11
2.2	Vegetation Conservation Areas	12
2.3	Description of Threatened Flora at Rookwood.....	15
2.4	Description of Threatened Fauna at Rookwood.....	16
2.5	Context of Necropolis Bushland in Relation to the Sydney Basin.....	17
2.6	The Bushland Management Plan- Current Management.....	18
3	Management Actions.....	19
3.1	Implement the Bushland Management Plan (BMP) for the Vegetation Conservation Areas (VCAs) ...	19
3.2	Increasing Biodiversity within the operational Cemetery	19
3.3	Increasing biodiversity within areas already buried	20
3.4	Noxious and Environmental Weed Control	20
3.5	Connectivity and Corridors.....	21
3.6	Management of Buffer and Edge conditions.....	21
3.7	Mitigation measures during clearing operations.....	22
3.8	Plant species lists for Rookwood as a whole	22
3.9	Maintenance of planted areas.....	23
3.10	Cooperation and coordination amongst managers.....	23
3.11	Fire management.....	23
3.12	Rubbish.....	23
3.13	Feral animals	23

3.14	Constraints to Ecology- balancing Rookwood’s values	23
3.14.1	Maximising burial	24
3.14.2	Heritage	24
3.14.3	Infrastructure upgrade and possible works within the term of this PMP	24
4	Assessments of Significance	26
4.1	Cumberland Plain Woodland	26
	Expected Impact on Cumberland Plain Woodland	27
4.2	Cooks River/Castlereagh Ironbark Forest	27
4.3	<i>Acacia pubescens</i> (Downy Wattle)	28
	Expected Impact on <i>Acacia pubescens</i>	29
4.4	<i>Epacris purpurascens</i> var. <i>purpurascens</i> (Port Jackson Heath)	29
	Expected Impact on <i>Epacris purpurascens</i> var. <i>purpurascens</i>	30
4.5	<i>Pomaderris prunifolia</i> var. <i>prunifolia</i>	30
	Expected Impact on <i>Pomaderris prunifolia</i> var. <i>prunifolia</i>	31
4.6	<i>Wahlenbergia multicaulis</i> (Tadgell’s Bluebell)	32
	Expected Impact on <i>Wahlenbergia multicaulis</i>	33
4.7	Grey-Headed Flying-Fox - <i>Pteropus poliocephalus</i>	33
	Expected Impact on the Grey-Headed Flying-Fox	33
4.8	Eastern Bentwing Bat - <i>Miniopterus orianae oceanensis</i>	34
	Expected Impact on the Eastern Bentwing Bat	34
4.9	Scarlet Robin <i>Petroica boodang</i>	34
	Expected Impact on the Scarlet Robin	35
4.10	Summary of Significance Assessment	35
5	Performance Measures	35
6	Monitoring and Review	35
5.1	Plant Census - Threatened species and Population Management	35
5.2	Intervening Actions if required	36
5.3	Audit and PMP Review	36
6	Bibliography	37

1 Introduction and Background

1.1 Purpose of this document- Why a PMP is required

This document is a Property Management Plan (PMP) for the whole of Rookwood Necropolis prepared under the requirements of the *Threatened Species Conservation Act 1995* (TSC Act). Rookwood's primary purpose of burial/interment is likely to require clearing of native vegetation in some areas. The previous PMP (Hassall 2002) set aside Vegetation Conservation Areas (VCAs) as an offset to the impacts of clearing vegetation outside these areas. These VCAs have been subject to ongoing management over some 19 years, and the updated management actions are prescribed in this new Property Management Plan. They are also described in more detail in the Bushland Management Plan 2014-2019.

1.2 The Site- Definition and Extent

Rookwood comprises 286 hectares of unique land within western Sydney. The first 200 acres were set aside for burial by the Government in 1862; purchased to fulfil the need for additional burial grounds for the expanding population of Sydney. 1879 saw the Government purchasing an additional 577 acres, making up what is now known as Rookwood Necropolis. The site supports a diversity of functions, primarily providing interment for nearly 25% of Sydney's annual deaths. Important values within the Necropolis include heritage, social, environmental and economic.

The Plan of Management, released in 2014, identified the values at Rookwood and the three tenants for ongoing management to ensure sustainability of the Cemetery; continued interment; environment- (heritage, flora and fauna), and social equity.

The context of Rookwood can be appreciated in the attached site location map.

1.3 Legislative Requirements

A complex legal framework applies to Rookwood, with the most relevant summarised in the Plan of Management 2014. Those impacting most significantly on the work associated with this Property Management Plan are:

Crown Lands Act 1989

The Act provides assurance that the land is managed for the benefit of the people of NSW in accordance with land management principles. Rookwood is dedicated as a Cemetery with the prime purpose being interment. Financial powers of the reserve trusts are outlined with contributions covered to manage the land for its purpose.

Heritage Act 1977

The Heritage Act provides mechanisms by which the heritage items and places are to be protected. As Rookwood's initial allocations of No. 1 burial areas (except No.1 General), are listed in the State Heritage Register, any actions within these areas require approval from the Heritage Council of NSW, within the Office of Environment and Heritage. Any actions outside the SHR area, require protection of heritage items and approval to disturb, or install additional structures.

Threatened Species Conservation Act 1995 and 2002.

The Act was introduced in 1995, providing protection mechanisms for threatened or endangered flora and fauna communities, as well as vulnerable, endangered or threatened species. Any activities undertaken

within a Bushland area of Threatened Species requires a Section 91 licence from the OEH. (TSC Act 1995) or a Section 132c Licence (NPW Act 1974). Simply put, an s91 licence is required for actions that are destructive, while a s132c licence is required for scientific and/or conservation purposes.

Prior to the preparation of the PMP the Office of Environment and Heritage OEH, (previously National Parks and Wildlife Service, NPWS) outlined to the Rookwood Necropolis Trust (prev. Joint Committee of Necropolis Trustees) what was required to enable activities to occur at Rookwood. It stated that a Property Management Plan (PMP in accordance with the TSC Act 1995) was *'more applicable for the actions that are proposed for the Rookwood site, i.e. actions that are to occur repeatedly over a long period of time. An approved PMP can also apply for a longer period than a licence. A PMP would thus provide the JCNT with more certainty in its planning for Rookwood Necropolis.'* (NPWS letter ref SZT/sb/98).

1.4 Previous PMP

Active bushland management works have 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.

The PMP was prepared in 2002 for the NSW Department of Lands and Water Conservation ('Lands') by Hassall/Gillespie to provide for the ongoing operation of the Necropolis and the protection of high conservation value native flora and fauna while at the same time maximising the Cemetery's capacity for burial. Under the previous PMP, Annual Bush Regeneration Progress Reports were prepared and submitted to the RNT and to OEH, which oversees the protection and management of Endangered, Vulnerable and Near Threatened (EVNT) entities in NSW.

Since the adoption of the PMP 2002 all actions undertaken at Rookwood within the VCAs and outside these zones where they affect threatened species, have been undertaken in accordance with the PMP.

The management of the PMP has been under the control of DEM/Landscan, with project management by Carolyn Tallents. Judith Rawling Project Ecologist of UBM Ecological Consultants has been responsible for the implementation of recommendations relating to Ecology; initially undertaking the on-site bush regeneration activities through their contracting company UBM Projects, and subsequently the management of the bush regeneration team Ecohort Contractors.

At the end of the term of the previous PMP (2012), UBM prepared Biodiversity Studies-Flora and Fauna Investigations for Native Bushland at Rookwood Necropolis in order to assess and update findings of the earlier Flora and Fauna Survey of Rookwood Necropolis prepared by P & J Smith in 1999. The Biodiversity Studies report formed part of the required monitoring and performance measures prescribed for Rookwood.

In December 2013, a 10-Year Review was prepared (DEM/UBM 2013) which summarised the bushland management activities undertaken, and which assessed the efficacy of the actions and strategies prescribed by the Bushland Management Plan ('the BMP').

Among the recommendations of the 10-Year Review was 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

previous PMP (Hassall 2002), and the recommendations of the 10-Year Review. These recommendations have been incorporated into the new BMP (UBM 2015).

The Conclusions of this 10 year review were that an updated PMP is the most relevant document for managing the ecological values at Rookwood Necropolis.

1.5 Scope of New PMP

Now that the 10 year review of the original PMP has been prepared, the Plan of Management 2014 completed and some of the Related Management Plans identified in the PoM underway, it is opportune to update and prepare a new PMP to direct activities at Rookwood for the next 5 plus years. The preparation of this PMP has been somewhat delayed by the Landscape Master plan, (Jacquet, F; August 2014 Draft), as it was necessary to wait until the Landscape Master plan had investigated options for management of flora and fauna. This investigation included exploration of Bio-banking, however these options were not taken up by the RNT, preferring to maintain a PMP for this purpose.

The 10 year review of the PMP has identified gains that have occurred as a result of the management under the PMP2002. It has also identified the pressures placed on the diminishing extent of bushland within Rookwood outside the Conservation Areas. A new PMP is beneficial to the ongoing management of flora and fauna at Rookwood as it identifies management actions for areas that are to be conserved and areas that can be managed in accordance with maximising burial and interment space at Rookwood. It is the means to balance these sometimes competing issues.

1.6 How to use this document

This document is to be read in conjunction with the Rookwood Necropolis Bushland Management Plan (BMP), dated January 2015. Some information is repeated in these two documents, in order to ensure that each stand-alone report is comprehensive and provides sufficient information to enable the management issues to be explained to the reader.

The purpose of the new BMP (2015) is to update the existing Bushland Plan of Management (2003) and to provide new baseline conditions for flora and fauna. It also includes updated management prescriptions, performance measures, monitoring and review.

The PMP, (this document), identifies the repeated actions that are required to be undertaken at Rookwood to manage the ecology, as well as the operational aspects of the functioning cemetery. It also identifies any known existing and future work that is required at Rookwood, and provides for their implementation with the least negative impacts. The BMP and PMP are complementary and should be read in conjunction. This PMP is intended to be a succinct document to be used for management and reporting requirements to the satisfaction of OEH. The BMP is a complementary report prepared under the PMP, providing detailed implementation measures.

The following diagram identifies the relationship of the various reports associated with the PMP.

1.7 Extent of Cleared areas and Vegetation Conservation Areas in 2015

Figure 2 shows the extent of the designated vegetation areas from the PMP 2002 that have now been cleared, or released for burial. These areas include all of the areas nominated within the PMP 2002 as 'Vegetation Areas to be released for burials', with the exception of Areas 16, 17, 18 north, and 18 south. These areas total approximately 8,490 square metres. The most recent area to be cleared is Area 3, currently underway, to provide for additional burial space within the General Cemetery Trust. There are other areas of vegetation outside these identified on this map, however these areas are part of the Necropolis burial lands, and will be subject to the management actions within Section 3 in this PMP.

Figure 1: The Property Management Plan and its Related Management Plans

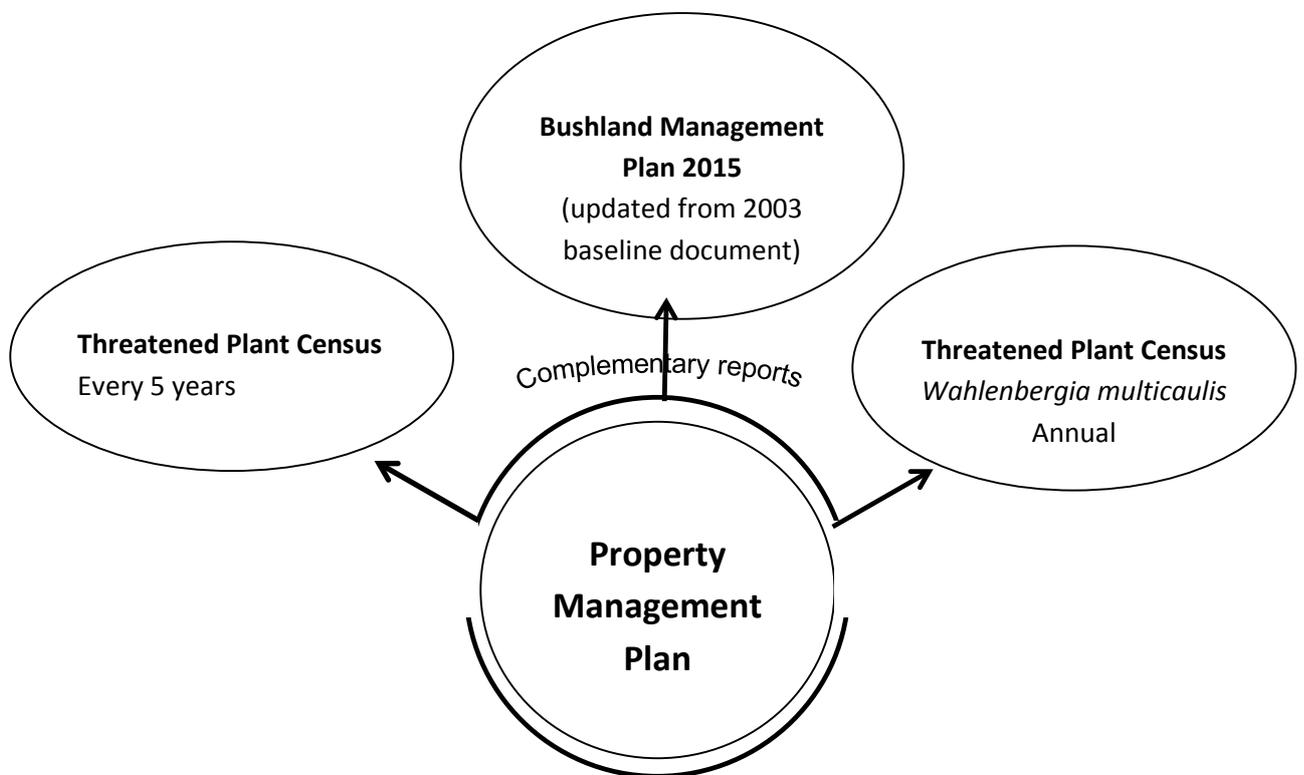
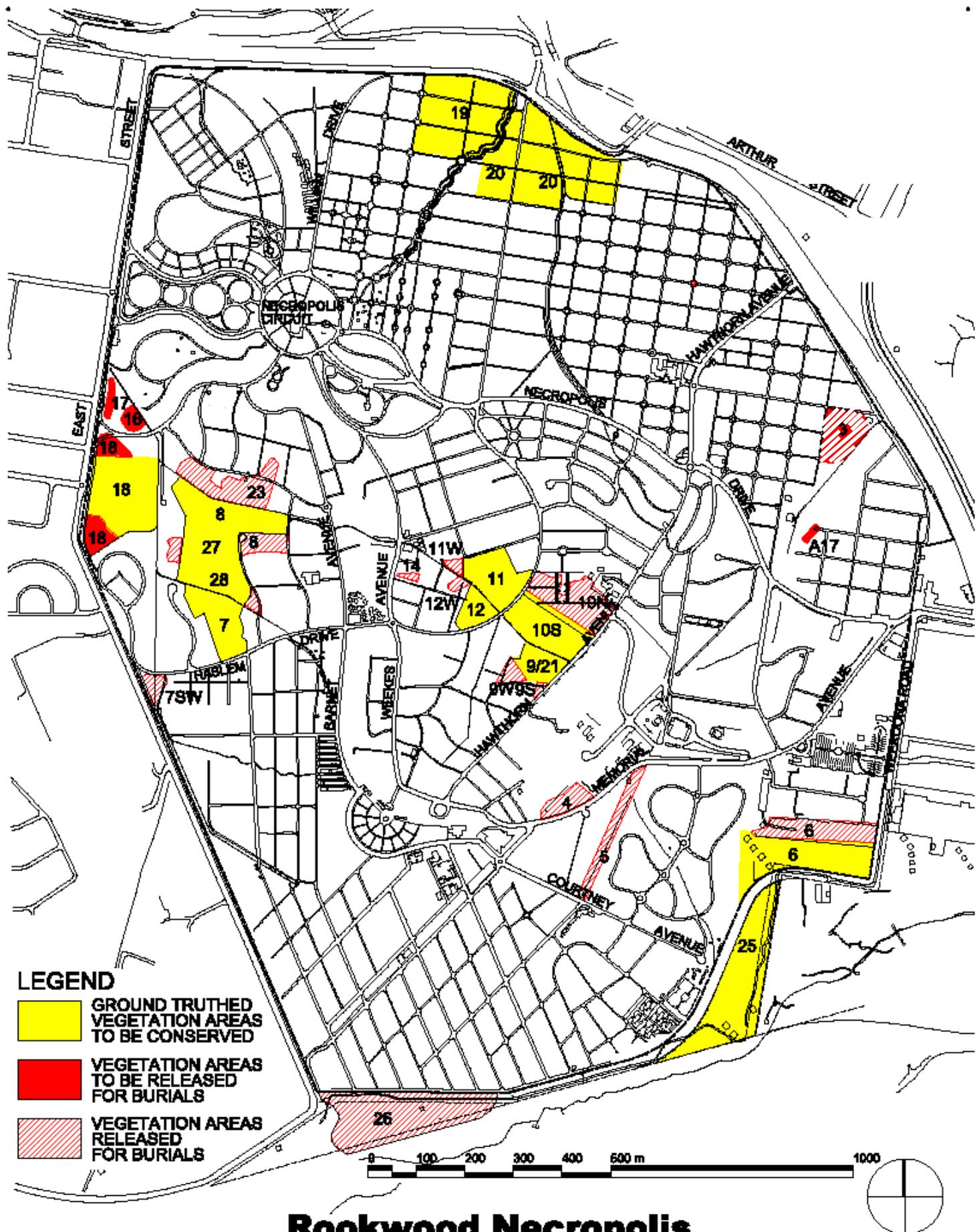


Table 1: Outline of Related Management plans for Rookwood

Related Management Plans	To include as complementary reports
Property Management Plan- This PMP updates the previous PMP 2002, 2008-9 Management of the Endangered Ecological Communities and Threatened/Vulnerable species/populations	<ul style="list-style-type: none"> • Bushland Plan of Management (2003 previous plan) - updated as Bushland Management Plan 2015 • Threatened Plant Census- to be every 5 years except <i>W. multicaulis</i> to be annual • Audits- every 5 years and at end of PMP period
Landscape Master Plan - 2014 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

(Original Source PoM (Plan of Management 2014), and PMP 10 year review DEM/Landscan 2013- adapted as part of this PMP)



Rookwood Necropolis Ground Truthed Vegetation Areas

Figure 2: Vegetation Conservation Areas and cleared areas in March 2015

(Source DEM/Landscan 2013- including updates/modifications)

2 Ecology at Rookwood

The following information describes the ecology at Rookwood. This information is also described in the BMP.

2.1 Plant communities at Rookwood

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.

The plant community in the Locality, as represented at Rookwood and nearby Chullora, is known as 'Cooks River/Castlereagh Ironbark Forest' (hereafter 'CRCIF'). This community is gazetted as an Endangered Ecological Community ('EEC') under the NSW *Threatened Species Conservation Act 1995* (TSC Act).

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. Cumberland Plain Woodland (hereafter 'CPW') is listed as a Critically Endangered Ecological Community ('CEEC') under the NSW *TSC Act*, while under the Commonwealth *Environment Protection & Biodiversity Conservation Act* ('EPBC Act') CSPW is listed together with Shale Gravel Transition Forest as a CEEC.

More recent vegetation mapping by Tozer *et al.* (SCIVI 2010) and by the Office of Environment & Heritage (OEH)¹ for the Sydney Metropolitan Catchment Area (2013) have mapped the dominant vegetation community in the Necropolis as Castlereagh Ironbark Forest. 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 areas also occur within the Necropolis, but the management of these areas is not prescribed in the Bushland Management Plan (BMP 2015), unless current management practices in these areas are likely to impact on remnant native bushland.

¹ OEH was formerly known as DEC, DECC, DECCW, and prior, NPWS

2.2 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 bushland areas is approximately 21 hectares.

These are described as the Vegetation Conservation Areas (‘the VCAs’). The numbering, size and locations of the VCAs within the Necropolis are confirmed under the PMP. For the past 10+ years these VCAs have been the focus of the on-going bushland management program.

Each of the VCAs represents a stand of remnant CRCIF or one of its ‘variants’. An exception to this is the Northern Cluster (VCA19 and 20), refer Figure 2, 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 has not been 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 2: 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).

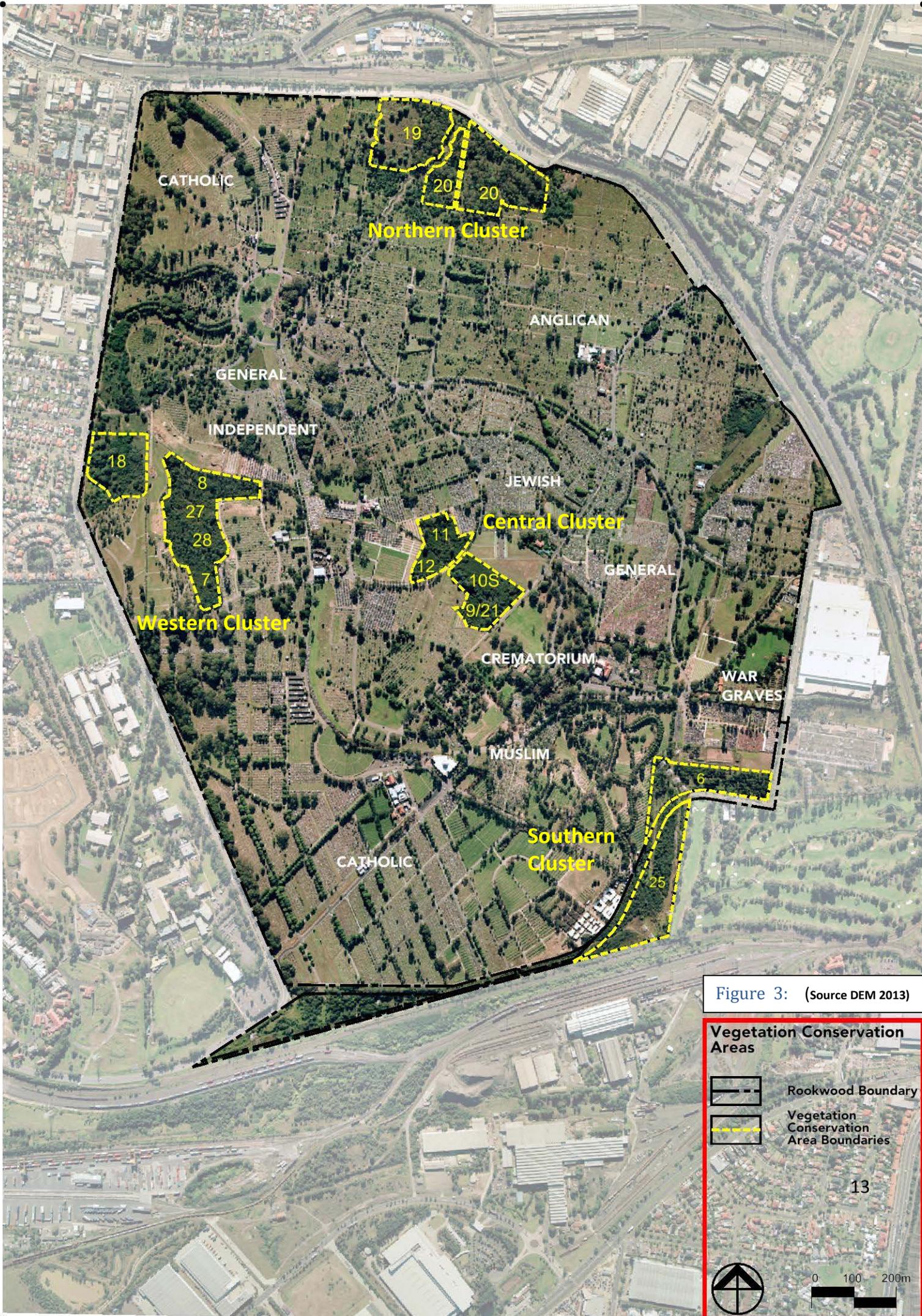


Figure 3: (Source DEM 2013)

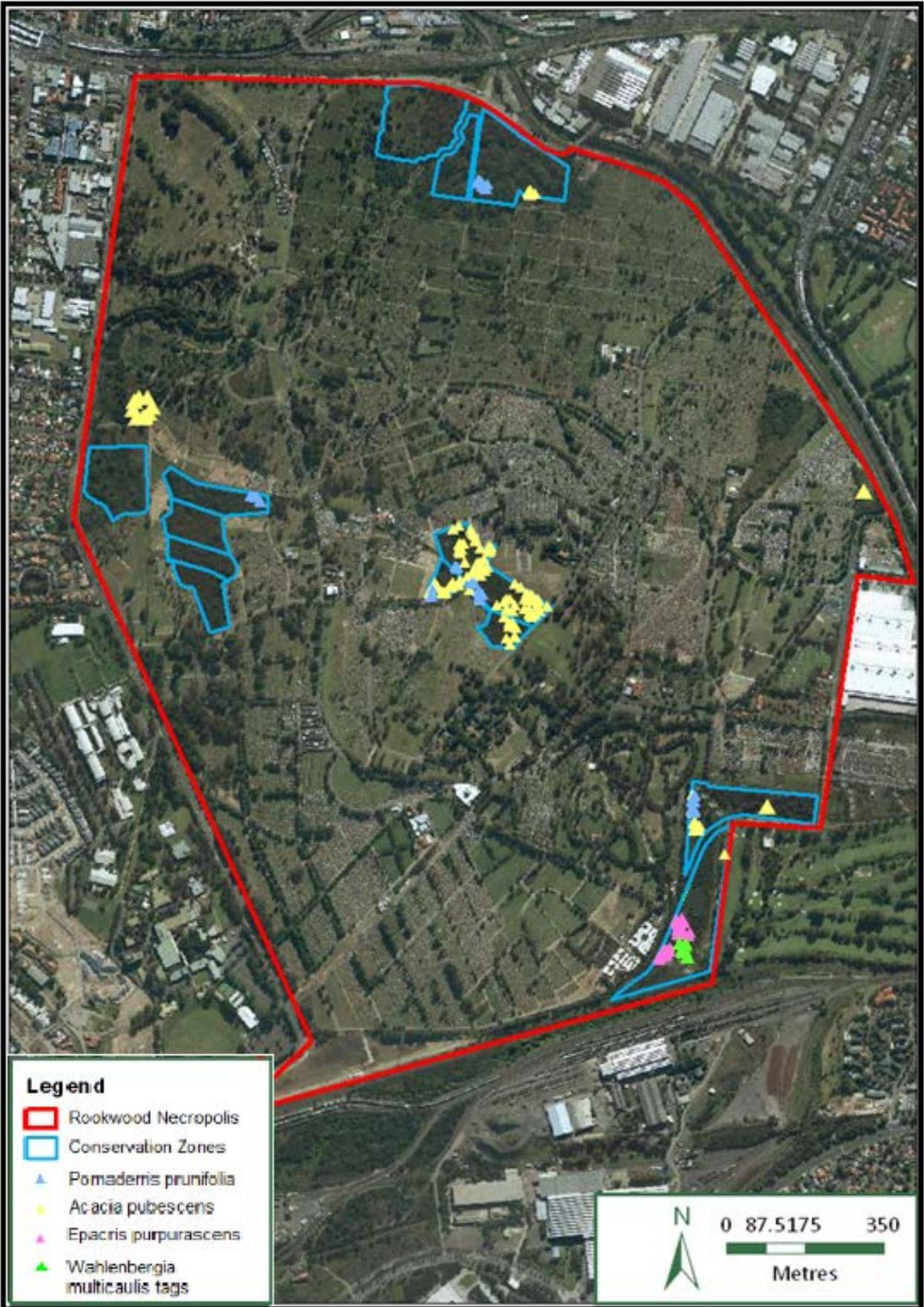


Figure 4: Mapped Threatened Flora species within Vegetation Conservation Areas- known stands (Source UBM Current in 2013- can vary each year)

2.3 Description of Threatened Flora at Rookwood

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.

Four (4) Endangered Vulnerable and Near Threatened ('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, with *Wahlenbergia multicaulis* plant census carried out by Smith and Smith. Based on these annual surveys, it is noted that no new threatened species have been observed at Rookwood since the 1999 survey. These surveys are carried out in the VCA's only. If it is known that Threatened species have been found outside the Conservation Areas these are recorded. In the case of *Wahlenbergia multicaulis* there are sites that have been tagged and may not be found in the survey year due to time of the survey and prevailing weather conditions. Each Annual Census reviews the known sites from the previous years to determine their presence.

The mapped locations of these threatened species at Rookwood in 2014 are shown on Figure 4.

TSC Act 1995

Endangered Flora Populations

Wahlenbergia multicaulis



Vulnerable Flora species
Epacris purpurascens var.
purpurascens



Endangered Flora Populations
Pomaderris prunifolia



Vulnerable Flora species
Acacia pubescens

2.4 Description of Threatened Fauna at Rookwood

Early surveys at Rookwood (Smith & Smith 1999) 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 the most recent fauna 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 Acts*;
- 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
- 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.

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 by UBM (2013) are those that forage and nest within the ground cover and lower canopy layers. The loss and/or opening up of these layers due to increased burial areas, clearance for maintenance and Cemetery functions within the Necropolis 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.

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 mown (*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 and the occasional pond, the latter supporting emergent and floating native and exotic aquatic vegetation.

Assessment of current fauna habitat values and recommendations to restore or enhance existing habitat has been presented in the Bushland Management Plan (UBM 2015).

Overview: A summary of flora and fauna conservation significance for Rookwood Necropolis is provided in Table 3.

Table 3: EVNT Flora and Fauna Species, Populations and Threatened Ecological Communities

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

Note: The PMP 2002 did not recognise any areas of CPW 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. For the purposes of the Significance Assessment the precautionary principle has been used. Refer later.

(Source UBM BMP 2015)

2.5 Context of Necropolis Bushland in Relation to the Sydney Basin

The ecological and environmental values of Rookwood Necropolis are described in the Rookwood Necropolis Plan of Management (NSW Department of Primary Industries (2014) as follows:

“Rookwood includes areas which are now dominated by indigenous and ‘naturalised’ plant species providing an important sanctuary for native flora and birdlife. Rookwood acts as the lungs of this area of Western Sydney. Its ecological values, biological diversity and natural systems provide a unique area of significant green space. It goes on to say that the Necropolis bushland “provides significant shelter for fauna and potentially connects with other green reserves in this area of Sydney”.

Due to extensive urban and light industrial development in the vicinity there are limited opportunities for the dispersal of fauna in the Region. 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 may only occasionally forage within the Study Area (*e.g.* the Grey-headed Flying-fox).

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, particularly those with a native understorey component.

2.6 The Bushland Management Plan- Current Management

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, UBMC² prepared the “Bushland Plan of Management for Rookwood Necropolis” to provide a framework for the implementation of the 1st PMP (Hassall 2002).

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 Landscape Architect, Consultant 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.

Objectives & Scope of Work

The new Bushland Management Plan (the ‘BMP’) identifies specific strategies and actions to implement recommendations of this new PMP, for the conservation and management of the remnant bushland and EVNT entities within the Necropolis.

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

- To implement the broad goals and objectives set out in this new PMP.

² now UBM Ecological Consultants - UBM

- 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 Management Actions

The following management actions are in place as part of the conservation and management of the remnant bushland and EVNT entities within Rookwood Necropolis. Many of the actions listed are included in the Bushland Management Plan, and are described in detail.

These activities are summarised here and are to be implemented as part of the management actions to increase or maintain biodiversity.

3.1 Implement the Bushland Management Plan (BMP) for the Vegetation Conservation Areas (VCAs)

The BMP has been prepared to provide management prescriptions for the VCAs. This document includes tasks and actions to be carried out under the bushland management program over the next five (5) years. It provides baseline conditions at January 2015 for flora and fauna, along with management actions for each VCA. Preferred Outcomes and Performance Measures are included in the BMP. One of the core aspects in maintaining biodiversity at Rookwood will be achieved by implementing the recommendations of the BMP.

3.2 Increasing Biodiversity within the operational Cemetery

The opportunity to increase biodiversity within the active burial and interment areas within the Cemetery is limited. Due to the pressures on land availability at Rookwood and all Cemeteries, it is necessary to maximise interment within the Necropolis, with limited areas for vegetation. The principle purpose of Rookwood Necropolis, since its establishment in 1867, has been to provide a place for burial or cremation for Sydney's deceased.

There are however, some measures that can increase potential species diversity and vegetation extent. Some of these are also described in the Landscape Master Plan 2014, and will continue to be promoted to the management Trusts for implementation in their operational aspects within the Cemetery.

- Designing burial/ interment areas with increased soft landscape areas capable of supporting indigenous plant communities. Maintaining a variety of habitats for native flora and fauna within interment areas, including providing areas with small to medium sized shrubs as refuge for small birds, and maintaining or establishing a suite of native grasses- *Themeda australis*, *Poa* sp, *Dichelachne* sp in preference to using exotic turf grasses wherever possible.
- Reduction in the amount of impermeable paved areas, in circulation areas, on graves, within landscaped areas.
- Utilisation of areas with less monumentation as native grass habitat; e.g. pauper burial areas.
- Increasing tree/vegetation cover in the Cemetery, along roads, drainage canals and within burial grounds.
- Reducing reflective surfaces.

3.3 Increasing biodiversity within areas already buried

Areas that have already been buried, and are subject to perpetual lease provide an opportunity for biodiversity. Potential in these areas include:

- Native grassland within the buried areas- particularly *Themeda australis* grassland. Refer to the attached Plate 1 of thriving grassland that provides habitat and aesthetic value. The important circulation paths within this area are mown periodically at a setting which maintains the cover of indigenous grasses and forbs.
- Encouraging regeneration of indigenous plant communities; as well as planting of indigenous species in landscape areas, where possible outside the VCAs. This is to be balanced with the retention and reinstatement of important cultural landscape species with the State Heritage Register (SHR) are of the Necropolis.



Plate 2: *Themeda australis* grassland within buried areas.

3.4 Noxious and Environmental Weed Control

Noxious weed control is part of the BMP and ongoing bushland regeneration program at Rookwood. The BMP includes target species listed in the Auburn, Strathfield and Bankstown LGAs and gazetted under the NSW Noxious Weeds Act 1993/2005. Keystone environmental weeds are also treated within the VCAs and the Necropolis as a whole. Details of the actions are included in the BMP with lists of target species for each VCA. The responsibility for noxious and environmental weed control within the VCAs remain with the Bush Regeneration Contractor. Control within the operational/interment areas of the Necropolis is the responsibility of the respective Trust.

Regular control of these weeds throughout the entire Necropolis is essential and will reduce maintenance if followed as prescribed. Failure to follow these practices consistently and in a timely fashion over the entire Necropolis will increase maintenance requirements. Coordination with the Trusts to undertake this work outside the VCA's is critical and this work will need to be reinstated within the Bushland Regeneration program if the maintenance is not being done.

3.5 Connectivity and Corridors

Although opportunities are limited, and the potential widths of corridors may be very narrow, assisted connectivity for flora and fauna will be achieved throughout the Cemetery by maintaining and improving corridor linkages. Corridor opportunities are to be implemented over a staged time frame within the 5 years of this Plan and beyond:

- Planted or regenerated corridor either side of canals to minimum 3 metres wide on both sides. In the State Heritage Registered Area this will include exotic/cultural plants.
- Canopy planting to all roads to improve connectivity at canopy level.
- Boundary areas planted with indigenous species to provide a landscaped edge to the Necropolis. The current proposals are to include a pedestrian and bicycle link along these boundaries, utilising the 10 metre boundary precinct for this purpose. An approximate width of 6 metres as a planted boundary with 3 metre pedestrian/bicycle route will be provided.
- Provide vegetated linking corridors between each VCA, where possible. These will essentially occur along canals and boundaries.
- Include recommendations from the Rookwood PMP 10 year review (November 2013) by DEM and UBM.

3.6 Management of Buffer and Edge conditions

The quantity and length of edges within the VCAs increases the maintenance requirements, particularly where there are adjacent exotic grasses (lawns), or exotic planting areas (gardens). VCAs are best to be consolidated into large uninterrupted areas with a low edge to core ratio. The amount and expense of routine site maintenance required within the VCAs can be reduced by:

- Limiting pedestrian and vehicular access through the area to limit edge conditions and impacts.
- Managing edge conditions to reduce seed/silt spread by overland runoff- i.e. erect silt fencing, create swales to trap corms and seed material, or plant a buffer or interface zone outside the VCA
- Providing a hard paved edge or barrier where adjacent exotic grasses (lawns) are adjacent to the VCA- i.e. a concrete edge to reduce grass runners from entering the VCA.
- Connecting adjacent VCAs with a potential trade off area to unconnected areas.
- Ensuring water flow and overland runoff from hard surfaces and developments higher in the catchment are not concentrated into an area of the VCA.
- Maintaining pre- development drainage regime- post development as far as possible (development may constitute new road, path, burial area, building, and watered planting area).
- Controlling and removing unauthorised dumping of materials- including garden waste, rubble, 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.
- Maintaining stockpile sites established by the various Trusts by stabilising exposed surfaces with temporary cover planting and periodic herbicide application to control weeds and prevent their spread.

These measures are being implemented as part of the BMP and the Landscape Master Plan proposals.

3.7 Mitigation measures during clearing operations

Where clearing is required to release areas for burial or infrastructure upgrades, it is essential to implement ameliorative measures to reduce impacts. There are limited areas available for clearing at Rookwood as most of the areas identified in the previous PMP as 'Vegetation Areas to be released for burials' have now been cleared. The following actions are to be implemented when clearing remnants of native vegetation approved for removal and subsequent burial. These are detailed in the BMP as plant salvage, propagation and planting, and are summarised below.

- Suitable plant material will be salvaged prior to clearing to conserve local genetic material. This has occurred previously through the translocation of divots, (grasses, groundcovers, herbaceous plants and seed bank within the soil), is relocated to another area. The recipient site is to be carefully selected to match the donor site conditions.
- Seed collection and propagation for use in degraded sites is to occur based on available resources. Seed collected as part of the bush regeneration works will continue and this material provided to Strathfield Community Nursery (or other specialist Nursery) for propagation when needed. A suitable seed storage program will be required.
- Native trees with hollows are to be checked for the presence of native fauna prior to removal, and any fauna relocated in accordance with best practice fauna management and OEH requirements.
- Drainage and sediment control measures are to be set in place prior to clearing and will apply to construction works as standard land management practice to reduce sedimentation, erosion and transport of weeds. Measures will include silt fences on the lower (downslope) side of the works area, grated inlet pit filters, along with minimising the extent of disturbed areas at any one time. Progressive ground stabilisation through revegetation - establishment of grasses, turf and planting areas is to occur as soon as possible after vegetation cover is removed. Where planting is delayed for some reason a nurse crop may be used to stabilize the soil surface.

3.8 Plant species lists for Rookwood as a whole

Plant species now recognised as environmental weeds and those likely to become a weed problem in the future, (i.e. those plants which spread and naturalise freely in bushland), are to be avoided. A list of existing and potential environmental weeds is included in the BMP. All planting proposed at Rookwood should be reviewed by the Project Ecologist UBM to ensure no environmental problems are being created by the selection of species.

Plant species lists are being prepared to guide the selection of suitable plants for various areas and purposes. The plant lists in the current Landscape Master Plan do not consider the potential for the recommended plants to become environmental weeds. These lists require review, coordination and expansion, to supplement design and ecological aspects.

Establishing balance between cultural landscape plant species selection and habitat management is paramount to the implementation works of the Landscape Master Plan, the BMP and PMP. Refer to 'Cultural Plantings' within the BMP.

3.9 Maintenance of planted areas

Along with the noxious weed control undertaken as part of the BMP it is essential that all planted areas are maintained on a regular basis to minimise weed invasion into the VCAs. This will also assist in the presentation of the Cemetery, along with minimising maintenance to the VCAs due to weed 'creep' into these areas. Maintenance of all areas outside the VCAs is the responsibility of the operational Trusts.

3.10 Cooperation and coordination amongst managers

In combination with the items previously mentioned there will be economies of scale and share of expertise if complete cooperation and coordination between Trust managers occur. This may extend to sharing equipment, mulching materials or use of brush matting to stabilise bare soil or disturbed areas. This should be a regular Agenda item at the managers meetings, as well as at the Vegetation Management Meetings. Shared information on the control of noxious and environmental weeds will be critical to managing unwanted vegetation (weeds) throughout the Necropolis. Management of the VCAs will continue to be the responsibility of the professional bush regeneration contractors.

3.11 Fire management

It has been difficult to establish consistent control burns of areas at Rookwood due to the NSW Fire Brigade's difficulty in committing to conducting ecological burns at Rookwood.

Regular ecological burns were recommended in the Bushfire Management Plan 2004, but have been placed on hold over the last few years due to this difficulty.

If further burns are not possible, this management tool will have to be abandoned. Further investigations into its potential implementation are being made.

3.12 Rubbish

Wind-blown debris and rubbish from burial areas, particularly flower wrappings, along with other plastics can cause damage to birds or small reptiles. A Formal protocol to be agreed between Trusts is required for the control, removal and minimisation of this material from the Necropolis within grave sites and vegetation areas. In particular, discussion with the florists within and adjacent to the Necropolis with a view to utilising only degradable paper wrappings may assist in removing this threat to Rookwood's fauna.

3.13 Feral animals

Feral animal control, (rabbits, hares, foxes, domestic dogs and feral cats), is essential to avoid predators killing native fauna, particularly ground-dwelling animals and small birds. Control programs on a regular basis are required. Without these controls fauna biodiversity values will be compromised. This is detailed in the BMP.

3.14 Constraints to Ecology- balancing Rookwood's values

The PoM highlights the values at Rookwood of interment, heritage and ecology balanced within this complex site. Each value treated individually without consideration of the effect on the other will result in compromised values.

3.14.1 Maximising burial

Maximising burial and interment spaces has been discussed previously, with this being the original primary function of Rookwood. However, Rookwood now supports a more complex set of values, and complementary activities to protect vegetation of significance can coincide with this function. These have been discussed previously.

3.14.2 Heritage

Retention of heritage values may sometimes conflict with vegetation conservation values. For example replanting some of the original heritage landscapes may require species selection that is not always completely authentic to the original plant material used in Edwardian and Victorian gardens. Some of these plants are now recognised as environmental and/or noxious weeds and the use of such plants (although known to be used in heritage gardens) will significantly increase maintenance costs in the VCA's.

Environmental weeds are those that spread easily by seed, suckers, corms or fragmentation and displace native species when they invade bushland. Some of the plants in this category that should not be planted at Rookwood are listed below. Some of these plants already exist in the State Heritage Registered (SHR) area of Rookwood.

- *Buddleia davidii* Summer Lilac
- *Cytisus scoparius* English and Spanish Broom
- *Coreopsis lanceolata*
- *Freesia refracta*
- *Cinnamomum camphora* Camphor Laurel
- *Raphirolepis indica* Indian Hawthorn
- *Watsonia bulbifera*
- *Morus alba* White Mulberry
- *Yucca sp.*

It will be necessary to review specific weed treatment to landscape and heritage areas within the Cemetery, particularly around heritage items- i.e. to isolate any invasive plants to the heritage area only and carry out weeding of an adjacent buffer area. By planting alternative, but complementary species in heritage areas it is possible to achieve a balance between heritage conservation and plant conservation. This will be addressed in the plant species lists described previously.

3.14.3 Infrastructure upgrade and possible works within the term of this PMP

There are a number of required upgrades to services and infrastructure within Rookwood, some identified in the Landscape Master Plan and others part of the ongoing replacement of aged infrastructure, installed over many years. This PMP has identified the following works that may be required in the next five years. These include:

- Boundary planting/fencing reinstatement and recreational bicycle/walking track.
- Identifying a pedestrian/bicycle link through Areas 19 and 20 to provide a recreational link for the proposed Necropolis pedestrian/bicycle network, along one existing historic east-west access path. The existing path is located in the State Heritage Register area (SHR), is edged with an historic brick kerb and gutter and is an historic circulation route. The nature of the pedestrian route would include either mowing of the track or installation of consolidated gravel if access frequency demands.

- Mowing access paths to burial sites in VCA 19 and 20, along some select existing access paths, part of the SHR area, and part of the existing historic circulation paths of the Necropolis. Only the main paths would be mown.
- The right to maintain individual graves in VCA 19 and 20 along with graves and monuments in other VCAs that are within buried areas. Expected frequency of access would be a predicted maximum of 5 every year. The assessment of significance outlined in the next section would be followed to minimise impacts.
- Maintenance of vehicular sight lines along the curved portion of Haslem Drive adjacent to VCA 10, 11 and 12. The boundary of these VCAs does not include a verge adjacent to the road, to enable the sightlines to be maintained. Due to the lack of visibility it will be necessary to slash this area to a height of approximately 500mm for a width of 2 metres from the back of kerb.
- Improvement to drainage and runoff around Courtney Avenue and the vaults in this vicinity- This would reduce negative impacts of uncontrolled runoff into the western boundary of VCA 25.
- Formalisation of the service access through Area 25, to avoid uncontrolled access in this area. Service access would follow the existing track through this area, until the RMS install their planned bicycle route through this area. (subject to their own approvals).
- Future installation of a bicycle track through Area 25 as part of RMS regional bicycle strategy. It will be the responsibility of the RMS to undertake their own assessment and Review of Environmental Factors. This PMP does not address this issue, however all available information has been provided to RMS should they decide to proceed with this track during the currency of the PMP.
- Improvement to drainage in Area 25, particularly upgrading the swale, (unformed canal), running through this area- refer to the next section identifying that this item will not form part of this PMP, due to the Seven Part Test results.

Assessments of Significance for these items have been undertaken under Part 5A of the *Environment Protection & Biodiversity Conservation Act* (commonly referred to as the Seven-part Test) and these are included in the Appendix. A summary of the Test outcomes follow. The approvals for these works may not only affect the existing vegetation on site but may require Auburn Council Development Applications and/or Heritage Council of NSW approvals. This will be determined prior to any of the works proceeding.

Guidelines for special request access to individual graves within VCAs (Note: 7 part test in Appendix)

In the case of the right to maintain individual graves in VCAs 19 and 20, along with monuments in other VCAs, these will be maintained on an “as needs basis”. Most of the monuments located in VCAs are not visited and it is possible to maintain the VCAs for their ecological value. Where special requests to provide access to a particular grave are made to the RNT or the two operational Trusts, the procedures outlined below will be followed.

- Provide a mown access track to the particular monument, restricting the extent of mown area to a maximum of 1 metre wide, and to a high mowing height. Mow only to provide access.
- Follow any existing track or path within the area where possible.
- Prior to the track being provided the area is to be surveyed by the Bush Regeneration team to identify locations of any endangered/vulnerable species; these are to be tagged and the track is not to remove or disturb any species.
- The bush regeneration team is to selectively cut material from around the monument to allow for visits. The plant material is not to be removed.

4 Assessments of Significance

The NSW *Threatened Species Conservation Act 1995 (TSC Act)* aims to conserve threatened species, populations, ecological communities and their habitats; to promote their recovery; and manage the processes that threaten or endanger them. Endangered³ species are listed under Part 1 Schedule 1 of the Act; endangered populations under Part 2 of Schedule 1; while communities considered ‘at risk of extinction’ are listed as Endangered Ecological Communities (EECs) under Part 3 of Schedule 1. Critically Endangered Ecological Communities (CEECs) are listed under Part 2 of Schedule 1A.

Under the terms of the legislation, Local Government must assess the impacts of any proposed activity which might adversely impact on any EEC/CEEC, threatened species or populations, and where these are likely to occur, must identify strategies to minimise any such impacts. Further, development on adjoining land may also have a significant impact on the bushland’s natural values, so that such activities must be carefully assessed by the Consent Authority prior to development consent being granted.

Under Section 5A of the *Environment Planning & Assessment Act 1979 (EP&A Act)*, any development activity impacting on a species, population or ecological community listed under the *TSC Act* requires the application of an Assessment of Significance.

An Assessment of Significance under the *TSC Act* (commonly called ‘the Seven-part Test’) is designed to determine “*whether there is likely to be a significant effect on threatened species, populations, ecological communities or their habitats*” (as listed on the Schedules of the *TSC Act*), and consequently, to determine whether a Species Impact Statement is required.

Where any threatened entity is also listed under the Commonwealth *EPBC Act* a similar Assessment process under the Act’s *Significant Impact Guidelines* will apply. Flora and fauna surveys undertaken at Rookwood Necropolis over a number of years (Smith & Smith 1999, UBM 2003, 2013, 2015 and Biosis 2014) have provided the ecological basis for Assessment.

Table 3, included earlier in this document provides a list of Endangered, Vulnerable and Near Threatened (EVNT) entities known to occur at Rookwood. Assessments of Significance have been undertaken for each of the EVNT entities listed occurring outside the VCAs, as well as Endangered Ecological communities (EEC) and Critically Endangered Ecological Communities (CEEC) occurring outside the VCAs. The Assessments of Significance that follow are prepared on the precautionary principle, to determine the impact if all EVNTs, EECs and CEECs occurring at Rookwood outside the VCAs, were cleared. The full assessment of significance for each entity is included in the Appendices. A summary of the assessment is included in the following pages.

4.1 Cumberland Plain Woodland

Cumberland Plain Woodland in the Sydney Basin Bioregion is listed as a Critically Endangered Ecological Community (CEEC) on Part 2 of Schedule 1A of the *TSC Act*. This community is also listed as Critically

³ Where the terms ‘threatened’ and ‘endangered’ have the same meaning under the Act.

Endangered under the Commonwealth *EPBC Act* as *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*. Mapping of vegetation communities at Rookwood prior to the preparation of the previous PMP 2002 did not recognise any areas of CPW 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. Irrespective, of these variations in opinion VCAs 19 and 20 are already within the dedicated Conservation Area and do not require further assessment under the 7-part test.

For land outside the dedicated Conservation Areas, flora survey by Biosis (2014) recorded a small fragment of CPW (~0.62 ha) comprising native trees over introduced lawns near the north-west corner of the Necropolis. However, recent inspection (UBM May 2015) confirms that this area is subject to on-going disturbance – the ground stratum has been mown for many years, with no evidence of any stratum other than canopy trees. Biosis (2014) also recognises a small area (~0.2 ha) of grassland with scattered native trees south-east of Conservation Areas 9 and 10 as remnant CPW (refer to Figure A1 in Appendix).

For the purposes of Assessment and in accordance with the precautionary principle, the most recent vegetation mapping by Biosis (2014) will be used. Therefore the potential clearing of these two (2) areas totalling ~0.82 ha have been considered by the following Assessments of Significance.

Expected Impact on Cumberland Plain Woodland

The Proposal, which at some time in the future clears the remaining stands of CPW outside the designated Conservation Areas, would result in the clearance or modification of ~0.82 ha of simplified and degraded CPW. Areas of low-value habitat will be removed, although the subject remnants of this Assessment are highly simplified both structurally and floristically.

If these remnants were connected with other local bushland areas, and if they retained a greater number of native shrubs or other understorey species, the impact of the Proposal may be deemed to be ‘significant’. However, as this is not the case, it is considered that the impacts of the Proposal would not be ‘significant’ and there is no need to undertake further studies (e.g. a Species Impact Statement) for this site.

However, having said this, under the Proposal there may be a net loss of ~0.82 ha of CPW, and as this ecological community is listed under both NSW and Commonwealth legislation as ‘Critically Endangered’, any loss must be of concern.

Therefore, giving consideration to Section 5(A) of the State *Environmental Planning and Assessment Act 1979*, it is considered that the matter WILL NOT REQUIRE a referral to the Director General Office of Environment & Heritage and the preparation of a Species Impact Statement for Cumberland Plain Woodland.

4.2 Cooks River/Castlereagh Ironbark Forest

Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion is listed as an Endangered Ecological Community on Part 3 of Schedule 1 of the *TSC Act*. It is estimated that the extent of intact remnants is now reduced to 1011 ha (OEH 2015).

CRCIF is the dominant vegetation community within Rookwood Necropolis (Tozer *et al.* 2010). Most stands of CRCIF have been conserved within the dedicated Conservation Areas (established under the previous

Property Management Plan 2002), and are currently being managed under the adopted Bushland Management Plans (UBM 2003 & 2015).

12 small stands of intact CRCIF have also been identified outside the dedicated Conservation Areas (see Figure 2). These 12 stands were approved for clearing under the former Property Management Plan (2002) but in May 2015, there are four (4) patches totalling **1.0908 ha** in size remaining to be cleared. OEH (S. Burke pers. Comm.) has advised that as the clearing of these 12 stands of CRCIF was offset under the former Property Management Plan (2002), no further Assessment is required.

Other than the remaining stands of CRCIF previously approved for clearing, there are no (0) stands of CRCIF remaining outside the dedicated Conservation Areas; therefore no Assessments under the NSW *TSC Act* have been required.

4.3 *Acacia pubescens* (Downy Wattle)

Acacia pubescens is listed as Vulnerable on Part 1 of Schedule 2 of the NSW *TSC Act* and Section 178 of the Commonwealth *EPBC Act*. *Acacia pubescens* commonly grows in dry sclerophyll forest and woodland on clay soils and alluviums of the Cumberland Plain, and is associated with a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest and Cumberland Plain Woodland (OEH, 2015). The main threat to this species is land clearance for urban development. *Acacia pubescens* is commonly found on lands recovering from disturbance, and may be seen on roadsides and rail embankments in Western Sydney. This species exhibits high seed dormancy and is a long-lived persistent in soil seed banks (OEH, 2015).

Acacia pubescens occurs throughout Rookwood Necropolis in recovering bushland and in areas subject to soil disturbance. Many individuals have been recorded in old burial grounds to the north of Conservation Area 18, and it has also been recorded in VCAs 6, 9, 10, 11, 12, 20 and 25 (see Figure 4). It occurs along the curved road verge of Haslem Drive, in VCAs 11 and 12 where it is regenerating following slashing of bushland encroaching on the roadway. It has also been planted in the past as part of the general landscaping program, with some of these planting sites not adequately identified.

At Rookwood, large clumps have expanded via vegetative reproduction growing from the centre outwards (via suckering), and in the absence of fire many of the older stems are senescing (refer to Plant Census UBM 2012). Genetic studies have shown that numerous plants over a large area may all be a single (clonal) individual (NPWS, 2003), and hence the significance of sites cannot be based on the number of plants/stems without genetic testing.

The Assessment of Significance has been prepared in light of a future scenario in which all remaining bushland remnants located outside of the 14 designated Vegetation Conservation Areas are cleared for burial or infrastructure purposes.

It is also possible that isolated individuals of *Acacia pubescens* occurring within Conservation Areas may have to be cleared for planned works which include but are not limited to: boundary fencing; recreational bicycle/walking paths (Areas 19, 20) mown access to burial sites (Areas 19 & 20), grave maintenance, drainage works (Area 25), relocation of electricity lines and poles (Area 25) and maintenance of sight lines along Haslem Drive (adjacent Area 10, 11 and 12)

This Assessment has been carried out under the precautionary principle to encompass all existing stands present with the Necropolis outside the Conservation Areas, including planted specimens and any *Acacia pubescens* regenerating as the result of soil disturbance.

Expected Impact on *Acacia pubescens*

The clearing of any native vegetation either outside or isolated individuals within the designated Conservation Areas, is unlikely to have a significant impact on the local population of *Acacia pubescens* given that the majority of occurrences are confined to the protected Conservation Areas. Provided these Conservation Areas are left *in situ* and protected, and provided that new occurrences are identified in a timely fashion and similarly protected there will be minimal impact on the existing local population of *Acacia pubescens* at Rookwood.

It is NOT considered that the removal of existing vegetation either outside or isolated individuals within the designated Conservation Areas at Rookwood Necropolis would have a significant impact on *Acacia pubescens* (Downy Wattle) individuals, populations and/or habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on this species is NOT REQUIRED.

4.4 *Epacris purpurascens* var. *purpurascens* (Port Jackson Heath)

Epacris purpurascens var. *purpurascens* is listed as Vulnerable under the NSW *Threatened Species Conservation Act 1995 (TSC Act)*. A 'vulnerable' species means a species specified in Part 1 of Schedule 2 of the Act, while an 'endangered species' means a species specified in Part 1 of Schedule 1. As such, any endangered or vulnerable species are described as 'threatened'.

An erect, prickly shrub, this species grows 50-180cm high and has prominent short, broad, leaf scars. From July to September, showy white and pink flowers cover much of the branchlets. It is an uncommon species confined to the coastal plateaus in the Sydney Region, where it can be found in a range of habitats including sclerophyll forest, scrubs and swamps. The majority of habitats exhibit a strong shale soil influence (OEH 2012). It is more commonly found in damp situations such as near creeks and swamps in sandstone woodlands (Robinson, 2003). *E. purpurascens* var. *purpurascens* has an estimated lifespan of 5-20 years, and takes about 2-4 years before seed is produced (OEH 2012). It is killed by fire and re-establishes from soil-stored seed.

Within the dedicated Conservation Areas at Rookwood, this species is currently known to occur naturally only in Area 25, where it is fairly common in open woodland and in clearings, although some plants have been observed along the margins of the unformed drainage line which runs through Area 25⁴.

Within Conservation Area 25 numerous new seedlings have resulted from germination of seed in the soil over the past decade. On site, the species has shown a high rate of fruit abortion in the later stage of development (D. Keith pers. com.). Further, there is evidence that excessive shading through re-establishment of the overhead canopy leads to plant loss over time (UBM 2012).

⁴ It is noted that *Epacris purpurascens* var. *purpurascens* once occurred in adjacent Area 6 North: land which has since been cleared and buried.

In November 2012, 137 *Epacris purpurascens* var. *purpurascens* individuals were identified, measured, tagged and located with a GPS (UBM Plant Census 2012), while in May 2015 a supplementary survey identified 65 *Epacris purpurascens* var. *purpurascens* in the same area.

This Assessment of Significance has been prepared to consider a future scenario in which some bushland in Area 25 would need to be cleared to install a concrete head wall at the site boundary and to clean out the existing drainage line, of weeds, rubbish and improve stormwater flows. This work has been pending for several years, although it is understood that there are no immediate plans to undertake the drainage works. However, this Assessment has been undertaken under the precautionary principle should the proposed drainage works be undertaken within the five-year time span of the new Property Management Plan (2015).

Expected Impact on *Epacris purpurascens* var. *purpurascens*

The removal or modification of the native vegetation in Area 25 to facilitate the proposed remedial drainage works is likely to have a significant impact on the population of *Epacris purpurascens* var. *purpurascens* on this site (estimated to be 65 individuals). As this population is the only one known to occur within the Necropolis bushland (nearest stand being in Boronia Park, Hunters Hill over 9km away), the potential loss of this population is considered to be significant in terms of local biodiversity.

Depending on the extent of the proposed drainage works (not quantified at the time of writing), damage or destruction of the threatened population of the threatened *Epacris* may lead to local extinction (i.e. within a five km radius), and is likely to result in a major or 'significant' impact on the subject entity.

It is considered that the removal or modification of existing native vegetation on Area 25 is likely to lead to local extinction of the threatened species *Epacris purpurascens* var. *purpurascens* and this would have a 'significant impact' on the only remaining population at Rookwood Necropolis. Therefore, the preparation of a Species Impact Statement that further considers the impacts of the proposed remedial drainage works on the threatened *Epacris* IS RECOMMENDED.

As a result of this Assessment any work that is proposed to be undertaken to improve the performance of the drain through Area 25 must be done by strictly limiting any disturbance to the surrounding vegetation, and particularly the sites of *Epacris purpurascens* var. *purpurascens*. As a Species Impact Statement will be required, and potentially a Review of Environmental Factors, the potential works associated with an upgrade of the drain through this area will be taken out of this PMP. If this work is proposed within the currency of this plan a detailed design with construction access requirements/restrictions, would be prepared. This would also be subject to other approvals, such as an Auburn Council development application. Once a detailed and sensitive design approach is determined a more accurate assessment of the potential impacts can be carried out. These results have informed this PMP and the works associated with the drain in Area 25 will not be sought for approval within this PMP.

4.5 *Pomaderris prunifolia* var. *prunifolia*

The population of *Pomaderris prunifolia* occurring within the Parramatta, Auburn, Strathfield and Bankstown local government areas is listed as an 'Endangered Population' on Part 2 of Schedule 1 under the *TSC Act*. This population is disjunct from other populations, and being at the near limit of its geographic range, OEH considers that this population is of significant conservation value as a remnant of the original flora of

Parramatta, Auburn, Strathfield and Bankstown. As a species, *P. prunifolia* is not listed on Schedule 1 of the TSC Act (although the population is listed - as above).

Pomaderris prunifolia var. *prunifolia* is a multi-branched shrub 1-3m high found on rocky slopes, often close to watercourses. This species has ovate to oblong leaves and rusty stellate hairs along the stems, displaying cream to yellow flowers (petals absent) from October to November. The species does not appear to spread vegetatively and is thought to have a lifespan of 10-25 years (OEH, 2012). Within Rookwood Necropolis, it occurs in a small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils (OEH, 2012).

This species was first identified in the Necropolis bushland (Smith & Smith 1999) in former Conservation Area 5 - part of a landscaped area located in the centre of the Necropolis. Area 5 was released for burial some years ago, but prior to clearing in 2003 a small number of individuals with the surrounding topsoil were relocated to Conservation Area 6 South (see *Pomaderris prunifolia* Translocation Program UBM, 2005).

Subsequently in 2011 and 2012, 48 advanced stock grown from local seed were planted into the Necropolis bushland, and are now considered mature and well established; setting fruit and producing seed. At present, *Pomaderris prunifolia* can be found in six (6) Conservation Areas: 6, 8, 10, 11, 12 and 20 (see Figure 4). No naturally occurring or planted *Pomaderris prunifolia* occur outside these dedicated Conservation Areas.

An Assessment of Significance has been requested by OEH (S. Burke pers. comm.) as part of the new Rookwood Necropolis Property Management Plan (pending 2015). OEH has envisaged a future scenario in which all remaining bushland remnants outside the 14 designated Conservation Areas at Rookwood are cleared or disturbed for burial and/or infrastructure works.

Although no (0) *P. prunifolia* are known to occur outside the dedicated Conservation Areas, this Assessment of Significance has been prepared under the precautionary principle to apply in the event that the species is found to occur on-site in the future.

Expected Impact on *Pomaderris prunifolia* var. *prunifolia*

The clearing of any native vegetation outside of the designated Conservation Areas at Rookwood is unlikely to impact on any occurrences of *Pomaderris prunifolia* given that they are confined to the protected Conservation Areas. In 2011-2012, 48 advanced *Pomaderris prunifolia* were planted into six (6) different Conservation Areas; a requirement under the earlier Property Management Plan (2002). Provided that these Conservation Areas are left *in situ* and protected, there will be no impact on the existing local population of *Pomaderris prunifolia* at Rookwood.

If identified elsewhere on site in the future, the removal or modification of areas of potential habitat, if such exist, is likely to present a threat to this endangered population. In this event, if additional occurrences of this species are located and positively identified as *Pomaderris prunifolia* another Assessment of Significance should be prepared.

It is NOT considered that the clearing or modification of existing native vegetation outside of the designated Conservation Areas within the Rookwood Necropolis would have a significant impact on the existing local population of *Pomaderris prunifolia* or its habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

4.6 *Wahlenbergia multicaulis* (Tadgell's Bluebell)

The population of *Wahlenbergia multicaulis* (Tadgell's Bluebell) occurring within the local government areas of Auburn, Bankstown, Strathfield and Canterbury is listed as an 'Endangered Population' on Part 2 of Schedule 1 under the *TSC Act*. Likely to be the only known population remaining in the Sydney Basin and Central Coast botanical subdivision, this population is disjunct and at the limits of its geographical range. At present, there are 13 known sites, with two (2) populations in Northern Sydney, and the majority of others found in Western Sydney (OEH, 2012). As a species, *W. multicaulis* is not listed on Schedule 1 of the *TSC Act* (although the population is listed - as above).

Tadgell's Bluebell is a perennial tufted herb around 10-75cm in height that is glabrous or sometimes sparsely hairy with small linear leaves. This species flowers throughout the year, peaking in late spring/early summer. The petals of the blue flowers form a tube with a corolla. Within Western Sydney, occurrence is closely aligned with the Villawood Soil Series characterised by poorly drained, yellow podsollic extensively permeated with fine, concretionary ironstone (laterite) (OEH 2012).

Tadgell's Bluebell occurs in a variety of habitats including dry sclerophyll forests, forested wetlands, grassy woodlands, and the edges of watercourses (OEH 2012). Within the Sydney Metropolitan Region, this species is associated with remnants of the Cooks River/Castlereagh Ironbark Forest.

Typically found in moist, disturbed sites amongst other herbaceous flora and often in unmown grassland, this species is known to respond favourably to soil disturbance in some situations with high exposure to sunlight (OEH 2012). Within Rookwood Necropolis, the regular slashing of long grasses for bushfire protection is thought to be benefitting this species.

This species is threatened by genetic swamping. Two (2) other species of *Wahlenbergia* (*W. littoricola* and *W. gracilis*) are described as 'widespread' in the Rookwood bushland (Smith & Smith, 1999, 2007) but these species are known to hybridise with *Wahlenbergia multicaulis*, making field identification difficult. Additional threats to the species include weed invasion, habitat clearing and the deposition of industrial refuse and excavated material (OEH 2012).

At Rookwood, 'pure' stands of *W. multicaulis* are thought to be confined to Conservation Areas 6 and 25, with no plants identified in the remainder of the Necropolis (Smith & Smith various dates). However, other *Wahlenbergia* species or hybrids are known to occur elsewhere in the Necropolis which at times results in mid-identification of the endangered species. The Rookwood population is monitored every year by botanical consultants Peter and Judy Smith.

An Assessment of Significance has been requested by OEH (S. Burke pers. comm.) as part of the new *Rookwood Necropolis Property Management Plan* (pending 2015). OEH has envisaged a future scenario in which all remaining bushland remnants outside of the 14 designated Conservation Areas are cleared or disturbed for burial and/or infrastructure works.

Although no *W. multicaulis* are known to occur in any area outside the dedicated Conservation Areas, this Assessment of Significance has been prepared under the precautionary principle to apply in the event that the species is found on-site in the future.

Expected Impact on *Wahlenbergia multicaulis*

The removal of existing native vegetation (including disused grassland) outside of the designated Conservation Areas at Rookwood may impact on any occurrences of *Wahlenbergia multicaulis* should individuals be identified in any future searches.

If identified elsewhere on site in the future, the removal or modification of areas of potential habitat, including grasslands which are currently disused or vacant land, is likely to present a threat to this endangered population. In this event, if additional occurrences of this species are located and positively identified as the threatened species *W. multicaulis*, another Assessment of Significance should be prepared.

Given that there are only two (2) pure stands of *Wahlenbergia multicaulis* known to occur at Rookwood, and both are located within dedicated Conservation Areas, it is considered unlikely that any future clearing of native vegetation outside of these Conservation Areas would have a significant impact on the local population of the species. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

4.7 Grey-Headed Flying-Fox - *Pteropus poliocephalus*

Australia's largest bat, the Grey-Headed Flying-Fox (GHFF) is an endemic species that is listed as Vulnerable on Part 1 of Schedule 2 under the *TSC Act* and Section 178 of the *EPBC Act*.

The GHFF was observed during nocturnal surveys flying over Rookwood Necropolis as well as feeding in trees that line Barnet Avenue (refer to UBM 2013). The nearest known camps are located 5 km away in Duck River Reserve in Clyde; 9 km away in Parramatta Park, and 15 km away in Jacquie Osmond Reserve at Warwick Farm. Duck River camp is relatively small with an estimated 2,500-9,999, with the other two (2) camps estimated to be between 10,000 and 15,999 in size (National Flying-Fox Monitoring Programme data, 2015). A high diversity of Myrtaceae species and other potential foraging species have been identified within the designated Conservation Areas (and elsewhere in the Necropolis), and it is likely that these provide suitable foraging habitat for this species.

This Assessment of Significance has been prepared in the event that all remaining bushland remnants outside of the 14 designated Conservation Areas are cleared for burial or infrastructure purposes. This scenario is extremely unlikely as the bushland remnants include street trees, horticultural specimens and other groups. The survey during 2013 recorded the species in street trees along Barnet Avenue, thereby identifying the importance of these clusters of trees lining streets and canals.

Expected Impact on the Grey-Headed Flying-Fox

The Proposal, if at some time in the future removes some or all of the existing vegetation outside of the designated Conservation Areas; may have a small impact on this species through the removal or modification of potential foraging habitat, in particular the removal of Myrtaceae species. However, given that no known breeding camp will be impacted, and that better quality foraging and roosting habitat exists within the designated Conservation Areas and elsewhere within the Locality and Region, such an event is unlikely to have a significant impact on this species such that local viable populations would be placed at risk of extinction.

It is NOT considered that the removal modification of the existing vegetation at Rookwood Necropolis outside of the designated Conservation Areas would have a significant impact on Grey-headed Flying Fox individuals, populations and/or habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

4.8 Eastern Bentwing Bat - *Miniopterus orianae oceanensis*

The Eastern Bentwing Bat (EBWB) is listed as Vulnerable on Part 1 of Schedule 2 under the *TSC Act*. The EBWB is found along the east and northeast coasts coast of Australia, predominately east of the Great Dividing Range (Churchill 2008).

The EBWB was detected by echolocation calls within Conservation Areas 10 south, 18 and 28 during site investigations (refer to UBM 2013). No suitable caves are available within the Necropolis and therefore it is likely that this species utilises the site on occasion for foraging purposes only.

This assessment of significance has been prepared in light of a future scenario in which all remaining bushland remnants outside of the 14 designated Conservation Areas cleared or modified.

Expected Impact on the Eastern Bentwing Bat

The removal of existing vegetation outside of the designated Conservation Areas may have a small impact on the EBWB through the removal or modification of potential foraging habitat. However, given that no potential roosting or maternity sites will be impacted, and that better quality foraging habitat exists within the designated Conservation Areas and elsewhere in the Locality and Region, such an event is unlikely to have a significant impact on this species such that local viable populations would be placed at risk of extinction.

It is NOT considered that the Proposal to remove existing vegetation outside of the designated Conservation Areas in Rookwood Necropolis would have a significant impact on Eastern Bentwing Bat individuals, populations and/or habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

4.9 Scarlet Robin *Petroica boodang*

The Scarlet Robin is listed as Vulnerable on Part 1 of Schedule 2 under the *TSC Act* and is distributed from south east Queensland to south east South Australia, as well as Tasmania and south west Western Australia. Within NSW, they can be found from the coast to the inland slopes (OEH 2015).

According to the Atlas of NSW Wildlife, records within the locality are rare. However, the most recent recording was in 2014 around 15km from the Necropolis. A male Scarlet Robin was flushed from a stand of Casuarinas north of Conservation Area 18 (Easting 319461; Northing 6250358) during site investigations (refer to UBM 2013). Given the time of year that it was observed, it suggests that this species migrates to the area during the winter months.

This assessment of significance has been prepared in light of a future scenario in which all remaining bushland remnants outside of the 14 designated Conservation Areas are to be cleared.

Expected Impact on the Scarlet Robin

The removal or modification of existing native vegetation outside of the designated Conservation Areas may have a small impact on this species through the removal or modification of potential foraging habitat. However, given the limited structural habitat present in these remnants, and that better quality foraging habitat exists within the designated Conservation Areas, such an event is unlikely to have a significant impact on this species such that local viable populations would be placed at risk of extinction.

It is NOT considered that the removal or modification of existing native vegetation outside of the designated Conservation Areas in Rookwood Necropolis would have a significant impact on Scarlet Robin individuals, populations and/or habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

4.10 Summary of Significance Assessment

By adopting the precautionary principle to determine the impact if all EVNTs, EECs and CEECs occurring at Rookwood outside the VCAs were cleared, the results determine that significant impacts are unlikely for all except, *Epacris purpurascens* var. *purpurascens*. In the case of this species, located within a VCA, the impact is based on the unlikely event that uncontrolled works associated with the improvement to the drainage canal in Area 25, were to occur. Should works be proposed within the currency of this PMP a detailed design, strictly limiting any disturbance to the surrounding vegetation, would be required, along with a Species Impact Statement.

5 Performance Measures

The BMP 2015 includes a comprehensive list of the performance measures designed to evaluate the success of the bush regeneration work to date and into the future. The BMP also includes a monitoring program that is to be adapted and altered as the need arises.

The performance measures listed in the BMP provide management prescriptions for the Endangered Ecological communities present, along with the threatened flora and EVNT fauna species. They outline the preferred outcome and the means to assess the efficacy of the management activities.

Please refer to Chapter 5 and Table 5.1 of the BMP 2015, prepared by UBM.

6 Monitoring and Review

Monitoring and review of performance measures will be required to continue the monitoring program established in the previous PMP (2002).

5.1 Plant Census - Threatened species and Population Management

Monitoring of all threatened ecological communities, flora and fauna species and populations known to occur in the VCAs will continue to be a priority. This will target the same information as the PMP 2002 and 2008, in order to maintain consistency in this data. The information targeted will include:

- Population size.
- The number of adult/mature plants.
- Health/condition of the population.

- Threats to the species/population; and
- Any changes since the previous monitoring period.

The plant census will take place every 5 years for all species except the *Wahlenbergia multicaulis*, which will be monitored every year. This will ensure that changes in the population are accounted for and any required contingency actions instigated in time for them to be effective.

5.2 Intervening Actions if required

If monitoring indicates non-conformance with the PMP, actions will be reviewed to determine the problem causing non-conformance. These actions will be determined by the Project Ecologist, in consultation with the bush regeneration contractor and with input from the RNT and Threatened Species Unit of OEH. Actions will be aimed at redressing any problems identified through monitoring.

5.3 Audit and PMP Review

A review of the efficacy of the strategies and actions set out in the PMP will take place at the end of the 5 year period, i.e. the end of the term of this PMP. This review will provide a comprehensive assessment of the success of the management and the success or otherwise of the performance measures.

At the end of this period it will be determined whether the PMP is rolled over for another 5 years, without significant changes; or whether other means are instigated to maintain the ecological values at Rookwood Necropolis.

Due to the time frame required for the review there will inevitably be a period where the 5 year management regime has been completed and the time for review is required. It is suggested that the management continue on the same basis until the review is complete, to avoid a hold on maintenance activities. This period could be on the order of 12 months. The Office of Environment and Heritage will be consulted during this period for the most appropriate actions for management of the VCAs beyond this period.

6 Bibliography

Bushfire Environmental Services, July 2004. *Fire Management Plan for Rookwood Necropolis*.

DEM and UBMC *Rookwood Necropolis PMP 10 year review*. December 2013.

DEM and UBMC *Rookwood Necropolis PMP Audit 2010*. December 2010.

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

Hassell & Associates / Gillespie Economics (2008). Amended July 2008 NSW Dept of Lands/Anne Clements and Assoc. *Property Management Plan for Rookwood Necropolis*. Prepared for the Joint Committee of Necropolis Trustees.

Hassell & Associates / Gillespie Economics (2009). Amended July 2008 NSW Dept of Lands/Anne Clements and Associates. Updated April 2009 DEM/Landscan and UBM Ecological Consultants. *Property Management Plan for Rookwood Necropolis*. Prepared for the Joint Committee of Necropolis Trustees.

Jacquet, F. (in association with Ignite, GB&A, Engeny, Biosis). *Rookwood Necropolis Trust Landscape Masterplan*. August 2014.

Office of Environment and Heritage Website

UBM Ecological Consultants (2015), *Rookwood Necropolis Bushland Management Plan 2014-2019*, 22 February 2015. Prepared for the Rookwood Necropolis Trust.

UBM Ecological Consultants (2013), *Biodiversity Studies: Flora and Fauna investigations for Native Bushland at Rookwood Necropolis*, August 2013. Prepared for the Rookwood Necropolis Trust.

UBMC (2003b). *Bushland Plan of Management for Rookwood Necropolis: NPWS Issue, October 2003*. Prepared for the Joint Committee of Necropolis Trustees and the NSW NPWS (now DECCW).

UBMC (2005), *Threatened Plant Census for Rookwood Necropolis, October 2005*. Prepared for the Joint Committee of Necropolis Trustees.

UBMC (2006), *Threatened Plant Census for Rookwood Necropolis, October 2006*. Prepared for the Joint Committee of Necropolis Trustees.

UBMC (2007), *Threatened Plant Census for Rookwood Necropolis, October 2007*. Prepared for the Joint Committee of Necropolis Trustees.

UBM Ecological Consultants (2008), *Threatened Plant Census for Rookwood Necropolis, October 2008*. Prepared for the Joint Committee of Necropolis Trustees.

UBM Ecological Consultants (2009), *Threatened Plant Census for Rookwood Necropolis, October 2009*. Prepared for the Rookwood Necropolis Trust.

UBM Ecological Consultants (2010), *Threatened Plant Census for Rookwood Necropolis, November 2010*. Prepared for the Rookwood Necropolis Trust.

UBM (July 2012 - June 2013). Rookwood Necropolis Bush Regeneration Program: Annual Report. Prepared for the Rookwood Necropolis Trust.

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

UBMC (March 2006). *Pomaderris prunifolia* translocation Project at Rookwood Necropolis - Stage 2 – Translocation of Seedlings and Remaining Soil from Area 5. Prepared for Joint Committee of Necropolis Trustees and DECC.

UBM Ecological Consultants (2008), *Rookwood Trial Fire Monitoring Program- August 2008*. Prepared for the Joint Committee of Necropolis Trustees.

UBM Ecological Consultants (2009), *Rookwood Trial Fire Monitoring Program- August 2009*. Prepared for the Joint Committee of Necropolis Trustees

UBM Ecological Consultants (2010), *Rookwood Trial Fire Monitoring Program - September 2010*. Prepared for the Rookwood Necropolis Trust.

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

Smith P & Smith J (2005). *Survey of Rookwood Vegetation Conservation Areas Wahlenbergia multicaulis, November 2004*. Prepared for the Joint Committee of Necropolis Trustees.

Smith P & Smith J (2006). *Survey of Rookwood Necropolis Wahlenbergia multicaulis, October 2006*. Prepared for the Joint Committee of Necropolis Trustees.

Smith P & Smith J (2007). *Survey of Rookwood Necropolis Wahlenbergia multicaulis, October 2007*. Prepared for the Joint Committee of Necropolis Trustees.

Smith P & Smith J (2008). *Survey of Rookwood Necropolis Wahlenbergia multicaulis, November 2008*. Prepared for the Rookwood Necropolis Trust.

Smith P & Smith J (2009). *Survey of Rookwood Necropolis Wahlenbergia multicaulis, November 2009*. Prepared for the Rookwood Necropolis Trust.

Smith P & Smith J (2010). *Survey of Rookwood Necropolis Wahlenbergia multicaulis, November 2010*. Prepared for the Rookwood Necropolis Trust.

Smith P & Smith J (2011). *Survey of Rookwood Necropolis Wahlenbergia multicaulis, October 2011*. Prepared for the Rookwood Necropolis Trust.

Smith P & Smith J (2012). *Survey of Rookwood Necropolis Wahlenbergia multicaulis, October 2012*. Prepared for the Rookwood Necropolis Trust.

Refer to separate Bibliography for the 7 part Tests within the Appendix.

8 Appendices

8.1 Assessments of Significance

The NSW *Threatened Conservation Act 1995 (TSC Act)* aims to conserve threatened species, populations, ecological communities and their habitats; to promote their recovery; and manage the processes that threaten or endanger them. Endangered¹ species are listed under Part 1 Schedule 1 of the Act; endangered populations under Part 2 of Schedule 1; while communities considered ‘at risk of extinction’ are listed as Endangered Ecological Communities (EECs) under Part 3 of Schedule 1. Critically Endangered Ecological Communities (CECs) are listed under Part 2 of Schedule 1A.

Under the terms of the legislation, Local Government must assess the impacts of any proposed activity which might adversely impact on any EEC/CEEC, threatened species or populations, and where these are likely to occur, must identify strategies to minimise any such impacts. Further, development on adjoining land may also have a significant impact on the bushland’s natural values, so that such activities must be carefully assessed by the Consent Authority prior to development consent being granted.

Under Section 5A of the *Environment Planning & Assessment Act 1979 (EP&A Act)*, any development activity impacting on a species, population or ecological community listed under the *TSC Act* requires the application of an Assessment of Significance.

An Assessment of Significance under the *TSC Act* (commonly called ‘the Seven-part Test’) is designed to determine “*whether there is likely to be a significant effect on threatened species, populations, ecological communities or their habitats*” (as listed on the Schedules of the *TSC Act*), and consequently, to determine whether a Species Impact Statement is required.

Where any threatened entity is also listed under the Commonwealth *EPBC Act* a similar Assessment process under the Act’s *Significant Impact Guidelines* will apply.

In order to determine whether further studies are required, a search of the relevant ecological databases is required in order to identify those ecological communities, threatened species or populations known for the Locality and Region. This is followed by a comprehensive site survey to determine the presence, or potential presence of threatened entities.

Flora and fauna surveys undertaken at Rookwood Necropolis over a number of years (Smith & Smith 1999, UBM 2003, 2013 and 2015 & Biosis 2014) have provided the ecological basis for Assessment.

Table A1, following in this document, provides a list of Endangered, Vulnerable and Near Threatened (EVNT) entities known to occur at Rookwood. Assessments of Significance have been undertaken for each of the EVNT entities listed.

¹ Where the terms ‘threatened’ and ‘endangered’ have the same meaning under the Act.

Table A1: EVNT Flora and Fauna Species, Populations and Threatened Ecological Communities

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

8.1.1 Cumberland Plain Woodland – a Critically Endangered Ecological Community

Cumberland Plain Woodland (CPW) is listed on Part 2 of Schedule 1A under the *TSC Act*. This community consists of distinct groupings of plants that occur on the clay soils derived from Wianamatta Shale on the undulating Cumberland Plain of Western Sydney. CPW is typically dominated by Grey Box (*Eucalyptus moluccana*) and Forest Red Gum (*E. tereticornis*) and less commonly occurring with Narrow-leaved Ironbark (*E. crebra*), Spotted Gum (*E. maculata*), and Thin-leaved Stringybark (*E. eugenioides*). The shrub-layer is often dominated by *Bursaria spinosa*, and the ground-stratum supports a dense sward of native grasses such as Kangaroo Grass (*Themeda australis*) and Weeping Meadow Grass (*Microlaena stipoides* var. *stipoides*).

CPW previously covered approximately 30% of the Sydney Basin; it is now thought to be reduced to only 9% of the original extent (OEH 2014). The primary threats to this community are clearing for urban or rural developments, and the subsequent impacts of fragmentation. Other threats include stock grazing and slashing, clearing for bushfire protection, inappropriate fire regimes and inappropriate water run-off (OEH 2014).

CPW at Rookwood Necropolis

Vegetation mapping by NPWS (2002) does not recognise any areas of CPW within Rookwood Necropolis. Subsequent vegetation mapping by Tozer *et al.* (2010) identified the large bushland remnant along the northern boundary (corresponding to Conservation Areas 19 and 20), as well as identifying very small fragments adjoining Conservation Areas 8/27/28/7 and 6/25 as Cumberland Shale Plains Woodland².

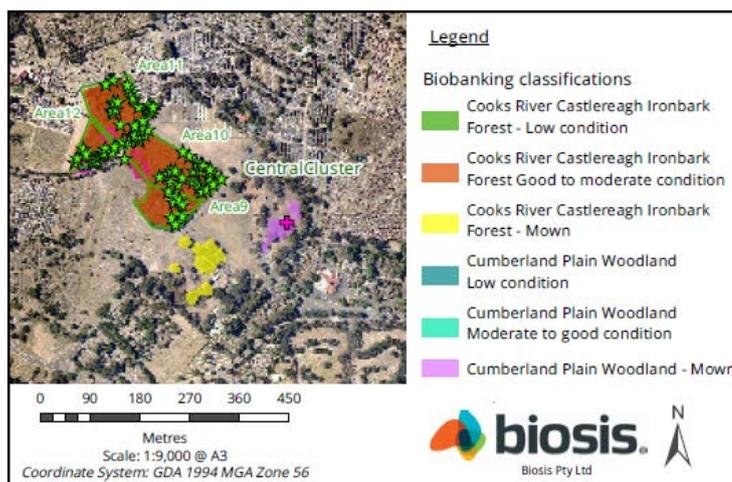
More recent flora survey (UBM 2013) applying the statistical analysis methodology of Tozer (2003), found that the northern remnants in Conservation Areas 19 and 20 did not meet specific criteria for listing as either CPW or Cooks River/Castlereagh Ironbark Forest (CRCIF), and consequently this area was mapped in the *Rookwood Biodiversity Studies Report* (UBM 2013) as 'modified woodland'. However, survey by Biosis (2014) identified Areas 19 and 20 as remnant CPW.

Areas 19 and 20 are located within dedicated Conservation Areas and as such are protected and managed for their natural conservation values. As the Assessments of Significance undertaken for this Property Management Plan (2015) relate *only* to stands of CPW *outside* the dedicated Conservation Areas, CPW in Areas 19 and 20 will not be considered further.

For land outside the dedicated Conservation Areas, flora survey by Biosis (2014) recorded a small fragment of CPW (~0.62 ha) comprising native trees over introduced lawns near the north-west corner of the Necropolis. However, recent inspection (UBM May 2015) confirms that this area is subject to on-going disturbance – the ground stratum has been mown for many years, with no evidence of any stratum other than canopy trees. Biosis (2014) also recognises a small area (~0.2 ha) of grassland with scattered native trees south-east of Conservation Areas 9 and 10 as remnant CPW (refer to map).

For the purposes of Assessment and in accordance with the precautionary principle, the most recent vegetation mapping by Biosis (2014) will be used. Therefore the potential clearing of these two (2) areas totalling ~0.82 ha have been considered by the following Assessments of Significance.

Figure A1: Extract of Vegetation mapping, Biosis 2014 as part of the Landscape Master Plan 2014.



² Cumberland Shale Plains Woodland is considered to be a sub-community of the CEEC Cumberland Plain Woodland

Commonwealth Legislative Considerations

The need to conduct an Assessment of Significance for Cumberland Plain Woodland (CPW) has been considered in accordance with the *Significant Impact Guidelines* (Department of the Environment and Heritage 2006). CPW is listed under the *EPBC Act* as 'Critically Endangered' (CEEC) and appears under the Schedules of the *Act* as *Cumberland Shale Plains Woodland and Shale Gravel Transition Forest*.

For consideration under the *EPBC Act*, the listing criteria require the subject stand (or patch) of CPW to be ≥ 0.5 ha in size AND have a perennial understorey vegetation of at least 30% native species AND retain connectivity to other large patches of native vegetation in the landscape.

Two (2) areas of remnant CPW have been identified outside the dedicated Conservation Areas at Rookwood (Biosis 2014). The total combined area of remnant CPW at Rookwood (~ 0.82 ha) is less than the ≥ 5 ha patch size required for Assessment under the Commonwealth criteria. Further, both remnants display poor structural integrity and both have low to very low floristic diversity. These remnants are isolated from one another; from the conserved stands in VCAs 19 and 20, and from other stands of CPW in Western Sydney.

Giving consideration to the *EPBC Act Listing Advice* (available at www.environment.com.au) it is considered that the two (2) stands of remnant CPW at Rookwood located outside the dedicated Conservation Areas do not meet the listing criteria for Assessment under the *EPBC Act*. Therefore an Assessment under the Commonwealth listing has not been prepared.

NSW Threatened Species Conservation Act – the Seven-part Test

Cumberland Plain Woodland in the Sydney Basin Bioregion – a Critically Endangered Ecological Community

Cumberland Plain Woodland in the Sydney Basin Bioregion is listed as a Critically Endangered Ecological Community (CEEC) on Part 2 of Schedule 1A of the *TSC Act*. As noted previously this community is also listed as Critically Endangered under the Commonwealth *EPBC Act* as *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*.

Two (2) areas of remnant CPW have been identified outside the dedicated Conservation Areas at Rookwood (Biosis 2014) (see Figure A1). However, although the extent of remnant CPW at Rookwood (~ 0.82 ha) is less than the ≥ 5 ha patch size or retains the 30% native understorey species required for Assessment under Commonwealth criteria, the *TSC Act* does not prescribe any such limits.

Although the remaining CPW remnants identified by Biosis (2014) are highly simplified structurally, have low floristic species diversity, and are fragmented and isolated from other CPW in the Locality and Region, there is some potential for genetic material to remain in the soil seed bank. The following Assessment of Significance has been prepared at the request of OEH (S. Burke pers. comm.) under the precautionary principle.

This Assessment of Significance has been prepared in the event that all remaining bushland remnants outside the designated Conservation Areas are cleared in the future (hereafter described as 'the Proposal').

(a) "...in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction..."

A threatened (endangered) species is defined under Part 1 of Schedule 1 of the TSC Act. CPW is not a threatened species, but is listed under Part 2 of Schedule 1A of the TSC Act as a Critically Endangered Ecological Community (CEEC).

(b) "...in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction..."

CPW is not an endangered population, but is listed under Part 2 of Schedule 1 of the TSC Act as a Critically Endangered Ecological Community (CEEC).

(c) "...in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) ..is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The Proposal is likely to remove about 0.82 ha of simplified and degraded CPW located outside the dedicated Conservation Areas. The remaining areas of CPW (Areas 19 and 20) are located in dedicated Conservation Areas so they will not be considered further in this Assessment.

The two (2) small remnants of CPW (~0.82 ha) located outside the Conservation Areas at Rookwood are surrounded on all sides by roads, burial grounds and tree plantings (predominantly exotic) over introduced lawns. Generally these small remnants are managed as part of the landscaped burial grounds.

The remnant vegetation in the Locality and Region has been simplified both structurally and floristically by past and current land uses, including urban development over a period of 100 years or more. The habitat value of the two (2) small remnants is negligible, with both lacking structural integrity and displaying very low species diversity. The lack of a shrub or mid-storey in both remnants reduces its value as fauna habitat. A disjunct connection remains between the CPW remnants within the Necropolis only through the tree canopy, with many of these trees being horticultural introductions.

Should any future Proposal seek to remove these two (2) small remnants, within the context of the Necropolis management regime, this is highly unlikely to place this community at risk of local extinction.

(ii) .. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction..."

The poor condition of the remnant CPW under considered by this Assessment is noted; both stands being structurally deficient and floristically depauperate, with both lacking a shrub and understorey strata. Any future clearing is likely to remove only remnant trees and possibly some few native ground covers; the latter having been replaced by introduced grasses (lawn) and/or mulched garden beds.

These two (2) stands of remnant CPW are already isolated from any other stands of CPW in the Locality and Region, so it is highly unlikely that the Proposal will result in local extinction of the community.

(d) "...in relation to the habitat of a threatened species, population or ecological community:

***(i)... the extent to which habitat is likely to be removed or modified as a result of the action proposed...”,
and***

Any future Proposal to clear the remaining native vegetation outside the dedicated Conservation Areas at Rookwood will remove or modify about 0.82 ha of simplified CPW. The vegetation in these remnants is structurally deficient and floristically depauperate, with both lacking a native shrub and understorey strata

Considering the small size (~0.82 ha) of these remnants, their low species diversity, modified structure, position surrounded by burial areas and landscaped grounds, and isolation from other CPW, it is considered that the Proposal is unlikely to significantly impact on any other existing CPW habitat in the Locality or Region.

(ii) ... whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action..., and

There are two (2) small CPW remnants located outside the dedicated Conservation Areas: one stand @0.62 ha in the north-west corner of the Necropolis, and a second stand @ 0.2 ha south-east of Conservation Areas 19 and 20. Connectivity to other stands of native bushland (including bushland of indeterminate origin in Areas 19 and 20) is maintained primarily through the tree canopy, with surrounding areas occupied by burial grounds and landscaped grounds. These small remnants are already isolated from other stands of CPW in the Necropolis, Locality and Region, so it is highly unlikely that the Proposal will result in local extinction of the community.

The Proposal, although potential clearing or modifying stands of remnant CPW at Rookwood will not further fragment or isolate stands of CPW in the Locality or Region.

(iii)...the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality...

As with all native vegetation at Rookwood, simplified stands of CPW and CRCIF have regenerated on land formerly occupied by burial grounds. Maps and photographs from the first part of the 20th Century show most of Rookwood as devoid of native vegetation, with exotic trees planted along roads and pathways between the burial grounds

Stands of native canopy trees with only a few small trees or large shrubs are present and the native understorey is dominated by introduced grasses (lawns). The habitat value of the Open Woodland in the subject remnants is considered to be ‘very low’ for native flora, and (other than for birds and possible microbats) ‘very low’ for native fauna.

However, the habitat provided by these small stands of canopy trees is not unique, and similar habitat is provided by other large trees at Rookwood (both native and introduced), and trees on neighbouring properties and along local roads. It is unlikely that any significant area of habitat will be removed, modified, fragmented or isolated under the Proposal.

(e) “...whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)...”

No habitats considered critical to threatened plant species, populations or ecological communities previously recorded in the Locality Region occur within Rookwood, or in close proximity to the subject remnants.

The Subject Property Rookwood Necropolis is not listed as 'critical habitat' under Part 3 Division 1 of the *TSC Act*.

(f) "...whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan..."

The *Approved Recovery Plan for the Cumberland Plain Woodland* prepared by the former DECCW³ (2011) takes a multi-pronged approach, building on four (4) themes:

- Consolidating and extending the network of existing remnants by identifying Priority Conservation Lands;
- Delivering best management practices to prevent the degradation of existing remnants;
- Community education and improve awareness; and
- Research to better understand ecological processes and to identify threats to the ecological community.

Remnants of this community would benefit from:

- Appropriate fire management – planned burns to be assessed by suitably qualified persons; 5-year minimal fire interval and 12-year maximum fire interval; burning in a mosaic pattern;
- Recognition and protection of remaining remnants;
- Prevention of too frequent mowing or prolonged or heavy grazing;
- Protection from run-off and the associated impacts of erosion and nutrient-enrichment;
- Weed control; and
- Bushland restoration activities (bush regeneration and revegetation).

Most of the recommendations listed above are currently being implemented at Rookwood as part of the Bushland Management Program (now in its 12th year). The use of fire as a management tool is a notable exception.

Remnant native vegetation (CPW & CRCIF) has been conserved in 14 dedicated Conservation Areas –totalling 21 ha in size (Refer Table 2, this PMP). These Conservation Areas were identified in the former Property Management Plan (2002) as 'offsets' against clearing of other stands of native vegetation for burial and for infrastructure works. Two (2) Conservation Areas 19 and 20 have been identified as containing some flora species characteristic of CPW (Biosis 2014).

The rehabilitation works being undertaken under the Bushland Management Plan are in keeping with the aims and objectives of the Cumberland Plain Woodland Recovery Plan.

³ Now Office of Environment & Heritage (OEH) within the Department of Premier and Cabinet

(g) “...whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process...”

Currently 38 key threatening processes (KTPs) are defined under Schedule 3 of the *TSC Act*.

The KTP ‘clearing of native vegetation’ is most applicable to the Proposal. Approximately 0.82 ha of simplified and degraded CPW in two (2) locations will potentially be cleared or modified.

The understorey vegetation is already significantly altered, with introduced (lawn) grasses and other ruderal species occurring. Both remnants have been substantially cleared of their native understorey, and as they are generally managed as part of the landscaped grounds, spread of woody weeds, vines or perennial weedy grasses (as listed as KTPs), weed invasion is unlikely.

None of the other identified Key Threatening Processes⁴ listed under Schedule 3 of the *TSC Act*, would be applicable to this Proposal.

However, one Key Threatening Process that may be relevant, particularly if machinery hygiene is not adequate, is infection by the soil pathogen *Phytophthora cinnamomi*. In order to guard against this KTP, it is recommended that all machinery entering the site be thoroughly cleared, especially if such machinery has been used in weedy or otherwise contaminated sites previously. Of particular importance is the prevention of movement by soil and/or water from the construction site(s) into local drainage lines as this could introduce *Phytophthora cinnamomi* activated by earthworks.

Expected impact on Cumberland Plain Woodland

The Proposal, which at some time in the future clears the remaining stands of CPW outside the designated Conservation Areas, would result in the clearance or modification of ~0.82 ha of simplified and degraded CPW. Areas of low-value habitat will be removed, although the subject remnants of this Assessment are highly simplified both structurally and floristically.

If these remnants were connected with other local bushland areas, and if they retained a greater number of native shrubs or other understorey species, the impact of the Proposal may be deemed to be ‘significant’. However, as this is not the case, it is considered that the impacts of the Proposal would not be ‘significant’ and there is no need to undertake further studies (e.g. a Species Impact Statement) for this site.

However, having said this, under the Proposal there may be a net loss of ~0.82 ha of CPW, and as this ecological community is listed under both NSW and Commonwealth legislation as ‘Critically Endangered’, any loss must be of concern.

Therefore, giving consideration to Section 5(A) of the State *Environmental Planning and Assessment Act 1979*, it is considered that the matter WILL NOT REQUIRE a referral to the Director General Office of Environment & Heritage and the preparation of a Species Impact Statement for Cumberland Plain Woodland.

⁴ Key Threatening Process has the same meaning as in the NSW *TSC Act* subject or to section 5C, Part 7A of the NSW *Fisheries Management Act 1994*.

8.1.2 Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion – an Endangered Ecological Community

Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion is listed as an Endangered Ecological Community on Part 3 of Schedule 1 of the *TSC Act*. It is estimated that the extent of intact remnants is now reduced to 1011 ha (OEH 2015).

The Cooks River/Castlereagh Ironbark Forest (CRCIF) is endemic to NSW, found only within the Cumberland sub-region of the Sydney Basin Bioregion where it mainly occurs on clay soils of ancient river systems (Tertiary alluvium) or shale soils on Wianamatta Shale (OEH 2015). Remnants are associated with Cumberland Dry Sclerophyll Forests and can be found throughout Western Sydney, with the most extensive stands found in the Castlereagh and Holsworthy areas.

CRCIF varies in structure from an open-forest to low woodland, usually with trees of Broad-leaf Ironbark (*Eucalyptus fibrosa*) and Prickly-leaved Paperbark (*Melaleuca decora*), and sometimes with Woollybutt (*Eucalyptus longifolia*) (OEH, 2015). The shrub stratum is typically moderate to dense, commonly with *Melaleuca nodosa* and Peach Heath (*Lissanthe strigosa*). Other shrub species include Downy Wattle (*Acacia pubescens*), and various member of the Pea Family such as *Dillwynia tenuifolia*, Gorse Bitter-pea (*Daviesia ulicifolia*), Hairy Bush-pea (*Pultenaea villosa*) and Prickly-leaf Spider Flower (*Grevillea juniperina*). The ground stratum is typically sparse, consisting of a range of herbs and grasses including Wiry Panic (*Entolasia stricta*), *Lepidosperma laterale*, *Opercularia diphylla*, Blue Paroo Lily (*Dianella revoluta*), Kangaroo Grass (*Themeda australis*), *Weeping Meadow Grass (Microlaena stipoides)* and White Root (*Pratia purpurascens*). The majority of species within this community are genetically programmed to regenerate after disturbance from lignotubers and buds beneath the bark, as well as from soil-stored seed (OEH, 2015).

CRCIF is the dominant vegetation community within Rookwood Necropolis (Tozer *et al.* 2010). Most stands of CRCIF have been conserved within the dedicated Conservation Areas (established under the previous Property Management Plan 2002 and later updates 2008 and 2009), and are currently being managed under the adopted Bushland Management Plans (UBM 2003 & 2015).

12 small stands of intact CRCIF have also been identified outside the dedicated Conservation Areas (see *Figure 2* in main body of document). These 12 stands were approved for clearing under the former Property Management Plan (2002) but in May 2015, there are four (4) patches totalling 1.0908 ha in size remaining to be cleared. OEH (S. Burke pers. Comm.) has advised that as the clearing of these 12 stands of CRCIF was offset under the former Property Management Plan (2002), no further Assessment is required.

Other than the remaining stands of CRCIF previously approved for clearing, there are no (0) stands of CRCIF remaining outside the dedicated Conservation Areas; therefore no Assessments under the NSW *TSC Act* have been required.

8.1.3 *Acacia pubescens* (Downy Wattle)

Acacia pubescens is listed as Vulnerable on Part 1 of Schedule 2 of the NSW *TSC Act* and Section 178 of the Commonwealth *EPBC Act*. This spreading shrub grows 1.5 metres high, displays brilliant yellow flowers from August to October, bipinnate leaves, and is given its name ('pubescens') by the conspicuously hairy branchlets (OEH, 2015; Robinson, 2013).

Acacia pubescens commonly grows in dry sclerophyll forest and woodland on clay soils and alluviums of the Cumberland Plain, and is associated with a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest and Cumberland Plain Woodland (OEH, 2015). The main threat to this species is land clearance for urban development. *Acacia pubescens* is commonly found on lands recovering from disturbance, and may be seen on roadsides and rail embankments in Western Sydney. This species exhibits high seed dormancy and is a long-lived persistent in soil seed banks (OEH, 2015).

Acacia pubescens occurs throughout Rookwood Necropolis in recovering bushland and in areas subject to soil disturbance. Many individuals have been recorded in old burial grounds to the north of Conservation Area 18, and it has also been recorded in Conservation Areas 6, 9, 10, 11, 12, 20 and 25 (see *Figure 4* in main body of document). It occurs along the curved road verge of Haslem Drive, in Conservation Areas 11 and 12, where it is regenerating following slashing of bushland encroaching on the roadway. It has also been planted in the past as part of the general landscaping program, with some of these planting sites not adequately identified.

Acacia pubescens colonises freely via vegetative reproduction (i.e. suckering, coppicing), and only occasionally via the setting of seed. *Acacia pubescens* regenerates along roadsides subject to frequent slashing, earthworks and sites recovering from bushfire.

At Rookwood, large clumps have expanded via vegetative reproduction growing from the centre outwards (via suckering), and in the absence of fire many of the older stems are senescing (refer to Plant Census UBM 2012). Genetic studies have shown that numerous plants over a large area may all be a single (clonal) individual (NPWS, 2003), and hence the significance of sites cannot be based on the number of plants/stems without genetic testing.

This Assessment of Significance has been prepared in light of a future scenario in which all remaining bushland remnants located outside of the 14 designated Conservation Areas are cleared for burial or infrastructure purposes.

It is also possible that isolated individuals of *Acacia pubescens* occurring within Conservation Areas may have to be cleared for planned works which include but are not limited to: boundary fencing; recreational bicycle/walking paths (Areas 19, 20) mown access to burial sites (Areas 19 & 20), grave maintenance, drainage works (Area 25), relocation of electricity lines and poles (Area 25) and maintenance of sight lines along Haslem Drive (adjacent Area 10, 11 and 12)

This Assessment has therefore been carried out under the precautionary principle to encompass all existing stands present with the Necropolis outside the Conservation Areas, including planted specimens and any *Acacia pubescens* regenerating as the result of soil disturbance.

(a) "...in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction..."

Removal or modification of the existing native vegetation both outside or isolated individuals within the designated Conservation Areas at Rookwood is unlikely to adversely impact on the lifecycle of this species considering:

- The proposed action is unlikely to result in an increase in the frequency or intensity of fire – a factor which is known to favorably influence the life cycle of this species;
- As the species is known to regenerate rapidly after disturbance, any Proposal to clear or modify sections of the native vegetation will not result in discontinuity of habitat between individuals - in fact numbers are likely to increase via vegetation reproduction (suckering);
- Records of this species at Rookwood are from both within and outside the designated Conservation Areas, and known populations generally consist of localized, small groups (clumps) of clonal plants.

The clearing of native vegetation outside or within the designated Conservation Areas is therefore unlikely to affect the life cycle of *Acacia pubescens* such that a viable local population is likely to be at risk of extinction.

(b) ...in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction...

An Endangered Population is defined under the *TSC Act* as ‘a population specified in Part 2 of Schedule 1’. At the present time, there are no endangered populations of this species listed under the *Act*. As such, the Proposal would not be significantly compromising an endangered population.

(c) “...in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) ..is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii).. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction...”

An Endangered Ecological Community means an ecological community specified in Part 3 of Schedule 1 of the *TSC Act*. *Acacia pubescens* is a threatened species. Therefore, this item is not applicable to an EVNT species.

(d) “...in relation to the habitat of a threatened species, population or ecological community:

(i)... the extent to which habitat is likely to be removed or modified as a result of the action proposed...”, and

Although potential habitat for *Acacia pubescens* may occur in the open woodland remnants within the Rookwood Necropolis, the majority of records are from within the Designated Conservation Areas, most notably within Areas 6, 9, 10, 11 and 12. Outside of these Areas, records exist within old burial sites that are not likely to be impacted in the future (e.g. they are unlikely to be cleared for new burial grounds) and a single record between the central and southern cluster.

Any future proposal to clear native vegetation from the remainder of the Necropolis will only affect a small number of individuals and is unlikely to impact on the local population of *Acacia pubescens*.

(ii) ... whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action..., and

The small remnant patches of native vegetation outside of the designated Conservation Areas are already highly fragmented and disturbed. Habitat between the central and southern clusters of *Acacia pubescens* is highly fragmented and discontinuous also. A single record (Biosis 2014) exists outside of the Conservation Areas, located between the central and southern clusters within degraded Cumberland Plain Woodland. This record is likely to be genetically identical to the neighbouring central cluster. Another regenerating population ~~not previously and located recently by UBM (2015)~~ occurs along Haslem Drive where slashing of bushland along the road verge has disturbed the soil surface.

Prior to any future clearing being undertaken, it would be prudent to undertake a targeted search for *Acacia pubescens* outside of its known ranges within the Necropolis, and if any new occurrences are found, a new Assessment of Significance should be prepared.

(iii)...the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality...

Records of *Acacia pubescens* occur in a scattered distribution outside of the designated Conservation Areas, although more plants are likely as plants regenerate from rootstock or the soil seed bank. These individuals are likely to be genetically identical and form part of the same population, as they have been propagated from pre-existing plants/clumps. Given the highly fragmented nature of the relatively small patches of native vegetation outside of the Conservation Areas (some of these patches consisting of native trees over introduced grasses), is it unlikely that removal or modification of these areas would further fragment or isolate areas of existing or potential habitat.

Provided that the Conservation Areas containing the groups of *Acacia pubescens* are retained and protected, and provided that new stands are identified in a timely fashion, there should be minimal impact on this threatened species.

(e) "...whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)..."

No "critical habitat" of relevance to this species has been declared by the Minister for the Environment.

(f) "...whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan..."

The National Recovery Plan for the Downy Wattle (*Acacia pubescens*) (NPWS, 2003) has an overall objective to "prevent the status of *Acacia pubescens* from becoming endangered, by reducing habitat loss and by implementing management regimes aimed at maintaining representative populations across the species' range".

According to OEH (2012), this species will benefit from:

- The removal of hybrids;
- The protection of known populations;
- The enhancement of existing habitat;

- Monitoring of the reproductive status of populations; and
- Ensure a minimum fire-free period of 5-7 years to allow an adequate seed bank to develop.

Given that the majority of *Acacia pubescens* at Rookwood are already protected within the designated Conservation Areas, a future proposal to clear native vegetation from the remainder of the Necropolis is not inconsistent with the overall objective of the National Recovery Plan.

(g) “...whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process...”

Currently 38 key threatening processes (KTPs) are defined under Schedule 3 of the *TSC Act*. KTPs relevant to this species include: Clearing of native vegetation; High frequency fire resulting in the disruption of life cycle processes in plants and animals; loss of vegetation structure and composition; and Infection of native plants by the soil pathogen *Phytophthora cinnamomi*.

Fire is one factor known to influence the life cycle of this species; another is disturbance of the soil; however the scenario postulated by OEH is unlikely to result in an increase in the frequency or intensity of fire.

Acacia pubescens has been identified as a species that may be adversely affected by *Phytophthora cinnamomi* (NPWS, 2003). There may be an increased risk of *P. cinnamomi* dispersal within Rookwood Necropolis if the proposed scenario involved the use of vehicles and earth moving equipment which are not subject to hygiene measures.

The further spread of woody weeds, vines and introduced grasses into existing *Acacia pubescens* habitat is unlikely given that the Conservation Areas are subject to an on-going bushland management program. Additionally, this species appears to be somewhat tolerant to competition by weeds (NPWS, 2003).

As there is no concrete development proposal at this time, it is not possible to accurately quantify the degree of vegetation loss or impacts to threatened entities (ecological communities, species or populations).

Expected impact on *Acacia pubescens*

The clearing of any native vegetation either outside or potentially the clearing of isolated individuals within the designated Conservation Areas is unlikely to have a significant impact on the local population of *Acacia pubescens* given that the majority of occurrences are confined to the protected Conservation Areas. Provided these Conservation Areas are left *in situ* and protected, and provided that new occurrences are identified in a timely fashion and similarly protected there will be minimal impact on the existing local population of *Acacia pubescens* at Rookwood.

It is NOT considered that the removal of existing vegetation either outside or isolated individuals within the designated Conservation Areas at Rookwood Necropolis would have a significant impact on *Acacia pubescens* (Downy Wattle) individuals, populations and/or habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on this species is NOT REQUIRED.

8.1.4 *Epacris purpurascens* var. *purpurascens* (Port Jackson Heath)

Epacris purpurascens var. *purpurascens* is listed as Vulnerable under the NSW *Threatened Species Conservation Act 1995 (TSC Act)*. A 'vulnerable' species means a species specified in Part 1 of Schedule 2 of the Act, while an 'endangered species' means a species specified in Part 1 of Schedule 1. As such, any endangered or vulnerable species are described as 'threatened'.

An erect, prickly shrub, this species grows 50-180cm high and has prominent short, broad, leaf scars. From July to September, showy white and pink flowers cover much of the branchlets. It is an uncommon species confined to the coastal plateaus in the Sydney Region, where it can be found in a range of habitats including sclerophyll forest, scrubs and swamps. The majority of habitats exhibit a strong shale soil influence (OEH 2012). It is more commonly found in damp situations such as near creeks and swamps in sandstone woodlands (Robinson, 2003). *E. purpurascens* var. *purpurascens* has an estimated lifespan of 5-20 years, and takes about 2-4 years before seed is produced (OEH 2012). It is killed by fire and re-establishes from soil-stored seed.

The main threats to this species are clearance or habitat modifications resulting from urban or rural development and too frequent fire (OEH 2012). Slashing, intensive fire and inappropriate fire regimes can threaten this species' viability.

Within the dedicated Conservation Areas at Rookwood, this species is currently known to occur naturally only in Area 25, where it is fairly common in open woodland and in clearings, although some plants have been observed along the margins of the unformed drainage line which runs through Area 25⁵.

Within Conservation Area 25 numerous new seedlings have resulted from germination of seed in the soil over the past decade. On site, the species has shown a high rate of fruit abortion in the later stage of development (D. Keith pers. com.). Further, there is evidence that excessive shading through re-establishment of the overhead canopy leads to plant loss over time (UBM 2012).

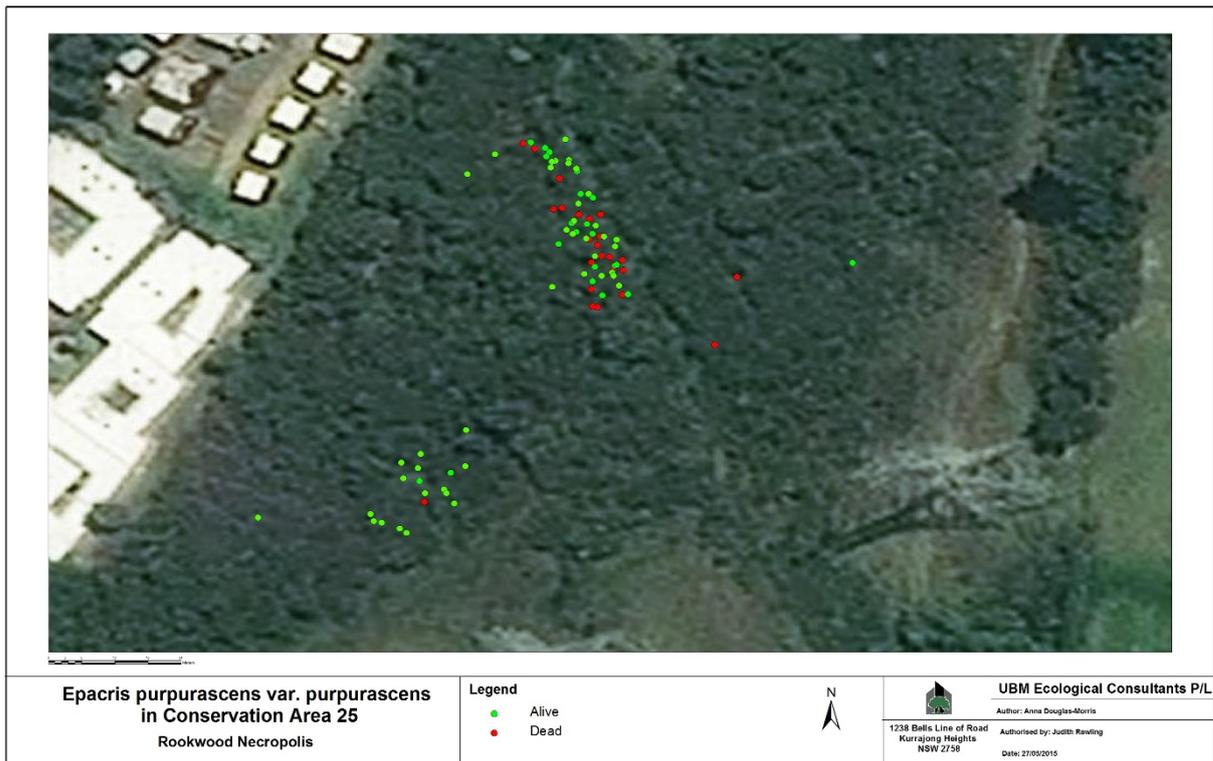
In November 2012, 137 *Epacris purpurascens* var. *purpurascens* individuals were identified, measured, tagged and located with a GPS (UBM Plant Census 2012), while in May 2015 a supplementary survey identified 65 *Epacris purpurascens* var. *purpurascens* in the same area.

This Assessment of Significance has been prepared to consider a future scenario in which some bushland in Area 25 would need to be cleared to install a concrete head wall at the site boundary and to clean out the existing drainage line, of weeds, rubbish and improve stormwater flows.

This work has been pending for several years, although it is understood that there are no immediate plans to undertake the drainage works. However, this Assessment has been undertaken under the precautionary principle should the proposed drainage works be undertaken within the five-year time span of the new Property Management Plan (2015).

⁵ It is noted that *Epacris purpurascens* var. *purpurascens* once occurred in adjacent Area 6 North: land which has since been cleared and buried.

Figure A2: Location of *Epacris purpurascens* var. *purpurascens* in VCA25 in 2015



(a) “...in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction...”

Drainage works will involve the use of machinery for clearing and construction, and given that there is no easily accessible route through the bushland to any part of the drainage line, extensive damage to the native vegetation is likely to occur.

It must therefore be assumed that the proposed drainage works are likely to have an adverse effect on the threatened *Epacris* population, and given that Area 25 is the only location where this *Epacris* species is known to occur within the Necropolis, it is possible that *Epacris purpurascens* var. *purpurascens* is likely to suffer *local extinction*.

(b) “...in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction...”

Epacris purpurascens var. *purpurascens* at Rookwood does not constitute an endangered population, but is a threatened species, listed as 'Vulnerable' under the TSC Act. Therefore item (b) does not apply.

(c) “...in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) ..is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii).. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction...”

An Endangered Ecological Community means an ecological community specified in Part 3 of Schedule 1 of the TSC Act. Therefore, this item is not applicable to a threatened species.

(d) “...in relation to the habitat of a threatened species, population or ecological community:

(i)... the extent to which habitat is likely to be removed or modified as a result of the action proposed...”, and

Bushland in Conservation Area 25 provides suitable habitat for a population of threatened *Epacris purpurascens* var. *purpurascens*. Clearing or modification of the vegetation to facilitate the proposed remedial drainage works (although the area to be impacted is not quantified at this time) is likely to seriously impact on the threatened *Epacris* and may destroy or damage a significant number of plants.

(ii) ... whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action..., and

The native vegetation in Conservation Area 25 with its population of *Epacris purpurascens* var. *purpurascens* is already fragmented and disturbed, and although it adjoins Area 6 to the north where the threatened *Epacris* was found prior to clearing for burial. Area 25 and 6 South where the threatened *Epacris* occurs are isolated from other stands of native bushland in the Necropolis (see *Figure 4 in main body of report*).

The proposed drainage works are not likely to further fragment or isolate bushland in Area 25 further, but it will reduce it in size and/or modify the vegetation such that the threatened *Epacris* are reduced in number.

(iii)...the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality...

Given the highly fragmented nature of the remnant/regrowth native vegetation in the Conservation Areas at Rookwood it is likely that removal or modification of habitat in Area 25 to facilitate drainage works will impact on the long-term survival of the threatened *Epacris* in the Locality (considered as within a 5 km radius of the subject site Areas 25). No other stands of *Epacris purpurascens* var. *purpurascens* are known to occur within 9 km of the Necropolis – the closest record within the past 10 years being at Boronia Park Reserve in Hunters Hill.

Suitable habitat exists in other parts of Rookwood and in Western Sydney generally. The NSW Atlas of Wildlife shows 16 records of this species within the last 10 years - all in Rookwood. The great majority of Atlas records occur in bushland north of the Western Motorway (M4). At this time (May 2015), other than the population in Area 25, no known occurrences of *Epacris purpurascens* var. *purpurascens* are found within the Necropolis.

(e) “...whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)...”

No “critical habitat” of relevance to this species has been declared by the Minister for the Environment.

(f) “...whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan...”

At present, no recovery plan or threat abatement plan exists for *Epacris purpurascens* var. *purpurascens*. Priority actions identified for this species suggests that it would benefit from a fire regime applied at intervals of 10-15 years, and the prevention of further loss and fragmentation of habitat.

(g) “...whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process...”

Currently 38 key threatening processes (KTPs) are defined under Schedule 3 of the *TSC Act*. KTPs relevant to this species in Area 25 as the result of the Proposal include clearing of native vegetation and possibly, and alteration to existing drainage patterns. The further spread of woody weeds, vines and introduced grasses is unlikely given that Area 25 is subject to regular bush regeneration work.

The removal or modification of the existing vegetation in Area 25 is likely to increase the impact of a key threatening process - i.e. clearing of native vegetation.

Expected impact on *Epacris purpurascens* var. *purpurascens*

The removal or modification of the native vegetation in Area 25 to facilitate the proposed remedial drainage works is likely to have a significant impact on the population of *Epacris purpurascens* var. *purpurascens* on this site (estimated to be 65 individuals). As this population is the only one known to occur within the Necropolis bushland (nearest stand being in Boronia Park, Hunters Hill over 9km away), the potential loss of this population is considered to be significant in terms of local biodiversity.

Depending on the extent of the proposed drainage works (not quantified at the time of writing), damage or destruction of the threatened population of the threatened *Epacris* may lead to local extinction (i.e. within a five km radius), and is likely to result in a major or 'significant' impact on the subject entity.

It is considered that the removal or modification of existing native vegetation on Area 25 is likely to lead to local extinction of the threatened species *Epacris purpurascens* var. *purpurascens* and this would have a ‘significant impact’ on the only remaining population at Rookwood Necropolis. Therefore, the preparation of a Species Impact Statement that further considers the impacts of the proposed remedial drainage works on the threatened *Epacris* IS RECOMMENDED.

As a result of this Assessment any work that is proposed to be undertaken to improve the performance of the drain through Area 25 must be done by strictly limiting any disturbance to the surrounding vegetation, and particularly the sites of *Epacris purpurascens* var. *purpurascens*. A Species Impact Statement is critical prior to any work being carried out. These results have informed this PMP and the works associated with the drain in Area 25 will not be sought for approval within this PMP.

8.1.5 *Pomaderris prunifolia* var. *prunifolia* – *P. prunifolia* (a shrub) population in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas (listed 1999 TSC Act)

The population of *Pomaderris prunifolia* occurring within the Parramatta, Auburn, Strathfield and Bankstown local government areas is listed as an 'Endangered Population' on Part 2 of Schedule 1 under the *TSC Act*. This population is disjunct from other populations, and being at the near limit of its geographic range, OEH considers that this population is of significant conservation value as a remnant of the original flora of Parramatta, Auburn, Strathfield and Bankstown. As a species, *P. prunifolia* is not listed on Schedule 1 of the *TSC Act* (although the population is listed - as above).

Pomaderris prunifolia var. *prunifolia* is a multi-branched shrub 1-3m high found on rocky slopes, often close to watercourses. This species has ovate to oblong leaves and rusty stellate hairs along the stems, displaying cream to yellow flowers (petals absent) from October to November. The species does not appear to spread vegetatively and is thought to have a lifespan of 10-25 years (OEH, 2012). Within Rookwood Necropolis, it occurs in a small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils (OEH, 2012).

This species was first identified in the Necropolis bushland (Smith & Smith 1999) in former Conservation Area 5 - part of a landscaped area located in the centre of the Necropolis. Area 5 was released for burial some years ago, but prior to clearing in 2003 a small number of individuals with the surrounding topsoil were relocated to Conservation Area 6 South (see *Pomaderris prunifolia* Translocation Program UBM, 2005).

Subsequently in 2011 and 2012, 48 advanced stock grown from local seed were planted into the Necropolis bushland, and are now considered mature and well established; setting fruit and producing seed. At present, *Pomaderris prunifolia* can be found in six (6) Conservation Areas: 6, 8, 10, 11, 12 and 20 (see *Figure 4* in main body of report). No naturally occurring or planted *Pomaderris prunifolia* occur outside these dedicated Conservation Areas.

An Assessment of Significance has been requested by OEH (S. Burke pers. comm.) as part of the new Rookwood Necropolis Property Management Plan. OEH has envisaged a future scenario in which all remaining bushland remnants outside the 14 designated Conservation Areas at Rookwood are cleared or disturbed for burial and/or infrastructure works.

Although no (0) *P. prunifolia* are known to occur outside the dedicated Conservation Areas, this Assessment of Significance has been prepared under the precautionary principle to apply in the event that the species is found to occur on-site in the future.

(a) "...in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction..."

As a species, *P. prunifolia* not listed on Schedule 1 of the *TSC Act* (although the local population is listed). Therefore item (a) does not apply.

(b) "...in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction..."

An endangered population is defined under the *TSC Act* as 'a population specified in Part 2 of Schedule 1'. One (1) population was recorded in former Area 5 prior to 2003. Subsequently several mature and one (1) seedling were translocated to Area 6 South, and from there seed was collected and propagated as tubestock.

At May 2015, 48 *Pomaderris prunifolia* are known to survive at Rookwood - all having being planted in each of six (6) separate Conservation Areas, i.e. Areas 6, 8, 10, 11, 12 and 20. No *Pomaderris* plants were planted outside the listed Conservation Areas and none (0) are known to occur naturally elsewhere.

Any future proposal to clear native vegetation from the remainder of the Necropolis is therefore unlikely to impact on the local population of *Pomaderris prunifolia* found at Rookwood.

(c) "...in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) ..is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii).. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction..."

An Endangered Ecological Community means an ecological community specified in Part 3 of Schedule 1 of the *TSC Act*. Therefore, this item is not applicable to an Endangered Vulnerable or Near Threatened (EVNT) species or population.

(d) "...in relation to the habitat of a threatened species, population or ecological community:

(i)... the extent to which habitat is likely to be removed or modified as a result of the action proposed...", and

Although potential habitat for *Pomaderris prunifolia* may occur in the open woodlands at Rookwood, there has never been any recorded occurrence of this species outside former Area 5. It is noted that Area 5 was originally a narrow strip of land between the RC and Muslim burial areas which had been landscaped using 'generally native' species.

Another small population was once recorded at the Mays Hills Cemetery in nearby Parramatta (believe to no longer occur). Neither site presents ideal habitat; being neither rocky nor close to a watercourse. Both cemeteries were landscaped around the same time by the same contractor, and as *Pomaderris prunifolia* in the Sydney area is close to or just beyond its natural range, its presence at Rookwood may not be a natural occurrence.

Given that 48 *Pomaderris prunifolia* occur as planted specimens in six (6) separate Conservation Areas, with no planted or naturally occurring individuals elsewhere, any future proposal to clear native vegetation from the remainder of the Necropolis is therefore unlikely to impact on the local population of *Pomaderris prunifolia*.

(ii) ... whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action..., and

The small remnant patches of native vegetation outside of the designated Conservation Areas is already highly fragmented and disturbed. Similarly, the Conservation Areas are fragmented and isolated from one another. *Pomaderris prunifolia* has been planted using material sourced from the original occurrence in former Area 5. Planting of *Pomaderris prunifolia* was a requirement of the previous Property Management Plan (2002).

No (0) *Pomaderris prunifolia* have been planted or are known to occur naturally in Rookwood outside the Conservation Areas. Therefore any proposal to clear native vegetation from the remainder of the Necropolis where no *Pomaderris prunifolia* are located is highly unlikely to impact on the local population of *Pomaderris prunifolia*.

However prior to any such clearing being undertaken, it would be prudent to undertake a targeted search for *Pomaderris prunifolia* outside the known planted areas, and if any such occurrences are found, a new Assessment of Significance should be prepared.

(iii)...the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality...

No (0) *Pomaderris prunifolia* have been planted or are known to occur naturally in Rookwood outside the six (6) Conservation Areas listed above. These individuals have been grown on from the original plant material found in former Area 5. Given the highly fragmented nature of the relatively small patches of vegetation outside of the Conservation Areas (some of these patches consisting of native trees over introduced grasses) , is it unlikely that removal or modification of these areas would further fragment or isolate areas of existing or potential habitat.

Provided the six (6) Conservation Areas containing the planted Pomaderris are retained, there should be no impact on the local population.

(e) "...whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)..."

No "critical habitat" of relevance to this species has been declared by the Minister for the Environment.

(f) "...whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan..."

At present, 27 Priority Actions have been identified to help recover this threatened population, which can be viewed on the Office of Environment & Heritage website:

<http://www.environment.nsw.gov.au/threatenedSpeciesApp/PasSearchSpecies.aspx?speciesName=P.+prunifolia+in+the+Parramatta%2C+Auburn%2C+Strathfield+and+Bankstown+Local+Government+Areas&generalType=Shrubs>

(g) "...whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process..."

Currently 38 key threatening processes (KTPs) are defined under Schedule 3 of the TSC Act. KTPs relevant to any Proposal to clear or modify the remaining native vegetation at Rookwood and located

outside the dedicated Conservation Areas may include (i) Clearing of native vegetation (ii) Invasion by woody weeds (various), exotic vines and introduced grasses, (iii) Infection of native plants by *Phytophthora cinnamomi*, and (iv) Loss of hollow-bearing trees.

Native bushland in the 14 dedicated Conservation Areas is subject to an on-going bushland management program which aims to control weeds and exotic introductions. A low-key noxious weed control program is carried out periodically by grounds staff employed by the various trusts at Rookwood.

Should the scenario postulated by OEH (i.e. clearing of native vegetation remnants and/or native trees outside the dedicated Conservation Areas) may be proposed in future, KTP such as clearing of native vegetation, loss of habitat trees and infection of plants by the soil pathogen *Phytophthora cinnamomi* are likely to occur. As there is no concrete development proposal at this time, it is not possible to accurately quantify the degree of vegetation loss or impacts to threatened entities (ecological communities, species or populations).

Expected impact on *Pomaderris prunifolia* var. *prunifolia* – Endangered Population

The clearing of any native vegetation outside of the designated Conservation Areas at Rookwood is unlikely to impact on any occurrences of *Pomaderris prunifolia* given that they are confined to the protected Conservation Areas. In 2011-2012, 48 advanced *Pomaderris prunifolia* were planted into six (6) different Conservation Areas; a requirement under the earlier Property Management Plan (2002). Provided that these Conservation Areas are left *in situ* and protected, there will be no impact on the existing local population of *Pomaderris prunifolia* at Rookwood.

If identified elsewhere on site in the future, the removal or modification of areas of potential habitat, if such exist, is likely to present a threat to this endangered population. In this event, if additional occurrences of this species are located and positively identified as *Pomaderris prunifolia* another Assessment of Significance should be prepared.

It is NOT considered that the clearing or modification of existing native vegetation outside of the designated Conservation Areas within the Rookwood Necropolis would have a significant impact on the existing local population of *Pomaderris prunifolia* or its habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

8.1.6 *Wahlenbergia multicaulis* (Tadgell's Bluebell) – *W. multicaulis* (Tadgell's Bluebell) population Auburn, Bankstown, Strathfield and Canterbury Local Government Areas (listed 2003 TSC Act)

The population of *Wahlenbergia multicaulis* (Tadgell's Bluebell) occurring within the local government areas of Auburn, Bankstown, Strathfield and Canterbury is listed as an 'Endangered Population' on Part 2 of Schedule 1 under the TSC Act. Likely to be the only known population remaining in the Sydney Basin and Central Coast botanical subdivision, this population is disjunct and at the limits of its geographical range. At present, there are 13 known sites, with two (2) populations in Northern Sydney, and the majority of others found in Western Sydney (OEH, 2012). As a species, *W. multicaulis* is not listed on Schedule 1 of the TSC Act (although the population is listed - as above).

Tadgell's Bluebell is a perennial tufted herb around 10-75cm in height that is glabrous or sometimes sparsely hairy with small linear leaves. This species flowers throughout the year, peaking in late spring/early summer.

The petals of the blue flowers form a tube with a corolla. Within Western Sydney, occurrence is closely aligned with the Villawood Soil Series characterised by poorly drained, yellow podsollic extensively permeated with fine, concretionary ironstone (laterite) (OEH 2012).

Tadgell's Bluebell occurs in a variety of habitats including dry sclerophyll forests, forested wetlands, grassy woodlands, and the edges of watercourses (OEH 2012). Within the Sydney Metropolitan Region, this species is associated with remnants of the Cooks River/Castlereagh Ironbark Forest.

Typically found in moist, disturbed sites amongst other herbaceous flora and often in unmown grassland, this species is known to respond favourably to soil disturbance in some situations with high exposure to sunlight (OEH 2012). Within Rookwood Necropolis, the regular slashing of long grasses for bushfire protection is thought to be benefitting this species.

This species is threatened by genetic swamping. Two (2) other species of *Wahlenbergia* (*W. littoricola* and *W. gracilis*) are described as 'widespread' in the Rookwood bushland (Smith & Smith, 1999, 2007) but these species are known to hybridise with *Wahlenbergia multicaulis*, making field identification difficult. Additional threats to the species include weed invasion, habitat clearing and the deposition of industrial refuse and excavated material (OEH 2012).

At Rookwood, 'pure' stands of *W. multicaulis* are thought to be confined to Conservation Areas 6 and 25, with no plants identified in the remainder of the Necropolis (Smith & Smith various dates). However, other *Wahlenbergia* species or hybrids are known to occur elsewhere in the Necropolis which at times results in misidentification of the endangered species. The Rookwood population is monitored every year by botanical consultants Peter and Judy Smith.

An Assessment of Significance has been requested by OEH (S. Burke pers. comm.) as part of the new *Rookwood Necropolis Property Management Plan* (pending 2015). OEH has envisaged a future scenario in which all remaining bushland remnants outside of the 14 designated Conservation Areas are cleared or disturbed for burial and/or infrastructure works.

Although no *W. multicaulis* are known to occur in any area outside the dedicated Conservation Areas, this Assessment of Significance has been prepared under the precautionary principle to apply in the event that the species is found on-site in the future.

(a) "...in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction..."

As a species, *W. multicaulis* is not listed on Schedule 1 of the *TSC Act* (only populations are eligible for listing). Therefore item (a) does not apply.

(b) "...in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction..."

An Endangered Population is defined under the *TSC Act* as 'a population specified in Part 2 of Schedule 1'. Two (2) populations are known to occur at Rookwood, in Areas 6 and 25 (Smith & Smith 1999 - 2012).

Their 2012 reports states "in 2011, as in 2009 and 2010, the great majority of the *W. multicaulis* population (172 plants or 96% of the total) occurred at four (4) neighbouring sites on the southern side of the canal in Area 25 (see Figure A3).

Figure A3: Location of *W. multicaulis* in 2012 on southern side of canal Area 25

(Source: P and J Smith *W. multicaulis* survey 2012)



(c) "...in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) ..is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii).. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction..."

An Endangered Ecological Community means an ecological community specified in Part 3 of Schedule 1 of the *TSC Act*. Therefore, this item is not applicable to an endangered population.

(d) "...in relation to the habitat of a threatened species, population or ecological community:

(i)... the extent to which habitat is likely to be removed or modified as a result of the action proposed...", and

W. multicaulis at Rookwood is recognised as an 'Endangered Population', occurring in only two (2) locations - Conservation Areas 6 South and 25. It is however possible that this species may also occur in suitable habitat elsewhere (open grassland, woodland edges or road verges) and if at some time in the future, this species is located destruction of existing or potential habitat will be a threat to the continued existence of the local population.

As there are currently no proposals to remove or modify any existing native vegetation outside the 14 dedicated Conservation Areas, it has not been possible to quantify impacts or to assess threats to the Rookwood population of *W. multicaulis*. Prior to any clearing outside the Conservation Areas, a targeted search for *W. multicaulis* should be carried out.

(ii) ... whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action..., and

The native vegetation in Conservation Area 25 is already highly fragmented and disturbed, and although it adjoins Area 6 to the north - where the threatened shrub *Epacris purpurascens* var. *purpurascens* also occurs it is generally isolated from other bushland in the Necropolis (see *Figure 4* main body of report), with very little native bushland remaining on the highly developed surrounding lands.

The small patches of remnant native vegetation outside of the designated Conservation Areas are already highly fragmented and disturbed. Connectivity between remnants is tenuous and relies heavily on landscaping and plantings made along canals and road verges.

Any Proposal to remove or modify existing stands of native vegetation or fell native trees outside the dedicated Conservation Areas would likely no fragment existing habitats further, although if connecting landscaping and indigenous plantings are removed this will sever any existing connectivity.

(iii)...the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality...

There are currently (@ May 2015) no parts of the Necropolis other than Conservation Areas 6 and 25 that are known to support pure stands of *W. multicaulis*. It is however possible that suitable habitat occurs (or may occur in future) in other locations outside the Conservation Areas, particularly if current management regimes are altered (e.g. frequency of grass slashing).

Prior to any future proposed clearing of native vegetation outside the Conservation Areas, a targeted search for *W. multicaulis* should be carried out. If the species is found and confirmed to be *W. multicaulis*, another Assessment should be prepared.

(e) "...whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)..."

No "critical habitat" of relevance to this species has been declared by the Minister for the Environment.

(f) "...whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan..."

The Tadgell's Bluebell population is not considered in the *Cumberland Plain Recovery Plan*; however a draft recovery plan is currently under works but has yet to be released for public exhibition.

At present, 10 Priority Actions have been identified to help recover this threatened population, which can be viewed on the Office of Environment & Heritage website:

<http://www.environment.nsw.gov.au/threatenedspeciesapp/PasSearchSpecies.aspx?speciesName=Tagell%27s+Bluebell+in+the+local+government+areas+of+Auburn%2C+Bankstown%2C+Baulkham+Hills%2C+Canterbury%2C+Hornsby%2C+Parramatta+and+Strathfield&generalType=Herbs+and+Forbs>

Any future action to clear areas of existing or potential habitat at Rookwood would not be in keeping with the listed Priority Actions.

(g) “...whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process...”

Currently 38 key threatening processes (KTPs) are defined under Schedule 3 of the *TSC Act*. KTPs relevant to any Proposal to clear or modify the remaining native vegetation at Rookwood and located outside the dedicated Conservation Areas may include (i) Clearing of native vegetation (ii) Invasion by woody weeds (various), exotic vines and introduced grasses, (iii) Infection of native plants by *Phytophthora cinnamomi*, and (iv) Loss of hollow-bearing trees

Native bushland in the 14 dedicated Conservation Area is subject to an on-going bushland management program which aims to control weeds and exotic introductions. A low-key noxious weed program is carried out periodically by the grounds staff employed by the various trusts.

Should the scenario postulated by OEH (i.e. clearing of native vegetation remnants and/or native trees outside the dedicated Conservation Areas) be undertaken in future, KTPs such as clearing of native vegetation, loss of habitat trees and infection of plants by the soil pathogen *Phytophthora cinnamomi* are likely to occur. As there is no concrete Proposal at this time, it is not possible to accurately quantify the degree of vegetation loss or impacts to threatened entities (ecological communities, species or populations).

Expected impact on *Wahlenbergia multicaulis* – Endangered Population

The removal of existing native vegetation (including disused grassland) outside of the designated Conservation Areas at Rookwood may impact on any occurrences of *Wahlenbergia multicaulis* should individuals be identified in any future searches.

If identified elsewhere on site in the future, the removal or modification of areas of potential habitat, including grasslands which are currently disused or vacant land, is likely to present a threat to this endangered population. In this event, if additional occurrences of this species are located and positively identified as the threatened species *W. multicaulis*, another Assessment of Significance should be prepared.

Given that there are only two (2) pure stands of *Wahlenbergia multicaulis* known to occur at Rookwood, and both are located within dedicated Conservation Areas, it is considered unlikely that any future clearing of native vegetation outside of these Conservation Areas would have a significant impact on the local population of the species. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

8.1.7 Grey-Headed Flying Fox - *Pteropus poliocephalus*

Australia’s largest bat, the Grey-Headed Flying-Fox (GHFF) is an endemic species that is listed as Vulnerable on Part 1 of Schedule 2 under the *TSC Act* and Section 178 of the *EPBC Act*. Characterised by a mantle of

rusty-brown fur encircling its neck and thick leg fur extending to the ankle, two (2) morphs occur: one with dark grey fur on its back, and another with a silver 'frosted' appearance (DoE 2015). Both have the signatory light grey fur on the head and black wing membranes with a wingspan of up to a metre.

Distributed from Rockhampton (Qld) to Adelaide (SA), they generally occur within 200km of the eastern coast. Occurrence and relative abundance changes with seasonality, variations in climate and the availability of blossoms and fruit. Individuals migrate between camps in irregular patterns. This species is a permanent occupant of the Sydney Region, and can be found in a range of habitats from subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps, as well as in urban environments.

Roosting camps are typically located in close to water, in stands of native vegetation such as mangrove, rainforest, *Melaleuca*, *Casuarina* or introduced trees, however they will form camps in almost any dense vegetation over 3 metres (Churchill 2008). Site fidelity to camps is high, and some camps have been used for over a century. They will forage up to 50km from their camp; with *Myrtaceae* plant species make up almost half of their foraging species, with a preference shown for *Eucalyptus*, *Melaleuca* and *Banksia*, as well as *Grevillea*, Lily Pilly and figs (Churchill 2008). This species has declined dramatically with the population size estimated at around 400,000 at present. This decline is due to a loss of roosting and foraging sites (especially foraging resources available during winter), electrocution on power lines, entanglement in netting and on barbed-wire, heat stress, and conflict with humans (DoE 2015).

The GHFF was observed during nocturnal surveys flying over Rookwood Necropolis as well as feeding in trees that line Barnet Avenue (refer to UBM 2013). The nearest known camps are located 5 km away in Duck River Reserve in Clyde; 9 km away in Parramatta Park, and 15 km away in Jacquie Osmond Reserve at Warwick Farm. Duck River camp is relatively small with an estimated 2,500-9,999, with the other two (2) camps estimated to be between 10,000 and 15,999 in size (National Flying-Fox Monitoring Programme data, 2015). A high diversity of *Myrtaceae* species and other potential foraging species have been identified within the designated Conservation Areas (and elsewhere in the Necropolis), and it is likely that these provide suitable foraging habitat for this species.

This assessment of significance has been prepared in the event that all remaining bushland remnants outside of the 14 designated Conservation Areas are cleared for burial or infrastructure purposes. .

(a) "...in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction..."

Removal of the existing vegetation outside of the designated Conservation Areas is unlikely to adversely impact on the lifecycle of this species considering:

- No significant stands of dense vegetation exist that would provide ideal roosting habitat;
- No camps have been identified within the Subject Property (Rookwood), and it is likely that this species utilizes the Subject Property for foraging purposes only;
- Such a Proposal will not result in the erection of any barriers to the dispersal, foraging or interbreeding needs of this species;

- It is highly unlikely that all standing canopy trees will be removed throughout the Necropolis due to heritage / landscaping / aesthetic reasons, with understorey species more likely to be targeted; therefore foraging resources for this species are less likely to be impacted;
- This species is highly mobile and adaptable to utilizing exotic flora species for foraging;
- The native vegetation to be impacted by such a Proposal is highly fragmented and simplified both structurally and floristically; and
- Better quality foraging and roosting habitat exists within the designated Conservation Areas and in other parts of the Necropolis. The native vegetation protected within the Conservation Areas contains a high diversity of Myrtaceae species and is of better quality for both foraging and roosting purposes, mapped as being 'fair' to 'good' condition by UBM (2013).

Therefore, the clearing of all vegetation outside of the designated Conservation Areas is therefore unlikely to affect the life cycle of the GHFF such that a viable local population is likely to be at risk of extinction.

(b) "...in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction..."

An endangered population is defined under the *TSC Act* as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of this species listed under the *Act*. As such, the Proposal would not be significantly compromising an endangered population.

(c) "...in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) ..is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii).. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction..."

An Endangered Ecological Community means an ecological community specified in Part 3 of Schedule 1 of the *TSC Act*. Therefore, this item is not applicable to an EVNT species.

(d) "...in relation to the habitat of a threatened species, population or ecological community:

(i)... the extent to which habitat is likely to be removed or modified as a result of the action proposed...", and

The remaining bushland remnants and scattered canopy tree species (especially *Eucalyptus* and *Corymbia* spp.) outside of the 14 designated Conservation Areas is likely to provide foraging opportunities for the GHFF when flowering or fruiting. However, the vegetation subject to such a Proposal makes up only a fraction of suitable habitat within the Locality and Region.

The GHFF prefers to roost on the bare branches of trees that form a dense canopy, and no ideal roosting habitat is likely to be affected by the removal of vegetation outside of the designated Conservation Areas.

(ii) ... whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action..., and

The Grey-headed Flying-fox is known to easily negotiate urban infrastructure, including urban areas, roads, open fields, water bodies and paddocks. Given the highly fragmented nature of the relatively small patches of vegetation outside of the Conservation Areas, is it unlikely that removal or modification of this habitat will disturb the foraging patterns of this species. This species is highly mobile and known to travel long distances in search of food.

The removal of vegetation outside of the designated Conservation Areas would not present a barrier to the movement patterns of this species such that any of its habitat areas are likely to become isolated. The retention and protection of the existing Conservation Areas that are of better quality vegetation and larger fragment size is of more relevance to this species.

(iii)...the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality...

The vegetation subject to such a Proposal is highly fragmented and contains a large number of non-indigenous and horticultural introductions. The removal of Myrtaceous plants (especially mature *Eucalyptus* and *Corymbia* spp.) is likely to affect potential foraging opportunities for the GHFF. However, suitable foraging habitat of better quality remnant bushland exists protected within the Conservation Areas, and a number of well-vegetated parks and reserves exist within the Locality and Region.

Given that this species is known to travel up to 50km from campsites to forage, it is not considered that clearing of vegetation outside of the Conservation Areas is likely to affect this species such that there would be an impact on long-term survival.

(e) "...whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)..."

The Subject Property is not listed as critical habitat under Part 3, Division 1 of the *TSC Act 1995*. Therefore, no critical habitat would be adversely affected by the Proposal. Critical habitat, aside from known camps that are important roosting and breeding habitat, is yet to be defined for this species.

(f) "...whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan..."

A Draft National Recovery Plan exists for the Grey-headed Flying-fox (DECCW 2009).

The following objective is relevant to this Proposal:

"to identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range and that habitat on the Study Area."

However, given the highly fragmented nature of existing vegetation and the high number of exotic / non-indigenous plantings within the Necropolis, it is unlikely that this vegetation would be identified as a priority foraging habitat for this species.

(g) "...whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process..."

Currently 38 key threatening processes (KTPs) are defined under Schedule 3 of the *TSC Act 1995*.

A high number of species within the Necropolis are non-indigenous, with remnants lacking a native grassy or shrubby understorey, and highly disturbed by weeds and horticultural introductions. Therefore the KTP 'Clearing of Native Vegetation' does not necessarily fit this definition for the majority of vegetation found outside of the designated Conservation Areas.

The loss of foraging habitat is a KTP for this species, however it is not considered that removal of vegetation outside the Conservation Areas would result in a significant loss of habitat for this species from the Locality or Region. In addition, the impacts of other key threatening processes such as the introduction and spread of weeds such as Lantana, exotic vines, perennial grasses, vines and scramblers, is unlikely to be worsened by such a proposal. The retention and protection of the intact bushland located within the designated Conservation Areas is of priority to minimise the impact of KTPs within the Necropolis.

Expected impact on the Grey-Headed Flying-Fox

The Proposal to at some time in the future to remove some or all of the existing vegetation outside of the designated Conservation Areas may have a small impact on this species through the removal or modification of potential foraging habitat, in particular the removal of myrtaceous species. However, given that no known breeding camp will be impacted, and that better quality foraging and roosting habitat exists within the designated Conservation Areas and elsewhere within the Locality and Region, such an event is unlikely to have a significant impact on this species such that local viable populations would be placed at risk of extinction.

It is NOT considered that the removal modification of the existing vegetation at Rookwood Necropolis outside of the designated Conservation Areas would have a significant impact on Grey-headed Flying Fox individuals, populations and/or habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

8.1.8 Eastern Bentwing Bat - *Miniopterus orianae oceanensis*

The Eastern Bentwing Bat (EBWB) is listed as Vulnerable on Part 1 of Schedule 2 under the *TSC Act*. The EBWB is found along the east and northeast coasts of Australia, predominately east of the Great Dividing Range (Churchill 2008). This species has dark reddish brown to dark brown fur on its back and slightly lighter fur on its belly, with a distinctly short muzzle and domed head with short rounded ears (Churchill 2008; OEH 2014). Forearm length of 45.2-50.0 mm, with the wing membrane attaching to the ankle. Their name comes from the last bone on the third finger being much longer than the other finger-bones, giving the wing a bent appearance.

The EBWB typically inhabits rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, Melaleuca forests and open grasslands however it is commonly encountered in residential and non-residential areas throughout Sydney (Churchill 2008; OEH 2014). Moths appear to be their preferred prey item, with some flies, cockroaches and beetles also eaten (OEH 2014). They typically forage just above the tree canopy in forested areas, but will also forage at lower levels in open grassy areas. Caves are their primary roosting habitat; however they are also known to use man-made constructions such as abandoned mines, old railway tunnels, bridges and buildings, and occasionally hollow-bearing trees (Churchill 2008).

Female Bentwing bats leave Sydney to rear their young between October and February, joining in maternity colonies at caves that are shared by up to 150,000 individuals. Such maternity caves are often utilised on an annual basis, and form the centre of discrete populations. No known maternity colonies have been identified in the Sydney Metro CMA (OEH 2014). In the southern Australian winter, this species enters torpor in selected (cold) hibernation caves (Churchill 2008). The Eastern Bentwing Bat is threatened by disturbance to roosting caves and adjacent areas (especially during the winter or breeding season), blockage of cave entrances, loss of high productivity foraging habitat, the introduction of exotic pathogens, and predation by feral cats and foxes (OEH 2014).

The EBWB was detected by echolocation calls within Conservation Areas 10 South, 18 and 28 during site investigations (refer to UBM 2013). No suitable caves are available within the Necropolis and therefore it is likely that this species utilises the Subject Property on occasion for foraging purposes only.

This assessment of significance has been prepared in light of a future scenario in which all remaining bushland remnants outside of the 14 designated Conservation Areas cleared or modified.

(a) "...in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction..."

The EBWB is listed as a Vulnerable species under the *TSC Act*. Removal or modification of the existing vegetation outside of the designated Conservation Areas at Rookwood is unlikely to adversely impact on the lifecycle of this species considering:

- No caves exist within the Subject Property at Rookwood, and therefore accessibility to caves will not be compromised by such a Proposal;
- No maternity roosts have been identified within the Sydney Metropolitan Catchment Management Area;
- The vegetation to be impacted by such a Proposal is highly fragmented;

- This species prefers to forage above forested areas; and
- Better quality foraging habitat exists within the designated Conservation Areas.

(b) "...in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction..."

An Endangered Population is defined under the *TSC Act* as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of this species listed under the *Act*. As such, the Proposal would not be significantly compromising an endangered population.

(c) "...in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) ..is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii).. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction..."

An Endangered Ecological Community means an ecological community specified in Part 3 of Schedule 1 of the *TSC Act*. Therefore, this item is not applicable to an EVNT species.

(d) "...in relation to the habitat of a threatened species, population or ecological community:

(i)... the extent to which habitat is likely to be removed or modified as a result of the action proposed...", and

The remaining bushland remnants and scattered canopy tree species outside of the 14 designated Conservation Areas may provide some foraging opportunities for the EBWB; however no suitable roosting habitat (e.g. caves) has been identified within Rookwood.

(ii) ... whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action..., and

The native vegetation outside of the designated Conservation Areas is already highly fragmented and disturbed, and no significant stands of vegetation remain.

(iii)...the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality...

Given the highly fragmented nature of the relatively small patches of native vegetation remaining outside the designated Conservation Areas, is it unlikely that removal or modification of this habitat will disturb the foraging patterns of this species.

This species is highly mobile and can easily negotiate open areas. The retention and protection of the existing Conservation Areas that are of better quality vegetation and larger fragment size is of more relevance to this species. Given that this species is known to travel up 65km from their roost site to

forage, and a number of parks and reserves with significant stands of forest exist within the Locality and Region, it is not considered that clearing of vegetation outside of the Conservation Areas is likely to affect this species such that there would be an impact on long-term survival. Further, no known roosting habitat will be impacted.

(e) "...whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)..."

No "critical habitat" of relevance to this species has been declared by the Minister for the Environment.

(f) "...whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan..."

At present, no recovery plan or threat abatement plan exists for the EBWB. This species will benefit from a number of activities including: the control of foxes and feral cats around roosting and maternity caves; retention of native vegetation around roost sites; limiting the use of pesticides in foraging areas; and protecting roosting sites from damage or disturbance (OEH 2014).

No roosting or maternity caves have been identified within the Necropolis, and it is likely that this species utilises the Subject Property on occasion for foraging purposes only, with foraging efforts likely to be concentrated over the forested areas protected within the designated Conservation Areas.

(g) "...whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process..."

Currently 38 key threatening processes (KTPs) are defined under Schedule 3 of the *TSC Act*. KTPs relevant to this species include: Clearing of native vegetation; Predation by the European Red Fox *Vulpes vulpes*; Predation by the Feral Cat *Felis catus*; and disturbance to caves.

No potential roosting or maternity caves occur within the Necropolis, and the highly fragmented nature of vegetation outside of the Conservation Areas means that limited preferred foraging habitat exists for this species. Therefore, removal of the existing vegetation outside of the designated Conservation Areas is unlikely to increase the impact of a key threatening process to any significant extent.

Expected impact on the Eastern Bentwing Bat

The removal of existing vegetation outside of the designated Conservation Areas may have a small impact on the EBWB through the removal or modification of potential foraging habitat. However, given that no potential roosting or maternity sites will be impacted, and that better quality foraging habitat exists within the designated Conservation Areas and elsewhere in the Locality and Region, such an event is unlikely to have a significant impact on this species such that local viable populations would be placed at risk of extinction.

It is NOT considered that the Proposal to remove existing vegetation outside of the designated Conservation Areas in Rookwood Necropolis would have a significant impact on Eastern Bentwing Bat individuals, populations and/or habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

8.1.9 Scarlet Robin - *Petroica boodang*

The Scarlet Robin is listed as Vulnerable on Part 1 of Schedule 2 under the *TSC Act* and is distributed from south east Queensland to south east South Australia, as well as Tasmania and south west Western Australia. Within NSW, they can be found from the coast to the inland slopes (OEH 2015).

The Scarlet Robin is given its name by the bright scarlet-red breast of the adult male. Both sexes have a white patch on their forehead; the male with a black head and upper parts. This species favours dry open eucalypt forests and woodlands, typically with an open and grassy understorey with scattered shrubs (OEH 2015). They can be found in both mature and regrowth vegetation. Their presence is positively associated with patch size and components of habitat complexity including tree canopy cover, shrub-cover, ground cover and leaf litter. Abundant logs and fallen timber are thought to be the most significant habitat components (OEH 2015). This insectivorous species utilised low perches for foraging, such as fence-posts or on the ground, feeding on invertebrates taken from the ground, tree trunks, logs and coarse woody debris (OEH 2015).

The Scarlet Robin breeds between the months of July and January, with a nest built into the fork of tree, dead branch in a live tree, or a dead tree or shrub (OEH 2015). Around autumn and winter, they are known to inhabit more open habitats such as open grassy woodlands, grazed paddocks with scattered trees, golf courses, parks, orchards and gardens (Pizzey & Knight 2012; OEH 2015).

According to the Atlas of NSW Wildlife, records within the locality are rare. However, the most recent recording was in 2014 around 15km from the Necropolis. A male Scarlet Robin was flushed from a stand of Casuarinas north of Conservation Area 18 (Easting 319461; Northing 6250358) during site investigations (refer to UBM 2013). Given the time of year that it was observed, it suggests that this species migrates to the area during the winter months.

This assessment of significance has been prepared in light of a future scenario in which all remaining bushland remnants outside of the 14 designated Conservation Areas are to be cleared.

(a) "...in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction..."

Any future Proposal to remove the existing vegetation outside of the designated Conservation Areas is unlikely to adversely impact on the lifecycle of this species considering:

- The majority of habitat outside of the designated Conservation Areas lacks structural complexity. There is a lack of logs and fallen timber (critical habitat components for this species) due to the use of the Subject Property as a cemetery and the associated maintenance and landscaping of the grounds;
- Standing dead timber and dead branches in canopy trees (important nesting habitat) may not be retained outside of Conservation Areas for aesthetic reasons or risk to public safety;
- The vegetation to be impacted by such any such Proposal is already highly fragmented, and this species is uncommon in isolated patches of habitat smaller than 10 ha;

- This species is known to be threatened by competitive exclusion by over-abundant Noisy Miners (*Manorina melanocephala*) within habitat; and
- Better quality foraging and roosting habitat exists within the designated Conservation Areas.

(b) "...in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction..."

An Endangered Population is defined under the TSC Act as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of this species listed under the Act. As such, the Proposal would not be significantly compromising an endangered population.

(c) "...in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) ..is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii).. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction..."

An Endangered Ecological Community means an ecological community specified in Part 3 of Schedule 1 of the TSC Act. Therefore, this item is not applicable to an EVNT species.

(d) "...in relation to the habitat of a threatened species, population or ecological community:

(i)... the extent to which habitat is likely to be removed or modified as a result of the action proposed...", and

The remaining native vegetation (bushland) remnants in the Necropolis and located outside of the 14 designated Conservation Areas provide little ideal foraging and breeding habitat for the Scarlet Robin.

(ii) ... whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action..., and

The native vegetation outside of the designated Conservation Areas is already highly fragmented and disturbed. The largest remnant patch (outside of the Conservation Areas) is located on the mid eastern border of the Necropolis and is approximately 7800m² in size. Mapped as Cooks River Castlereagh Ironbark Forest (or equivalent) by Tozer *et al.* (2010) and SMCMA (2013) this forested area may afford foraging and breeding habitat for this species, however this patch is already fragmented and isolated from other significant stands of vegetation.

(iii)...the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality...

Given the highly fragmented nature of the relatively small patches of native vegetation outside of the Conservation Areas, is it unlikely that removal or modification of this habitat will disturb the foraging patterns of this species. The retention and protection of the existing Conservation Areas that are of

better quality vegetation and larger fragment size is of more relevance to this species. Given that recordings of this species are rare, and a number of parks and reserves with significant stands of forest exist within the Locality and Region, it is not considered that clearing or modification of native vegetation outside of the Conservation Areas is likely to affect this species such that there would be an impact on long-term survival.

(e) “...whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)...”

No “critical habitat” of relevance to this species has been declared by the Minister for the Environment.

(f) “...whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan...”

At present, no recovery plan or threat abatement plan exists for this species. This species will benefit from a number of management activities including: retention of dead timber on the ground in open forest and woodland areas; increasing the size of existing remnants; retention of existing forest, woodland and remnant grassland vegetation; and the appropriate management of domestic cats (OEH, 2015).

(g) “...whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process...”

Currently 38 key threatening processes (KTPs) are defined under Schedule 3 of the *TSC Act*. KTPs relevant to this species include: Clearing of native vegetation; Predation by the Feral Cat *Felis catus*; Active exclusion of birds from woodland and forest habitat by abundant Noisy Miners *Manorina melanocephala*; Invasion of native plant communities by exotic perennial grasses; Removal of dead wood and dead trees.

The remaining native vegetation outside of the Conservation Areas is highly fragmented and offers limited preferred foraging or roosting habitat for this species. Therefore, removal of the existing vegetation outside of the designated Conservation Areas is unlikely to increase the impact of a key threatening process to any significant extent.

Expected impact on the Scarlet Robin

The removal or modification of existing native vegetation outside of the designated Conservation Areas may have a small impact on this species through the removal or modification of potential foraging habitat. However, given the limited structural habitat present in these remnant, and that better quality foraging habitat exists within the designated Conservation Areas, such an event is unlikely to have a significant impact on this species such that local viable populations would be placed at risk of extinction.

It is NOT considered that the removal or modification of existing native vegetation outside of the designated Conservation Areas in Rookwood Necropolis would have a significant impact on Scarlet Robin individuals, populations and/or habitats. Therefore, the preparation of a Species Impact Statement that further considers the impacts of such a Proposal on these species is NOT REQUIRED.

References

- Biosis Pty Ltd (2014).** Flora surveys undertaken for Rookwood Necropolis Trust Landscape Masterplan.
- Churchill, S. (2008).** Australian Bats: Second Edition. Jacana Books, Crows Nest, Australia.
- DECC (2009).** Draft National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus*. Australian Government.
- DoE (2015).** SPRAT (Species Profile and Threats Database) threatened species profiles available from the Department of the Environment. Accessed online at: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- Hassall & Gillespie (2002).** *Rookwood Necropolis Property Management Plan*. Unpublished report prepared for Department of Land and Water Conservation and Joint Committee of Necropolis Trustees.
- National Flying-Fox Monitoring Programme (2015).** Collaboration between the Australian Government, the South Australian, Victorian, New South Wales, Australian Capital Territory and Queensland Governments, CSIRO, local governments and volunteers in NSW and Queensland. National Flying-fox monitoring viewer available online: <http://www.environment.gov.au/biodiversity/threatened/species/flying-fox-monitoring>
- KTPs (2015).** List of Key Threatening Processes issued by the Office of Environment & Heritage available online: <http://www.environment.nsw.gov.au/threatenedspecies/KeyThreateningProcessesByDoctype.htm>
- National Parks & Wildlife Service of NSW (2002).** *Native Vegetation of the Cumberland Plain*. Final Edition. NPWS, Hurstville.
- National Parks & Wildlife Service of NSW (2003).** Recovery Plan for *Acacia pubescens*. NPWS, Hurstville.
- NSW Department of Environment and Climate Change (2008).** *Best Practice Guidelines: Cooks River/Castlereagh Ironbark Forest*. Found online: <http://www.environment.nsw.gov.au/resources/threatenedspecies/08601tsdsbpgcooksriver1.pdf>
- OEH (2012-2015).** Threatened species profiles available from the Office of Environment & Heritage. Accessed online at: <http://www.environment.nsw.gov.au/threatenedSpeciesApp/>
- Pizzey & Knight (2012).** The field guide to the Birds of Australia: Ninth Edition. Harper Collins, Sydney, Australia.
- Robinson, L. (2003).** *A Field Guide to the Native Plants of Sydney*. 3rd Edition, Kangaroo Press, 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 (2011).** *Survey of Rookwood Necropolis Wahlenbergia multicaulis, October 2011*. Prepared for the Rookwood Necropolis Trust.

Smith P & Smith J (2012). *Survey of Rookwood Necropolis Wahlenbergia multicaulis, October 2012.*

Prepared for the Rookwood Necropolis Trust.

SMCMA (2013). *The Native Vegetation of the Sydney Metropolitan Area – Version 2.0.* NSW Catchment Management Authority and Office of Environment & Heritage.

Tozer, M. (2003). The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities in *Cunninghamia* (2003) 8(1):1-75.

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 tablelands* in *Cunninghamia* 11(3). NSW Department of Environment & Climate Change.

TSSC (2015). Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s266B) Approved Conservation Advice (including listing advice) for Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion. Threatened Species Scientific Committee, Department of the Environment, Australian Government.

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

UBM Ecological Consultants (2012). *Threatened Plant Census for Native Vegetation at Rookwood Necropolis.* Unpublished report prepared for the Rookwood Necropolis Trust.

UBM Ecological Consultants (2013). *Biodiversity studies: Flora & fauna investigations for native bushland at Rookwood Necropolis.* Unpublished report prepared for the Rookwood Necropolis Trust.

UBM Ecological Consultants (2015). *Rookwood Necropolis Bushland Management Plan 2014-2019.* Unpublished report prepared for the Rookwood Necropolis Trust.