

Vegetation Management Plan

Lot C DP 391729

Lot 1 DP 540437

Lot 2 DP 540437

9, 11A and 11 Livingstone Ave

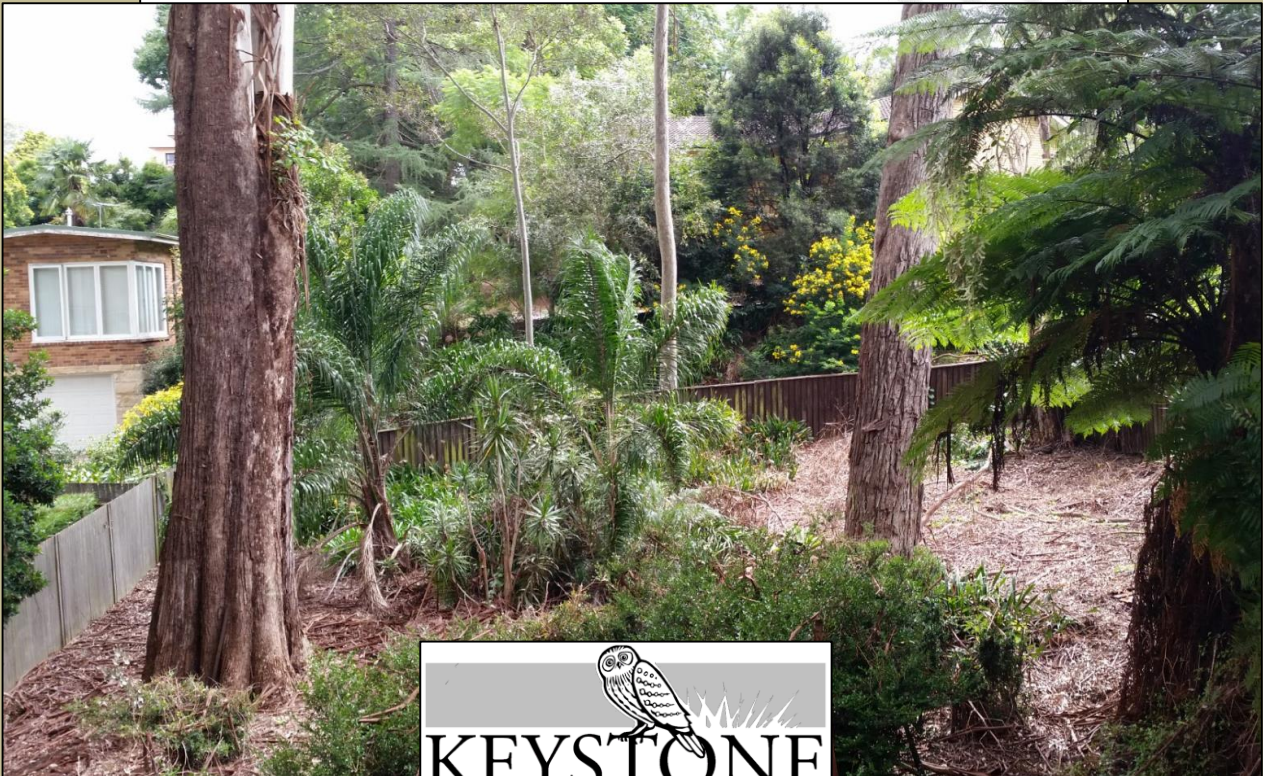
Pymble

Ku-ring-gai LGA

For: Pymble Livingstone Pty Ltd

REF: KMC 15-740

26th February 2016



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<p>Keystone Ecological <i>Flora and Fauna Specialists</i></p> <p>mail: PO Box 5095 Empire Bay NSW 2257 telephone: 1300 651 021 email: office@keystone-ecological.com.au web: www.keystone-ecological.com.au abn: 13 099 456 149</p>	<p>Cover: Looking north east across the heavily littered riparian corridor of 9 Livingstone Ave.</p> <p>Photo: E. Ashby, 1st April, 2015</p>
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PART A - BACKGROUND

1 INTRODUCTION

Keystone Ecological has been contracted by Pymble Livingstone Pty Ltd to prepare a Vegetation Management Plan (VMP) for 9, 11A and 11 Livingstone Ave, Pymble in the Kuring-gai Local Government Area.

The location of the subject site is shown in Figure 1.

It is proposed to subdivide the lots and build a multi- unit townhouse development. A layout of the proposal is shown in Figure 2.

At a pre-Development Application meeting on the 21st July 2015, Council officers requested that the entire site be managed under a VMP. This is due to the ecological sensitivity of the site arising from the presence of a riparian corridor through the site, the presence of the Critically Endangered Ecological Community Blue Gum High Forest on site and the recognition of its importance in the Local Centres DCP 2012.

The Greenweb Map for the Pymble local area recognises the natural vegetation on the subject site as Category 2 Support for Core Biodiversity Lands, edged with Category 4 Biodiversity Corridors and Consolidation. The front section of the site is also recognised as Category 3 Landscape Remnant. An extract of this mapping is provided at Figure 3.

In essence, the definition of these categories are:

- Category 2 Support for Core Biodiversity Lands. These areas are those that are considered to provide support for Category 1 lands (formally reserved lands or areas of regionally important habitat) by providing a buffer between core lands and the urban environment. They have also been chosen based on their proximity to riparian lands;
- Category 3 Landscape Remnant. These areas are those that are considered to be more fragmented than Category 2 lands and contain key vegetation communities and support to core areas.
- Category 4 Biodiversity Corridors and Consolidation. These areas consist of an 8 metre wide buffer applied to the edges of Category 1 and 2 lands in order to highlight areas where improved connectivity is sought.

Objectives and controls for these categories of vegetation are detailed in Table 1 overleaf.

Table 1: Objectives and Controls for Vegetation identified in the Local Centres DCP 2012.

Vegetation Category	Objectives	Controls
<p>Category 2 Support for Core Biodiversity Lands</p>	<ul style="list-style-type: none"> • To support core areas of vegetation and fauna habitat. • To contribute to the protection and recovery of key vegetation communities, threatened species, populations and their habitats. • To contribute to the protection, restoration and management of biodiversity corridors. • To contribute to the protection, restoration and management of vegetation and habitat in riparian lands. • To contribute to the net improvement of ecological function. 	<ul style="list-style-type: none"> • Avoid locating development on land identified as Category 2 on the Greenweb map. • Land within Greenweb Category 2, which is already cleared or disturbed and does not form part of any existing or proposed development, is to be stabilised and progressively rehabilitated with indigenous vegetation, to an extent commensurate with the scale of the proposal. • Vegetation retention and rehabilitation must be designed to enhance and link existing vegetation and habitat within the site and within adjacent sites, biodiversity corridors and riparian lands. • Where land within an allotment is identified as Category 2, works must be consistent with a plan of management (e.g. vegetation management plan). Where no plan of management exists, a plan of management, or equivalent plan, may be required. The plan must be prepared by a suitably qualified person and must identify ongoing initiatives to preserve, protect and promote the environmental values of the land. • Planting within land identified as Category 2 is to consist of not less than 70% locally native tree species and 30% locally native understorey species. Species are to reflect the relevant vegetation communities within the area. A mix of groundcover, shrubs and trees is desirable. • The design of any permanent fencing is to minimise obstruction to the movement of small fauna species.
<p>Category 3 Landscape Remnant</p>	<ul style="list-style-type: none"> • To maintain smaller key vegetation communities remnants as 'stepping stones', providing habitat, seedbank and pollination resources (facilitating gene flow) and supporting flora and fauna resilience. • To maintain and restore smaller remnants of key vegetation communities across a range of topographies. • To protect trees within key vegetation communities that provide food, shelter or nesting resources for native fauna, or that are of exceptional aesthetic value. 	<ul style="list-style-type: none"> • Avoid locating development on land identified as Category 3 on the Greenweb map; • Vegetation retention and rehabilitation on site that include land identified as Category 3 must be designed to improve connectivity with existing vegetation and habitat; • Planting within land identified as Category 3 on the Greenweb map is to consist of not less than 50% locally native species. Species area to reflect the relevant vegetation communities within the area. A mix of groundcover shrubs and trees is desirable; and • Where the site contains high species diversity or is dominated by weeds within any stratum, a vegetation management plan may be required.
<p>Category 4 Biodiversity Corridors and Consolidation</p>	<ul style="list-style-type: none"> • To manage areas providing a buffer to Core and Support for Core Biodiversity Lands. • To reduce edge effects and to improve the health, connectivity and function of local ecosystems. • To revegetate and restore biodiversity corridors, significant vegetation and habitat across the landscape. 	<ul style="list-style-type: none"> • The siting and design of development within Category 4 on the Greenweb map, must be designed to minimise edge effects on Category 1 and 2 areas. • Landscaping and revegetation on sites identified as Category 4, must be designed to consolidate fragmented and linear vegetation and habitat areas within the site and adjacent sites. • Where little or no indigenous vegetation currently exists on the site, the development must be designed to incorporate revegetation to restore and strengthen biodiversity corridors. • The width of biodiversity corridors should be maximised and gaps and barriers reduced or minimised. • Planting within land identified as Category 4 is to consist of <ul style="list-style-type: none"> ▪ a mix of groundcover, shrubs and trees; ▪ not less than 50% locally native species. Species are to reflect the relevant vegetation communities within the area. • Any permanent fencing should be designed to consider the movement of small fauna species where relevant.

The Riparian lands map for the Pymble local area recognises a Category 3a riparian corridor passing through the subject site from east to west. An extract of this mapping is provided in Figure 4.

Category 3a watercourse restoration lands are those with an area of 10 metres on each side of a discontinuous or piped watercourse.

Objectives of category 3a Watercourse restoration include:

- To re-create the core riparian zone;
- To emulate a naturally functioning watercourse, with associated riparian vegetation where possible;
- To prevent development from compromising the ability to re-create the core riparian zone (including the watercourse) in the future; and
- To contribute to improved water quality within the catchment.

The controls to be applied to this land are:

- All parts of the development are to be located outside the Core Riparian Zone (CRZ);
- The CRZ is up to 10 metres from the centreline of the watercourse. In determining the appropriate width for the CRZ the following must be considered:
 - The location of the riparian land within the catchment;
 - The scale of the proposed development;
 - The location of existing development to be retained;
 - The type and condition of existing vegetation; and
 - Drainage characteristics, including flooding.
- Vehicular and pedestrian crossing over piped waterways must comply with easement provisions;
- Where feasible, reinstatement of the channel form of watercourse is to be undertaken where they have been piped or channelised. Feasibility of channel restoration is to be determined taking in to consideration the factors outlines in the location controls; and
- Where a watercourse is re-created, the design, access and watercourse and flood process controls for *Category 3 Bank stability and water quality* apply.

This VMP is intended to provide a working document to deliver the objectives and adhere to the controls for the important areas of biodiversity to be retained and managed on site. This will be delivered by successful native revegetation and weed management in the long term which will in turn enhance and protect habitat for threatened species.

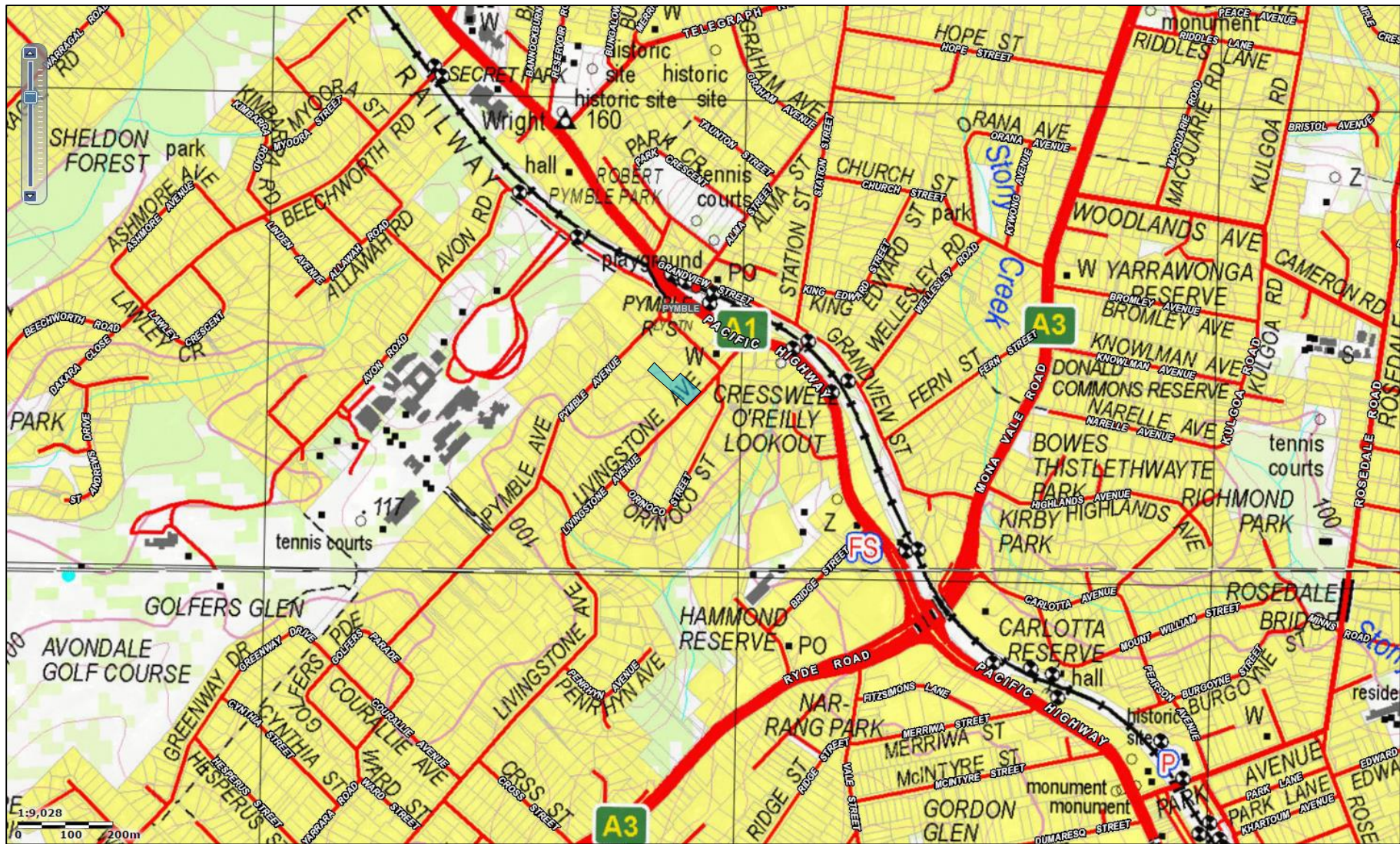


Figure 1: Location of the subject site (blue). Source map: Department of Lands SIX Viewer (<http://maps.six.nsw.gov.au/>).



Figure 2: Aerial photo showing the footprint of the lower ground floor (yellow). The remainder of the subject site is the subject of this Vegetation Management Plan.

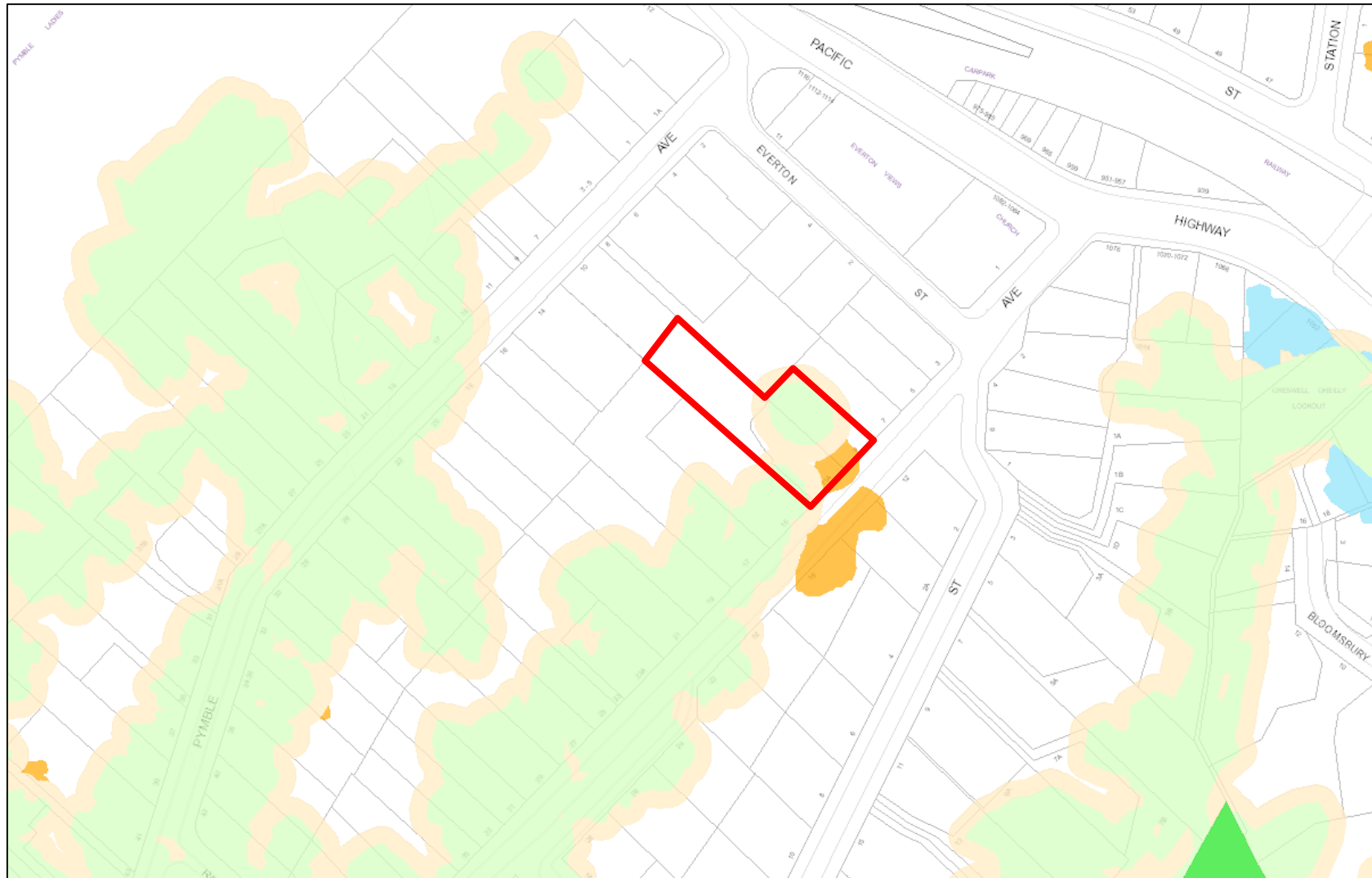


Figure 3: Greenweb Map showing the subject site containing Category 2 (green); Category 3 (dark orange) and Category 4 (light orange) lands.

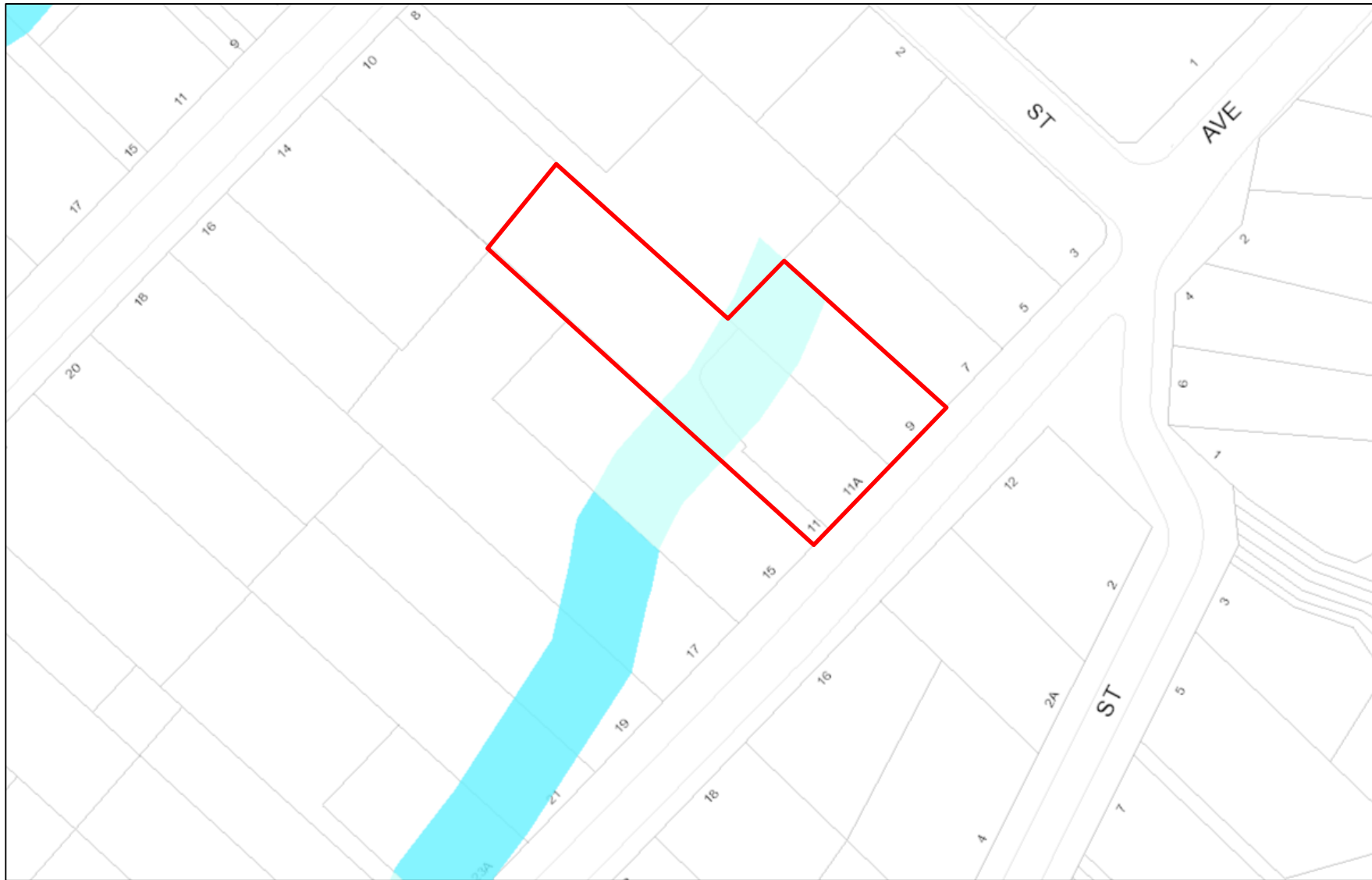


Figure 4: Riparian lands map showing the subject site containing Category 3a (light blue) riparian land.

2 SITE ASSESSMENT

The site was inspected in April 2015 and January 2016 in order to ascertain its general condition, identify the exotic species present, the extent of weeds and define management actions.

The site contains three residential dwelling, with their gardens in different conditions. The gardens in number 11 and 11A are well tended, with lawns, garden beds and large mature trees (native and exotic). The garden in number 9 however has been neglected as the house is uninhabited. The yard is consumed by woody debris and leaf litter from the large naturally occurring trees.

The different states of the yards are illustrated in Photographs 1 (rear of number 11) and 2 (rear of number 9).



Photograph 1: Rear yard of number 11



Photograph 2: Rear yard of number 9.

The exotic species observed across the site are listed in Table 2 overleaf.

A number of these exotic species have the potential to compromise the integrity of regeneration efforts if these weeds are not fully controlled and suppressed. These include Weeds of National Significance, listed Noxious Weeds as well as a number of other environmental weeds.

The following potential and realised environmental issues were identified during site inspection. These matters are the focus of management actions in this VMP and include:

- The lack of native understorey;
- The likely low resilience;
- The presence of weed species that have the potential to dominate if left unchecked;
- The potential for the mobilisation of soil after weed control;
- The potential for continued incursions of weed species from uncontrolled areas in adjacent areas; and
- The potential for accidental removal of native species which can resemble weed species during weed management.

Table 2: Exotic / introduced flora species on site and their management priority.

Abundance ratings: * = few, observed infrequently (<5% cover), ** = many – observed often (5-30% cover), *** = abundant, almost always seen (31-100% cover).

Family	Species	Abundance			Risk Level	Management Priority
		#9	#11	#11a		
Aceraceae	<i>Acer</i> sp. Japanese Maple		*		Low	Low
Agapanthaceae	<i>Agapanthus praecox</i> African Lily	**	**	**	High Potential to dominate	High
Araliaceae	<i>Hedera</i> sp. Ivy	***		***	High Potential to dominate and smother trees Key threatening process: Invasion and establishment of exotic vines and scramblers	High
Arecaceae	<i>Syagrus romanzoffiana</i> Cocos Palm	**		*	High Spread by birds	High Slow-growing but produces dangerous thorns.
Asparagaceae	<i>Asparagus aethiopicus</i> Asparagus Fern		*		High Class 4 Noxious Weed Weed of National Significance	High The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.
Bignoniaceae	<i>Jacaranda mimosifolia</i> Jacaranda	*	*		Moderate	Low
Hamamelidaceae	<i>Liquidamber styraciflua</i> Sweet Gum	**	*	*	Moderate	Low
Lauraceae	<i>Cinnamomum camphora</i> Camphor Laurel		*		High Potential to dominate Class 4 Noxious Weed	High The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Lythraceae	<i>Lagerstroemia indica</i> Crepe Myrtle		**		Moderate	Low
Magnoliaceae	<i>Magnolia</i> sp. Magnolia		*		Low	Low
Pinaceae	<i>Cedrus deodora</i> Deodar Cedar		**	*	Moderate	Low
Rosaceae	<i>Prunus persica</i> Peach Tree			*	Low	Low
Rosaceae	<i>Pyrus</i> sp. Pear Tree			*	Low	Low

Family	Species	Abundance			Risk Level	Management Priority
		#9	#11	#11a		
Rutaceae	<i>Citrus limon</i> Lemon Tree			*	Low	Low
Theaceae	<i>Camellia sasanqua</i> Camellia			*	Low	Low
Theaceae	<i>Gordonia axillaris</i> <i>Gordonia</i>	*			Low	Low

PART B - MANAGEMENT

4 MANAGEMENT AREAS – DEFINITIONS, OBJECTIVES AND STRATEGIES

The retained area around the townhouse buildings has been divided up into 3 Management Units (MUs), characterised by their starting conditions and objectives.

The distribution of these management units are overlain on the Landscape Plan overleaf in Figure 5.

The Landscape Plan has been prepared by Site design and studios with advice from Keystone Ecological regarding species selection. It is integral to this VMP, being the blueprint for the revegetation component delivering the rehabilitation of Blue Gum High Forest.

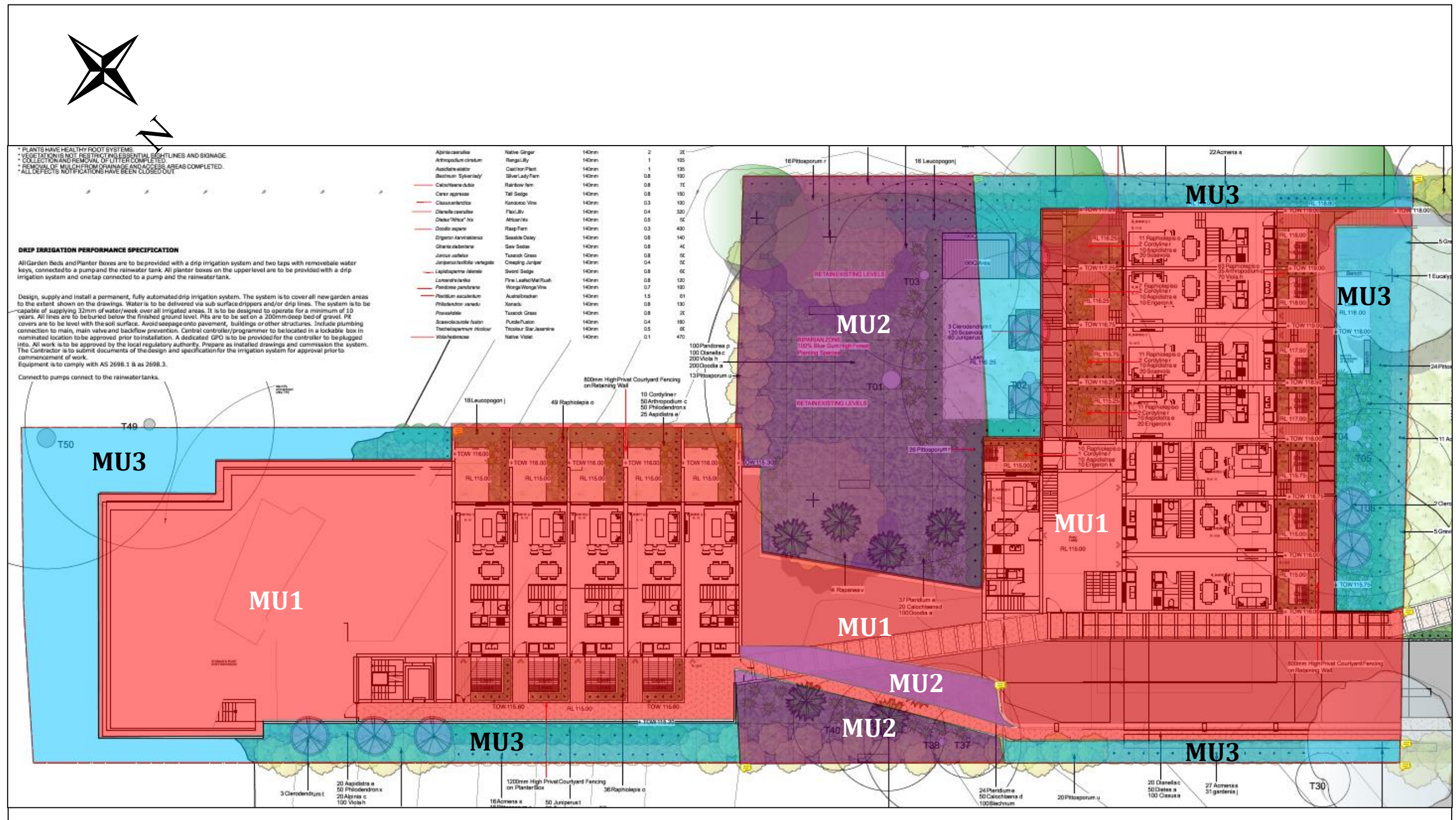
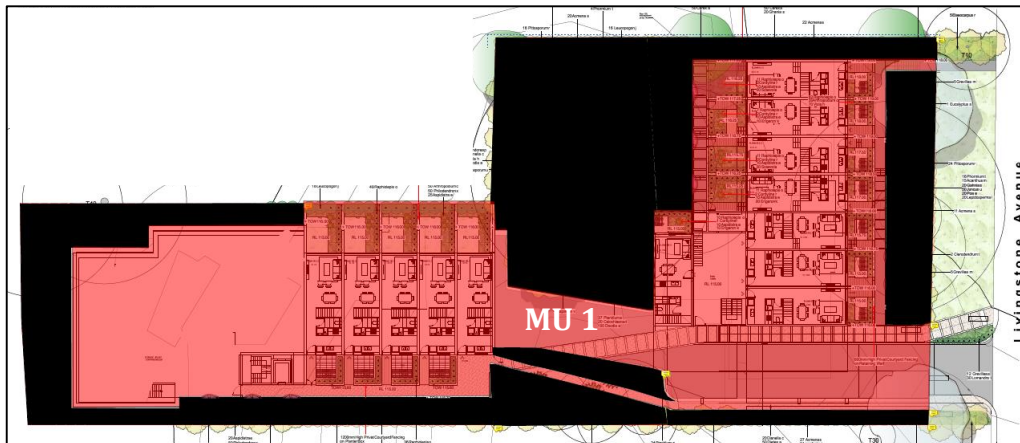


Figure 5: Distribution of the Management Units across the site.

4.1 Management Unit 1 - Footprint



Description: Management Unit 1 occurs in the centre of the site and occupies approximately 2,219 square metres. It is currently dominated by the existing dwellings and some of the exotic trees.

Natural resilience: Not applicable.

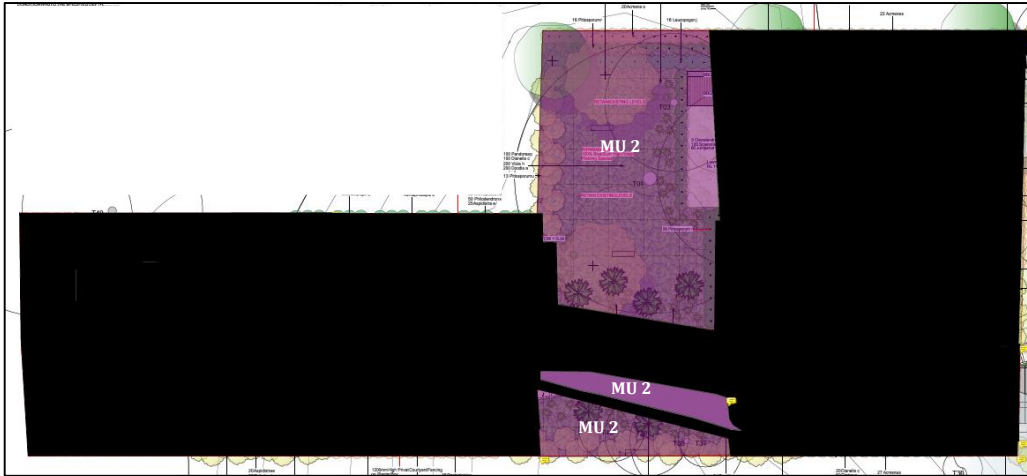
Objectives: Clear vegetation and construct the buildings and associated infrastructure without damaging the adjacent Management Units or other biodiversity on site.

Management Strategies

1. Construct barrier fence around works area to prevent accidental damage to adjacent Management Units during construction (e.g. to prevent stockpiling or parking within TPZs, unapproved root damage).
2. Installation and maintenance of erosion and sediments control measures.
3. Remove trees that are listed in the following table that are within the footprint in a manner that will not impact on adjacent retained vegetation (e.g. by sectional felling or careful pushing over in a direction away from retained trees):

Tag no.	Species	Height (m)	DBH (mm)
20	<i>Camellia sasanqua</i>	4	2.0
24	<i>Citrus x Limon</i>	4	3.0
25	<i>Angophora floribunda</i> Rough-barked Apple	8	-
26	<i>Jacaranda mimosifolia</i> Jacaranda	-	3.6
43	<i>Cornus</i> sp.	26	7.5
45	<i>Magnolia x soulangeana</i> Saucer Magnolia	5	2.1
46	<i>Camellia sasanqua</i>	5	3.7
47	<i>Camellia sasanqua</i>	6	3.7
52	<i>Acer palmatum</i> Japanese Maple	5	2.0
55	<i>Livistona chinensis</i> Chinese Fan Palm	10	3.0

4.2 Management Unit 2 – Riparian Corridor



Description: Management Unit 2 occurs in the riparian corridor of the marked first order stream and occupies approximately 666 square metres. It includes the 20 metre wide riparian corridor.

Natural resilience: Moderate.

Objectives: Replace weeds and exotic species with fully structured BGHF as well as Riparian structural elements and natural pathways.

Management Strategies:

1. Construct barrier fence on accessible perimeter of Management Unit 2 to prevent incursions during construction (e.g. parking of vehicles and machines, delivery of building materials) around works area to prevent accidental damage to adjacent Management Units during construction (e.g. to prevent stockpiling or parking within TPZs, unapproved root damage).
2. Retain and protect the trees in the following table according to arborist's recommendations:

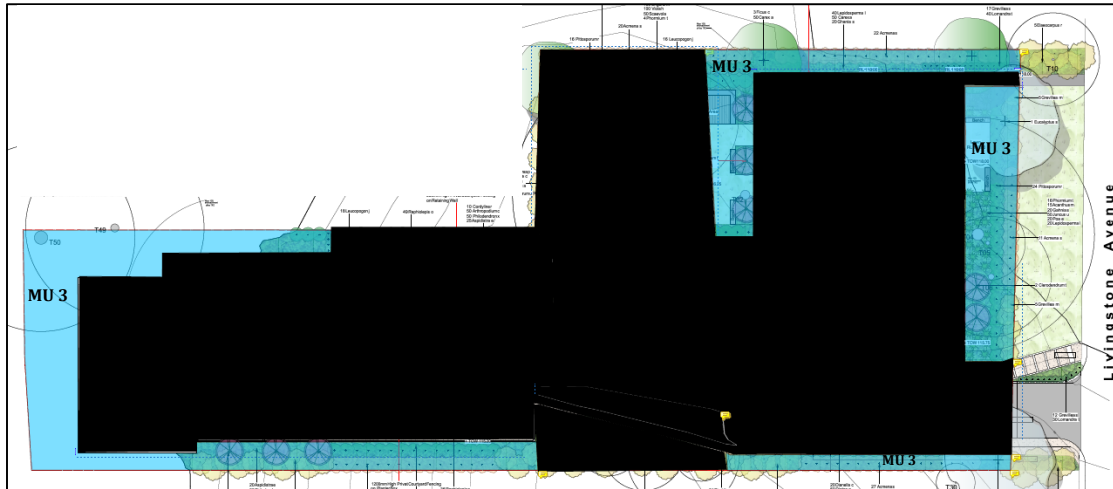
Tag no.	Species	Height (m)	DBH (mm)
1	<i>Eucalyptus saligna</i> Sydney Blue Gum	34	14.4
3	<i>Eucalyptus saligna</i> Sydney Blue Gum	30	7.2
37	<i>Backhousia myrtifolia</i>	6	2.2
38	<i>Backhousia myrtifolia</i>	6	2.2
39	<i>Pittosporum undulatum</i> Sweet Pittosporum	4	2.0
40	<i>Pittosporum undulatum</i> Sweet Pittosporum	6	2.2

3. Remove the remaining trees in the following table in a manner that will not impact on retained trees (e.g. by sectional felling or careful pushing over in a direction away from retained trees):

Tag no.	Species	Height (m)	DBH (mm)
15	<i>Cyathea cooperi</i>	8	4.2
16	<i>Syagrus romanzoffiana</i> Cocos Palm	6	3.0
17	<i>Syagrus romanzoffiana</i> Cocos Palm	7	3.0
21	<i>Prunus persica</i> Peach Tree	6	2.1
22	Unknown sp.	5	3.0
23	Unknown sp.	5	3.0
41	<i>Liquidambar styraciflua</i> Sweet Gum	22	10.2

4. Remove all weeds using aggressive techniques. Plant out with local provenance material and riparian land material, according to the Landscape Plan recommendations.
5. Close maintenance of plantings to occur for a period of two years. Weeds are to be controlled according to best practice methods appropriate to each species. Control methods for the high priority weeds identified on site are detailed in Table 3. Weed control to rely chiefly on manual methods with some spot-spraying.
6. Dead plants to be replaced by the same species from local provenance material. If unavailable or if planting the same species is not recommended (e.g. due to disease), then a replacement species must come **only** from the list of species provided in the NSW Scientific Committee's Final Determination of BGHF Critical Endangered Ecological Community listing.

4.3 Management Unit 3 – Landscaped ex-garden



Description: Management Unit 3 occurs along the boundaries of the site and occupies approximately 729 square metres. It is comprised of dense weed infestations and lawns.

Natural resilience: Low.

Objectives: Control weeds, replace with landscaped gardens and lawns, using many BGHF species.

Management Strategies:

1. Ensure erosion and sediment controls are in place prior to any weed works or tree removal.
2. Retain and protect the trees in the following table according to arborist's recommendations:

Tag no.	Species	Height (m)	DBH (mm)
2	<i>Eucalyptus saligna</i> Sydney Blue Gum		
4	<i>Eucalyptus saligna</i> Sydney Blue Gum	30	8.4
5	<i>Angophora floribunda</i> Rough-barked Apple	12	3.6
6	<i>Angophora floribunda</i> Rough-barked Apple	16	5.0
50	<i>Cinnamomum camphor</i> Camphor Laurel	30	15.0

Note that although tree 50 is an exotic species, a listed noxious weed species and a serious threat to local bushland, Council has requested that it remain and be protected.

Note that although tree 2 contains the hollow in the trunk and must be protected during construction.

- Remove the following trees in a manner that will not impact on retained trees (e.g. by sectional felling or careful pushing over in a direction away from retained trees):

Tag no.	Species	Height (m)	DBH (mm)
9	<i>Liquidambar styraciflua</i> Sweet Gum	20	7.2
11	<i>Jacaranda mimosifolia</i> Jacaranda	10	2.9
12	<i>Jacaranda mimosifolia</i> Jacaranda	12	2.9
13	<i>Cyathea cooperi</i>	5	2.0
14	<i>Cyathea cooperi</i>	6	2.0
19	<i>Cyathea cooperi</i>	5	2.0
31	<i>Lagerstroemia indica</i> Crepe Myrtle	5	3.7
32	<i>Lagerstroemia indica</i> Crepe Myrtle	6	3.7
33	<i>Lagerstroemia indica</i> Crepe Myrtle	6	2.4
34	<i>Jacaranda mimosifolia</i> Jacaranda	6	2.0
35	<i>Macadamia tetraphylla</i> Rough-leaved Queensland Nut	5	3.4
36	<i>Fraxinus excelsior</i> Common Ash	8	3.9
51	<i>Liquidambar styraciflua</i> Sweet Gum	24	6.8
53	<i>Liquidambar styraciflua</i> Sweet Gum	8	2.0
54	<i>Cumquat</i>	5	3.0
18	<i>Cyathea cooperi</i>	5	2.0
48	<i>Cedrus deodora</i> Deodar Cedar	24	5.4

- Remove all weeds using aggressive techniques. Plant out with local provenance material according to the Landscape Plan recommendations.
- Plant out with local provenance material according to the Landscape Plan recommendations.
- Close maintenance of plantings to occur for a period of two years. Weeds are to be controlled according to best practice methods appropriate to each species. Control methods for the high priority weeds identified on site are detailed in Table 3. Weed control to rely chiefly on manual methods with some spot-spraying.

7. Dead plants to be replaced by the same species from local provenance material. If unavailable or if planting the same species is not recommended (e.g. due to disease), then a replacement species must come **only** from the list of species provided in the NSW Scientific Committee's Final Determination of BGHF Critical Endangered Ecological Community listing.

5 VMP ACTIONS AND PROCEDURES

All works are to be carried out in accordance with this plan as detailed below.

5.1 VMP Personnel

All vegetation management actions should only be carried out by suitably qualified and experienced professionals. However, if other unqualified agents undertake the vegetation management actions for this site, then the work must be supervised by a suitably qualified and experienced professional.

5.2 Weed Control

Weed control is usually undertaken in 3 stages:

- 1) Primary weed control: The first step targets primary weeds but does not remove all weeds. Involves getting rid of larger debris and raking up areas of invasive creepers.
- 2) Secondary weed control: Intensive follow up weeding straight after primary weeding and treating weed seedlings as they germinate and regrowth. Progress of the weeds is monitored and some are allowed a month or two of growth before they are treated.
- 3) Maintenance weeding: Maintain and control low weed levels ensures new weeds that have moved into the area or have had the chance to germinate are eliminated.

Initial efforts should be focused on intensive primary and secondary weed control to ensure the revegetation zones have been prepared appropriately. If weeding is not undertaken properly the quality of revegetation outcomes will be severely compromised and maintenance costs will be high.

Weeding should also begin from upslope areas first, as weed propagules inevitably spread downslope in soil and water.

The only species to be retained shall be those native species regenerating naturally on the site. Weeding activities are not to interfere with natural regeneration.

The best weeding strategy should be determined at the initiation of each vegetation management session as the species present and their abundance will change with the seasons and over time.

The basic principles of the “Bradley method” (Bradley 1988) should be followed for weeding the site:

- Work from the best areas of native plants towards weed infested areas;
- Make minimal disturbance as minimising the amount of soil disturbance will reduce the potential for a fresh weed invasion; and
- Let native plant regeneration and establishment of installed plants dictate the rate of weed removal.

Application of these three basic principles of bush regeneration has been proven more effective and efficient in terms of results, cost and labour. Weed control activities will necessarily be more intensive at the beginning of the implementation period and taper off as the weed seed bank in the soil is exhausted.

Manual removal of weeds is preferred as this usually results in minimal disturbance to the soil and existing native species. Such manual methods are considered adequate for the herbaceous and smaller woody species observed. Small bushes and herbaceous weeds and grasses can easily be hand-weeded by pulling out or using a hand trowel. Persistent clumps of exotic grasses may need to be dug out using a shovel.

NO MACHINERY IS TO BE USED IN THE NATIVE REVEGETATION AREAS.

Where possible, removal work is to be undertaken outside of the fruiting and seeding period of weeds that produce large quantities of seed that may be spread by weeding activities. However, if such work is undertaken within these periods, fruits and seeds must first be collected, bagged and disposed of offsite prior to other removal activities that might disturb and distribute the weed seeds.

Weed eradication may include strategic use of herbicide on woody weeds; chemical treatment is considered appropriate for larger woody weeds such as Privet where the alternative methods for large specimens (tree felling and digging up roots) can be dangerous, expensive, time-consuming and may also create an erosion hazard. Only glyphosate-based herbicide that is appropriate for use near water is recommended for use.

For woody weeds, the best method of control is to cut the stem and **immediately** paint the newly exposed cut surface with full strength herbicide. For species with a taproot (such as *Ligustrum sinense* Small-leaved Privet), the best method is to scrape the surface of the stem near the base of the plant and immediately paint the exposed surface with full strength herbicide.

Given the proximity to riparian habitats on site, herbicide use should be kept to an absolute minimum and best practice guidelines at the time of writing for herbicide application are described below. **However, because of advances in knowledge, it is important to check on the currency of any proposed chemical management technique by consulting the latest *Noxious and environmental weed control handbook – A guide to weed control in non-crop, aquatic and bushland situations* (currently 5th Edition 2011, Rod Ensbey principal author) and / or with the Department of Primary Industries.**

HERBICIDE APPLICATION – CUT AND PAINT

Step 1: clear the area around the base of the stem, then cut the stem horizontally as close to the ground as possible, using secateurs, loppers, bush saw or chain saw (Weeds CRC 2004).

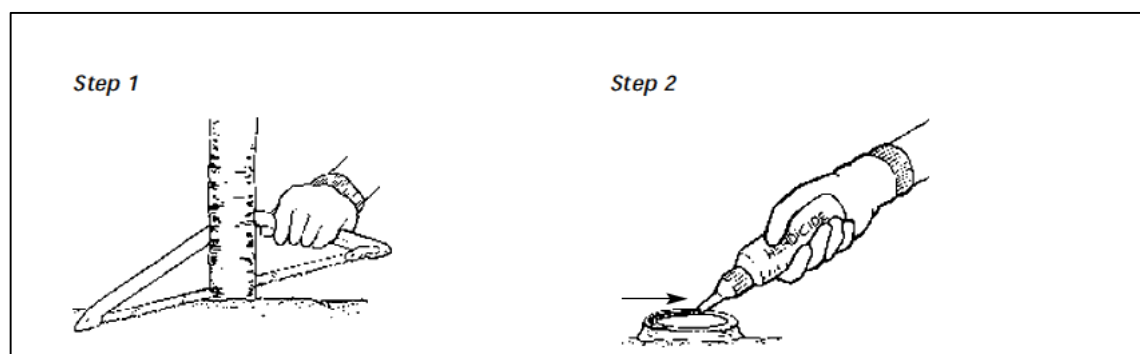
It is important that the cut is horizontal to avoid runoff of herbicide, and sharply angled cuts may present an injury risk.

Step 2: herbicide is then applied as soon as possible (preferably within 10 seconds) to the exposed surface before the plant's cells close up and inhibit the entry of the herbicide.

On larger stems, focus herbicide application on the sapwood and not the heartwood, as herbicide will not be translocated through the stump by the heartwood and will be wasted.

It is easiest to have two people for this process, one to cut and one ready to apply the herbicide as soon as possible.

This approach, though reliable, does not always provide a 100% kill rate, and ongoing follow-up and monitoring of treated plants is required.



Figures from Weeds CRC (2004)

HERBICIDE APPLICATION – SCRAPE AND PAINT

Using a knife and starting from the base, scrape 20 mm to 1 m of the stem to expose the sapwood and apply herbicide to the scraped area within 10 seconds (Weeds CRC 2004).

Do not ring bark the stem. Scrape about one-third of the stem diameter. Larger stems (>10 mm) can be scraped on two sides.

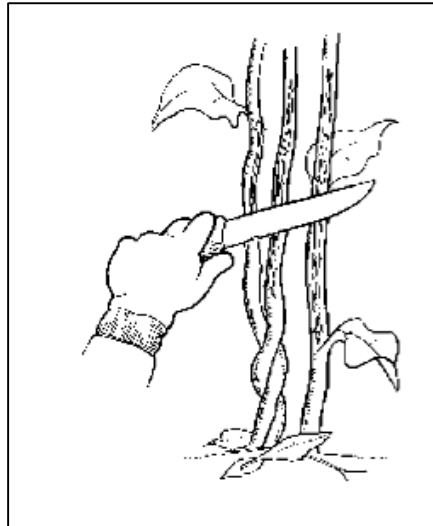


Figure from Weeds CRC (2004)

CAUTIONS AND HAZARDS

As with all herbicide applications, avoid using cut and paint or scrape and paint and similar methods if rain is expected. Herbicide labels have information on the amount of time needed after application before rain for the chemical to remain effective (Weeds CRC 2004).

Herbicides need to be handled with care. They should always be kept well away from children (preferably stored in a locked cabinet) and in the original labelled container.

Ensure that all who are going to use herbicides read and understand the label and can speak to someone qualified in herbicide use if they have any questions.

Herbicides can enter the human body through the skin, or by inhalation or swallowing. Basic safety precautions that should always be observed when using herbicides include:

- **Read the label** before opening the container and follow instructions exactly. If you do not understand the instructions seek advice from appropriate authorities.
- **Store only the amount of herbicide that you need.** Surplus chemicals remain a hazard.
- **Wear protective clothing:** long sleeves, long pants, sturdy shoes, gloves, and eye protection (goggles/safety glasses). Cotton, leather, canvas and other absorbent materials are not resistant to herbicides so the more layers the better. A PVC apron covering from shoulders to boots should be worn during the mixing process. Note that protective equipment should be worn during:
 - mixing of herbicides (be extremely cautious at this point as herbicide is in its most concentrated form)
 - application
 - entering a treated area before the herbicide has dried or dissipated.

- **Always wear chemical-resistant gloves.** A respirator is advised when mixing or pouring liquid herbicides.
- **Do not eat, drink or smoke** while using herbicide and wash hands after handling.
- **Wash skin and equipment afterwards.** Shower and wash hair at the end of the workday. Wash contaminated clothing separately.
- **Know what the correct procedures are in the event of an accidental spill.**

KEEPING RECORDS

It is recommended and good practice to keep records of herbicide application (Weeds CRC 2004). This allows for the review of the effectiveness of the herbicide treatments and will be included in the compliance monitoring reports.

Specific management information for the most problematic weed species observed on site is provided in Table 3 overleaf.

Table 3: Recommended specific weed control actions for high priority weed species.

Species	Habit and Habitat	Underground structure	Reproduction / dispersal	Removal	Confusing species
<i>Agapanthus praecox</i> African Lily	Perennial strappy herb. Common in gardens and spreading into bushland.	Fibrous lateral roots.	Reproduces by seed. Light seed spread by wind when spent flower heads not cut.	Hand remove.	May be confused with other exotic strappy lilies.
<i>Asparagus aethiopicus</i> Asparagus Fern	Persistent perennial herb. Many habitats, from coastal dunes to open woodland on many soil types, but particularly where there is shade.	Short thick rhizome. Tuberous roots used as storage organ.	Flowers late winter to spring. Red berries attractive to birds. Grows from seeds that last in soil at least 5 years. Will resprout from rhizome after disturbance, incomplete removal or fire.	Hand remove rhizome by crowning with sharp knife. Autumn-winter best before berries mature. Dispose of removed material off-site.	May be confused with other <i>Asparagus</i> species, all of which are exotic and many of which are WONS.
<i>Cinnamomum camphora</i> Camphor Laurel	Large tree common in coastal gullies, bushland and backyards. Invades areas where forest has been cleared.	Deep tap root and lateral roots.	Flowers in spring and reproduces by succulent black berries that are spread by birds and possums. Short-lived, remaining viable for only 3 years; 70% of seeds germinate in first year. Germinates readily after being ingested by birds.	Hand pull small seedlings. Cut and paint or inject trees with glyphosate-based herbicide. Will resprout after cutting, fire or poisoning, so complete removal of roots required if herbicide not used. Young trees will form multiple stems after injury.	May be confused with native species in the same family, including <i>Cinnamomum oliveri</i> , <i>Cryptocarya glaucescens</i> , and <i>Cryptocarya microneura</i> .
<i>Hedera sp.</i> Ivy	Vigorous climber, attaching by suckering. Shady forest areas and around old gardens.	Rhizomes.	Reproduces by seed and also vegetatively by stems (or stem fragments) coming into contact with the soil or by rhizomatous growth. Black shiny fruit attractive to birds. Seeds and pieces of stem can also be spread in dumped garden waste.	Hand removal most effective, especially for small plants. Foliar spray not recommended as waxy coating on leaves make them resistant. If growing on smooth-barked trees, cut Ivy at the base and leave the aerial parts to die. Apply herbicide to cut stump. Treat in spring-summer before fruit develops. Monitor and follow up. If growing on rough-barked trees, apply herbicide using drill-frill or stem-scrape methods.	Similar climbers include <i>Delairea odorata</i> Cape Ivy, also exotic.
<i>Syagrus romanzoffiana</i> Cocos Palm	Large tree. A weed of roadsides, disturbed sites, waste areas, riparian areas and urban bushland.	Lateral roots.	Reproduces entirely by seed. Seeds are spread by bats and other animals that eat the fruit (e.g. rats, possums). They are also dispersed by water and in dumped garden waste.	For seedlings hand pull out or chip the crown out. For large palms, chainsaw at ground level to avoid leaving a stump. In bushland settings, cutting the crown off below the lowest frond is sufficient. If leaving the Cocos Palm in place, they should be managed by cutting off their fruits while green and before they can spread as weeds. Dense seedlings from germinated fruits on the ground can be foliar sprayed with a registered herbicide	Can be confused with <i>Archontophoenix cunninghamiana</i> Bangalow Palm as juveniles.

5.3 Plantings

5.3.1 Species

Natural regeneration will not be sufficient in this site and so revegetation using locally indigenous species is required. Naturally occurring remnant vegetation (preferably from the works area or otherwise sourced locally) is the best source of seed and / or vegetative material for revegetation. Generally, these plants will have evolved to suit local environmental conditions and have a broad genetic base. Ecologically and genetically, local seed complements other plants and animals in the area and poses the least potential threat of genetic contamination.

Plant species to be used for revegetation works in each Management Unit are detailed in the Landscape Plan and in section 4 above.

5.3.2 Watering

It is important to provide adequate water at planting. Plants should be soaked for at least 30 minutes prior to planting (before being removed from their pots) and watered thoroughly at planting by applying 1-1.5 litres of water to each new plant.

After planting, plantings should be watered on a weekly basis for a period of 4 weeks (weather conditions dictating frequency). After this period, watering comprising one litre of water per plant each month will be required until the plants have established. Watering is best carried out in the morning (watering at dusk encourages fungal attack in some species).

Drip irrigation is recommended in the Landscape Plan and is to be installed according to recommendations.

5.3.3 Mulching

Organic mulch should be used around planting holes to assist in weed suppression as well as keeping soil moist and cool.

Recommended depths for mulch are 15 to 35 millimetres maximum. Excess levels of mulch will reduce water penetration to the soil as well as promote rapid decomposition of the mulch into fines that will promote weed growth. Mulch can also harbour weeds that recruit to the site if not carefully managed, so stockpiling should be avoided.

After original mulch supplies are exhausted, the re-application of any mulch over the life of the VMP shall be certified as weed free by VMP contractors and comprise native organic material.

5.3.4 Plant guards

The use of plant guards is not recommended as the plants are not likely to be eaten by large herbivores and the site is well protected from wind.

5.3.5 Maintenance weeding

The competition for water from grass and weeds during the first spring and summer is possibly the most important influence on seedling survival and growth. It is vital to reduce weed and grass growth as much as possible during this time. The finely divided dense roots of many weeds (especially grasses) effectively compete with native tree and shrub roots for nutrients and, more importantly, water.

Approximately three months after planting, a follow-up application of herbicide is to be applied. This will maintain an area free from competition around each plant. Future herbicide application will be applied as required (two to four times a year) for up to three years.

5.4 Hygiene Protocols

Hygiene is particularly important to prevent the transfer of plant diseases. The following simple procedures can reduce the chance of transferring diseases during vegetation management activities:

- use of sharp equipment (i.e. knives and secateurs) that are regularly cleaned with methylated spirits;
- cleaning of loose soil from boots and tools with bleach;
- keeping vehicles out of the works area as soil could be attached to the tyres; and
- ensuring all plants brought onto the site are free of *Phytophthora* fungus and invasive Myrtle Rust. Appendix 1 provide best practice guidelines to control known threats to local vegetation.

6 MONITORING

The main objective of the monitoring program is to evaluate the effectiveness of the revegetation and weed management program, to determine if adequate weed suppression is occurring and monitor the success of plantings. If, after monitoring, it is deemed that the weed eradication techniques are ineffective, then the plan can be altered at any time to reduce the weed biomass. Likewise, if plantings fail to establish within 3 months after installation, supplementary planting will be required to meet the required densities.

It is expected that at the end of a 2 year maintenance period of this VMP that:

- Maintenance of planted stock including replacement plantings to achieve a minimum survival rate of 95% by the end of the 2 year maintenance period;
- Weed density to be maintained below 5%; and
- Total native vegetation cover is to exceed 95%.

Continued small scale weed control and maintenance of MUs will be required for the life of the development.

Reference points for monitoring and reporting should be established before vegetation management begins. The locations of these points – one in each MU - may be marked permanently on the ground by iron stake, rock cairn or similar, or the location simply recorded by GPS.

Once the locations for the reference points are established, standard photographs should be taken before this plan is implemented and then again at each monitoring session. The aim of the reference photographs is to provide a pictorial record that will aid in the judgement of the effectiveness of the vegetation management strategies.

Monitoring of each Management Unit should be carried out immediately before the implementation of this VMP, at regular intervals during the life of the plan and at the end of the 2 year period.

Progress reports are to be provided to Council at least annually, although Consent Conditions may require such reports to be provided more frequently. At each of these assessments, the efficiency of the program should be assessed and any necessary changes made to the regeneration strategy.

The template overleaf is provided as a guide for monitoring and reporting.

Progress Report for Bushland Management Works

Management Unit (tick as applicable)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Other
------------------------------------------------	----------------------------	----------------------------	----------------------------	----------------------------	--------------------------------------

Date of inspection	Stage of inspection (e.g. pre works, 6 month year 1, 12 months year 1)
Name and contact details of person(s) collecting data	
Degree of previous activity since last audit / report	
_____ person hours allocated	_____ person hours spent

GENERAL CONDITION					
	Major	Minor	None	N/A	Notes
Pollution					
Litter / rubbish					
Excessive sediment					
Erosion					
Weeds adjacent to rehabilitation area					
Pests					
Diseases					
Feral animals					
Native fauna evidence (scats, sightings etc)					
Overall habitat value (logs, cover, food etc)					

REGENERATION / WEED CONTROL PERFORMANCE					
Quadrat identifier:					
Photograph identifier:					
Locational details of quadrat (e.g. GPS reading)					
Natural recruitment observed		In quadrat: Y <input type="checkbox"/> N <input type="checkbox"/>			
WEEDS					
Exotic species identified	% cover			% age composition	
	Canopy	Mid storey	Ground	Seedling / juvenile	Mature / semi mature
Weed control comments:					

NATIVES					
		Trees	Shrubs	Grasses / graminoids / herbs	Climbers / scramblers
Species Diversity (number) (approx. number of species in each layer)					
Structure (m) (height of average specimen in each stratum class)					
Overall cover in quadrat	Nil <input type="checkbox"/>	<5% <input type="checkbox"/>	5-20% <input type="checkbox"/>	>20% and <50% <input type="checkbox"/>	>50% <input type="checkbox"/>
Extent of bare soil in quadrat	Nil <input type="checkbox"/>	<5% <input type="checkbox"/>	5-20% <input type="checkbox"/>	>20% and <50% <input type="checkbox"/>	>50% <input type="checkbox"/>
Extent of leaf litter in quadrat	Nil <input type="checkbox"/>	<5% <input type="checkbox"/>	5-20% <input type="checkbox"/>	>20% and <50% <input type="checkbox"/>	>50% <input type="checkbox"/>
Depth of leaf litter (mm)					
Evidence of plant damage / death by feral animals	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Details		
Native plant regeneration - comments					
Corrective actions					
Were previous corrective actions implemented?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	Comments	
Proposed corrective actions – detail					

7 VMP WORKS SCHEDULE

The VMP shall last for 2 years or as specified by Council. The following works schedule shows the timing of management actions required.

WORKS SCHEDULE – YEAR 1														
Management Unit	Management Activity	Sequencing and Timing of Actions by Months												Responsibility
		Year 1												
		1	2	3	4	5	6	7	8	9	10	11	12	
All Units	Erect exclusion fencing and gates	✓												Owner Fencing Contractor
	Establish monitoring points	✓												Bush Regeneration Contractor
	Order local provenance material	✓												Owner Bush Regeneration Contractor
	Prepare and lodge Progress Report	At interval as required by Council												Owner Bush Regeneration Contractor
MU1 Footprint	Protective Fencing		✓											Owner Vegetation Contractor Project Ecologist
	Tree removal - remove tree 25 under ecological supervision					✓								
	Monitor and review												✓	
MU2 Riparian land	Primary weeding		✓											Owner Bush Regeneration Contractor
	Secondary weeding					✓								
	Follow up weeding									✓			✓	
	Plant out material			✓				✓			✓			
	Monitor and review												✓	
MU3 Ex Garden	Primary weeding		✓											Owner Bush Regeneration Contractor
	Secondary weeding					✓								
	Rock treatment			✓										
	Follow up weeding									✓			✓	
	Plant out material			✓				✓			✓			
	Monitor and review			✓				✓			✓			
MU4 Common lawn	Primary weeding		✓											Owner Bush Regeneration Contractor
	Secondary weeding					✓								
	Follow up weeding									✓			✓	
	Plant out material			✓				✓			✓			
	Monitor and review			✓				✓			✓			
WORKS SCHEDULE – YEAR 2														
Units 2, 3, and 4	Follow up weeding						✓						✓	Owner Bush Regeneration Contractor
	Monitor and review												✓	
	Prepare and lodge Progress Report	At interval as required by Council												

REFERENCES

- Bradley, J. (1988) *Bringing back the bush: The Bradley method of bush regeneration*. Lansdowne Publishing. The Rocks, NSW
- Buchanan, R. A. (1989) *Bush Regeneration: Recovering Australian Landscapes*. TAFE Student Learning Publications, NSW
- Department of Infrastructure Planning and Natural Resources (2007) Attachment A: How to prepare a Vegetation Management Plan. Draft version 6: January 07
- Ensby, R. (2011) *Noxious and environmental weed control handbook – A guide to weed control in non-crop, aquatic and bushland situations* 5th Edition. Department of Primary Industries
- Robertson, M. (1994) *Stop Bushland Weeds: A guide to successful weeding in South Australia's bushland*. The Nature Conservation Society of South Australia Inc

APPENDIX 1

PATHOGEN CONTROL