Vegetation Management Plan

53A Warriewood Rd, Warriewood NSW 2102

By Ecological Consultants Australia Pty Ltd

TA Kingfisher Urban Ecology and Wetlands

October 2022 updated March 2025

About this document

Copyright Statement©

Statement of Authorship

This study and report were undertaken by Ecological Consultants Australia for the client. The author of the report is Geraldene Dalby-Ball whose qualifications are BSc majoring in Ecology and Botany with over 25 years' experience in this field and specialising in projects within Sydney urban areas.

Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any particular proposal or pre-determined position.

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Summary

Ecological Consultants Australia (ECA) has been contracted by Willowtree Planting to provide a Vegetation Management Plan (VMP) for vegetation within the subject site identified as 53A Warriewood Rd, Warriewood NSW 2102 within the Northern Beaches Council Local Government Area (LGA).

This VMP was prepared for the proposed development at 53A Warriewood Rd, Warriewood NSW 2102 identified as Lot 2 DP 1115877 which includes an 18 lot Community Title Subdivision.

Methods

- On-ground site inspection took place in August 2022 by Senior Ecologist Geraldene Dalby-Ball and Ecologist Gabriel James, September 2022 and December 2024 by Geraldene Dalby-Ball (Elaway).
- Flora and fauna observations were recorded on-site with both general and species specific surveys. Notes, photos, and samples of flora species were taken, on-site and neighbouring sites, to assess the ecological health and value of the site.
- Methods – Document Reviews
- The following Northern Beaches Council documents guide the planning aspects of this VMP.
- DCP Part C6 Design Criteria for Warriewood Release Area in particular 6.1 and 6.2.
- **Pittwater 21 DCP (2014) – C6.1 Integrated Water Cycle Management** (full DCP outcomes section include in Appendices) https://eservices.northernbeaches.nsw.gov.au/ePlanning/live/Pages/Plan/Book.aspx?exhibit=PDCP
- **Pittwater 21 DCP (2014) – C6.2 'Natural Environment and Landscaping Principles'**, (full DCP outcomes section include in Appendices) https://eservices.northernbeaches.nsw.gov.au/ePlanning/live/Pages/Plan/Book.aspx?exhibit=PDCP
- **Warriewood Valley Riparian Corridor Design requirements** in the Warriewood Valley Landscape Masterplan and Design Guidelines (Public Domain) 2018.
- https://files-preprod-d9.northernbeaches.nsw.gov.au/nbc-prod-files/Warriewood_Valley_Landscape_Masterplan_-_August_2018.pdf
- This VMP has consideration of **D16.5 Landscaped Area for Newly Created Individual Allotments**
- https://eservices.northernbeaches.nsw.gov.au/ePlanning/live/Pages/Plan/Book.aspx?exhibit=PDCP&hid=12349
- Along with the State Governments Water Management Act Waterfront Land and Riparian Guidelines.
- *Controlled activities – Guidelines for vegetation management plans on waterfront land*
- https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0009/386208/Fact-sheet-Guidelines-for-vegetation-management-plans-on-waterfront-land-May-2022.pdf
- *Controlled activities – Guidelines for riparian corridors on waterfront land*
- https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0008/386207/licensing_approvals_controlled_activities_riparian_corridors.pdf

Summary of findings

- Desktop mapping identified two plant community types (PCT) on either side of the site boundary. 4006 Northern Paperbark-Swamp Mahogany Saw-sedge Forest and 4028 Estuarine Swamp Oak Twig-rush Forest These PCT and Council DCP list have been used for species selection in planting.
- The site consists of a large open lot with evidence of past cultivation resulting in a turfed terrace of exotic grass species. The western corner of the property includes a water-logged area adjacent to the creek line made up of both exotic and native wet-edge species.
- Past clearing and weed abundance must been managed effectively for the success of the VMP planting.
- Tree species include a mix of *Eucalyptus* and *Casuarina* species in low abundance.
- Proposed works will see the removal of weeds in the planting of local native species indicative of this location and drawing on the two PCTs and the NBC Warriewood Valley Landscape DCP.
- The APZ can be achieved while not compromising integrity of the inner 25m.
- The area of the VMP is mapped as ground-water dependant lands.
- The area of the VMP includes an area of SEPP Coastal Wetland buffer with the wetland being a Swamp Mahogany and Cabbage Tree Palm Endangered Ecological Communities (EEC). A review of the available information indicates that there will not be a negative impact on this wetland. No additional silt/sediment, pollutants, light. The changes in levels at the creek bank are expected to not change the water table or ground water levels/availability to the wetland. See the separate report addressing SEPP Resilience and Hazards (March 2025)
- Weed management must occur as per the schedule of works within the management zone to ensure exotic species do not establish.
- Creek works include reshaping the bank and changing the levels to meet water management objectives.
- This is a controlled activity due to excavation within 40m of the creek.
- Planting of native species is recommended in this VMP to reinstate the condition of the site to that prior of clearing and disturbance. Once plantings become established, the site will add ecological value to the and provide habitat (such as foraging habitat and potentially roosting habitat) for listed threatened species including Microbats and Glossy Black Cockatoos.
- Area of the VMP zone is 25m back from centre line. This is 1200m^2. The area available for planting is 1050m^2.
- Plants include all strata and average at 5 plants per m^2 equating to a total of 6000 plants including addition for the swales increased surface area. There will be an average of 1 tree ever 10m^2.
- Edge plants are suitable for wet/dry and have a low to mid-level hydraulic roughness.
- Nest boxes (x 2 one bat one parrot) are required to keep habitat during plant establishment. A habitat log is to be retained from tree felling and secured, in the VMP area so it can't wash away.

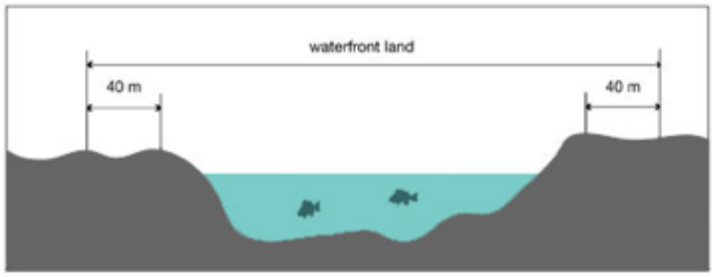
Recommendations

Key recommendations of this VMP include:

- Planting locally native plants of local provenance stock as per this VMP
- On-going weed management,
- Erosion management,
- Reporting and monitoring as per schedule,
- Recommendations have been costed for a 5-year VMP.

Glossary

- **Controlled activity:** Controlled activities are certain types of activities which are
  i) carried out on waterfront land, and
  ii) defined as a controlled activity in the Water Management Act 2000.
  'Waterfront land' as per the Water Management Act definition means the bed of any river, lake or estuary, and the land within 40 metres of the riverbanks, lake shore or estuary mean high water mark.



Examples of controlled activities relevant to this VMP and Riparian Plan include:
i) modifications to a watercourse, such as erosion control works
ii) construction of stormwater management devices, outlets and spillways

- **Controlled activity approval**: A controlled activity approval confers a right on its holder to carry out a specified controlled activity at a specified location in, on or under waterfront land. Waterfront land as defined in the Water Management Act 2000. A controlled activity approval is as per Chapter 3, Part 3, Division 1, Section 91. There are two kinds of activity approvals, namely, controlled activity approvals (for works in 40m of a waterway) and aquifer interference approvals (not relevant here). https://www.dpie.nsw.gov.au/water/licensing-and-trade/approvals/controlled-activity-approvals/what/how-to-apply

- **Cycleways and paths:** Cycleways or paths no wider than four metres total disturbance footprint can be built in the outer 50 per cent of the VRZ.

- **Detention basins:** As per the Guidelines detention basins can be built in the outer 50 per cent of the VRZ or online where indicated. Refer to the Office of Water's Controlled activities. Guidelines are that basins are to:
  - be dry and vegetated
  - be for temporary flood detention only with no permanent water holding
  - have an equivalent VRZ for the corresponding watercourse order
  - not be used for water quality treatment purposes.

  DPE: NSW Dept of Planning and Environment –for Controlled Activity Approvals (work in waterfront land).

- **Guidelines for Riparian Corridors**

  https://www.industry.nsw.gov.au/__data/assets/pdf_file/0003/160464/licensing_approvals_controlled_activities_riparian_corridors.pdf

- **Guidelines for Vegetation Management Plans**

  https://www.industry.nsw.gov.au/__data/assets/pdf_file/0006/160467/licensing_approvals_controlled_activities_veg_mgt_plans.pdf

- **Guidelines for instream works on waterfront land**

  https://www.industry.nsw.gov.au/__data/assets/pdf_file/0018/160461/licensing_approvals_controlled_activities_instream_works.pdf

- **Guidelines for outlet structures on waterfront land**

  https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/160463/licensing_approvals_controlled_activities_outlet_structures.pdf

- **Guide to preparing a Vegetation Management Plan within the Campbelltown Local Government Area**

  file:///C:/Users/Kingfisher/Downloads/MRVegetationManagementPlan.pdf

- **Riparian:** terrestrial land alongside a waterway
- **Vegetation Management Plan:** A VMP is intended to assist land managers and/or owners in managing the impacts of development (planned, previous or existing), in order to protect existing bushland and habitat from disturbance and/or remediate impacts from development activities. A VMP outlines the objectives, techniques and actions specific to the management of vegetation on site.
- **Water Management Act 2000:** The name of the legislation (Act) governing water management in NSW with the current version being 1 November 2019.
  https://legislation.nsw.gov.au/#/view/act/2000/92
- **Stream order:** The watercourse order as classified under the Strahler System based on 1:25,000, 1:50,000 or 1:100,000 topographic maps whichever is the smallest scale available. See extract from the Water Management Act (2012) below.

Riparian corridor widths

The Officer of Water recommends a VRZ width based on watercourse order as classified under the Strahler System of ordering watercourses and using current 1:25 000 topographic maps (see Figure 2 and Table 1). The width of the VRZ should be measured from the top of the highest bank on both sides of the watercourse.

Figure 2. The Strahler System

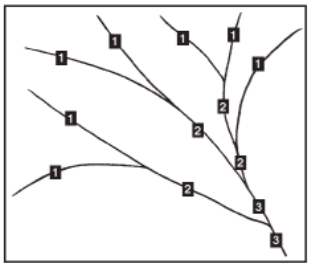


Table 1. Recommended riparian corridor (RC) widths

Watercourse type	VRZ width (each side of watercourse)	Total RC width
1st order	10 metres	20 m + channel width
2nd order	20 metres	40 m + channel width
3rd order	30 metres	60 m + channel width
4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

- **Suitably Qualified person:** the definition from DPE and Campbelltown City Council are covered by the following minimum requirements: i) a tertiary degree in Natural Sciences and/or a Certificate IV in Conservation and Land Management ii) a minimum of 500 hours practical bushland regeneration. Brief CVs of authors are provided with this Plan.
- **Vegetated riparian zone (VRZ):** The required width of the VRZ measured from the top of the high bank on each side of the watercourse.
- **Riparian corridor (RC) off-setting for non-RC uses:** non-riparian uses, such as Asset Protection Zones are allowed within the outer 50 per cent of the VRZ, so long as offsets are provided in accordance with the averaging rule as seen in Figure 2-7.
- **Subject site**: General term for 20-22 Macpherson St, Warriewood which the riparian works will occur.
- **Stormwater outlet structures and essential services:** Stormwater outlets or essential services are allowed in the RC. Works for essential services on a fourth order or greater stream are to be

undertaken by directional drilling or tied to existing crossings. Refer to the Office of Water's Controlled activities. *Guidelines for laying pipes and cables in watercourses* and *Controlled activities. Guidelines for outlet structures.*

- **Stream realignment:** Indicates that a watercourse may be realigned. Refer to the Office of Water's *Controlled activities. Guidelines for instream works.*
- **Road crossings:** Indicates permitted road crossing methods. Refer to the Office of Water's *Controlled activities. Guidelines for watercourse crossings* and NSW DPI policy and guidelines for fish friendly waterway crossings for Class 1 and 2 waterways

1 Introduction

1.1 Riparian Vegetation Management Plan Preparation

This Riparian Vegetation Management Plan (VMP) applies to the site identified as 53A Warriewood Road, Warriewood NSW 2102. This Riparian VMP has been prepared to satisfy the DCP Controls of Northern Beaches Council (Warriewood Valley) and NSW Department of Primary Industries (DPI) Office of Water guidelines, including but not limited to:

- *Guidelines for vegetation management plans on waterfront land* 2012,
- *Guidelines for riparian corridors on waterfront land* 2012, and
- *Guidelines for controlled activities on waterfront land* 2018.

The guidelines for vegetation management plans on waterfront land and the associated section in this report are outlined in Table 1.1.

Table 1.1 Guidelines for a VMP

Source: *Guidelines for vegetation management plans on waterfront land* (DPI Office of Water 2012)

Criteria	Included
An appropriate width for the riparian corridor should be identified by consulting either the development consent, the relevant environmental planning instrument or the NSW Office of Water guidelines for riparian corridors. The VMP should consider the full width of the riparian corridor and its functions including accommodating fully structured native vegetation.	Y
Maps or diagrams which clearly identify the riparian corridor; the existing vegetation; the vegetation to be retained; the vegetation to be cleared; the footprint of construction activities; and areas of proposed revegetation etc. should be prepared.	Y
The location of the bed and banks or foreshore of waterfront land and the footprint of the riparian corridor should be clearly identified. Vegetated riparian zones must be indicated.	Y
Photographs of the site should be supplied and photo points should be identified. To assist with future monitoring and reporting requirements, the photo points should be identified by GPS coordinates or by survey. This is particularly important for large scale earthworks or extractive industries.	Y Note PMP will be with first report
Measures for controlling long term access and encroachments (bollards, fences, etc.) into the riparian corridor should be identified.	Y
Vegetation species composition, planting layout and densities should be identified. The required mix of plant species relates to the actual community to be emulated and the size of the area or areas to be rehabilitated but mature vegetation communities	Y

Criteria	Included
are generally well structured, comprising trees, shrubs and groundcovers species. Planting densities should achieve quick vegetative cover and root mass to maximise bed and bank stability along the subject watercourse.	
Costs associated with high density planting will be recovered through reduced maintenance costs for weeding or replacement planting in the maintenance period specified in the controlled activity approval (CAA).	Y
Seed or plant sources should be identified. Where possible, native plants and seed sources of local provenance should be used.	Y
Exotic vegetation should be avoided. The use of exotic species for temporary soil stabilisation is permitted provided they are sterile, non-invasive and easily eradicated when permanent vegetation is established.	Y
Details of the planting program, rehabilitation methods and staging should be provided. Techniques such as hydro-seeding, direct seeding, brush matting or assisted natural regeneration may be considered.	Y
Maintenance requirements should extend for a minimum of two years after the completion of works or until such time as a minimum 80 per cent survival rate of each species planted and a maximum 5 per cent weed cover for the treated riparian corridor controlled activity is achieved.	Y
Project tasks should be defined and described, including a schedule detailing the sequence and duration of works necessary for the implementation of the VMP.	Y
Costings for the implementation of all components and stages of the work including materials, labour, watering, maintenance which includes plant replacement, monitoring and reporting should be prepared.	Y
Processes for monitoring and review, including a method of performance evaluation should be identified. This should include replacing plant losses, addressing deficiencies, problems, climatic conditions and successful completion of works.	Y
Regular reporting on the implementation and status of works covering progress, success or failures and completion should be provided. The number and duration of reporting periods will be identified in the CAA. Works as executed plans and reports detailing how the components of the VMP have been implemented will be required prior to the release of any security held by the NSW Office of Water.	Y
Security such as bank guarantees may be required before a controlled activity involving the implementation of a VMP is commenced. The amount of security is usually based on the costings provided.	N/A

1.2 Aims and objectives

The aim for this Riparian VMP is to provide a working document that will successfully protect, maintain and enhance the riparian vegetation onsite both for immediate restoration and rehabilitation purposes and for maintenance of the riparian corridor long-term. This VMP details recommendations relating to site restoration and rehabilitation fulfilling the requirements of the guidelines outlined by the DPI Office of Water.

The riparian vegetation on the site identified as 53A Warriewood Road, Warriewood NSW 2102 is covered by this VMP. The authors Geraldene Dalby-Ball and Brooke Thompson have over 25 years' experience in ecology projects and large-scale environmental restoration activities in Sydney and are familiar with the requirements of a VMP.

The objectives of the VMP are to ensure that biodiversity values onsite are improved and maintained. The overarching objectives of this VMP include, but are not limited to:

- conserve and preserve the existing native vegetation,
- undertake rehabilitation activities in the riparian zone,
- undertake native vegetation protection measures,
- restore native vegetation such that the vegetation onsite reflects the cover, diversity and density of the Indigenous vegetation, and
- provide education material to promote responsible management of the riparian corridor.

The information in the following sections ensure that the objectives of the VMP are achieved.

1.3 Legislation and policies

The implications for the VMP are assessed in relation to key biodiversity legislation, policy and guidelines and include the following:

- *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act),
- *Environmental Planning and Assessment Act* 1979 (EP&A Act),
- *Biodiversity Conservation Act* 2016 (BC Act),
- *Local Land Service Act* 2013 (LLS Act),
- *Biosecurity Act* 2015,
- *SEPP Resilience and Hazards*
- *Guidelines for vegetation management plans on waterfront land* 2012,
- *Guidelines for riparian corridors on waterfront land* 2012, and
- *Guidelines for controlled activities on waterfront land* 2018.

2 Site Description

2.1 Identification and description of the site and surrounds

The site identified as 53A Warriewood Rd, Warriewood (Lot 2 DP 1115877) is located within the Northern Beaches Council LGA, 31.7 kilometres northeast of the Sydney CBD. The site fronts Warriewood Road. The primary land use of the site is residential. Narrabeen Creek runs adjacent to the southwestern boundary of the property. This waterway runs south to join Mullet Creek which leads into Narrabeen Lagoon. The bushland surrounding the site forms part of the riparian vegetation community that lines this creek.

Table 2.1 Site administrative information

Category	Details
Title reference (Lot/Section/Plan No)	2/-/1115877
Area (m^2)	9,251 m^2
Street address	53A Warriewood Rd, Warriewood NSW 2102
LGA	Northern Beaches Council
Land zoning	R3 – Medium Density Residential

2.1 Site features

The site is largely cleared and is comprised of a raised terrace made up of exotic grass and tree species with evidence of previous modification. The rear of the property descends into a soak area adjacent to the creek line behind the property. This contains a greater variety of grass and sedge species containing both native and exotic species due to its high-water content, however habitat and vegetation condition remains poor with the presence of abundant weed species.

The existing habitat does not meet the required benchmark conditions for any PCT. PCTs Northern Paperbark-Swamp Mahogany Saw-sedge Forest (4006) and Estuarine Swamp Oak Twig-rush Forest (4028) are mapped on either side of the site. The 428 is the Forested Wetland that makes up the SEPP Coastal Wetland. The 4006 is a small patch (50m x 30m) in the neighbouring riparian area.

2.1 Site context

The site is within Garimaigal Homelands, and this area is currently known as the Warriewood Valley. Two main creek lines, Narrabeen and Fern are within the main development area and Mullet is to the South and runs along the edge of Warriewood Wetlands (Figure 1.1). This site (red outline) backs onto Narrabeen Creek.

Figure 2.1 Site in surrounds.

Source: NearMap

Figure 2.2 Site location

Source: NearMap Accessed March 2025

2.1 Catchment context

Narrabeen Creek (1st order creek) runs adjacent to the southern boundary of the site (Refer to Figure 2.4) and continues south to enter Mullet Creek (1st order creek) that leads to South Creek (4th order creek) also known as Narrabeen Lagoon.

The vegetated riparian zone width, as per the DPI Office of Water, for 1st order watercourses is 10 metres on each side of the watercourse. The NBC DCP is for 25m inner zone and 25m outer zone. Refer to Figure 2.5.

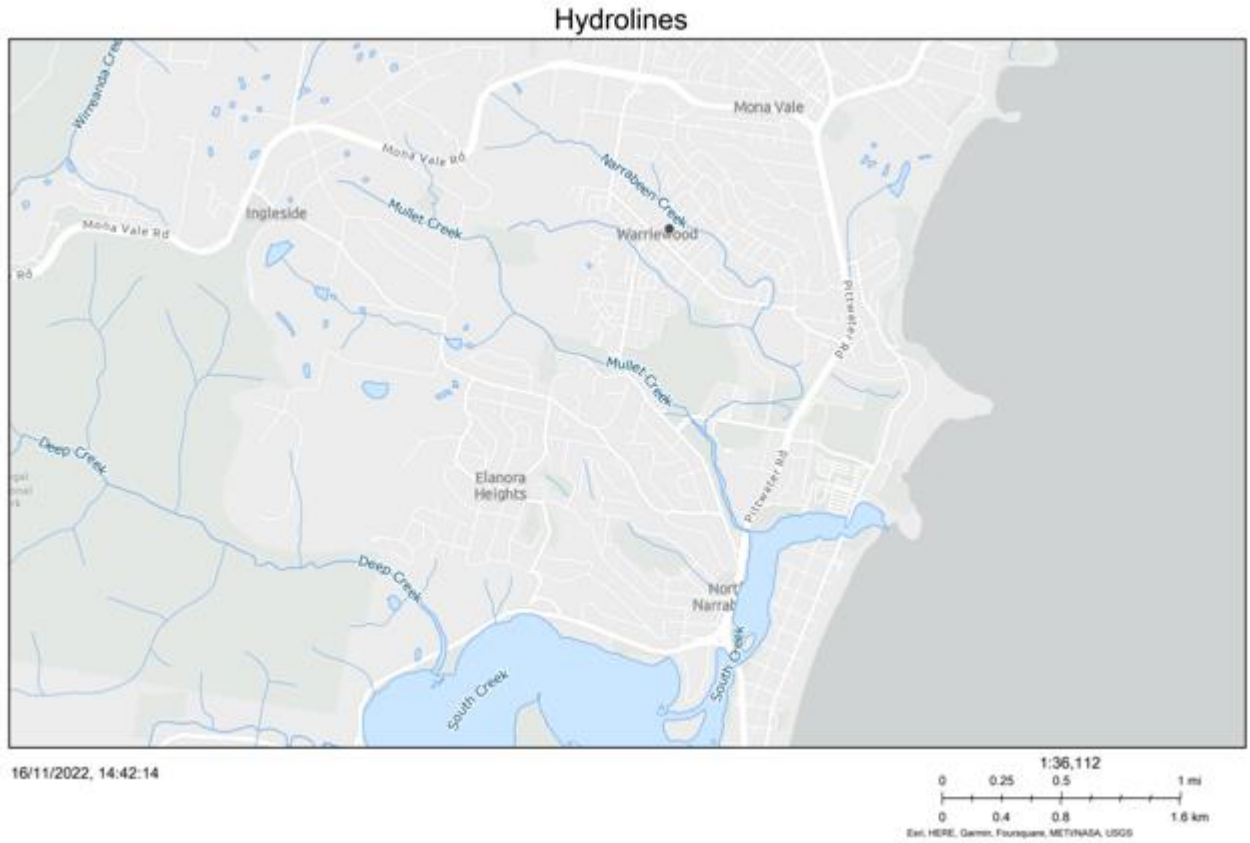
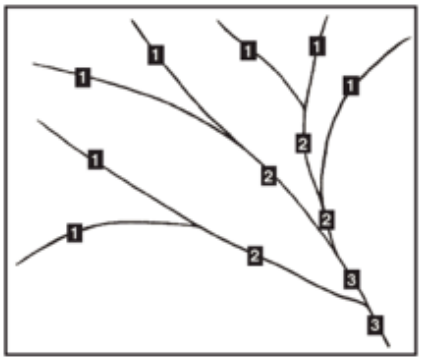


Figure 2.3 Hydrolines surrounding the site (black dot).

Source: Water Management (General) Regulation 2018 Hydro Line spatial data

Figure 2. The Strahler System



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3rd order	30 metres	60 m + channel width
4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

Figure 2.4 Strahler system and recommended riparian corridor width

Source: Guidelines for riparian corridors on waterfront land – Department of Primary Industries Office of Water July 2012

Figure 2.5 Hydrolines surrounding the site (black dot)

Source: Water Management (General) Regulation 2018 Hydro Line spatial data

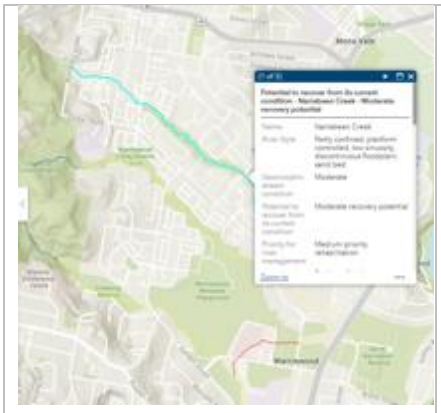
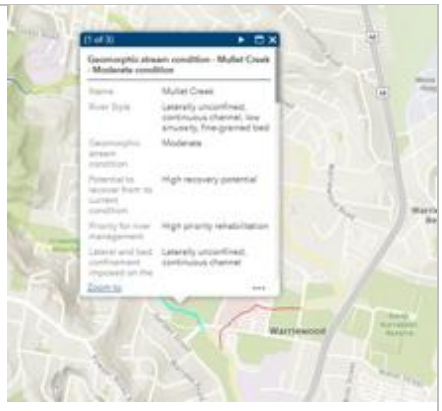
		
Narrabeen Creek	Fern Creek	Mullet Creek

Figure 2.6 Hydrolines of the 3 creeks in the vicinity of the site

Source: Water Management (General) Regulation 2018 Hydro Line spatial data

2.2 SEPP Resilience and Hazards

The VMP site is within the buffer of Coastal Wetland as per mapping under the SEPP Resilience and Hazards shown in Figure 2.7. The light blue line is the buffer edge. Impacts on this area are covered in the SEPP Resilience and Hazards Report (March 2025). Conclusions from that report are no significant impact is expected on the Coastal Wetland based on the indicative data of ground water levels not being impacted by the creek edge reshaping. Noting too the swale has been designed to infiltrate water back to ground as well as directing to the creek. On-site storm water management aims to capture and slow water so there is infiltration in the outer and inner 25m corridors.

Figure 2.7 SEPP Resilience and Hazards – Wetland

Figure 2.8 SEPP Resilience and Hazards – Wetland Site close up

2.3 Ground Water

Mapping of Groundwater Dependent Ecosystems (GDE) shows the surrounding mapping PCT are GDE with a category of medium See extract for PCT 4006 in Figure 2.8. This is to be expected and will be the same on the site – once it is replanted. The lack of mapping at the moment is due to there no being sufficient native species to refer to it as an ecosystem.

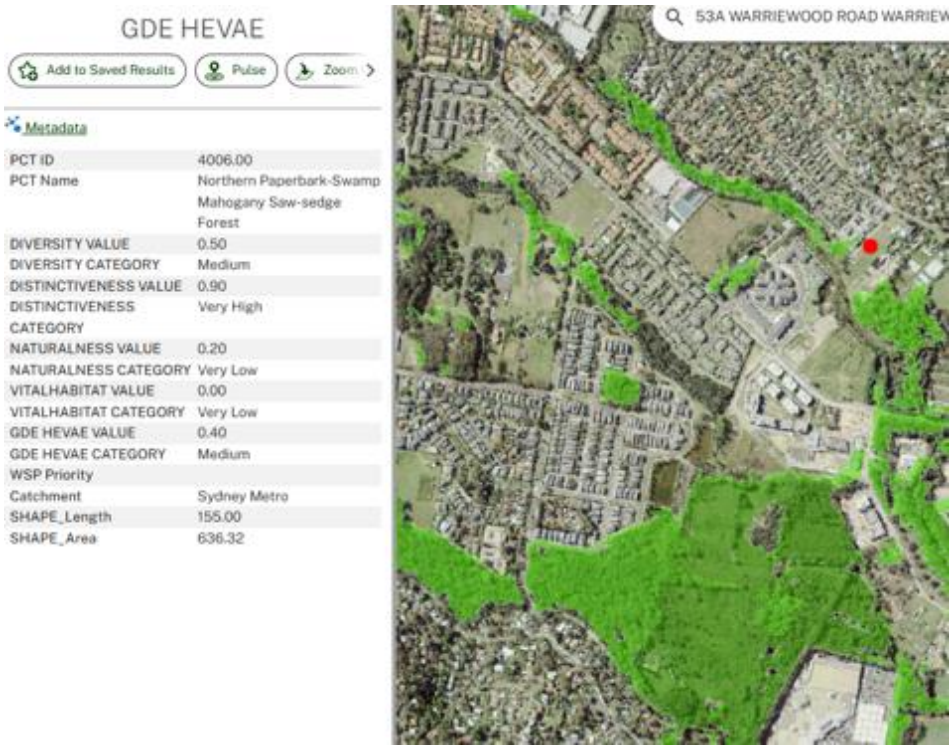


Figure 2.9 Groundwater Dependent Ecosystems (GDE) mapping near the site. This colour code is medium.

3 Site Assessment

3.1 Vegetation

A review of the most up-to-date vegetation mapping, indicate no PCT within eh site boundaries however they are on each side of the site. A small area of 4006 is west of the site *Northern Paperbark-Swamp Mahogany Saw-sedge Forest* and a larger area of PCT 4028 *Estuarine Swamp Oak Twig-rush Forest* is to the East. This eastern vegetation joins the mapped Coastal Wetland (SEPP resilience and hazards). Both PCTs are part of the EEC Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. Both species have informed the species selection for the VMP planting.

Table 3.1 Table of vegetation community synonyms as per NSW and Commonwealth legislation

NSW	PCT Name	BC Act 2016	EPBC Act 1999
PCT Code 4006	Northern Paperbark-Swamp Mahogany Saw-sedge Forest vegClass Coastal Swamp Forests	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions Status: Endangered Ecological Community (EEC) https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2004-2007/swamp-sclerophyll-forest-coastal-floodplains-endangered-ecological-listing	No associated TEC
4028	Estuarine Swamp Oak Twig-rush Forest vegForm Forested Wetlands vegClass Coastal Floodplain Wetlands		No associated TEC

Figure 3.1 Mapped PCT either side. PCT - 4006 Northern Paperbark-Swamp Mahogany Saw-sedge Forest and 4028 Estuarine Swamp Oak Twig-rush Forest. None mapped on the site.

The existing habitat and vegetation do not meet the required benchmark conditions of the vegetation community in the vicinity of the site.

The vegetation onsite makes up part of the riparian vegetation/habitat corridor lining Narrabeen Creek and adjoining vegetation in surrounding areas. Refer to Figure 3.2

Figure 3.2 Vegetation/habitat corridors surrounding the site. Site yellow star.

Source: Nearmap

3.2 Current condition

The site is largely cleared with few scattered Swamp Oak (*Casuarina glauca*). The creek is dominated by exotic species, including highly invasive *Ludwigia peruviana* and Coral Trees. The rear of the site descends into a soak area adjacent to the creek. This area consists of a variety of grass and sedge species containing both native and exotic species due to its high-water content. Habitat and vegetation condition remains poor with the presence of high threat exotic (HTE) weeds.

The site shows evidence of disturbance and vegetation removal due to the high percentage of exotic turf species. The depressed area at the rear of the property holds a high-water content, and as a result, contains a mix of largely exotic gras and sedge species with some native species present. The site does contain some native trees along the eastern border, however exotic trees have also been planted.

Weed invasion and sediment transport are the primary threats at the site, due to the existing presence of some weed species and the slope of the site which includes a creek that runs behind the property. The mitigation measures outlined in this report will be implemented to reduce the likelihood of these factors causing further degradation to the site.

3.3 Weeds

The following weeds of significant importance were identified within the site during the site assessment. Weeds must be controlled as required under the *Biosecurity Act 2015*. Refer to Table 3 Weeds.

Table 3.2 Weeds present in the area with the potential to spread – species on the site in bold

Scientific name	Common name	Legal requirements under the Noxious Weed Act
Asparagus asparagoides	Bridal Creeper	The plant must not be sold, propagated, or knowingly distributed
Asparagus aethiopicus	Asparagus fern	The plant must not be sold, propagated, or knowingly distributed
Cestrum parqui	**Green Cestrum**	**The plant must not be sold, propagated, or knowingly distributed**
Cortaderia sp.	Pampas grass	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Lantana camera	**Lantana**	**The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread**
Ludwigia peruviana	**Peruvian Primrose**	**The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread**
Ligustrum lucidum	Broad-leaf Privet	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Ligustrum sinense	Small-leaf Privet	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Ipomoea purpurea	Morning Glory	Environmental Weed
Opuntia sp.	**Prickly Pear**	**The plant must not be sold, propagated, or knowingly distributed**

3.4 Site photos

The following photos were taken during the August 2022 site inspection. Plates display the vegetation condition on the site.

Plate 1. Site closest to the creek in the foreground and neighbouring property with exotics including Arundo and coral trees on the neighbouring property

Plate 2. Coral trees on creek edge.

Plate 3. The immediate creek line is exotic species practically coral trees large leaf privet and annual weeds. Swamp Mahogany species present as are Swamp She Oaks in low number.

4 Proposed development and associated works

The proposed development is for a multi-lot subdivision (Figure 4.1) with associated infrastructure and a 50m multi-use corridor made up of an inner 25m fully vegetated riparian corridor and an outer 25m mixed use native species landscape and access zone.

Figure 4.1 Proposed development is for a multi-lot subdivision

Works include the reestablishment of a 50m creekline corridor with an inner 25m fully vegetated and the outer 25m integrated with the riparian vegetation and also having landscaped features and multi-use access (Figure 4.2). The creekline works are covered in the Vegetation management plan for the site and the outer 25 metre area is addressed in the landscape plan for the site.

Figure 4.2 50m creekline corridor with inner 25m fully vegetated

A number of iterations to manage the stormwater have occurred including designs for wetlands and rain gardens however due to other site constraints these have not been possible on the site. This has low environmental impact as there is no wetland being lost and there are other open water bodies in the vicinity. Both the proposed vegetated swale and the proposed headwalls have included provision for habitat enhancement for frogs and small reptiles. The swale for the carriage of water to the creek will be fully vegetated with locally native species, mostly sedges and rushes. The location is shown in Figure 4.3.

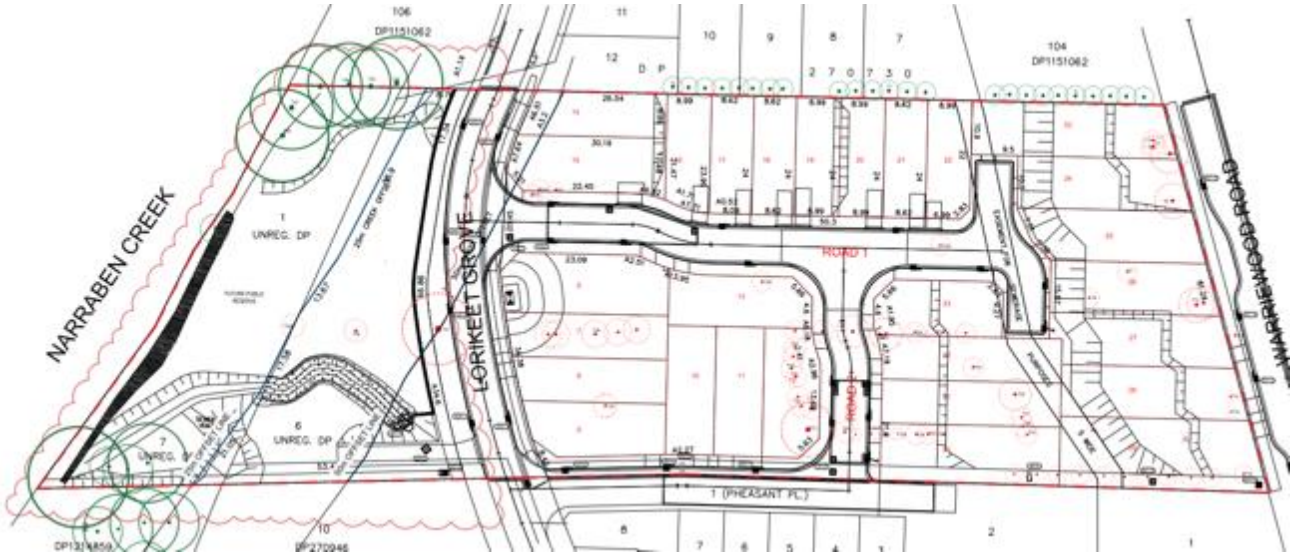


Figure 4.3 Proposed vegetated swale. Existing native trees shown by green circles.

4.1.1 Inundation, levels and species selection

An existing retaining wall is located along the creek embankment, and this is to be removed, and levels lowered, to allow for additional flood storage through the inner and outer Creekline corridor.

The creek embankment is proposed to be reinstated with a 1 in 3 batter and rock armouring as per WVLMDG. This is shown on the revised engineering set of plans.

Due to the lowering of levels within the inner and outer creek line corridors, some loss of native vegetation is expected. All proposed vegetation within the inner/outer Creekline corridors will be to Council's specifications.

Revised Civil Engineering Plans are provided in the DA package have amended the creek line embankment works. Specifically, it is proposed to reinstate the creek line embankment and provide rock armouring for a significant portion of the creek within the site. Further details of the works will be provided as part of the Subdivision Works Certificate. No retaining walls are proposed along the length of the creek.

The Engineering team have worked with the ecologist in an effort to retain native trees on the bank. Numerous iterations of designs have been trials to Avoid impact. No design that avoids tree removal fulfilled the flood storage capacity requirements. Minimising impact has been applied throughout the 25m zone. XX native trees still require removal. Seed has been collected (and more will be). This local seed is being used to propagate trees to be planting back into this area. The seed collection and planting are part of the Mitigation measures. In the case of the creekline bank it has not been possibly to Avoid impact and remove the existing vertical wall or create the necessary levels drop in levels. The process of Avoid,

Minimise, Mitigate is in the Biodiversity Report. Recommendations are detailed in this VMP as this is the tool to have the diversity and abundance of native species returned.

Species selection and location for planting has taken into account the hydraulic roughness of vegetation and flood storage capacity. The ecological outcomes can be achieved while facilitating the hydrological requirements providing there is a full riparian vegetation selection and staging of zones back from the predicted typical creek edge. This is what has been provided in the concept planting plan for the inner 25m.

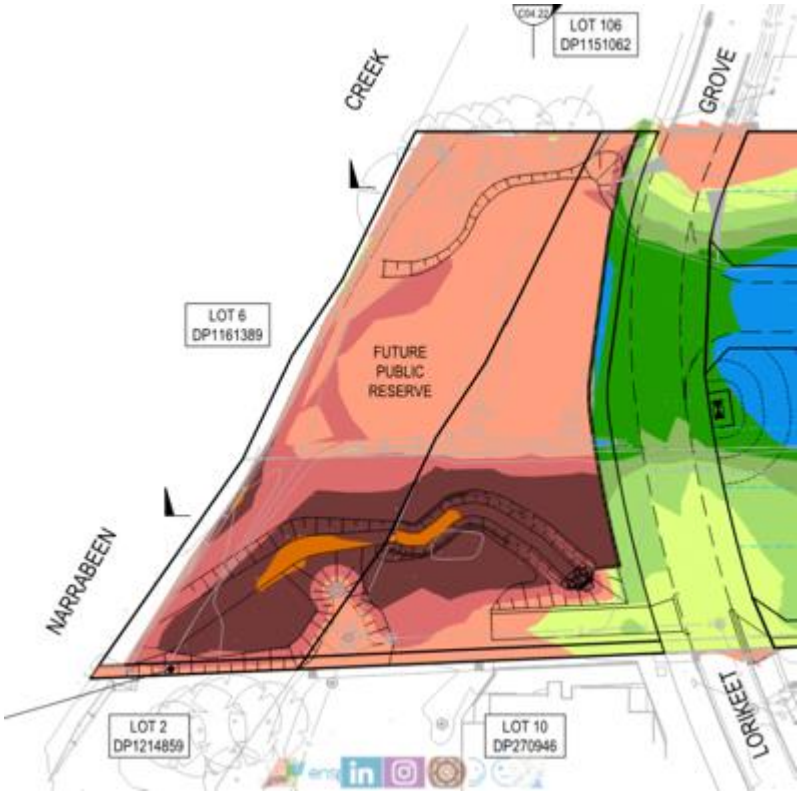
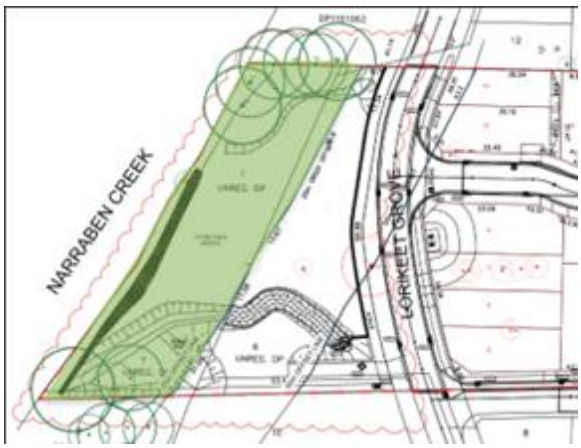


Figure 4.4 Riparian area (inner and outer – oranges) showing areas of predicted flood storage. See Flood modelling for event sizes and frequency.

5 Management Actions and Monitoring

Due to the size of the site and available area for revegetation, only one management zone has been allocated – this is the full inner 25m. This area is shown in the Figures in section 4 and the extract here from Figure 4.3, shaded green.



The full area is approximately 1200m^2 as can be seen in Figure 5.2. As this include the centre line of the creek it is larger than the area for planting. Planting area is shown on Figure 5.3 and starts at the existing creek bank.

Planting will be incorporated into the creek toe stabilisation and the head-wall and stormwater swale. Note the stormwater swale has the ecological characterise of a low-flow creek in a riparian zone, will be fully vegetated and thus is included in the riparian area calculation. Maintenance access has been designed in via the planting of robust, low-growing sedges and grasses such that the swale can be accessed for clearing out if required.

The outer 25m has been covered in the Landscape Plan (March 2025). Species selection being from the WWV DCP Landscaping list.

The VMP zone is the inner 25m as shown in Figure 5.1 (full VMP area overlaid on aerial) and 5.2 (planting area overlaid on aerial).

Figure 5.1 Full VMP area overlaid on aerial 1200m^2

Source: Nearmap

Figure 5.2 VMP area to the current, typical, creek edge overlaid on aerial 1050m^2

Source: NearMap

The objectives within the inner 25m are for reinstating the ecological integrity of the zone, flood storage in high-flow events and carriage of water in the lower part of the 25m during higher flow events. The inner 25 connects directly with the outer 25m. The outer includes the APZ, partial road, multiuse access track and native landscaping.

This VMP has provided the actions required to reinstating the ecological integrity of the zone, taking into consideration the other requirements.

Planting density includes the proposed swale, and additional plants have been added to the count to take into consideration the increase surface area of the swale.

Proposed activities within the management zone include but are not limited to:

1. Commission and secure locally provenance native species as per this VMP.
2. Installation of nest boxes (x2).
3. Native trees approved for removal to be cut and retained as future ground habitat.
4. Machinery removal of weed mass.
5. Retention of topsoil – stockpiles and weed treated.
6. Laying soil (site and imported) and placement of habitat logs.
7. Swale created and the all rockwork and headwalls completed.
8. Decompaction – ripping.
9. Identify and mark the APZ
10. Installation of Environmental Zone signage and bunting flag demarcation from landscape area.
11. Irrigation set up and irrigate to get weed seed germinating if present
12. Follow up weed treatment for at least 6 weeks post ripping
13. Mulching with leaf mulch and jute matting in areas that may be inundated with high-flow events during the establishment period (9 months). Areas with Jute to have leaf mulch included in the soil and mixed prior to spreading.
14. Irrigate mulch (if not sufficient rain to stimulate weed seed germination)
15. Weed treatment at least 6 weeks post mulching.
16. Native species planting in jute areas can be immediately after placement. Into mulch areas after the 6 weeks for weed treatment (if needed).
17. Irrigate as needed for high survival rate.
18. Photo monitoring points (PMP) set
19. First report of what has been planted (species and numbers) report including PMP and recommendations.
20. On-going maintenance such that the native species success and low weed targets are met.
21. Monitor and report at 3, 6, 12 months then annually for 5 years. Report including PMP and recommendations and outcomes relative to targets.
22. Targets and outcomes attained with flexibility for adaptive management given the dynamic nature of riparian environmental.

5.1 Management tasks

5.1.1 Restoration activities

5.1.1.1 Plant Ordering and Species

Plants to be order with 12 months advanced noticed (or as much as possible). Any species substitutions to be reviewed by the VMP author. Plant list is provided in Appendix IV.

5.1.1.2 Delineation of Work Areas

During the construction, impact to the site and the adjacent vegetation should be reduced by the delineation of work zone areas. The access to the site would be best restricted to the development footprint only. An exclusion zone should be established for the vegetation outside the work areas.

5.1.1.3 Tree Protection

Tree protection will be consistent with the Arborist report. The main trees to be managed are the trees within close proximity to the Earth works. NB see final Arborist report for details of works and tree numbers.

5.1.1.4 Primary Weed Removal

Weed species are present within the management zone. Most weeds on-site are woody or fleshy in nature. It is recommended that larger woody weeds are poisoned via cut and scrape techniques before their removal, while small weeds can be sprayed with a combination of non-selective and selective herbicides prior to planting. Machinery will be reshaping this section and can remove weeds with machines for the primate works stage.

All works within a TPZ must be done by hand.

Prior to planting all weeds to be eradicated from this zone.

5.1.1.5 Maintenance Weed Works

Ongoing maintenance of the management zone is essential, otherwise it may result in increased weed growth within the site. All bush regeneration activities requiring the use of chemicals must be performed in accordance with the *NSW Pesticides Act 1999*. Herbicides must not be applied whilst exotic plants are setting seed. The weed removal program aims to be broad in approach and sustained in application to provide the best possible conditions for natural regeneration and to control weeds within the site.

Post planting performance targets for weed species include:

- Biosecurity Weed density to 2% or less; and
- All other weed density to under 10%.

Examples of control methods for several different weed types are in the Weed Removal Methods table.

Weed Removal Methods

As part of the VMP, weed removal methods have been provided and tailored specifically to the site. Along with traditional bush regeneration techniques, thermal weeding has been recommended in controlling non-

seeding annuals and grasses. Thermal weeding may stimulate natural regeneration and germination of native species as well as achieving ecological burns. An experience bush regeneration company with knowledge of riparian vegetation is to undertake the works. They will know the appropriate methods. Refer to Table 5.1 Weed Removal Methods. Aquatic Weeds are highlighted as those doing the work will need to know these and how to manage them – these are likely to be persistent in piece and seed on the wet edge.

Table 5.1 Weed removal methods – for in TPZ or follow up noting early works by machinery

Weed type	Primary control treatment	Follow up control	Maintenance post-planting	Disposal
Aquatic weeds including Alligator Weed and Ludwigia – both on-site.	Hand dig/pull juvenile plants. Contact your local weed officer if you require a permit to spray near water.	Hand pull.	Monitored and carried out regularly for a period of five years from the date of final planting.	Bag and remove from site.

Note: [1] Some weeds will have different treatment requirements i.e., *Ochna serrulata* requires scrape and paint on one side with stem width less than 2 cm thick, scrape and paint both sides from root to 2/3 up the stem >2 cm thick. *Ligustrum s*pp. and Lantana are treated with cut and paint.

[2] After drill and inject treatment, the plant usually will drop its leaves within six weeks and dies within a few months. Monitor the plant and if it re-sprouts, the process will need to be repeated. Drill around the base of the tree and on exposed lignotubers less than 20mm apart and as deep as possible.

[3] If hand pulling/dig, ensure all reproductive parts of the plant e.g., corms, tubers and rhizomes are removed.

Refer to Appendix I for more details on Bush Regeneration Techniques.

5.1.1.6 Revegetation Activities

Restoration activities aim to establish a community which reflects that of a Coastal Flats Swamp Mahogany Forest/ Coastal Freshwater Swamp Forest community and draws on the species of the PCTs on each side of the site.

The management zone should be planted with local wetland species that are suitable to tolerate the saturated conditions on the site to ensure maximum recruitment. This should include a mix of canopy, shrubs, and clumping grasses/ groundcover species. Planting is to occur during the Spring, if possible, with Autumn planting reserved as backup. Restoration planting should only occur once all weed species are removed.

Refer to Appendix V for the Recommended Planting List for the site.

The management zone covers an area of 1,050 m^2.

Planting density for the vegetation community on-site has been calculated as 5 plants per m^2.

Estimated number of tube stock required is 6000 – taking the swale increase area into account.

Planting pattern to mimic a natural bushland configuration and species placement to be in keeping with predicted inundation.

Species will be in 3 groupings. The grouping are showing the image below. The swale will run across all 3 and be the same species as in the blew zone.

Blue zone is wet edge, and main species are Gahnia and Carex and typical wet edge and understory species.

Yellow zone is shrubs and trees typical of the neighbouring PCTs (a gradation between those on either side).

Green canopy, shrub and linkage with the Landscaped outer 25m and intergrading with the Inner Protection Area (bushfire).

It is expected that natural recruitment of native species will occur within the management zone after 1-3 years. She Oaks and Cheese trees are expected first then the existing Swamp Mahoganies will have successful recruitment once the weeds are managed.

Definitions relating to Plant Supply

***Locally Native**: Locally native (local provenance stock) refers to the area the stock is collected from, i.e., being within the area that the natural pollinators and / or natural dispersal agents would be expected to move in usual circumstances.*

***Stock:** Nurseries supplying locally native plants have been included in Appendix III.*

***Diversity:** Plants recommended here include a wider diversity than expected. A wide range has been provided to ensure a diversity of locally native plants is available and then established in the restoration area. Table 3 summarises the minimum diversity (number of different species) of each plant type (ground, vines, shrubs, & trees).*

***Size:** All plants can be Hikos (50mm) and or Forestry tubes (75mm).*

***Bushfire Protection:** Planting densities should adhere to any Bushfire Protection requirements for the site. This may result in lower planting densities or modified planting schedules in areas which are identified as Asset Protection Zones.*

5.1.1.7 Ripping

After Earthworks the soil will be compacted and ripping is required and can be implemented by light mechanical tillage of the ground surface, via a rotary hoe or ripper implement on a tractor. Soil to be ripped to a depth of 20 to 50 cm and include the mixing of organic soil, original weed treated topsoil and eucalyptus leaf-mulch.

Where the ground is sloping, the rip lines are to follow the bank contour to prevent erosion. Soil disturbance is likely to stimulate weed growth and is to be monitored and treated as part of the maintenance program **pre planting**.

5.1.1.8 Mulching

Mulch from native trees on-site can be stored for use. Mulch can only be used where wash-away into the creek is unlikely. Place sediment fence on the mulch boundary as an interim measure. Closer to the creek have jute matting. Mulch stockpiles, if any, must be kept under 1m in height, must be monitored for the presence of weeds and turned frequently to avoid spoilage. As the site will not contain enough mulch in situ, a native leaf mulch will be imported to the site.

5.1.1.9 Sediment Controls and Organic Layer

Silt and Sediment controls are required prior to and during ripping and during plant establishment.

NOTE THE SITE HAS DISPERSIVE SOIL ORGANIC LAYER IS ESSENTIAL everywhere including under Jute.

The management zone is sloping towards Narrabeen Creek. Due to the slope, immediate measures to stabilise the soil and reduce erosion risk may include slitted jute matting, coir log baffles, and sediment fencing. Thick jute matting will be implemented to stabilise the soil on the bank with the additional benefit of suppressing weed growth. Additional sediment controls may be required throughout the site post primary weeding and soil scarification. The installation of additional soil stabilisation apparatuses (slitted jute matting, coir log baffles, and sediment fencing) will be performed at the discretion of the property owner and/or bush regeneration contractor if necessary.

Sediment and erosion control measures must ensure that no settlement of sediment or silt is to occur within areas of vegetation to be retained. All sediment fences should be retained for as long as practical. If removed, then monitoring is required to ensure flows do not concentrate and cause further erosion. If concentrated flows do occur and/or erosion gullies develop then coir logs baffles are required across the slope.

Table 5.2 Sediment control methods

Sediment control method	Recommendations	Examples of appropriate sediment control method
Slitted jute matting	Slitted jute matting can be place on the bank to stabilise the soil and reduce the likelihood of erosion or sediment transport. MUST HAVE ORGANIC LAYER UNDER not just the existing soil	
Coir log baffles	Coir log baffles should be installed where run off water may increase erosion or sediment transport. Baffles are recommended to be constructed with coir logs that have been staked into the soil. This method will ensure soil is not disturbed and the baffles are secure.	
Sediment fence	Sediment fencing should be installed around any areas of exposed or disturbed soil. Any excavated or cleared areas must be stabilised or covered to minimise the risk of sediment transport occurring.	

5.1.1.10 Secondary Weed Removal

Secondary weed removal will be monthly until plant establishment (9 months minimum).

Then it may be able to be done bi-monthly, considering the life cycles of targeted weed species, with greater effort required in the warmer months when weed growth will be greater.

Secondary weed removal will follow the protocols outlined for primary weed removal, with more of a focus on controlling new weed growth in their early stages to prevent future release of propagules.

5.1.1.11 Natural Regeneration Areas

Natural regeneration on the site will be suitable once initial tube stock plantings become established, and weeds are being consistently maintained. Two methods of natural regeneration are expected to be implemented including assisted and unassisted natural regeneration.

Assisted and Unassisted

Unassisted natural regeneration may be applicable in the final stages of the VMP (3-5 years). Unassisted natural regeneration will be into planted areas. Seed will need to be brought in (assisted) and others will move in from surrounds (unassisted).

Weed removal techniques including thermal weeding, cut and paint, spot spraying, and hand pulling should be used to remove exotics and encourage native seed germination.

5.1.1.12 Plant Replacement

Plant replacement must account for the 10-20% of planted vegetation that is expected to fail. Any plants that fail are to be replaced by another individual of the same species, except for the case that an entire species displays low success rates. In this case, individuals from the same growth form may be substituted. Plant replacement must occur within three months following the death of a plant.

5.1.1.13 Watering

Within two hours of planting, each plant will require 10L of water if the soil profile is moist and 20L of water if the soil profile is dry. It is recommended that an irrigation system is be established within the planting areas. The irrigation system is to be established within each planting area for a total duration of 6 months to ensure adequate watering of establishing plants and to reduce the risk of plant loss.

5.1.1.14 Habitat supplementation

Two nest boxes are required one for microbats, one for parrots. Other significant habitat features including rocks, logs, and leaf litter will also need to be added. This will encourage native animals to use the area including amphibians and reptiles.

5.1.1.15 Maintenance Inspections

Maintenance inspections will be required to determine how the management zone is responding to rehabilitation works, and whether the performance criteria are being met. Maintenance inspections will be performed by comparing the objectives of the VMP to the maintenance information recorded by the property owner and/or bush regeneration contractors. Maintenance inspections must be performed quarterly during the restoration phase, reduced to bi-annually during the post-restoration phase if performance criteria are consistently being met.

Quarterly maintenance inspections at the time of monitoring will including the following:

- **Weeds**: Weeds must be assessed in terms of total weed cover per management zone with average densities of each species provided and updates to treatment recommendations.
- **Pests and disease**: Regenerating areas within the management zone must be monitored for herbivory by exotic and native fauna and the presence of any other disease or infection. The species being impacted must be recorded in addition to the type of pest or disease, proportion of the total individuals being impacted and treatment recommendations.
- **Sedimentation and erosion**: Regenerating areas within the management zone must be monitored for sedimentation and erosion.

5.1.2 Management and mitigation measures

All managed areas should be maintained and monitored for at least five years after last planting completed. Table 4.3 provides a summary of mitigation measures to be implemented with each year of operation of the restoration plan. Mitigation measures or other activities have been divided into three broad phases:

- Pre-restoration works
- Restoration phase
- Post-restoration works

Table 5.3 Summary of mitigation activities associated with each year of operation of the restoration plan

Mitigation Measure	Timing			Frequency	Management Zone	Responsibility
	Pre-restoration	Restoration phase	Post-restoration			
Biodiversity Management						
Define work areas and access paths	✓			Prior to commencement of works and continually maintained	✓	Property owner and/or bush regeneration contractor
Any surplus woody debris to be mulched and reused within the site where appropriate		✓		Throughout all activities	✓	Property owner and/or bush regeneration contractor
Restoration Activities						
Tube stock plantings		✓		Spring plantings recommended	✓	Property owner and/or bush regeneration contractor

Soil scarification	✓			Once	✓	Property owner and/or bush regeneration contractor
Installation of a 75 mm layer of mulch to planted areas and/or in cleared areas to suppress weeds	✓	✓		With plantings or as weed suppression	✓	Property owner and/or bush regeneration contractor
Sediment and Erosion Control						
Implementation of sediment, soil, or water controls	✓	✓	✓	Applied continually and daily	✓	Property owner and/or bush regeneration contractor
Bush Regeneration						
Primary weeding	✓			Once	✓	Property owner and/or bush regeneration contractor
Secondary weeding		✓		Quarterly	✓	Property owner and/or bush regeneration contractor
Weed inspections	✓	✓	✓	Quarterly	✓	Property owner and/or bush regeneration contractor
Maintenance Activities						
Pest and disease monitoring	✓	✓	✓	Quarterly	✓	Property owner and/or bush regeneration contractor
Maintenance weeding		✓	✓	Quarterly	✓	Property owner and/or bush regeneration contractor

Maintenance watering		✓	✓	Initially after planting followed by quarterly deep watering	✓	Property owner and/or bush regeneration contractor
Replacement plantings		✓	✓	Approximately 6 months following initial planting	✓	Property owner and/or bush regeneration contractor
Maintenance inspections		✓	✓	Quarterly	✓	Property owner and/or bush regeneration contractor
Reporting		✓	✓	Annually throughout the implementation of the restoration plan	✓	Ecologist / bush regeneration contractor
Confirmation of completion of key performance indicators			✓	Once all performance criteria have been met including: Biosecurity 5%. Reduction in all other weed density to 10% or less Native vegetation displays a diversity of species from the EEC. Evidence of expansion of native plant cover. Appropriate erosion and sediment control throughout the project.	✓	Ecologist / bush regeneration contractor
Bushland Management Plan						
Development of a bushland management plan as a continual management tool reflecting the aims and objectives of the VMP			✓	Post-maintenance certification	✓	Ecologist

6 Monitoring and Reporting

6.1 Performance criteria

In order to provide an effective method of assessing the success of the VMP, performance evaluation targets such as the following must be provided. Table 6.1 provides a summary of the outcomes to be achieved each year.

Table 6.1 Summary of the outcomes to be achieved each year

Time	Native Plant Species Diversity	Native Plant Cover	Weed Cover
6 months	At least 10 species of native plants included in the plantings. – At least **7** different species from herbs, grasses, and groundcovers, with no more than 25% of any 1 species. – At least **1** different shrub species and no more than 25% of any 1 species. – At least **2** different tree species and no more than 25% of any 1 species.	5-10% tree cover 5-10% shrub cover 15% ground cover	<10%
12 months	At least 10 species of native plants included in the plantings. – At least **7** different species from herbs, grasses, and groundcovers, with no more than 25% of any 1 species. – At least **1** different shrub species and no more than 25% of any 1 species. – At least **2** different tree species and no more than 25% of any 1 species.	10-20% tree cover 10-20% shrub cover 20% ground cover	<10%
30 months	At least 10 species of native plants included in the plantings. – At least **7** different species from herbs, grasses, and groundcovers, with no more than 25% of any 1 species. – At least **1** different shrub species and no more than 25% of any 1 species. – At least **2** different tree species and no more than 25% of any 1 species.	10-30% tree cover 10-20% shrub cover 20-30% ground cover	<10%
Final Criteria	At least 10 species of native plants included in the plantings.	20-40% tree cover 20-30% shrub cover	<5%

Time	Native Plant Species Diversity	Native Plant Cover	Weed Cover
(60 months)	– At least **7** different species from herbs, grasses, and groundcovers, with no more than 25% of any 1 species. – At least **1** different shrub species and no more than 25% of any 1 species. – At least **2** different tree species and no more than 25% of any 1 species. – Unassisted natural regeneration present. – Overall density of 5 plants per m^2 made up of groundcovers, shrub, and tree species. – Groundcovers average 4 per m^2. – Shrubs average 4 per m^2. – Trees average 1 per $16m^2$. – Site displaying signs of Coastal Flats Swamp Mahogany Forest/ Coastal Freshwater Swamp Forest community.	30-50% ground cover >15 large shrubs /trees	

A suitability qualified Ecologist should monitor and report on the condition of the site on an annual basis. The site is too variable and small for BAM plots and the whole area is to be surveyed.

- Ongoing maintenance will be required to ensure that ratios and performance targets are maintained in the long-term.
- Reduction in noxious weed density to 5% or less in all management zones and a reduction in all other weed density to 10% or less in all management zones at the end of the maintenance period.
- Plant replacement must account for the 10-20% of planted vegetation that is expected to fail. Any plants that fail are to be replaced by another individual of the same species, except for the case that an entire species displays low success rates. In this case, individuals from the same growth form may be substituted. Plant replacement must occur within three months following the death of a plant.

6.2 Reporting

To assess the success of the VMP against the established performance evaluation targets, subsequent reporting will be required. This is to include:

- Demonstrated compliance with performance evaluation targets.
- Identification of deficiencies and corrective actions taken to ensure targets are met.
- A photographic record before, during, and after works is to be provided with the final compliance certification.

- Copies of annual reports are to be provided to the Environmental Compliance Officer at Northern Beaches Council.
- Reporting at the completion of the first year should be provided to Council to enable a review and consideration in the development of actions and objectives for the following year. This first-year report also enables an early assessment of the works and suitability of performance criteria.
- Monitoring to be performed by a suitably experienced Ecologist on an annual basis, in consultation and collaboration with the property owner and/or project bush regeneration contractor. Reporting must be performed in association with maintenance inspections to form the primary source of information for monitoring and review reports. Monitoring by the property owner and/or project bush regeneration contractor must occur quarterly during the restoration phase and bi-annually in the post- restoration phase if adequate progress towards performance criteria is achieved. A primary goal of monitoring and reporting will be to provide recommendations to improve compliance.

7 Schedule of Works

The schedule of works will commence on the day of approval from the consent authority. Refer to Figure 6 Schedule of Works.

The VMP is to be implemented for a period of 5 years from date of commencement. Council is to be consulted in the initial review after 12 months on receiving the first annual report.

		Year 1												Years 2-5											
		Month												Month											
Management Task	**Frequency**	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Exclusion Zone	Once and Ongoing																								
Primary Weed Removal	Once																								
Soil Scarification	Once																								
Sediment Controls	Once and Ongoing																								
Revegetation Activities	Once																								
Mulching	Once																								
Watering	6 weeks																								
Habitat Supplementation	Once																								
Secondary Weed Removal	Quarterly and Bi-annually																								
Plant Replacement	Quarterly and Bi-annually																								
Maintenance Inspections	Quarterly and Bi-annually																								
Pre-restoration Phase																									
Restoration Phase																									
Post-restoration Phase																									

Figure 7.1 Overview of Schedule of works for the VMP at 53A Warriewood Rd, Warriewood NSW 2102. Kingfisher 2025.

8 Estimate Costs

The following cost estimates have been provided by a bush regeneration company based on a management period of five years. This estimate provides an indication of the costs associated with the bush regeneration aspects of the implementation of the VMP. This estimate of cost does not include construction related items such as fencing, signage, or the production of mulch in situ. Estimates are indicative only; final costs should be expected to vary. A formal quote from a bush regeneration company would be required to refine these estimates. Table 8.1 provides a detailed breakdown of estimated costs.

Table 8.1 Cost indication summary

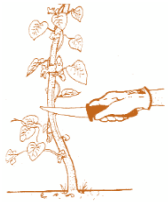
Item	Cost excl. GST
Primary Weeding (hand in TPZ) excluding machinery work	$8,000
Planting, mulching and irrigation	$85000
Bunting fencing and signage	$950
Year 1 Maintenance	$43000
Year 2 Maintenance	$38000
Year 3 Maintenance	$38000
Year 4 Maintenance	$38000
Year 5 Maintenance and confirmation of compliance with performance criteria	$38000
Total excl. GST	**$288,950**

9 Appendices

9.1 Appendix I Key Weed Removal Methods

Techniques here are advisory. Experienced bush regenerators will know the best techniques and may differ from this.

Technique	Method	Equipment
Hand Removal 	Seedlings and smaller weed species where appropriate will be pulled out by hand, without risk of injury to workers. The size that this can occur varies throughout the treatment area. Generally, it ranges from post seed to approximately 300mm in height. Rolling and raking is suitable for larger infestations of Wandering Jew. The weed can be raked, and stems and plant parts rolled. The clump of weed material can then be bagged and removed from site.	Tools: gloves, rakes, knife, and weed bags
Crowning 	Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning. A knife, mattock, or trowel is to be driven into the soil surrounding the bulb or rhizome at an angle of approximately 45 degrees, to cut any roots that may be running off. This is to occur in 360 degrees around the bulb/rhizome. The rhizome or bulb is to be bagged and removed from the site and disposed of at an appropriate waste recycling facility. Soil disturbance is to be kept to a minimum when using this technique.	Tools: knife, mattock, trowel, impervious gloves, and all other required PPE
Cut and Paint Stems 	Weed species deemed unsuitable for hand removal shall but cut. Those that have persistent vigorous growth will be cut and painted with Roundup® Biactive Herbicide or equivalent. Juvenile and smaller weed species will be cut with secateurs at base of plant, and herbicide applied via applicator bottle. Stem to be cut horizontally as close to the ground as possible, using secateurs, loppers, or a pruning saw. Horizontal cuts to be made on top of stem to prevent the herbicide running off the stump. Apply herbicide to the cut stem immediately, within 10-20 seconds, before the plant cells close and the translocation of herbicide is limited. Herbicide is not to reach sediment or surrounding non-target plants.	Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide and all other required PPE

Scrape and Painting 	More resilient weed species, where other techniques are less reliable are to be scraped with a knife or chisel and painted with undiluted Glyphosate ® Biactive Herbicide. Works to be carried out by a contractor with a current herbicide license. Weed species will be scrapped with a knife or chisel up the length of the trunk, and herbicide applied via applicator bottle. Scrape the trunk from as close to the ground as possible to approximately ¾ of the plants height. Where trunk diameters exceed approximately 5cm a second scrape shall be made on the other side of the trunk. Apple undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of herbicide is limited. Herbicide is not to reach sediment or surrounding non-target plants. Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred.	Tools: knife, chisel, protective clothing, safety glass, herbicide applicator/sprayer, impervious gloves, Glyphosate ® Biactive Herbicide, and all other required PPE
Cut with a Chainsaw and Paint 	Larger size weed species, too large for cutting with hand tools, shall be cut with a chainsaw, and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current chainsaw and herbicide license. Larger weed species will be cut with a chainsaw at base of plant, and herbicide applied via applicator bottle. Cut the stem horizontally as close to the ground as possible, using the chainsaw. Remove upper branches to reduce bulk of plant. If cutting at the base is impractical, cut higher to get rid of the bulk of the weed, then cut again at the base and apply herbicide. Make cuts horizontal to prevent the herbicide running off the stump. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of herbicide is limited. Herbicide is not to reach sediment or surrounding non-target plants. Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred.	Tools: chainsaw, earmuffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Glyphosate® Biactive Herbicide, and all other required PPE
Spot Spraying	Spot spraying involves spraying non-seeding annuals and grasses, and for regrowth of weeds once an area has been cleared or brush cut. Works to be carried out by a bush regenerator experience with ID of native species and a current herbicide license.	As above

9.2 Appendix II – Native Plant Nurseries

Indigo Native Nursery Ingleside NSW 2101 (02) 9970 8709 indigonursey.com.au/

Wirreanda Nursery Ingleside NSW 2101 (02) 9450 1400 wirreandanursery.com.au/

Kulgoa Nursery Terrey Hills NSW 2084 (02) 9450 1217 kulgoa.com.au/

Harvest Seeds & Native Plants Nursery Terrey Hills NSW 2084 (02) 9450 2699 harvestseeds-nativeplants.com.au/

Ingleside Plant Growers Ingleside NSW 2101 (02) 9912 1028

Avalon Aquatics Ingleside NSW 2101 (02) 9918 4486 or sales@dragonflyenv.com.au for enquiries

Wildflower Nursery Ku-ring-gai (02) 9423 0353 or kwg@krg.nsw.gov.au for enquiries

Bush to Bowl, Ingleside

9.3 Appendix III – Checklists

The following checklists have been included as a simple guide to ensure management measures within each stage of restoration are implemented.

Pre-restoration Checklist

Management Measure	Details
1. Soil and Water Management	• Bushland Hygiene Protocols outlined in Appendix II must be followed. The hydrological conditions of the site may promote the spread of Phytophthora. • Sediment controls may be implemented following weed removal and are to remain implemented throughout the restoration period.
2. Access Controls	• Parking, access/egress routes, stockpiles and materials storage areas must be identified and mapped outside the protected vegetation areas.
3. Biodiversity Protection	• Fencing must be erected to protect the native flora and fauna within the site. An exclusion zone will be established for bushland.
4. Weed Control	• Weeds must be managed, to a small degree in areas of earthworks, prior to commencement of works. Weed propagules must be disposed of within the site waste streams.

Restoration Phase Checklist

Management Measure	Details
1. Soil and Water Management	• Bushland Hygiene Protocols outlined in Appendix II must be followed. The hydrological conditions of the site may promote the spread of Phytophthora. • Sediment controls may be implemented following weed removal and are to remain implemented throughout the restoration period.
2. Access Controls	• Parking, access/egress routes, stockpiles and materials storage areas must be identified and mapped outside the protected vegetation areas.
3. Biodiversity Protection	• Fencing must be erected to protect the native flora and fauna within the site. An exclusion zone will be established for bushland.

Management Measure	Details
4. Planting	• Planting is to occur during Spring, if possible, with Autumn planting reserved as a backup.
5. Bush Regeneration	• Primary weeding is to commence throughout the site to facilitate rehabilitation of native vegetation.
6. Reporting	• Reporting is to occur yearly (Ecologist) including the results of quarterly maintenance inspections and whether performance criteria are being met.

Post- restoration Phase

Management Measure	Details
1. Soil and Water Management	• Soil, sedimentation, erosion, and water management strategies implemented in earlier phases are to be retained where appropriate to continue to protect native vegetation zones from additional minor works and impacts arising from site operation.
2. Access Controls	• Parking, access/egress routes, stockpiles and materials storage areas must be identified and mapped outside of biodiversity protection exclusion zones.
3. Biodiversity Protection	• Fencing must be erected to protect the native flora and fauna within the site. An exclusion zone will be established for bushland.
4. Bush regeneration	• Maintenance weeding is to commence throughout the site to facilitate rehabilitation of native vegetation. • The soil seedbank is to be triggered to encourage natural regeneration in areas of medium to high resilience or where appropriate at the discretion of the bush regeneration contractors.
5. Planting	• Planting is to commence once performance criteria are on track to being met and there is little risk of plantings being outcompeted by exotics.
6. Reporting	• Reporting is to occur yearly (Ecologist) including the results of quarterly maintenance inspections and whether performance criteria are being met.

9.4 Appendix IV – Recommended Planting List for the Site

Plant species have been selected from the approved list (DCP) and from both PCT lists for the communities either side of the site. Where from the PCT list it's been selected if it occurs in this area and is typically available to purchase. The full list from both PCTs is available to anyone who needs it. Can be supplied by the author of the VMP.

Plant species locations are to be provide in the final detailed planting plan prior to construction and will take into consideration species availability.

For canopy trees those in bold

Scientific name	Common name
Trees 200 required (1/10m^2) at least 5 species from this list including the bold. Min numbers in () after some species.	
Alphitonia excelsa	Alphitonia
Allocasuarina littoralis	Coastal She Oak
Casuarina glauca	**Swamp She Oak (20)**
Clerodendrum tomentosum	
Ceratopetalum gummiferum	Christmas Bush
Glochidion ferdinandi	Cheese Tree (5)
Eucalyptus botryoides	Bangalay
Eucalyptus robusta	**Swamp Mahogany (25)**
Livistona Australia	Cabbage Palm
Ferns - optional	
Cyathea cooperi	Straw Tree-fern
Shrubs required 3000. At least 20 species from below and no one species over 60 in number (20%) **Bold are must have species**	
Acmena smithii	Lilly-pilly (Broad-leaf local one)
Viminaria juncea	Native Broom
Acacia elongata	Swamp Wattle
Acacia floribunda	White Sally (20)

Scientific name	Common name
Acronychia oblongifolia	
Callicoma serratifolia	Coachwood (20)
Callistemon citrinus	Scarlet Bottlebrush
Callistemon linearis	Narrow-leaved Bottlebrush (20)
Callistemon salignus	
Elaeocarpus reticulatus	Blueberry Ash
Ficus coronata	**Sandpaper Fig (40)**
Homalanthus populifolius	
Leptospermum juniperinum	**Prickly Tea-tree (40)**
Melaleuca ericifolia	Swamp Paperbark
Melaleuca thymifolia	
Melaleuca linariifolia	**Flax-leaved Paperbark (40)**
Melaleuca nodosa	
Melaleuca styphelioides	
Myrsine howittiana	
Pittosporum revolutum	
Polyscias sambucifolia	
Groundcovers and wetland species 2000 needed	
Blechnum camfieldii	Water Fern
Blechnum indicum	Swamp Water Fern
Gahnia clarkei	
Gahnia sieberiana	
Entolasia marginata	Bordered Panic
Hemarthria uncinata	Mat Grass

Scientific name	Common name
Isachne globosa	Swamp Millet
Oplismenus aemulus	Broad-leaved Basket Grass
Paspalum distichum	Water Couch Grass
Alternanthera denticulata	Common Joyweed
Ludwigia peploides subsp. *montevidensis*	Water Primrose
Viola hederacea	Native Violet
Alisma plantago-aquatica	Water-plantain
Alocasia brisbanensis	
Commelina cyanea	Blue Spiderwort
Triglochin microtuberosum	
Triglochin procerum	Water Ribbons
Lomandra longifolia	Spiny-headed Mat-rush
Philydrum lanuginosum	Woolly Waterlily
Dianella caerulea	Blue Flax-lily
Dianella caerulea var. producta	
Baumea articulata	Jointed Twig-rush
Baumea juncea	Bare Twig-rush
Baumea rubiginosa	Soft Twig-rush
Bolboschoenus fluviatilis	Club-rush
Carex appressa	Tall Sedge
Cladium procerum	
Cyperus exaltatus	Giant Sedge
Eleocharis equisetina	
Eleocharis sphacelata	Tall Spike-rush

Scientific name	Common name
Ficinia nodosa	Knobby Club-rush
Gahnia sieberiana	Red-fruited Saw-sedge
Melaleuca styphelioides	Prickly Tea-tree
Schoenoplectus mucronatus	
Schoenoplectus validus	River Club-rush
Juncus kraussii subsp. *australiensis*	Sea Rush
Juncus polyanthemus	Tussock Rush
Juncus usitatus	
Baloskion tetraphyllum	Tassel Cord-rush
Leptocarpus tenax	

Elaway Geraldene Dalby-Ball

DIRECTOR

With over 30 years wetland and urban ecology experience, a great passion for what she does, and extensive technical and on-ground knowledge make Elaway a valuable contribution to any project.

Urban Wetlands and Waterway expert. Learning for years from Geoff Sainty.

Elaway has over 8 years local government experience as manager of environment and education for Pittwater Council. Elaway presented papers on the topic at the NSW Coastal Conference, Sydney CMA and Hawkesbury Nepean forums and has been a Technical Advisor Sydney Olympic Park Wetland Education and Training (WET) panel.

Elaway has up to date knowledge of environmental policies and frequently provides input to such works. Mia was a key contributor to the recent set of Guidelines commissioned by Southeast Queensland Healthy Waterways Water Sensitive Urban Design Guidelines. Geraldene's role included significant contributions and review of the Guideline for Maintaining WSUD Assets and the Guideline for Rectifying WSUD Assets.

A frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. \

A joint author on the popular book Burnum Burnum's Wildthings published by Sainty and Associates. Author of the Saltmarsh Restoration Chapter Estuary Plants of East Coast Australia published by Sainty and Associates (2013). Geraldene's early work included 5 years with Wetland Expert Geoff Sainty of Sainty and Associates. Geraldene is an expert in creating and enhancing urban biodiversity habitat and linking People with Place.

SPECIALISATIONS

- Urban Ecology – and habitat rehabilitation and re-creation.
- Urban waterway management – assessing, designing, and supervising rehabilitation works
- Saltmarsh and Wetland re-creation and restoration – assessment, design, and monitoring
- Engaging others in the area of environmental care and connection
- Technical Advisor – environmental design, guidelines, and policies
- Sound knowledge and practical application of experimental design and statistics
- Project management and supervision
- Grant writing and grant assessment
- Budget estimates and tender selection
- Expert witness in the Land and Environment Court

CAREER SUMMARY

- **Director and Ecologist**, Ecological Consultants Australia. 2014-*present*
- **Director and Ecologist**, Dragonfly Environmental. 1998-*present*
- **Manager** Natural Resources and Education, Pittwater Council 2002-2010
- **Wetland Ecologist** Sainty and Associates 1995-2002

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Science with 1st Class Honors**, Sydney University.
- WorkCover WHS General Induction of Construction Industry NSW White Card.
- Senior First Aid Certificate.