Landscape Plan 252 Hudson Parade – to be read with report

LANDSCAPE ZONING

MANAGEMENT ZONE 1	BUSH REGENERATION AREA AND 100% PSG SPECIES PLANTING INCLUDING 8 ADDITIONAL CANOPY TREES. WEED REMOVAL
MANAGEMENT ZONE 2	BUSH REGENERATION, REMOVAL OF EXOTIC GRASS/WEED SPECIES. LANDSCAPING WITH 80% PSG SPECIES. PLANTING OF 3-4 INDIVIDUAL TREES
SCREENING	SMALL TREES - ROW 1M SPACING AND SECOND ROW OF LARGE SHRUBS AT ALTERNATE 1M SPACINGS

THIS PLAN TO BE READ IN CONJUNCTION WITH:
'LANDSCAPING IN PITTWATER SPOTTED GUM FOREST'
BY ECOLOGICAL CONSULTANTS AUSTRALIA PTY LTD TA
KINGFISHER URBAN ECOLOGY AND WETLANDS
NOVEMBER 2021 - MAY 2023

INDICATIVE PLANT LIST

CLASSIFICATION	COMMON NAME	BOTANICAL NAME	POT SIZE	MATURE HEIGHT	MATURE SPREAD
CANOPY TREES	SYDNEY RED GUM	ANGOPHORA COSTATA			
	GREY IRONBARK	EUCALYPTUS PANICULATA			
TREE	ACACIA	ACACIA FLORIBUNDA			
	BLUEBERRY ASH	ELAEOCARPUS RETICULATIS			
	SCENTLESS ROSEWOOD	SYNOUM GLANDULOSUM			
SHRUBS	APPLE BERRY	BILLARDIERA SCANDENS			
	COFFEE BUSH	BREYNIA OBLONGIFOLIA			
	HOP BUSH	DODONAEA TRIQUETRA			
	HANDSOME FLAT-PEA	PLATYLOBIUM FORMOSUM			
FERN	MAIDENHAIR FERN	ADIANTUM AETHIOPICUM			
GROUND	PENNYWORT	HYDROCOTYLE PEDUNCULARIS			
	SPINY-HEAD MAT-RUSH	LOMANDRA LONGIFOLIA			
	BURRAWANG	MACROZAMIA COMMUNIS			
VINE	PURPLE CORAL PEA	HARDENBERGIA VIOLACEA			

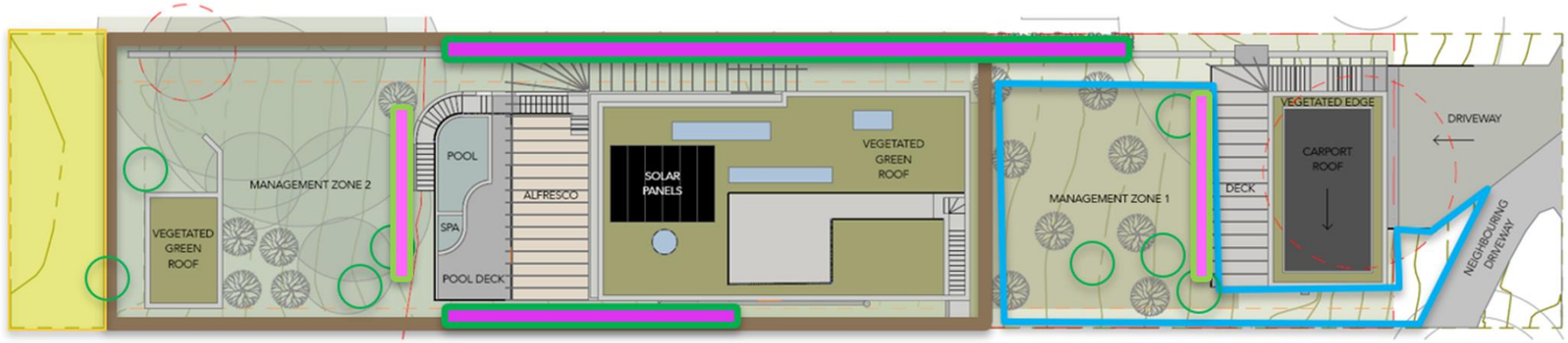
All plants will be tube stock with the exception of screening plants, and these will be 200mm pots to maximise speed of site line cover. Vines may also be used for rapid screening (within 12 months) if needed.

Growth Size definitions: Canopy >10m, Tree >3-5m, Shrubs to 1m; ferns, ground plants and vines all under 1m. Vines may be trailed up for screening. See Table for typical dimensions of each species.

LEGEND

- MANAGEMENT ZONE 1
- MANAGEMENT ZONE 2
- NATIVE GRASSES - '*MICROLAENA STIPOIDES*' AND *VIOLETS*
- SCREENING
- TREE PROTECTION FENCE
- EXISTING SCREENING TO BE RETAINED/REPLANTED
- VEGETATED GREEN ROOF
- EXISTING TREE TO BE REMOVED
- ADDITIONAL INDIVIDUAL TREES
- EXISTING TREES TO BE RETAINED

Light green box – dense planting with shrubs and small trees 2-3.5m) to screen stairs pool and spa. Double row 200mm pots 50cm centers. 200 additional plants in front of pool and 50 in front of carport.



1 Landscape Plan 1:250

General Notes
The Builder shall check all dimensions and levels on site prior to construction.
Notify any errors, discrepancies or omissions to the architect.
Drawings shall not be used for construction purposes until issued for construction.
Do not scale drawings.
All boundaries and contours subject to survey

Project Name	Drawing Title:	Revision:	Status:	Date:
Cove House	Landscape Plan	A	Development Application	7/7/2023
Project Address	Drawing No.:	Scale:	Client	
252 Hudson Parade, Clareville, NSW 2017	DA21	1:250 @ A3	Marcel and Elle Dupont-Lou	

Update 14 July 2023

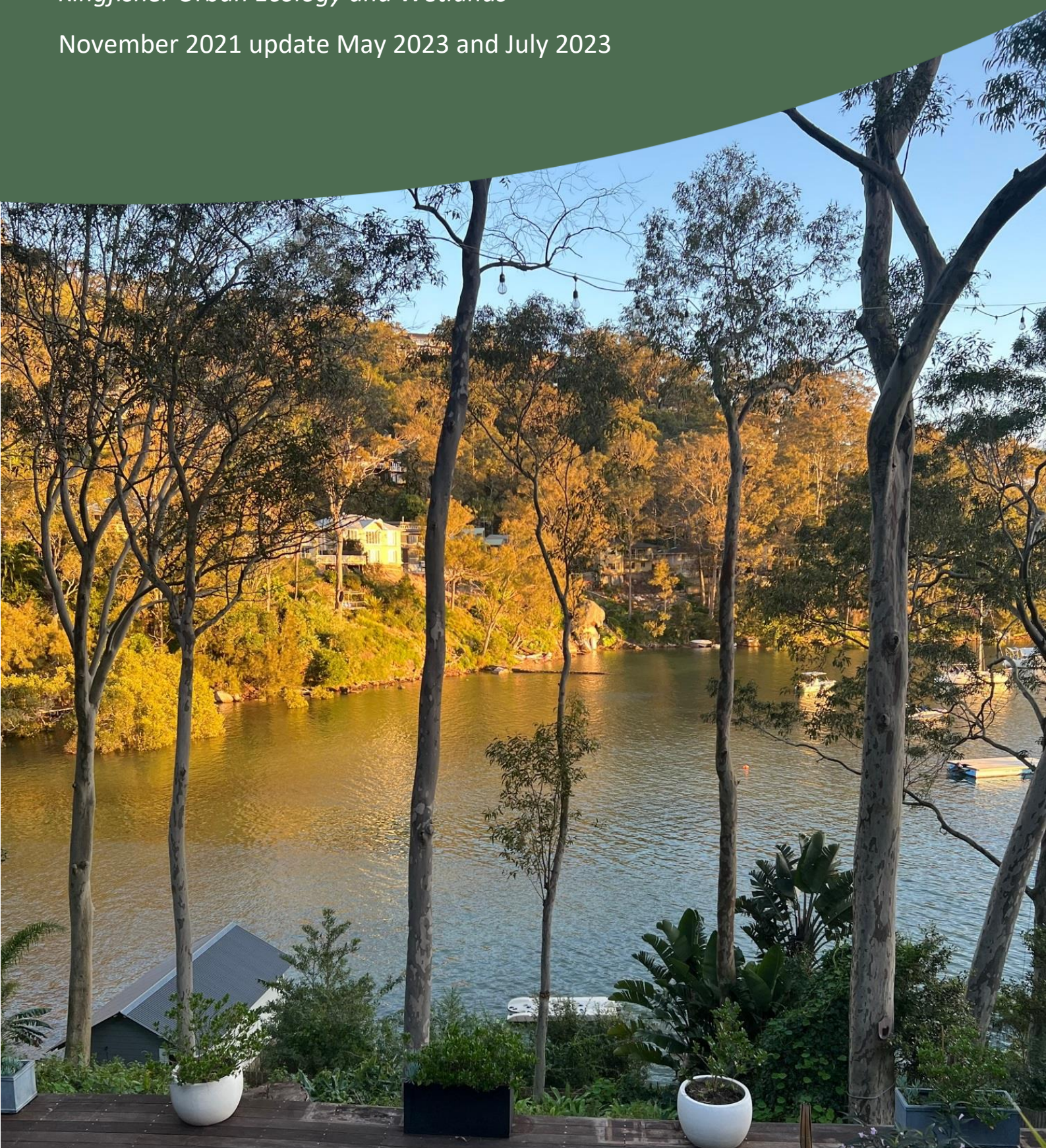
Landscape Plan 252 Hudson Parade - in Pittwater Spotted Gum Forest July 2023. To be read in conjunction with the Landscape Plan report (Ecological Consultants Australia) July 2023 – includes green roof details.

Landscape Plan for 252 Hudson Parade Clareville

By Ecological Consultants Australia Pty Ltd TA

Kingfisher Urban Ecology and Wetlands

November 2021 update May 2023 and July 2023



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Statement of Authorship

This was created by Ecological Consultants Australia. The author is Geraldene Dalby-Ball with qualifications BSc. majoring in Ecology and Botany with over 30 years' experience in this field.

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.

Document Control Sheet	
Title:	Landscaping in Pittwater Gum, 252 Hudson Pde, Clareville
Version:	Final
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File location:	ECA 4 Projects\2 Projects\2022-2023\Landscape Plans

Geraldene Dalby-Ball – Director of Ecological Consultants Australia

Summary

- This updated plan includes the requests from Council for the following information in relation to Councils request (in italics). It is noted that as this is an area of Endangered Ecological Community the plant layout is not the same of a typical landscape plan with 'off-the-shelf species. It does however provide the full information on numbers, density, plant sizes and commentary on screening outcomes. Also noted that there is existing landscaping and native species so the planting is in parts of the site – not all.
    - *A planting scheme shall be included identifying species, locations, quantities, mature heights and pot sizes.*

A planting scheme has been included Figure 2.4 it is noted that the species listed on the plan are representative of a larger number of the species of in each size class that could be used based on availability.

When working with locally native species, and an endangered ecological community, it is necessary to have diversity and the flexibility to plant what is available at the time – given that many of these species are not 'off-the shelf' and if not ordered 1 year in advance may not be available.

The plan here provides for the density of tube stock 5/m^2 and the number of ground, shrub and small tree species to be planted per 5m^2. All are tube stock size.

There is no planting in the core Mgt Zone 1 as this is densely vegetated and will be retained and expanded.

Planting will occur in areas disturbed by the proposed car parking area. Planting is to be with Ferns of the Pittwater Spotted Gum Forest species of the list provided. Forty Ferns have been allocated around the structure to soften the appearance from the road. These are from 2 species: the low and dense *Doodia caudata* (to 40cm) and the taller (to 1.4m) Soft Bracken Fern *Calochlaena dubia.* This building will be screened from Pittwater already by the existing vegetation.

- *If trees are proposed to be removed, replacement tree planting shall also be shown on the Landscape Plan.*

Eight trees are shown on the plan. The aim is have 4 alive to maturity and beyond. These are shown on the Landscape Plan – see the 8 green circles. It is noted that as this site has existing trees and weeds the precise location may be within 5m of that proposed and will be situated in the best location for tree survival and growth. There will be a mix in the front and back (with at least 4 in the front) to ensure screening. Tree species are Spotted Gum and then any other from this Endangered Ecological Community (EEC) – as provide in the list. All are of similar growth form and habit reaching 10-15+m.

- *Planting shall be used to soften the bulk and scale of the development when viewed from the Pittwater waterway and to soften/screen any proposed undercroft areas.*

Screening from Pittwater will be mainly from Management Zone 2 as this is on the property between the waterway and the built form. A double row of native small trees/ tall shrubs is noted for planting in front of the stairs/pool area. With a mature height of up to 3.5m and beign densely vegetated species these will provide a green' wall to the structure when view from the water. This area is unlikely to be seen from the

water due to the existing and to be planted vegetation in front (between the built form and the waterway). This can be seen on the plan and there are 200 x 200mm pot size to go in this location. Again due to locally native species being of varied ability the full mix of suitable species has been given and those available to achieve this outcomes will be used.

The public land works will consist of converting weed grass to native grasses and ground covers – good for biodiversity yet low screening. Screening from the road side will be via existing and planted vegetation – as well as Green roof over-flow plants.

The garage on the road side will also have screening (existing vegetation and additional will be planted around the disturbed area (undercroft) to soften the look. Species have already been allocated for here and include Blueberry Ash and Christmas bush (Locally native) as these will form a bushy screen to around 4m. The area under these will be a continuation of the native ferns including King Fern to 1.5m (this is noted as screen on the plan and detailed provide in the text).

Management Zone 2 has existing native shrubs, small trees and canopy – all being retained and providing an existing and on-going screen to Pittwater (~30% of built form will be screen immediately with existing vegetation).

Planting in Management Zone 2 includes planting at a density of over 5/m^2 where there is not already existing native vegetation.

Planting includes all strata (ground 0.4m to 1.5m), mid-story (1m to 3m), small trees (3m-5m) and canopy (10m+). Screening and diversity will be provided.

The planting is being conducted by an ecological restoration company who know the plants species and will be planting them according to the following specifications. Unlike an ordinary landscape plan, this one in an Endangered Ecological Community doesn't note exactly what species whereas it's most likely not achievable and will require changes and substitutions. What is achievable is to have the agreed, density, diversity and size at maturity mix.

Placement of species then follows the layout of each 5m^2 area having 25 plants made up of:

12 ground plants, 10 mid story, 3 small trees.

The 8 canopy (4 at maturity) are also in Management Zone 2 and have been shown on the plan.

Species will be selected from each of these growth types and the diversity of species of each growth type has been provide in this plan.

- *Green roofs are proposed and a planting scheme is required, identifying the suitable species to be used.*

A schedule of plants has been provided for the green roofs. These are a mix of Spotted Gum Community ground and vine species and NSW native species that are known to be robust in green rooves.

The Green roof (x3) of 148m^2 total area will have 6/m^2 totalling 888 plants. The species list has been provided. Plant pot size is viro tubes and forestry tubes.

On-slab landscape planting shall be installed into minimum 300mm soil depth for groundcovers and native grasses, and 600mm for shrubs.

Yes this can be achieved and groundcovers and native grasses will be in the 300mm and shrubs in the 600mm. All plants will be labelled as ground/grass or shrub so their placement (regardless of species) is appropriate). In addition to the people doing the planting are restoration specialist who know the PSG species in detail.

- All plants recommended are tube-stock (larger sizes for Spotted gum trees are not recommended as they are unlikely to be locally native stock and tube stock grow better). A condition of consent can be that 4 Pittwater Spotted Gums must be alive and growing after 12 months and 5 years (at which time they will be protected under the TPO).
- Screening will be provided by a mix of retaining the existing screening and supplementary planting. Small Trees/ large shrubs proposed for this area do not exceed 3m. Pruning can occur to stop potential neighbouring view loss. Plants for screening will be larger pot size (200mm) if needed for faster screening. Vines may also be used on supports for rapid (within 12 months) screening while the small trees grow. Screening in front of the pool, spa stairs area will be with PSG community shrubs and small trees minimum 2.5 to 3m grown height. An additional 200 x 200mm pot size plants have been allocated for screening here and if permitted on the foreshore nature-strip to better screen the boat house.
- The area of landscaping / native vegetation is 611.6m^2 on-ground and an additional 148m^2 of green roof. At a density of 5 plants per m2 the on-ground planting will require 3060 plants (see Table 2.1 for numbers of each growth form). A complete list of appropriate species has been provided for on-ground planting and these may be used as substitutes to those shown on the Landscape Plan to fulfil availability. Any substitutes will be the same size/shape as the one being replaced. Substitutes off this list must be approved by Council and the ecologist.
- The Green roof (x3) of 148m^2 total will have 6/m^2 totalling an additional 888 plants. The species list has been provided.

Table of Contents

1 Introduction

ECA has been contracted to complete a 'simple' landscaping plan for 252 Hudson Parade, Clareville for areas being disturbed by the proposed development works.

Figure 1.1 Site of the proposed development. Source: AusMaps 2022.

Figure 1.2 Location of site relative to the occurrence of PSGF (PCT1214). Source: SEED 2022.

The Plan includes the background matters to consider and the overall plan of what to implement. Being in Pittwater Spotted Gum Community the aim is to retain and enhance areas with the potential to restore and plant appropriate locally native species in areas that are too degraded to regenerate at a sufficient cover or speed. Locally native tube-stock can be obtained from Indigo Nursery at Elanora.

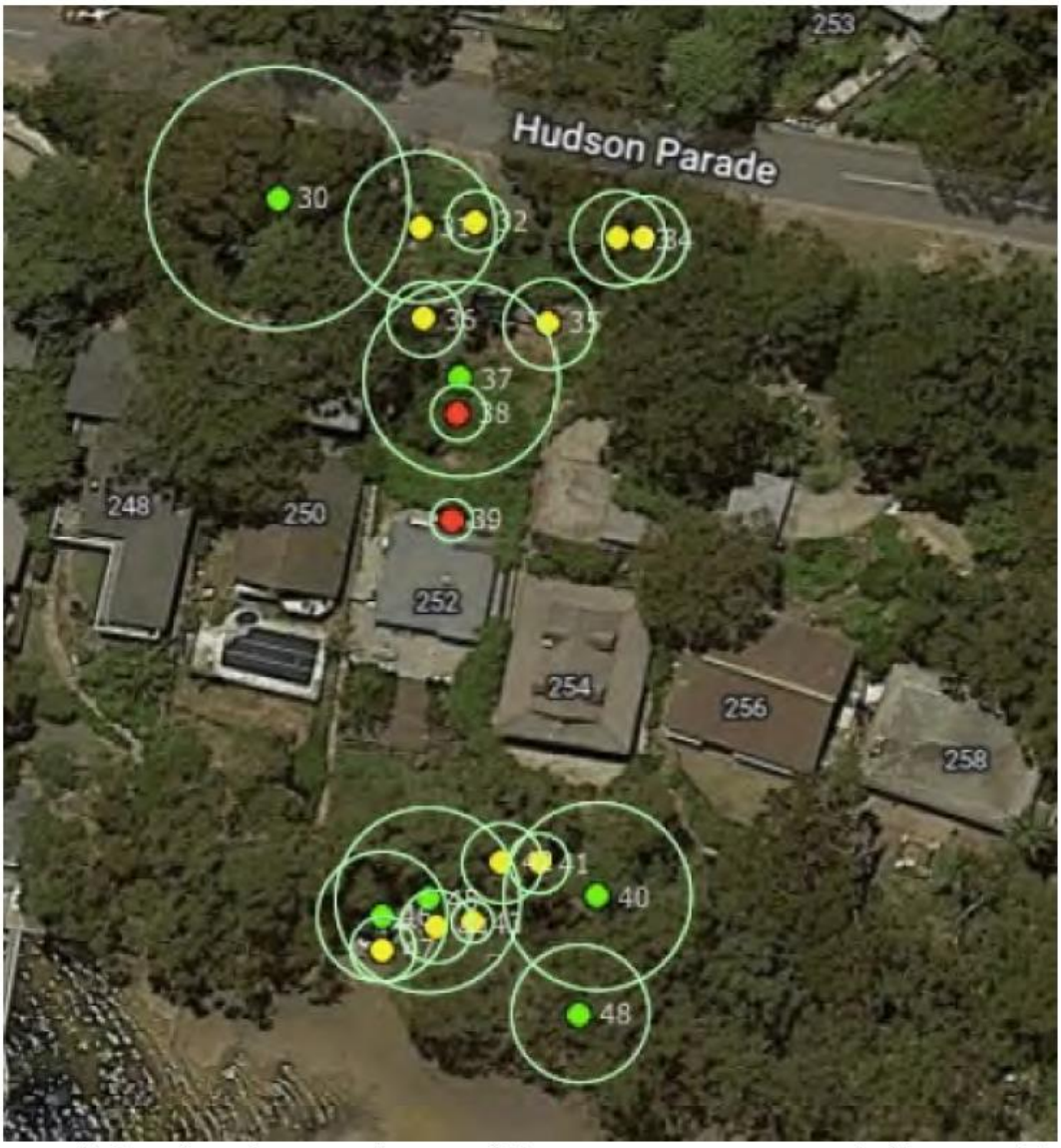


Figure 1.3. Tree Retention and removal plan (two spotted gums proposed for removal) Source: Arborsaw April 2023.

This Landscape Plan is consistent with DCP B7 Pittwater Spotted Gum Forest Figure 1.3 shows the site is within PSGF (blue highlight area). Figure 1.3 shows the trees to be retained and the two proposed for removal.

Outcomes of the DCP B1.7

- Conservation of intact Pittwater Spotted Gum Forest EEC. (En)
- Regeneration and/or restoration of fragmented and / or degraded Pittwater Spotted Gum Forest EEC. (En)
- Reinstatement of Pittwater Spotted Gum Forest to link remnants. (En)
- Long-term viability of locally native flora and fauna and their habitats through conservation, enhancement and/or creation of habitats and wildlife corridors. (En)
- Controls
- Development shall not have an adverse impact on Pittwater Spotted Gum Endangered Ecological Community.
- Development shall restore and/or regenerate Pittwater Spotted Gum Endangered Ecological Community and provide links between remnants.
- Development shall be in accordance with any Pittwater Spotted Gum Forest Recovery Plan.
- Development shall result in no significant onsite loss of canopy cover or a net loss in native canopy trees.
- Development shall retain and enhance habitat and wildlife corridors for locally native species, threatened species and endangered populations.
- Caretakers of domestic animals shall prevent them from entering wildlife habitat.
- Fencing shall allow the safe passage of native wildlife.

Development shall ensure that at least 80% of any new planting incorporates native vegetation (as per species found on the site or listed in Pittwater Spotted Gum Endangered Ecological Community).

Development shall ensure any landscaping works are outside areas of existing Pittwater Spotted Gum Endangered Ecological Community and do not include Environmental Weeds.

1.1 Landscape Plan

1.1.1 Background and Schematic – ground planting

The Landscape Plan schematic is included below in Figure 1.4. Requirements and background to the Landscape Plan are provided in text and in Figures 1.5a and 1.5b. It is noted that on-slab landscape planting shall be installed into minimum 300mm soil depth for groundcovers and native grasses, and 600mm for shrubs. All plants will be labelled as per their growth form e.g. ground/grass or shrub so their placement (regardless of species) will be into the appropriate soil depth. In addition to the labeling the people doing the planting are restoration specialist who know the PSG species in detail (growth type, size, sun/shade preferences etc) this needs to be considered on-site at the time of planting.

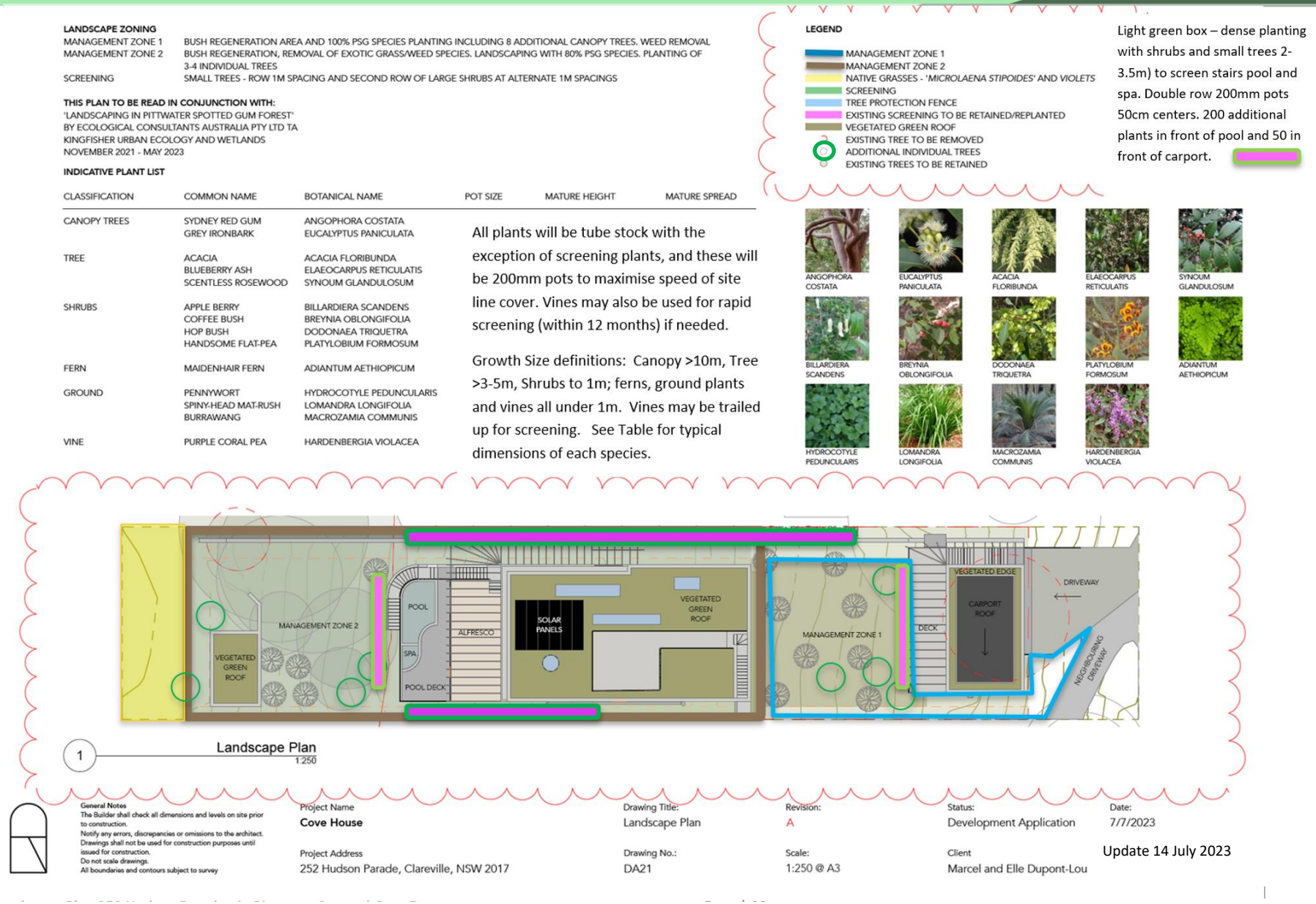


Figure 1.4 Landscape Plan schematic July 2023. Species for the green roofs are provided after Figure 1.7 (See also A 3 provided)

The Landscape Plan applies to the whole site with an emphasis on screening from neighbors and weed removal along the sandstone rock area and immediately in front of it. Canopy trees are already present and of large size. Eight additional canopy trees are to be planted to assist with long-term tree canopy cover (Assuming 4 to maturity). Landscaping is concentrated from Riverview Road to over the rock scarp. Bush regeneration will dominate the activity between the existing 'cottage' and the road. Weed removal and planting from the dwelling (existing and proposed location) to the foreshore of Pittwater).

Plan showing the layout of the proposed dwelling and tree retention (and removal red). The remaining area will be landscaping (611.6m^2). Note there are also 3 green roofs and the area and sepceis for these are provided .

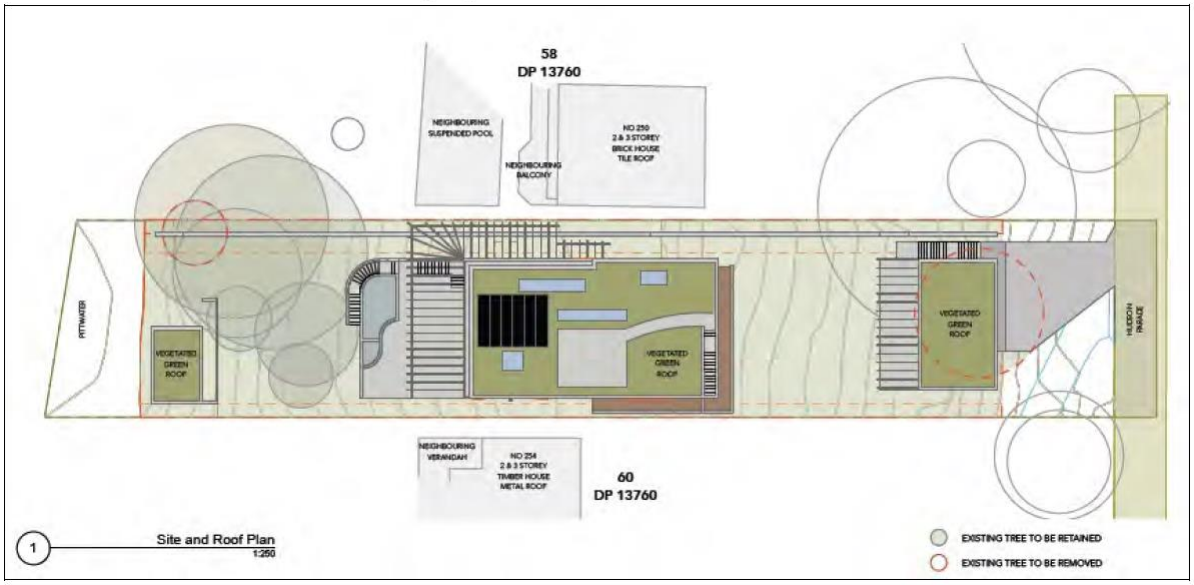


Figure 1.4. Proposed Plan Source: Anne Robson Architecture April 2023

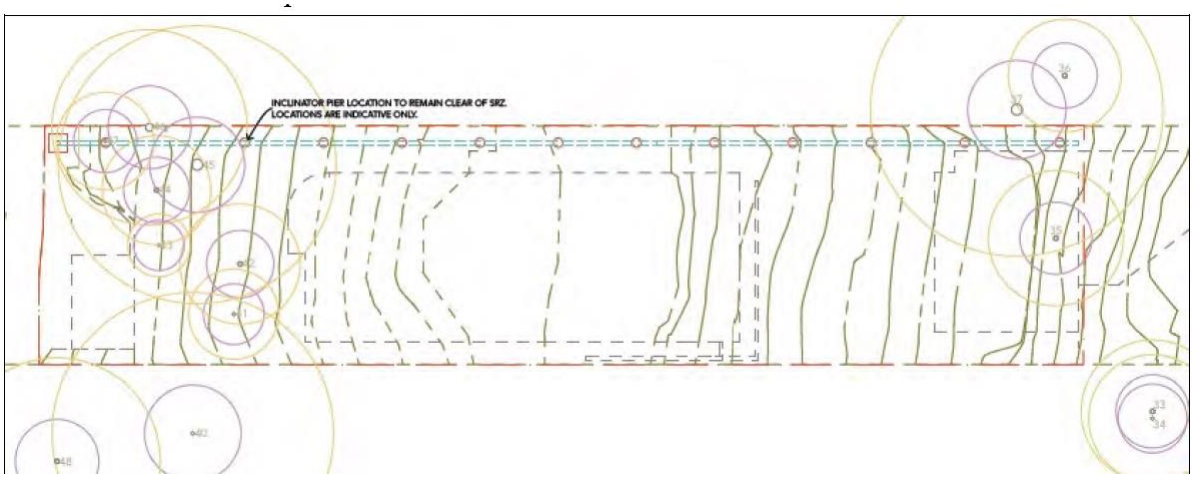


Figure 1.5. Trees and contours. Note the site slopes to Pittwater Waterway.

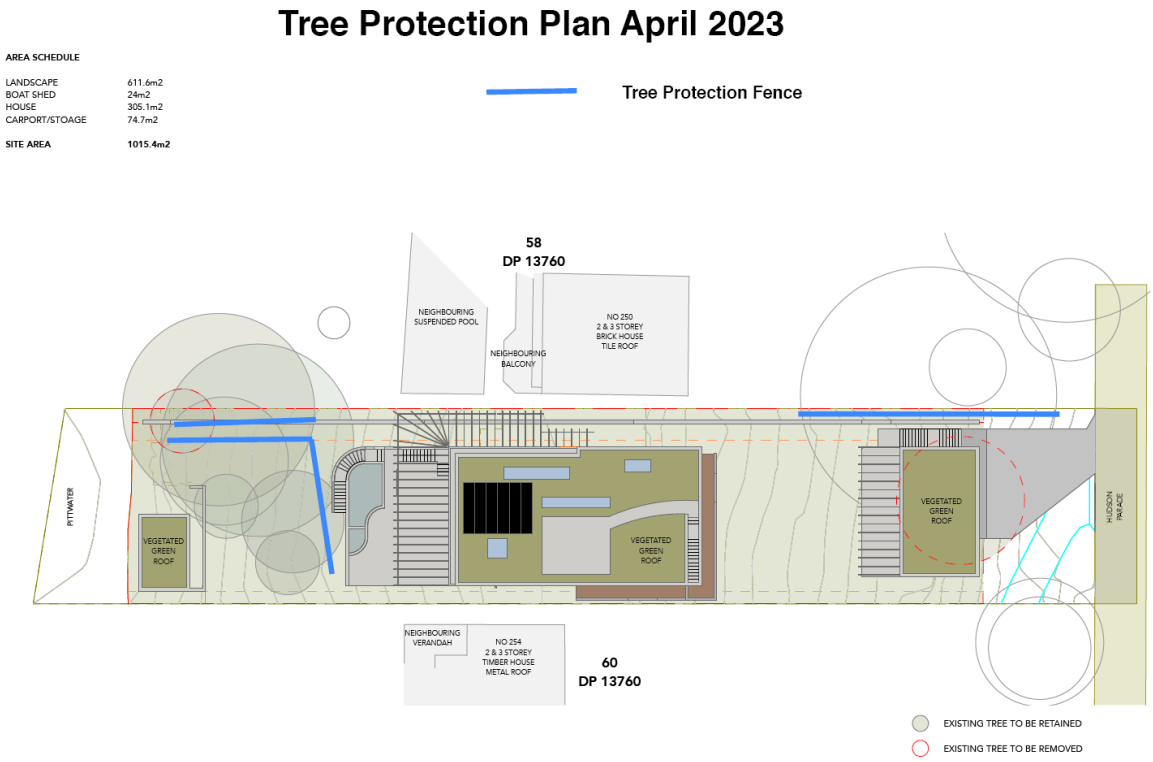


Figure 1.6. Trees and contours. Note the site slopes to Pittwater.

Bright green area on the plan below are where there will be screening by way of small trees – row 1m spacing and 2nd row of large shrubs at alternative 1 m spacings. Existing screening plants will also be retained. End result is to have at least a small tree (to 3m) every 1m so there will be a solid line of green to screen the neighbors.

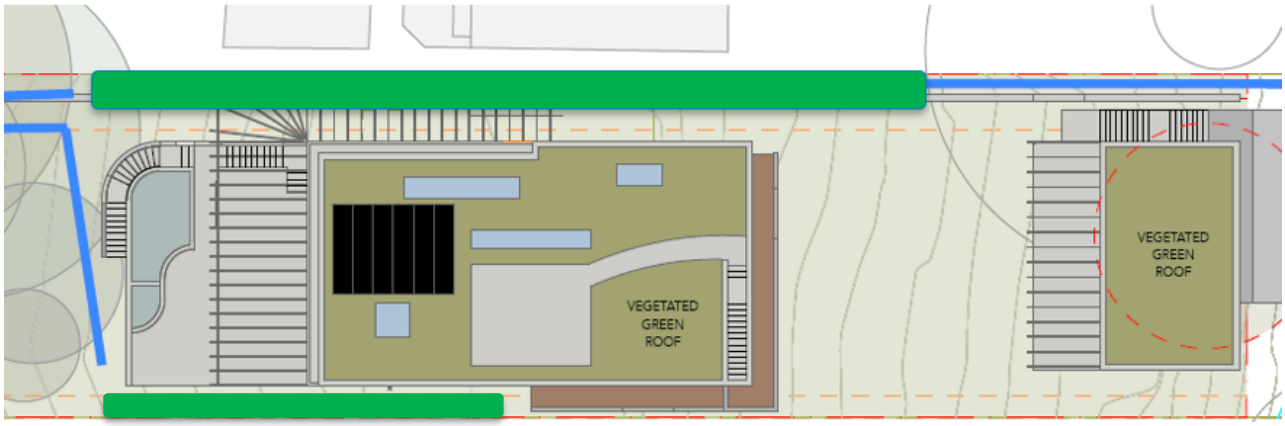


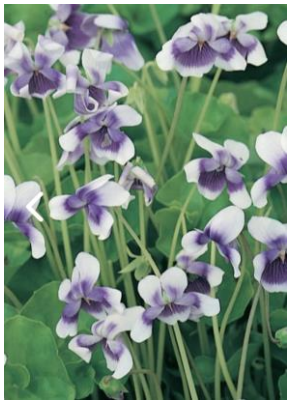
Figure 1.7. Screening required along this boundary. Screening from the water will be from native plantings - as proposed in this plan and the existing trees.

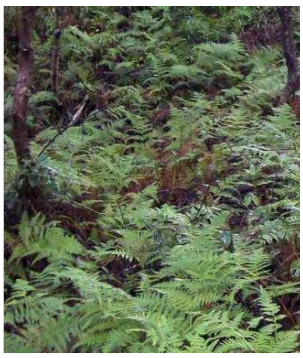
1.1.2 Green Roof – planting schedule

Species for the green roofs are a mix of Spotted Gum Community ground and vine species and NSW native species that are known to be robust in green roofs and tolerant of shade.

The Green roof (x3) of 148m^2 total area will have 6/m^2 totalling 888 plants. The species list has been provided. Plant pot size is viro tubes and forestry tubes. Either size is acceptable.

Species placement in the green roofs will be mixed placement to ensure some of each species throughout as this will increase the likelihood of some species doing well in each area and expanding. All chosen are non-invasive and most are locally native – though not all PSCG.

		
Scaevola spp. *30cm x 50cm* *50 plants*	*Brachyscome* spp. *50cm high x 1m wide* *50 plants*	*Myoporum* sp. (dwarf) Creeping boobialla 1 x 1m 50 plants
		
Dianella caerulea 1 x 1m 150 plants	Native Violet *Viola* sp 20 x 50cm 50 plants	*Dichondra repens* 10 x 10cm 50 plants

		
Lomandra longifolia - spiny-headed mat-rush 1 x 1.2m 150 plants	*Facinnia nodosa* Knobby Club Rush 100 plants	*Doodia aspera* Rasp Fern 150 plants
		
Soft Bracken *Calochlaena dubia* *40cm to 1.5m height* 50 plants	*Doodia caudata (Fern* *40cm x 40cm* 50 plants	*Hibbertia scandens* Vines to be planted near edges for sprawling over. 40 in total
		
Kennedia rubicunda	*Hardenbergia violacea*	*Smilax glyciphylla*

Total plants required for 6/m2 over 148m2 for the Green Roofs is 880 plants. 900 will be ordered as per the list here.

The site has been divided into two management zones due to the differences in native plant composition and canopy covers. These management zones aim to restore and return the site to its original state which reflects the PSGF community by providing separate recommendations for each area.

Management Zone 1

Green = bush regeneration area and 100% PSG species planting.

Management Zone 2

Orange = Landscaping with 80% PSG species.

Green roofs = see plan for species noting there are no invasive species proposed in green roofs.

Yellow = optional planting / regeneration back to native grasses. Currently 90% exotic grass. Weeping Meadow Grass *Microlaena stipoides* recommended for this area.

Figure 1.7 Summary of Management Zones

Figure 1.8a Artistic impression – NB this has fewer trees than the site has so the screening will be more than shown here. Screening with also be from the mid-story small trees and shrubs - not shown in the impression. Figure 1.8b screening that would be present (within 2 years) based on the landscaping proposed.

1.1.1 Management Zone 1

Management Zone 1 is located on the northside of the property between the existing dwelling and the road (Figure 1.9). Proposals have been developed to facilitate the construction of a driveway and garage which also includes an additional granny flat. This area shows evidence of previous modification due to activities such as abrasive landscaping, vegetative stripping and the creation of building foundations located around the site including paved pathways. As a result, this area is highly disturbed and has been unable to return to its natural state. A low to medium mix of native species is present within this area. As a result, the foundations of mid-story and bottom-story canopy cover are already present. This area however does not have adequate top-story canopy cover due to the absence of mature trees. Additionally, due to the high modification and disturbance of the area, the presence of exotic weed species is high.

Figure 1.9 Location of Management Zone 1 within property. Source: Six Maps 2022.

To improve the vegetative conditions of this area on site, it is recommended that bush regeneration and native planting occurs within management zone 1, in all areas that are being retained.

Bush regeneration will successfully remove the presence of exotic weed species which are currently prohibiting the success on any native species present. Additionally, the planting of natives in the disturbed areas will strengthen the condition on the area where natives are already present. This includes mid-story and bottom-story cover however the planting of at least 5-6 individual trees belonging to the PSFG community is required to assist the development of top-story canopy cover within this area. This will benefit the site by improving vegetation corridors and providing additional habitat for fauna species. The proposed area of focus within management zone 1 is highlighted in Figure 1.7.

Images of Zone 1 – diverse native species to be protected pre and during works.

MZ 1 – Native species to be retained. Asparagus Fern to be removed by Bush Regenerators.

MZ 1 – Native species to be retained. Asparagus Fern to be removed by Bush Regenerators.

MZ 1 – Native species to be retained. Area to be protected with fencing and signage pre and during development.

MZ 1 – Native species to be retained. Bush regeneration required in 50% of areas. Very low planting density needed – only for disturbed areas to be planted post works..

End of MZ 1 – Native species to be retained. Weeds to be removed from this area behind Ferns.

1.1.3 Management Zone 2

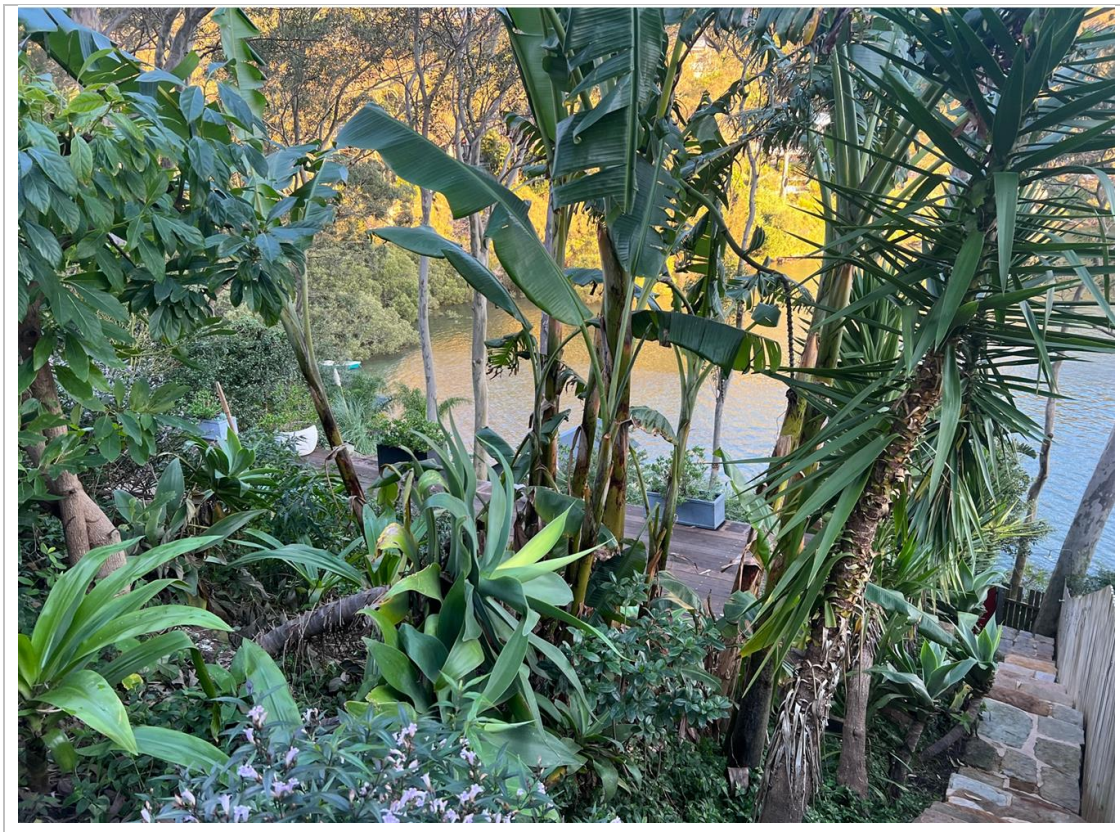
Management Zone 2 is located on the southern side of the property between the existing dwelling and the end of the property boundary (Figure 1.9). An additional strip is present from the boundary to the waterline and this currently has exotic grasses. Reseeding with native grasses is recommended (optional).

The current condition of the vegetation in MZ2 is poor and does not represent the natural conditions of the PSGF vegetative community. Planting of native plants is recommended to increase biodiversity values on site, improving the conditions of the PSGF community and available habitat for local fauna.

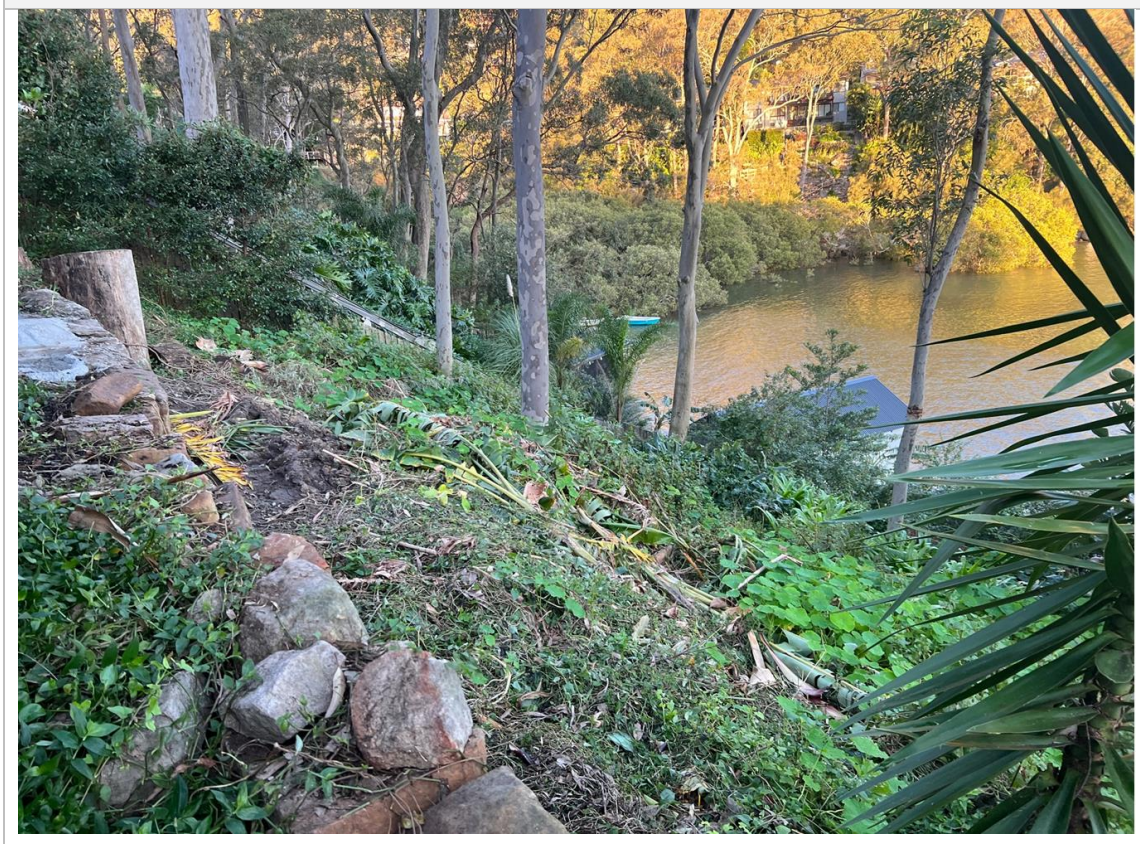
Developments of a boatshed and recreational pool have been proposed for this area, leaving some designated areas for a garden and landscaping. This area also shows evidence of disturbance and modification and as a result, the vegetative condition is poor and has been unable to return to a state that represents that of the PSGF community. This area has minimal to no natives present within the bottom-story to mid-story cover and instead is covered with the regeneration of exotic grass and weed species. This area does have good top-story canopy cover, provided by native trees belonging to the PSGF community.

Figure 1.9 Location of Management Zone 2 within property. Source: Six Maps 2022.

Initial bush regeneration followed by the planting of natives will improve the vegetative condition of this site. Bush regeneration should take place first to remove the presence of any exotic grass and weed species which currently dominate the bottom-story cover. This should be followed by the planting of natives belonging to the PSGF community, with intentions to develop the bottom-story and mid-story cover currently absent. The planting of 3-4 individual trees should also take place within management zone 2 to assist with long-term top-story canopy cover. The planting of native plants within this area will significantly improve and restore the vegetation on site to conditions similar pre-development. This will benefit the local and surrounding area by strengthening connectivity and habitat availability. The proposed area of focus for landscaping is highlighted in Figure 1.8.



MZ 2 – existing landscaped zone



MZ 2 – below existing landscaped area in Zone 2 – area to be weeded and requiring 100% planting, including screening shrubs.

Optional additional area – boundary to water. Weed removal required – Asparagus Fern. Turf could be replaced with native Weeping Meadow Grass and violets (optional)

Boundary to foreshore – neighbouring property with Asparagus Fern

2 Landscape Species

Species will be based on those known from locally occurring PSGF species and consistent with the list in:
https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/1996-1999/pittwater-spotted-gum-forest-endangered-ecological-community-listing
Table 2.1 Species in the planting plan can only be changed for like species and there is to be at least the following:

Stratum (layer)	Number of Species (no more than 20% from any one species)	Minimum total number of plants (min size = tube-stock)
Ground strata, ferns and low clumping plants	6	1200
Mid-level (shrubs)	6	1100
Small trees	2	700
Canopy	1	8 to be planted for 4 at least to grow to maturity.
Screening from Pittwater	4	200 (200mm pots)
Totals	-	3260 plants

This averages at 5/m^2 in areas proposed for disturbance – this will be 100% PSGF species over an area of 616m^2. Other areas of the property will retain the mix of current landscaping being retained (where not environmental weeds).

Green Roof (x 3 total 148m^2)	6 per m2 = 880 needed. 900 to order	
Totals	All ground species (see list)	900 plants

Total to purchase is 3960 and 40 as contingency = 4000 plants.

2.1 Plant Species and supply for ground plants

The required numbers and the list below can be provided to any of the locally native supply nurseries such as Indigo Native Plant nursery in Ingleside. The nurseries know which are ground, lower-mid, upper-mid and canopy and can provide what is available and in keeping with the table above for total numbers and ratios. Copy of purchase of locally native plants to be provided to council with certification pre-OC. Those outlined are the priority species from each layer Blue is canopy, Green is small tree, Orange is shrub, Black is ground or vine or palm.

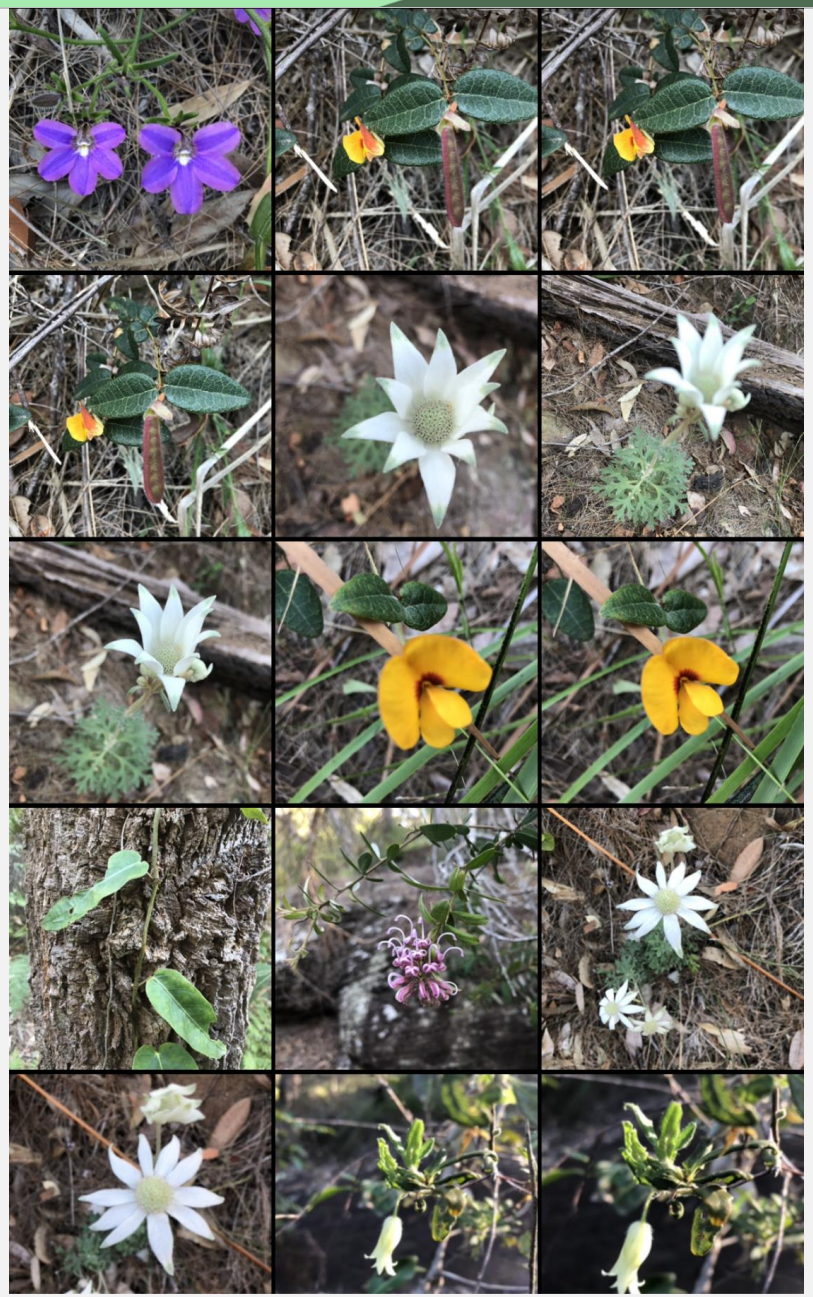
Pittwater Spotted Gum EEC List	*Height (m) and spread*	Pittwater Spotted Gum EEC List	*Height (m) and spread*
Vines		**Small Trees**	
Cassytha paniculata (Vine)	*Vine*	*Hakea sericea*	*2.5*
Cayratia clematidea (Vine)	*Vine*	*Allocasuarina litoralis*	*3*
Cissus hypoglauca (Vine)	*Vine*	*Eleocarpus reticulatis*	*3*
Eustrephus latifolius (Vine)	*Vine*	*Glochidion ferdinandi*	*3*
Geitonoplesium cymosum (Vine)	*Vine*	*Acacia floribunda*	*4*
Pandorea pandorana (Vine)	*Vine*	*Pittosporum undulatum*	*4*
Ferns		*Synoum glandulosum*	*4*
Adiantum aethiopicum (Fern)	*0.2*	*Allocasuarina torulosa*	*5*
Doodia caudata (Fern)	*0.4*	*Livistona australis (Palm)*	*7*
Pteridium esculentum (Fern)	*1.5*	**Canopy**	
Calochlaena dubia (Fern)	*0.4 to 1.5*	*Angophora floribunda*	*12*
Grasses		*Corymbia gummifera*	*12*
Microlaena stipoides	*0.4*	*Angophora costata*	*15*
Entolasia stricta (Ground)	*0.4*	*Corymbia maculata*	*15*
Hydrocotyle peduncularis (Ground)	*0.4*	*Eucalyptus botryoides*	*15*
Themeda australis (Ground)	*0.4*	*Eucalyptus paniculata*	*15*
Ground Plants		*Eucalytpus punctata*	*15*
Dianella caerulea (Ground)	*1*	*Eucalyptus umbra*	*15*
Lomandra longifolia (Ground)	*1*	*Syncarpia glomulifera*	*15*
Pseuderanthemum variabile (Ground)	*1*		
Shrubs			
Billardiera scandens	*1*		
Macrozamia communis (Ground)	*1*		
Oxylobium ilicifolium	*1*		
Platylobium formosum	*1*		
Pultenaea flexilis	*1*		
Xanthorrhoea macronema	*1*		
Gymnostachys anceps	*1.5*		
Breynia oblongifolia	*2*		
Dodonaea triquetra	*2*		
Notelaea longifolia	*2*		

As well as additional vine species for Green Roofs and the additional Vines (optional) that are locally native and well suited to cover the existing terraces (see images at end of this plan).

Images of plants naturally occurring in PSGF and drier edges (Angophora/sandstone) in Avalon.

NB: Acessways through the site will be kept low-key and pourous as per the examples in these images form Angophoa Reserve (except in areas of approved stairs).

While not all native plants shown here are on the species list, any of these ss are suitable for the site. The local native plant nurseries know the species in each photo and can provide information on their availability.



Species suitable on the the sandier soils

Species suitable on the the sandier soils

Table 2.2 – selection of vine species in the planting list

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Trailing Guinea Flower	*Hibbertia scandens*		Vine NF	All vines species can be inter-planted. Trailing Guinea Flower and Purple Coral Pea are the most appropriate as Dusky Coral Pea can be very vigorous in growth.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Dusky Coral Pea	*Kennedia rubicunda*		Vine NF	Dusky Coral Pea is recommended in the open space foreshore zone to provide colour, habitat and "rooms" (delineated areas) for sitting on the foreshore also for over copper-log posts and along rails used to delineate access ways on the estuary foreshore. Caution: use sparingly very Vigorous
Purple Coral Pea	*Hardenbergia violacea*		Vine NF	Purple Coral Pea is one of the most appropriate species to plant within the open space areas and in pots in and around the Built areas.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Native Sarsaparilla	*Smilax glyciphylla*		Vine NF, BF	The least aesthetic of the recommended vines Native Sarsaparilla has been chosen due to it plant food and tea attributes. Leaves are sweet and make local tea.
Note - Habitat for Native Fauna (NF), Bush Food (BF) Examples of the species available for planting in this community – are also those on the northwestern facing the PSG, and sandstone intergrading, areas of Angophora Reserve				

3 Recommendations

3.1 Mitigation Measures

Mitigation Measures

Before and During works:

- Tree protection in place.
- Effective site management to ensure polluted water and silt/ sediment doesn't leave the site.
- Removal of weed species to prevent spread of seed.
- Bush hygiene protocols should be followed to prevent the spread of pathogens including *Phytophthora*.
- Patch removal of weed shrub species, with replanting with native shrubs, to ensure habitat for wrens remains on-site during works.

After completion of works and on-going

- Companion animals are to be kept out of bushland areas at all times.

Legislation: Various pieces of legislation apply to this location and the proposed landscaping is in keeping with the objective of the Acts. Key acts are listed below.

- *Pittwater LEP in particular 7.6 Biodiversity Protection and in the DCP B:7 B4.7 Pittwater Spotted Gum Forest - Endangered Ecological Community (https://eservices.northernbeaches.nsw.gov.au/ePlanning/live/pages/plan/Book.aspx?exhibit=PDCP&hid=11852)*
- *Biosecurity Act (superseding the Noxious Weed Act 1993) (NW Act).*
- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*
- *Biodiversity Conservation Act 2016 (BC Act).*

3.1.1 Delineation of work areas

During construction, impacts on the site and adjacent vegetation (trees) should be minimized by the delineation of works zones and tree protection. Must implement Arborist Plan.

3.1.2 Landscaping and planting natives

The Landscape Plan is to be implemented. Any changes to be approved by ecologist with experience in PSGF.

Weed management is required in a staged manner to retained patches of small bird habitat. Planting locally native species to increase the habitat value of the site.

3.1.3 Erosion and runoff

Silt and sediment controls will be put in place. These will include, but not be limited to silt and sediment fences. Sediment controls will be reviewed during site inspections and/or after significant rainfall (more than 10mm in 24hrs resulting in site runoff).

3.1.4 Weed Removal Techniques

Weed removal proposed for the site will consist of hand removal techniques, manual/mechanical removal using bush regenerator tools. This approach will reduce the amount of herbicide used and reduce the amount of off-target damage through spot on application.

Woody perennial weeds less than 2 metres in height will require cut and paint or scrape and paint bush regenerator techniques based on the germinating/epicormic behaviour of the plant (especially plants that tend to coppice or sucker).

It is recommended that seed heads are removed prior to commencement of primary works. This would be best performed carefully by hand with secateurs with the aim of avoiding the spread flowers or seeds into planting zones. See Appendix II for further details.

3.1.5 Pathogen prevention

To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix V should be followed. The site is considered to be an area which may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to water. It is recommended that Bushland Hygiene Protocols be followed closely.

4 Appendices

4.1 Appendix I – Key Weed Removal Methods

Physical removal

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 plants 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 with surrounding soil, so as 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 P.P.E.

Technique	Method	Equipment
Cut and Paint Stems 	Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent of 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 the herbicide is limited. Herbicide is not to reach sediment or surrounding non-targeting plants.	Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide and all other required P.P.E.
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 Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current herbicide license. Weed species will be scraped 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 5 cm a second scrape shall be made on the other side of the trunk. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting 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 glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.

Technique	Method	Equipment
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 the herbicide is limited. Ensure there is no runoff of poison. All care must be taken by the contractor not to spill herbicide into water, onto sediment, or surrounding non-targeting plants. Follow up treatment will be required. If plants resprout, cut and paint the shoots using the same method.	Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.
Spot Spraying	Spot spraying involves spraying non-seeding annuals and grasses, and for regrowth of weeds once an area has been cleared or brushcut. Works to be carried out by a contractor with a current herbicide license. Herbicide will be mixed up according to the manufacturer's directions for the particular weed species being targeted. Mixed herbicide shall be applied to the targeted weed species with a backpack sprayer. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants.	Tools: protective clothing, safety glasses, herbicide sprayer, impervious gloves, Herbicide, and all other required P.P.E.

4.2 Bushland Hygiene Protocols for Phytophthora

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection and, always assume that the activity you are about to undertake has the potential to introduce the disease.
- Before you move onto the site spray the bottom of your shoes with 70 % metho. Bleach solution (1% strength) or household/commercial disinfectant (as per label) are also suitable.
- Check all tools and equipment that comes in contact with soil are clean before entering the area (they should have been cleaned on site at the end of the previous work session). If there is any dirt on them, spray them with 70% metho.
- Clean all tools at the end of each work session while still on site ensuring this is done away from drainage lines and adjacent work areas. Knock or brush off encrusted dirt and completely spray with 70 % metho. Replace in storage/transport containers.
- Preferably compost all weed material on site.
- Never drag vegetation with exposed roots and soil through bushland.
- Always work in areas known to be free of the pathogen before working in infected areas.
- Minimise activities wherever possible when the soil is very wet.

Kit should contain: 1 bucket, 1 scrubbing brush, 1 spray bottle (metho 70% solution), 1 bottle tap water, 1 bottle methylated spirits.

Facts about Phytophthora

Phytophthora cinnamomi (Phytophthora) is a microscopic, soil borne, water-mould that has been implicated in the death of remnant trees and other plants in Australian bushland. Phytophthora is not native to Australia. It is believed to have been introduced sometime after European settlement. Phytophthora is a national problem and is listed as a key threatening process under the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999.

Infection

There is no way of visually telling if Phytophthora is present in the soil as its structures and spores are microscopic (invisible to the naked eye). Phytophthora requires moist soil conditions and warm temperatures for infection, growth and reproduction. Spores travel through moist soil and attach to plant roots. Once Phytophthora has infected a host plant it can grow inside plant root tissue independent of external soil moisture conditions. After infection, Phytophthora grows through the root destroying the tissue which is then unable to absorb water and nutrients.

5 Expertise of authors

Geraldene Dalby-Ball

DIRECTOR With over 25 years wetland and urban ecology experience, a great passion for what she does, and extensive technical and on-ground knowledge make Geraldene a valuable contribution to any project.

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

Geraldene has up to date knowledge of environmental policies and frequently provides input to such works. Geraldene was a key contributor to the recent set of Guidelines commissioned by South East 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.

Geraldene is a frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. She is an excellent Project Manager.

Geraldene is 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.
- **Practicing member** Ecological Consultants Association of NSW
- **Accredited Biobank Assessor** in renewal

Gabriel James

Finishing his environmental degree at Macquarie University, Gabriel's passion for nature is evident through his pursuit as an ecologist, working on a range of projects across all sectors. Gabriel has contributed to a number of government projects where he conducted ecological surveys to identify the presence of any threatened species and habitat features.

These have been for the development of sustainable energy alternatives as well as the construction of a feral predator-free fence with aims to introduce endangered native species and re-establish their populations.

Within these projects, Gabriel has developed his skills in fauna handling and species identification for both flora and fauna across multiple regions within NSW. Additionally, Gabriel has been required to liaise with clients to achieve both efficiency for the client as well as a positive outcome for the environment.

SPECIALISATIONS

- Urban and landscape ecology
- Flora and Fauna Assessments
- Habitat tree assessment, marking and mapping
- GIS mapping

CAREER SUMMARY

- **Trainee Ecologist**, Ecological Consultants Australia. *2022-present*
- **Bush Regenerator,** Dragonfly Environmental. *2021*
- **Landscaping labourer,** Oxygenhort Horticultural Services. *2019-present*

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Environmental Science Major in Biology, Macquarie University.**
- **WHS General Induction of Construction Industry NSW White Card.**
- **First Aid Certificate**