Landscaping Plan for Pittwater Spotted Gum Forest

252 Hudson Parade, Clareville

Prepared by Ecological Consultants Australia Pty Ltd TA

Kingfisher Urban Ecology and Wetlands

May 2023

About this document

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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 with qualifications BSc majoring in Ecology and Botany with over 25 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.

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Geraldene Dalby-Ball – Director of Ecological Consultants Australia

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1 Introduction

Ecological Consultants Australia (ECA) trading as Kingfisher Urban Ecology and Wetlands has been contracted by Zephyr Charters to prepare a 'simple' **Landscaping Plan** for 252 Hudson Parade, Clareville NSW 2107, identified as Lot 59 in DP 13760, within the Northern Beaches Council Local Government Area (LGA) (see **Figure 1.1**; **Figure 1.2**).

This plan is intended to guide landscaping works for areas being disturbed by the proposed development. The proposal is for the construction of several new buildings including a new resident property, boatshed, carport and garage with integrated granny flat and the construction of an outdoor pool and landscaping to support well-being and provide accessibility within outdoors areas.

This plan is consistent with the *Pittwater 21 Development Control Plan* (DCP) *B4.7 Pittwater Spotted Gum Forest – Endangered Ecological Community*. The site is within the Pittwater Spotted Gum Forest (see **Figure 1.3**). Two spotted gums (Corymbia maculata) are proposed for removal to facilitate the development (see **Figure 1.4**).

Outcomes of the Pittwater 21 DCP B4.7

- *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 of the Pittwater 21 DCP B4.7

- *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.*

Figure 1.1. Site of proposed landscaping works. Source: *SIX Maps.* Date accessed: 3/05/2023.

Figure 1.2. Location of the site of proposed landscaping works. Source: *SIX Maps*. Date accessed: 3/05/2023.

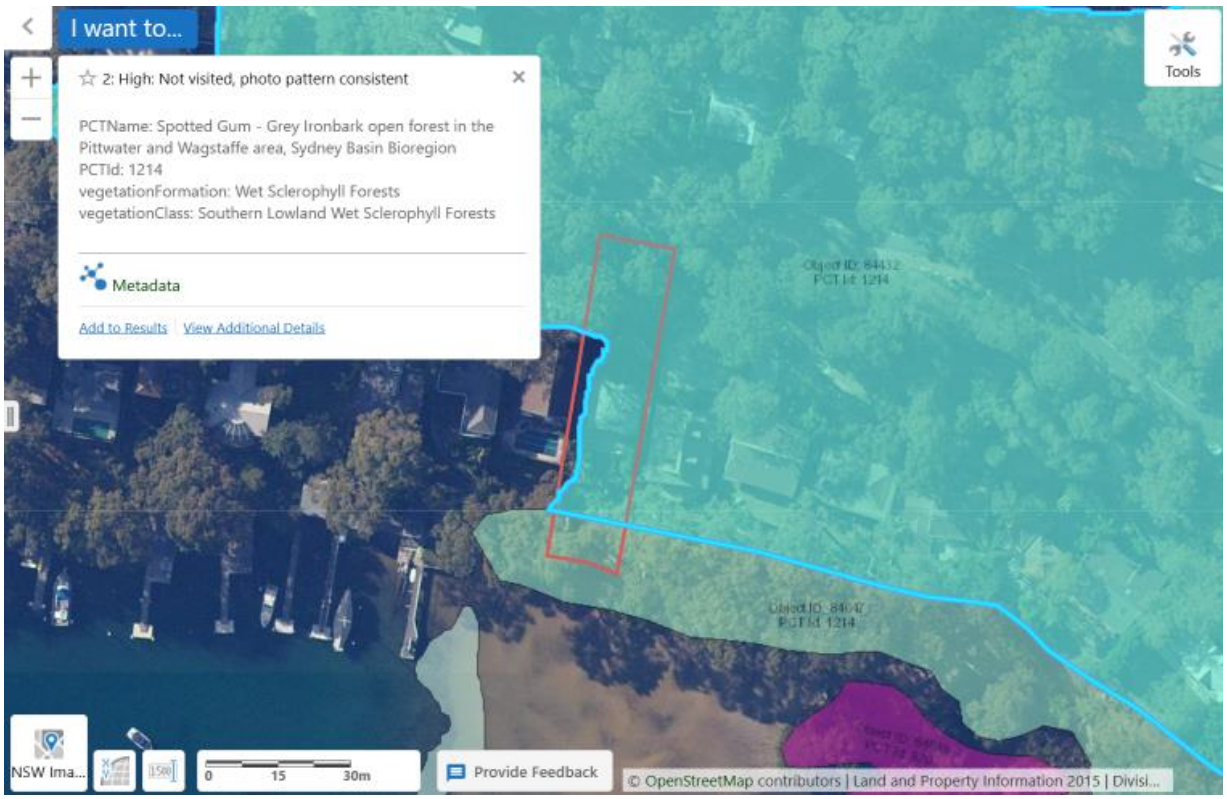


Figure 1.3. Site of proposed landscaping works relative to the occurrence of Pittwater Spotted Gum Forest. Source: *The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016) VIS_ID 4489*. Date accessed: 3/05/2023.

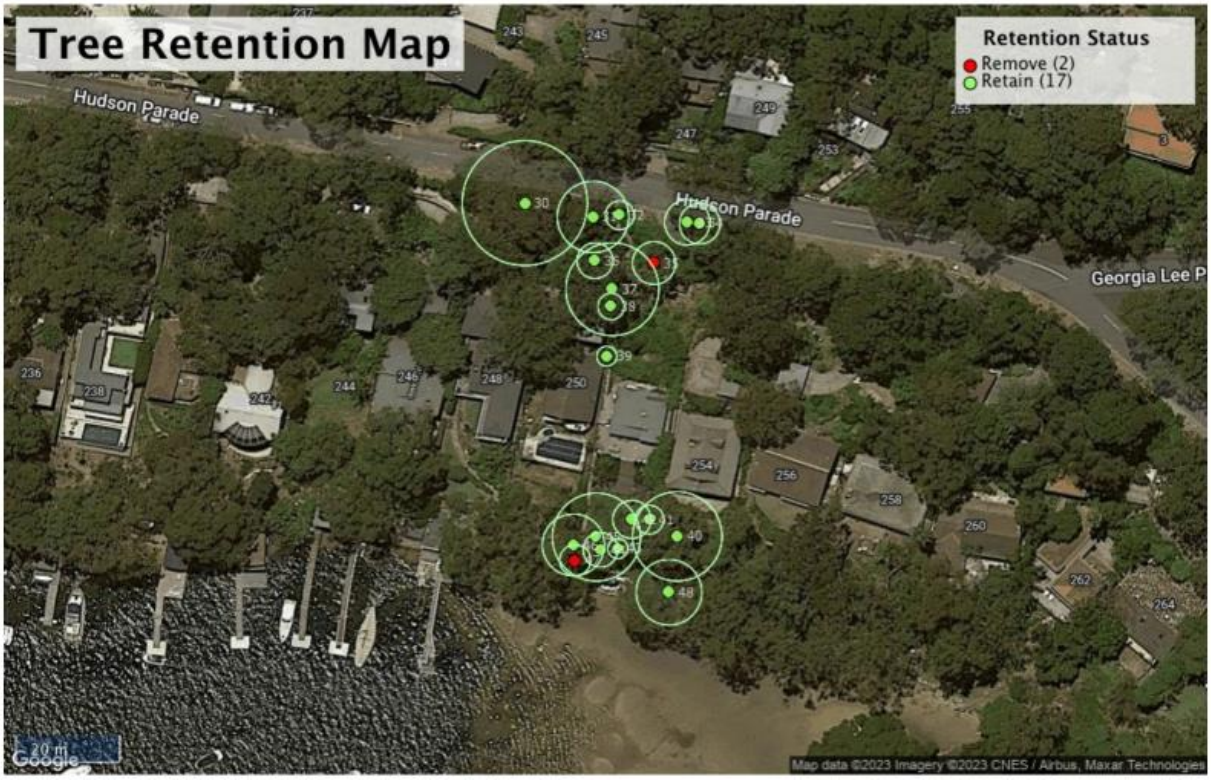


Figure 1.4. Tree Retention Map. Two spotted gums (*Corymbia maculata*) proposed for removal. Source: *Arboricultural Impact Assessment*. Arborsaw. April 2023.

2 Landscaping Recommendations

This Landscaping Plan applies to the whole property with an emphasis on screening from neighbours and weed removal along the sandstone rock scarp 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 the long-term tree canopy cover (assuming four to maturity). Landscaping is concentrated from Hudson Parade to over the rock scarp. Bush regeneration activities are recommended between the existing dwelling and Hudson Parade. Weed removal and planting are recommended from the existing dwelling / proposed dwelling to the foreshore of Pittwater.

The Site and Roof Plan shows the layout of the proposed development and tree retention and removal (see **Figure 2.1**). The remaining areas are proposed for landscaping (611.6 m^2). Note there are also three green roofs.

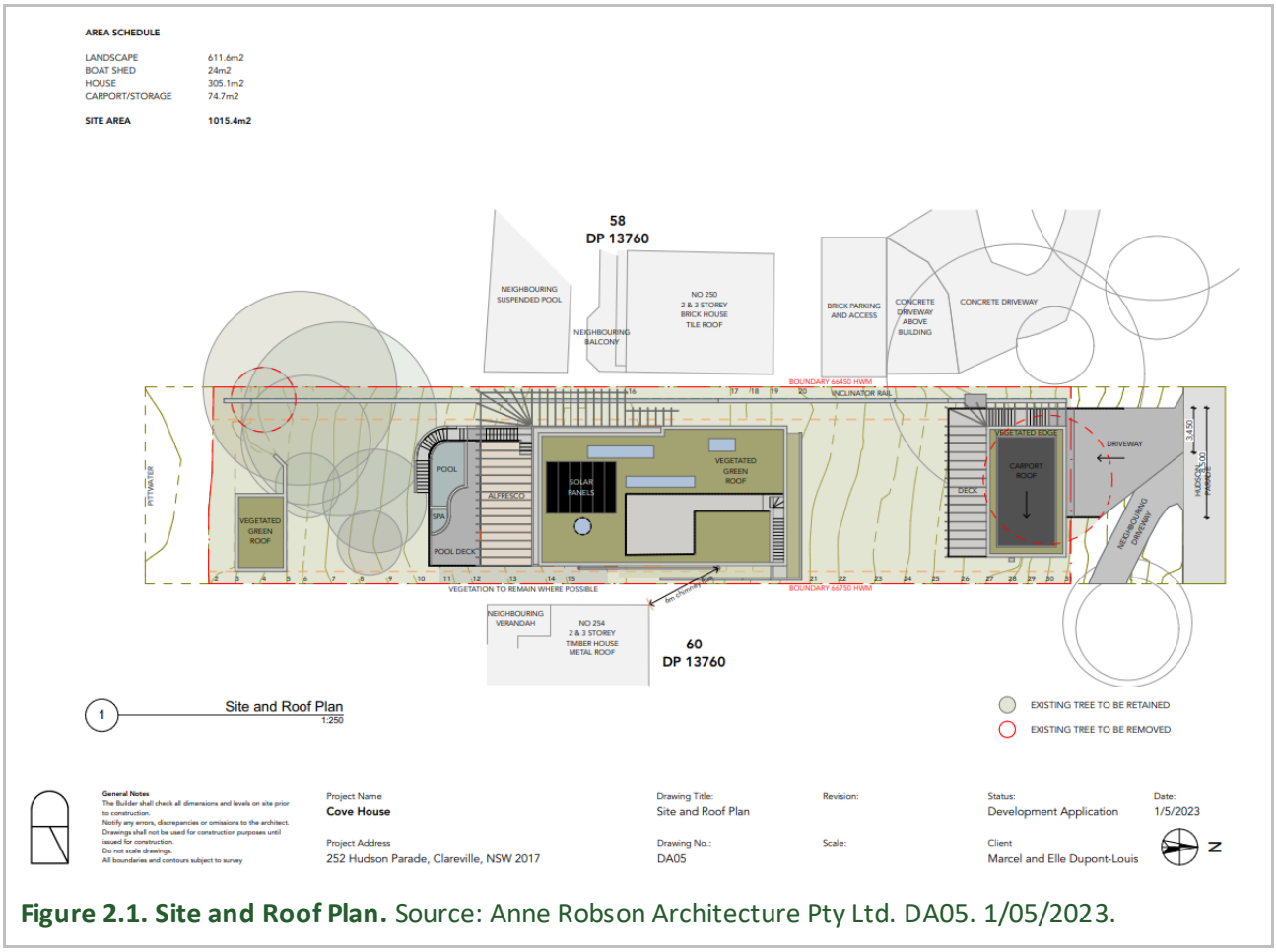
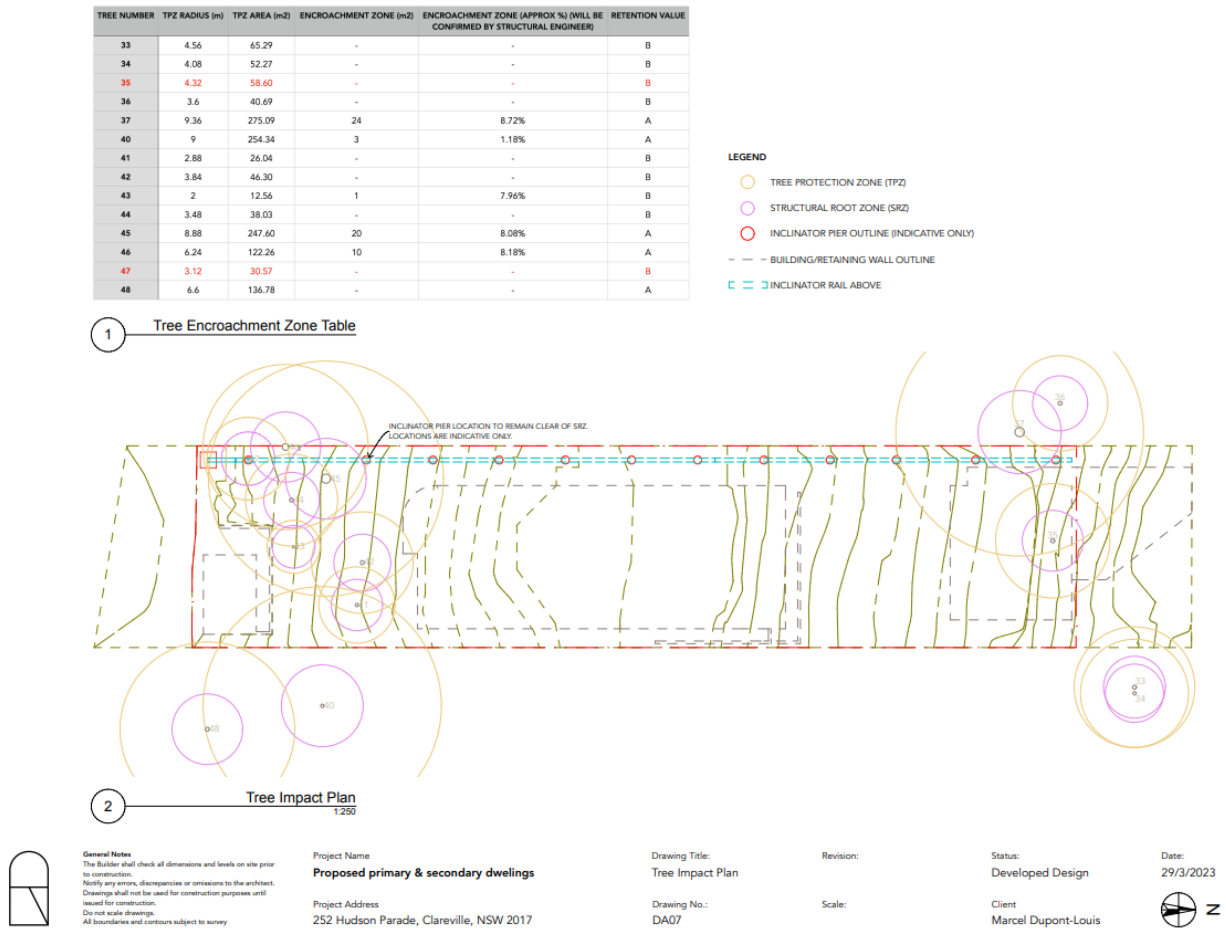


Figure 2.1. Site and Roof Plan. Source: Anne Robson Architecture Pty Ltd. DA05. 1/05/2023.



TREE NUMBER	TPZ RADIUS (m)	TPZ AREA (m2)	ENCROACHMENT ZONE (m2)	ENCROACHMENT ZONE (APPROX %) (WILL BE CONFIRMED BY STRUCTURAL ENGINEER)	RETENTION VALUE
33	4.56	65.29	-	-	B
34	4.08	52.27	-	-	B
35	4.32	58.60	-	-	B
36	3.6	40.69	-	-	B
37	9.36	275.09	24	8.72%	A
40	9	254.34	3	1.18%	A
41	2.88	26.04	-	-	B
42	3.84	46.30	-	-	B
43	2	12.56	1	7.96%	B
44	3.48	38.03	-	-	B
45	8.88	247.60	20	8.08%	A
46	6.24	122.26	10	8.18%	A
47	3.12	30.57	-	-	B
48	6.6	136.78	-	-	A

Figure 2.2. Tree Impact Plan. Note the site is sloped toward Pittwater. Source: Anne Robson Architecture Pty Ltd. DA07. 29/03/2023.

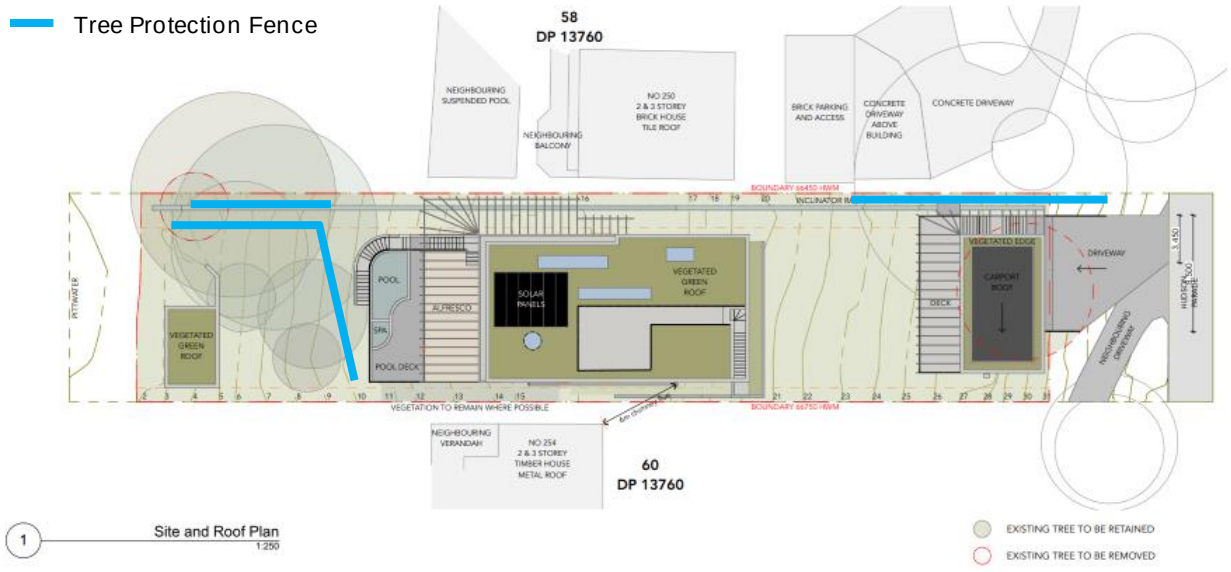


Figure 2.3. Tree Protection Fence to be installed.

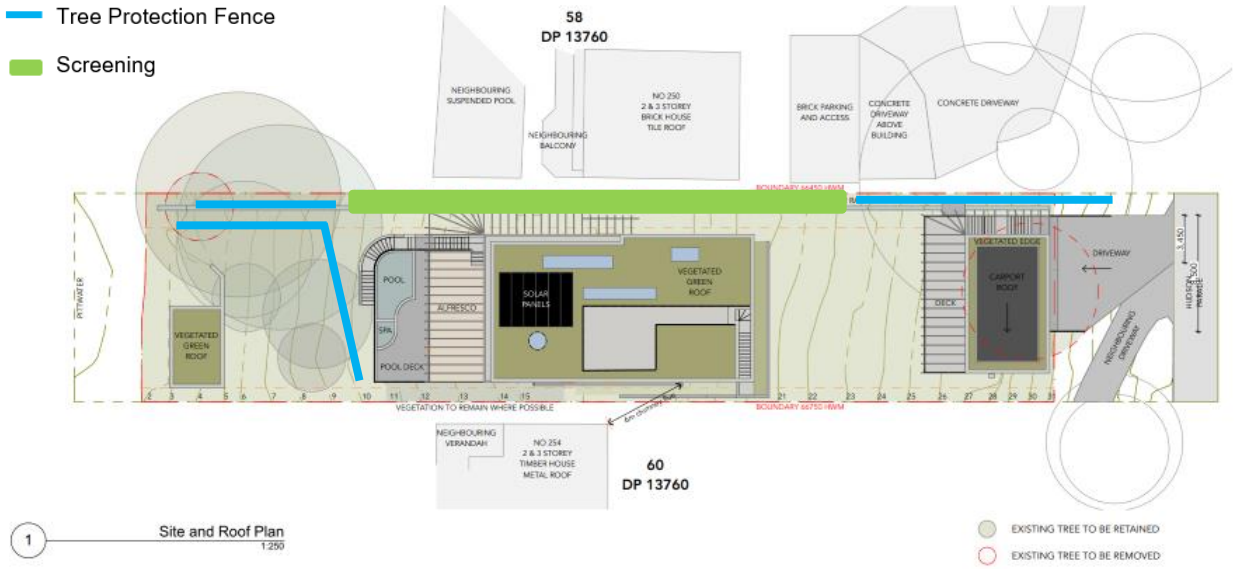
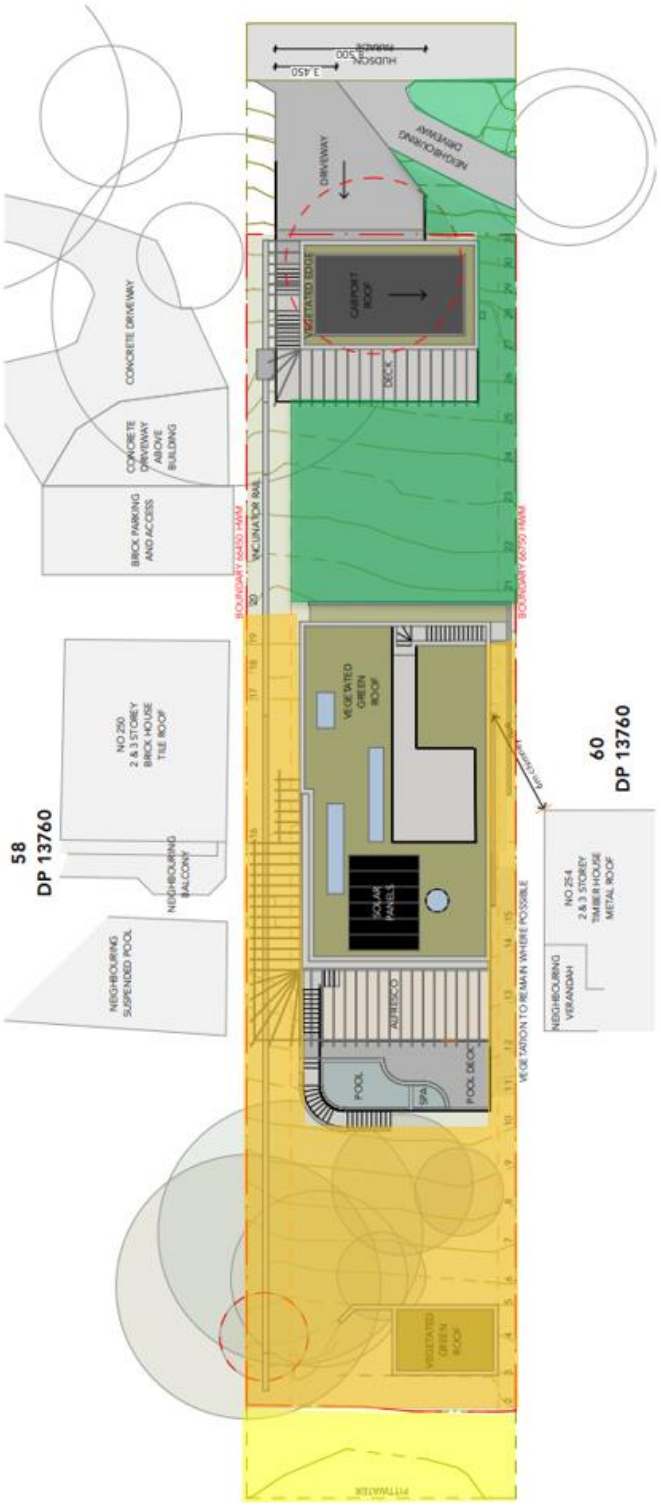


Figure 2.4. Screening to be planted on west boundary by way of small trees. 1st Row 1 m spacing and 2nd Row of large shrubs at alternative 1 m spacing. Screening from Pittwater will be provided from native plantings as proposed in this plan and the existing trees.

3 Management Zones

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 and 100% Pittwater Spotted Gum Forest species planting.

Management Zone 2 (Orange)

- Landscaping to include 80% Pittwater Spotted Gum Forest species.

Green Roofs (See Site and Roof Plan)

- Note no invasive species proposed on green roofs.

Optional planting (Yellow)

- Regeneration back to native grasses (currently 90% exotic grass)
- Weeping Meadow Grass (*Microlaena stipoides*) recommended for this area.

Figure 3.1. Summary of Management Zones.

Figure 3.2. Artistic impression. Note this impression displays fewer trees than what occurs on the site therefore screening to Pittwater will be more than what is displayed here.

3.1.1 Management Zone 1

Management Zone 1 is located on the northside of the property between the existing dwelling and the Hudson Parade (see **Figure 3.1**). The proposal has 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.

To improve the vegetative conditions of this area on site, it is recommended that bush regeneration and native planting occurs 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 of 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 3.1**.

Site photos of Management Zone 1. Diverse native species to be protected pre, during and post works.

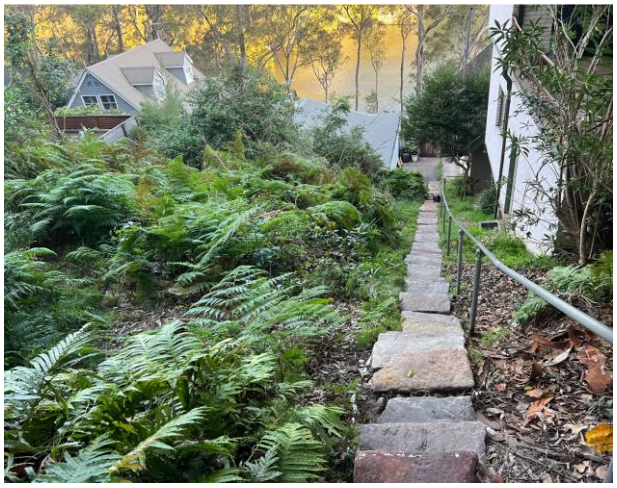


Plate 1. Native species to be retained. Asparagus Fern to be removed by Bush Regenerators.

Plate 3. Native species to be retained. Area to be protected with fencing and signage pre and during works.

Plate 4. Native species to be retained. Bush regeneration required in 50% of the area. Very low planting density needed. Only disturbed areas to be planted post works.

Plate 5. Native species to be retained. Weeds to be removed from this area behind Ferns.

3.1.2 Management Zone 2

Management Zone 2 is located on the southern side of the property between the existing dwelling and Pittwater (see **Figure 3.1**). An additional strip is present from the south boundary to the waterline, and this is currently dominated by 90% exotic grasses (see **Figure 3.1**). Reseeding with native grasses is recommended (optional).

The current condition of the vegetation in Management Zone 2 is poor and does not represent the natural conditions of the PSGF community. Planting of native species is recommended to increase biodiversity values on site, improving the conditions of the PSGF community and available habitat for local fauna.

Development of the 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 ground-story to mid-story cover and instead is covered with the regeneration of exotic grass and weed species. This area does have a good top-story canopy cover, provided by native trees belonging to the PSGF community.

Initial bush regeneration followed by the planting of natives will improve the vegetative condition of this area. Bush regeneration should take place first to remove the presence of any exotic grass and weed species which currently dominate the ground-story cover. This should be followed by the planting of natives belonging to the PSGF community, with intentions to develop the ground-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 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 3.1**.

Plate 6. Existing landscape area.

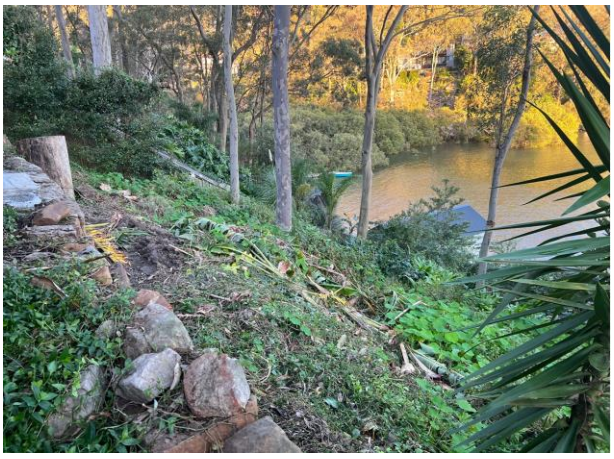


Plate 7. Below existing landscape area. Area to be weeded and requires native species planting including screening shrubs.

Plate 8. Optional additional area (yellow in Figure 3.1) boundary to waterline. Asparagus Fern to be removed by Bush Regenerators. Exotic grasses may be replaced with native Weeping Meadow Grass and violets (optional).

Plate 9. Boundary to foreshore. Neighbouring property with Asparagus Fern.

4 Landscape Species

Landscaping will included species known to the Pittwater Spotted Gum Forest and consistent with the assemblage of species characteristic of the PSGF identified by the NSW Threatened Species Scientific Committee see https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/Determinations/2013/pittwater-wagstaffe-spotted-gum-forest-nsw-scientific-committee-final-determination.pdf?la=en&hash=95E95CC5FFA86592227BE0A6B42614F597BCE468

Species included in the landscaping plan can only be changed for like species and the plan must follow the below requirements (see Table 4.1).

Table 4.1. Landscaping plan requirements.

Stratum (layer)	Number of Species (No more than 20% from any one species)	Minimum total number of plants (Tube-stock)
Groundcover	6	492
Shrubs	6	500
Small trees	2	200
Trees	1	8 to be planted (4 at least to grow to maturity)
Total	-	1200 plants

This averages at 3 plants per m^2 in areas proposed for disturbance. Disturbance area to be plant with 100% PSGF species. An area of 400 m^2.

Other areas of the property will have a mix of current landscaping being retained (where not environmental weeds) and additional planting of PSGF species.

4.1.1 Plant species and supply

The required tube-stock and the list on the following page can be provided to any of the local native supply nurseries such as Indigo Native Plant Nursery in Ingleside. The nurseries know which are ground, shrub, small trees, and trees, 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 must be provided to council with certification pre-OC. Those outlined are the priority species from each layer Blue is tree, Green is small tree, Orange is shrub, Black is groundcover, vine or palm.

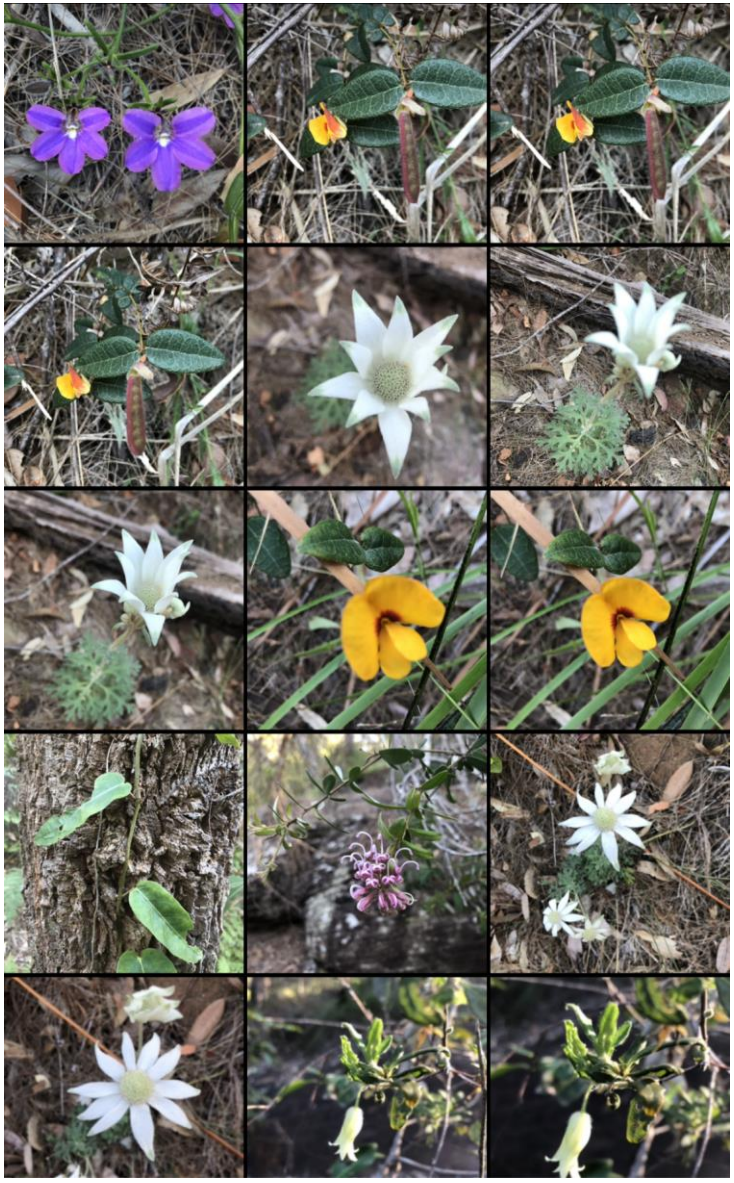
- *Acacia floribunda*
- *Acrotriche divaricata*
- *Adiantum aethiopicum (Fern)*
- *Allocasuarina litoralis*
- *Allocasuarina torulosa*
- *Angophora costata*
- *Angophora floribunda*
- *Billardiera scandens*
- *Breynia oblongifolia*
- *Cassytha paniculata (Vine)*
- *Cayratia clematidea (Vine)*
- *Cissus hypoglauca (Vine)*
- *Corymbia gummifera*
- *Corymbia maculata*
- *Dianella caerulea (Ground)*
- *Dodonaea triquetra*
- *Doodia caudata (Fern)*
- *Eleocarpus reticulatis*
- *Entolasia stricta (Ground)*
- *Eucalyptus botryoides*
- *Eucalyptus paniculata*
- *Eucalytpus punctata*
- *Eucalyptus umbra*
- *Eustrephus latifolius (Vine)*
- *Geitonoplesium cymosum (Vine)*
- *Glochidion ferdinandi*
- *Gymnostachys anceps*
- *Hakea sericea*
- *Hydrocotyle peduncularis (Ground)*
- *Livistona australis (Palm)*
- *Lomandra longifolia (Ground)*
- *Macrozamia communis (Ground)*
- *Notelaea longifolia*
- *Oxylobium ilicifolium*
- *Pandorea pandorana (Vine)*
- *Pittosporum undulatum*
- *Platylobium formosum*
- *Pseuderanthemum variabile (Ground)*
- *Pteridium esculentum (Fern)*
- *Pultenaea flexilis*
- *Syncarpia glomulifera*
- *Synoum glandulosum*
- *Themeda australis (Ground)*
- *Xanthorrhoea macronema* (Grass Tree)

As well as additional vine species that are locally native and well suited to cover the existing terraces (see images in **Table 4.2**).

Images of plants naturally occurring in PSGF and drier edges in Avalon.

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

While not all native plants shown here are on the species list, any of these species 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 sandier soils

Species suitable on sandier soils

Table 4.2. Selection of vine species in the planting list.

Common Name	Scientific Name	Photo	Growth Habit (NF) habitat for native fauna, (BF) Bush Food.	Notes
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.
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.

Common Name	Scientific Name	Photo	Growth Habit (NF) habitat for native fauna, (BF) Bush Food.	Notes
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.
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: Examples of the species for planting in this community are also those on the northwestern facing PSGF, and sandstone intergrading areas of Angophora Reserve.

5 Recommendations

5.1.1 Mitigation Measures

Pre and during works:

- Tree protection measures to be installed including fencing and signage.
- Effective site management to ensure any polluted water and/or 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.

5.1.2 Delineation of work areas

During the development, impacts to the site and the vegetation to be retained should be minimized by the delineation of work areas. Access to the site would be best restricted to the development footprint only. An exclusion zone will be established for the vegetation outside the work areas. See Arboricultural Impact Assessment for details on tree protection.

5.1.3 Landscaping and planting natives

The Landscaping Plan is to be implemented. Any changes must be approved by Ecologist with experience in PSGF.

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

5.1.4 Erosion and runoff

Where required, sediment controls will be put in place. These will include, but not limited to sediment fencing, jute mating, crushed sandstone, and coir logs. Sediment controls will be revised during site inspections and/or after significant rainfall (more than 10 mm in 24 hours resulting in site runoff). 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.

5.1.5 Weed Removal Techniques

Weeds are present on site and must be appropriately managed to ensure they do not spread. 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. There must be continuous maintenance of the vegetation onsite otherwise increased weed growth may result, exacerbated by the high abundance of weeds present pre-

works. Weeds will colonize and pioneer on any cleared grounds, therefore must be managed during works as well as ongoing post-works. 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 areas. See Appendix I for further details.

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.

Although soil-borne pathogens have not been identified as a Key Threatening Process, the accidental spread of pathogens can occur at any time. To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix II must be followed. Hydrological conditions may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to moist soil and proximity to water. It is recommended that Bushland Hygiene Protocols be followed closely.

5.1.6 Pathogen prevention

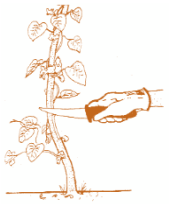
To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix II should be followed. The site is considered an area which may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to water. It is recommended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

6 Appendices

6.1 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.
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	Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup® Biactive

	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.	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 plant 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.
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.	Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive

	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.	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.

Flame Weeding

Thermal (flame) weeding is a method where high temperatures are applied to weeds, causing the plant to die. Thermal weeding is particularly useful in situations where conservation or health considerations are high and weed density is low such as waterways where herbicide use is not permitted.

While flame weeding is not suited to most streetscapes due to the fire hazard nor can it be used on materials such as soft fall and similar playground equipment it is noted that 'flame' weeding in waterways allows weed management in areas where herbicides are not permitted.

Also, for native vegetation areas thermal weeding, with a flame weeder, has been shown to stimulate germination of native plants while killing the seeds of annual weeds such as Devils Pitchfork, *Bidens pilosa*. Flame weeding is also effective in killing persistent weeds like

Mother of Millions.

Best results are obtained when follow up weed control is undertaken 4-6 weeks after treatment. In addition, weed control should be conducted periodically after that for example to control weeds over a period of a year it is likely that between 3-5 applications will be necessary, depending on rainfall and the extent of the weed seed bank. This method is most effective on young annual weeds and least effective on older perennial weeds. In some cases, control of perennial weeds will be ineffective however this depends on the species present and its age.

Images provided by Dragonfly Environmental

Flame weeding should be undertaken outside of the fire seasons. Flame weeding allows for the mimicking of a burn in areas where a control burn could not be undertaken. See native plants regenerating after flame weeding.

6.2 Appendix II – Bushland Hygiene Protocols for Phytophthora (Hornsby Council Recommendations)

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection.
- Always assume that the activity you are about to undertake has the potential to introduce the disease.
- Arrive at site with clean shoes, i.e.: no dirt encrusted on them.
- If you arrive with shoes that are encrusted with dirt, they will have to be completely soaked in metho or disinfectant and allow a few minutes to completely soak in. NEVER scrape untreated dirt off your shoes onto the ground.
- 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
- 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.
- When removing weeds from site, remove as much soil as possible from them in the immediate work 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.area and carefully place vegetative material into plastic bags.
- Try not to get the bag itself dirty; don't put it on/in a muddy area.
- Always work from the lower part of a slope to the upper part.
- 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.
- Vehicles should not be driven off track or into reserves (unless vehicle decontamination is carried out before and after entering a single work site)
- Only accredited supplies of plants/mulch to be used.

Kit should contain: 1 bucket, 1 scrubbing brush, 1 spray bottle (metho 70% solution), 1 bottle tap water, 1 bottle methylated spirits. Contact Hornsby Bushcare if you require any refills or replacements of your Phytophthora Kits on 9484 3677 or bushcare@hornsby.nsw.gov.au

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.

Symptoms including Dieback

"Dieback" simply means dying or dead plants. There are many causes of dieback; Phytophthora is just one of them. Often dieback is the result of a combination of factors such as changed drainage patterns and nutrient loads (e.g.: increased stormwater run-off) or changed soil conditions (e.g.: dumped fill or excavation of/near root zone). Plants that are stressed are more vulnerable to Phytophthora.

Initial symptoms of Phytophthora include wilting, yellowing and retention of dried foliage, loss of canopy and dieback. Infected roots blacken and rot and are therefore unable to take-up water and nutrients. Severely infected plants will eventually die. Symptoms can be more obvious in summer when plants may be stressed by drought. If you suspect that Phytophthora is on your site, please contact the Bushcare team to collect a soil sample to be lab tested. This is usually done in the warmer months where conditions are optimum for the disease.

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.

7 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 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.

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 and vice president** Ecological Consultants Association of NSW

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**