BUSHFIRE FUEL & VEGETATION MANAGEMENT PLAN

SPRING COVE ESTATE, MANLY NSW

PREPARED FOR:
SPRING COVE DEVELOPMENTS PTY LTD

BY:
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WITH INPUT FROM TOTAL EARTH CARE, BUILDING CODE & BUSHFIRE HAZARD SOLUTIONS PTY LTD AND RENATA BALI

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Introduction

Objectives

This Bushfire Fuel and Vegetation Management Plan (BF&VMP) has been prepared by McGregor Coxall in conjunction with Total Earth Care with input from Building Code & Bushfire Hazard Solutions Pty Ltd and Renata Bali for Spring Cove Developments Pty Ltd to address Condition 81 of the Notice of Determination of Development Application No. 482/04.

This plan provides guidelines for the overall implementation and management of the vegetation within the Spring Cove estate with the aim of protecting and enhancing habitat for native fauna and flora while managing fuel loads for bushfire. This plan details the protection of the existing vegetation cover, staged weed removal and revegetation and the on-going management required to maintain fuel loads to minimise the risk of bushfire.

The plan included in Appendix A delineates the various areas of bushfire fuel and vegetation management approaches referred to this document.

Previous Studies, Reports and Management Plans

This BF&VMP has been prepared following the review of the following documents and includes exerts and references from these documents where applicable:

- Bandicoot Monitoring Spring Cove, North Head, 14 December 2011 prepared by LesryK Environmental Consultants;
- Bandicoot Management Plan, St Patrick's Estate, April 2005 prepared by Lend Lease;
- Species Impact Statement, Proposed Residential Development Precincts 5, 6 & 10 St Patrick's Estate, Manly, April 2005 prepared by Renata Bali;
- Flora and Fauna Assessment, Residential Development of Precincts 5, 6 & 10 St Patrick's Estate, Manly, September 2004 prepared by Ecosense Consulting Pty Ltd;
- Bandicoot Habitat Assessment and Management Plan for St Patricks Estate, Manly, 25 October 1996 prepared by Biosis Research Pty Ltd;
- Bushfire Hazard Assessment Report, Proposed Spring Cove Residential Development Precincts 5, 6 & 10 St Patrick's Estate, Manly, August 2004 prepared by Building Code & Bushfire Hazard Solutions Pty Ltd;
- Updated Arboricultural Data for Construction Certificate of Spring Cove 106 Darley Road, Manly, November 2011 prepared by Tree Wise Men Australia Pty Ltd;
- Arborist's Report, Proposed Development (DA482/2004) Precincts 5, 6 and 10 – Spring Cove St Patrick's Estate Manly NSW, November 2005 prepared by Tree Wise Men Australia Pty Ltd;
- Conservation Management Plan for St Patrick's Estate Darley Road Manly, December 2002 prepared by Tanner & Associates Pty Ltd;
- Report on Geotechnical Investigation Precincts 5, 6 & 10, Residential Subdivision St Patrick's Estate, Manly, February 2002 prepared by Douglas Partners.

Statutory Requirements/Approvals

The Spring Cove Estate development has been approved by Manly Council in accordance with the Conditions of Consent relating to Development Application No. 402/04. This BF&VMP has been produced to specifically address Condition 81:

"A detailed Bushfire Fuel & Vegetation Management Plan is to be prepared by a landscape architect identifying the existing vegetation cover and the proposed planting densities and species within bandicoot vegetation links and adjacent the southern boundary wall. The planting densities and species within the vegetation links are to be based upon the ecological needs of bandicoots and the bushfire sprinklers within the vegetation links is to be designed based upon the existing vegetation and the proposed planting densities. The Bushfire Fuel & Vegetation Management Plan is to be certified as being suitable for encouraging bandicoot movement by an

professional ecologist and the bushfire sprinkler system within the vegetation links is to be certified as being suitable by a professional bushfire consultant."

Other related Acts, Regulations and Standards relevant to the management of bushfire fuel and vegetation on the Spring Cove Estate site are:

- NSW Threatened Species Conservation Act 1995
- NSW National Parks & Wildlife Act 1974
- Planning for Bushfire Protection 2001 (superseded by Planning for Bushfire Protection 2006)
- AS4970-2009 Protection of Trees on Development Sites
- AS4373-2007 Pruning of Amenity Trees
- Manly Council Tree Preservation Order 2008

It should be noted that the planning, design and approvals for the development have been undertaken/assessed against Planning for Bushfire Protection 2001 being the current document at the time. That document has since been superseded by Planning for Bushfire Protection 2006 (and amendments).

Site Description

Spring Cove Estate is located adjacent to Spring Cove and Collins Beach on the southern most section of the St Patricks Estate in Manly encompassing precincts 5, 6 and 10. The site is bordered to; the north by the existing Archbishops' residence and Catholic School, the east by the Sydney Harbour National Park and North Head, the west by existing residential flat buildings and houses, and the south by a small unnamed Manly Council Reserve and the adjacent Sydney Harbour.

The sandy heath landscape character of adjacent North Head has been an important reference for the development of this estate. The topography of the site generally falls in a south westerly direction towards Spring Cove and has a total level change of 27 metres. According to the 1:100,000 Geological Series map for Sydney, the site is underlain by Hawkesbury sandstone geology. The Douglas Partners Geological Investigation indicates that the rock is weathered to a 1-2 metre depth from the surface before high strength rock is encountered. A veneer of sandy soil of depths varying from 1.2 metres to 300 mm covers the rock strata. North Head was originally a sand dune formation.

Previous Land Use

As the St Patrick's Estate Manly Conservation Management Plan (Tanner and Associates December 2002) states, St Patrick's Estate was "established as the first National Catholic ecclesiastical seminary in Australia" The following extract has been taken from this report (page 64) which describes the former land use and landscape character specific to the Spring Cove Estate site:

"A linear path and steps, originally connected the Archbishop's Residence with the Harbour frontage and some terraces were formed along it's length, with shrubs and in some cases trees providing definition to both the path and terraces. With the subsequent construction of tennis courts/playing fields and Gilroy House this feature can now only be grasped in a residual way. Of the conscious planting found on this site, the species are all hardy varieties, reflect the tough marine environment and poor soil. They typically include: Norfolk Island pines, radiata pines, palms, oleander bushes."

Proposed Development

Spring Cove Estate is a tripartite configuration spread over three distinct topographic zones, an upper, mid and lower terrace according to topography. Dwellings include a single residential flat building consisting of 16 apartments with 5 semi-detached and 17 detached houses.

Construction Staging

Construction works associated with the development will be staged to minimise negative impacts on the bandicoot population and include (Ecosense, 2004):

- Stage 1 - Construction of all roads and services, including:
  - Erecting protective fencing around trees and other vegetation to be protected;
  - Erecting construction fencing in accordance with the Bandicoot Construction Protocol and constructing site compounds on existing cleared land;
  - Construction of erosion and sedimentation controls;
  - Weed removal, bush regenration and revegetation works to the northern, eastern and central vegetated links;
  - Installation of services and utilities across the site;
  - Construction of vehicular and pedestrian accessway network across the site;
  - Construction of site storm water infrastructure including infiltration areas, drainage swales, headwalls, scour protection, etc;
  - Construction of parkland areas within the public lot and axial pathway.
- Stage 2 - Construction of apartments and various houses generally including:
  - Erecting protective fencing around any newly established or enhanced vegetated links;
  - Erecting construction fencing in accordance with the Bandicoot Construction Protocol;
  - Construction of apartments and houses.

Access for the purpose of the above works will be through the development site.

Definitions used in this Plan

BF&VMP: Bushfire Fuel and Vegetation Management Plan which provides guidelines for the overall implementation and management of the vegetation within areas at risk of bushfires. These guidelines detail the protection of existing vegetation cover and the on-going management required to maintain fuel loads to minimise the risk of bushfire.

Common Lot: A common lot is an area that is used but not owned by a private owner. It is a shared space that needs to be managed by a joint group or body. In this case, the common lots are to be managed by The Church.

DA: Development Application - This particular document refers to Development Application No. 402/04

IPA: Inner Protection Area - The NSW Rural Fire Service defines the inner protection zone (IPA) as inner most part of an Asset Protection Zone (APZ). These zones are put in place to protect human life and highly valued assets such as buildings. The inner protection area is located immediately adjacent to the asset and incorporates a defendable space and also significantly reduces heat intensity at the building surface.

Lot Owners: Owners of the private lots

Maintenance Contractor: The Contractor appointed by The Church to undertake the maintenance required under this plan.

Private Lot Landscape Areas: These areas are owned by individual private owners and not owned by the Church. These areas are still managed as 'Inner Protection Areas'.

RFS: NSW Rural Fire Service

Spring Cove Estate: The spring cove estate comprises of lots 5, 6 and 10 of DP 544297.

The Church: St Patricks Roman Catholic Church for the Archdiocese of Sydney.

Vegetated Corridor: Also referred to as vegetated links, these corridors/links allow for the movement of bandicoots within and between the Spring Cove Estate site, Sydney Harbour National Park and adjoining environments.

Vegetation Management

This section encompasses the issues and approach relating to vegetation management across the entire Spring Cove Estate.

Landscape Architecture Strategy

The landscape strategy for the Spring Cove Estate aims to:

- create a contemporary low density residential environment that is derived from, and guided by, the natural context and character of the site;
- minimise intervention on topography, storm water and vegetation;
- maximise the opportunities for bandicoots, residents and the public to co-exist in a balanced environment proposing a sustainable future for the site;
- protect and conserve trees and grass lands to prevent disturbance by managing existing flora and promoting bush regeneration;
- maximise bandicoot foraging and shelter area amongst dwellings and across the site by educating residents of the new community about the fauna species they live with;
- retain the conservation value of existing heritage paths, stairs and structures.

Threatened Species

Flora

Ecosense Consulting Pty Ltd prepared the Species Impact Statement (*Proposed Residential Development Precincts 5, 6 & 10*) and recorded a total of 221 plant species within St Patrick's Estate south of Darley Road. Approximately 50% of the species were considered as endemic. It was noted that the landscape has been substantially modified from its original condition showing clear evidence of previous soil disturbance and filling, with only small areas of native vegetation remaining (Ecosense 200?). No threatened plant species were recorded on the subject site, and it was concluded that none were likely to occur in the study area or on the subject site (Ecosense 2004).

More recent survey of the subject site by Total Earth Care, including the adjoining Council Reserve and a section of the National Park immediately to the south, did not record any threatened flora species. However, one locally significant species *Synoum glandulosum* Scentless Rosewood is present but uncommon within the site and the adjoining Council Reserve (TEC 2011, Tree Wise Men 2006).

Fauna

Most of the fauna species previously recorded in the locality are widespread, common to abundant and typically found in urban environments where they are subject to varying degrees of disturbance (Ecosense 2004). The SIS lists a total of 42 species (8 mammal, 30 bird, 3 reptiles and one frog), with an additional nine species recorded within other precincts of the Estate. Introduced mammals known to occur on the site include the Black Rat (*Rattus rattus*), European Rabbit (*Oryctolagus cuniculus*), feral cat (*Felis catus*) and potentially the Red Fox (*Vulpes vulpes*) (Ecosense 2004). Ecosense recorded one threatened fauna species Grey-headed Flying Foxes (*Pteropus poliocephalus*) feeding on fig trees adjoining the site.

Two broad fauna habitat types classified as disturbed habitat and scrub occur on the subject site. The disturbed habitat includes managed lawn grass and occurs across the majority of the site. It is maintained as mown grass, with remnant native trees and planted horticultural trees present. It represents a highly altered landscape and lacks many of the natural habitat features and resources that are important in the maintenance of native fauna diversity and life cycles. However, the mown grass habitat provides suitable foraging habitat for the Long-nosed Bandicoot, and a number of bandicoot diggings were observed within the grassed areas during the previous and most recent site survey (Ecosense 2004, TEC - October 2011).

The scrub habitat, where it occurs, is generally 5m to 10m high and consists of a combination of native and exotic plant species. The understorey varies from almost non-existent to relatively dense, where Lantana,

native vines and shrubs, and exotic shrubs occur. As well as nesting or shelter habitat for the Long-nosed Bandicoot, it also provides valuable foraging, nesting, and roosting habitat for a variety of small bird species commonly found in urban bushland areas such as Fairy Wrens, Thornbills, and Scrub Wrens.

The Long-nosed Bandicoot population on North Head is listed as an endangered population under Schedule 2 of the Threatened Species Conservation Act 1995. The areas of scrub layer found within the adjoining Council Reserve and National Park, and to a lesser extent within the site, provide Long-nosed Bandicoots with suitable habitat to construct nests for breeding and sheltering. The open grassed areas provide suitable foraging habitat. The areas of scrub habitat to be retained will be weeded and enhanced to form the proposed vegetated links.

Sections of the adjoining Council Reserve and National Park are declared 'critical habitat' for the endangered Little Penguin population, with other areas considered to be potential habitat areas for the population within the Critical Habitat declaration. The site boundary wall and the sandstone cliff face within the adjoining Council Reserve separates the subject site from Spring Cove, thereby effectively preventing Little Penguins from utilising the subject site as breeding and nesting habitat. However, rock platforms around Spring Cove provide intertidal areas with habitat for foraging and resting opportunities during the day.

Ecological Communities

The Native Vegetation of the Sydney Metropolitan SMCMA Region (DECCW 2009) maps the majority of the vegetation on the subject site as part of an urban native and/or exotic community. The SIS described this area as “grassland dominated by introduced grasses” with “patches of horticultural plantings of trees and shrubs including a range of endemic, non-endemic and exotic tree species” amongst the grassland areas.

There are some degraded patches of native vegetation located along the small embankment in the middle of the site, near the southern boundary and the northeastern part of the site (Ecosense 2004), and some of these areas are previously mapped as Coastal Sandstone Foreshore Forest (SMCMA 2009).

The strip of vegetation adjacent to the heritage wall has scattered native trees including Bangalay, Sydney Red Gum, Cheese Tree, Coast Banksia and Broad-leaved Paperbark. This area is the eastern edge of a larger vegetation community within the national park, and is mapped as Coastal Escarpment Littoral Rainforest (CELR). CELR is a component of the Endangered Ecological Community Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions listed under Schedule 1 Part 3 of the TSC Act. Coastal Escarpment Littoral Rainforest is also encompassed by the definition of Littoral Rainforest and Coastal Vine Thickets of Eastern Australia listed as a Critically Endangered Ecological Community under the EPBC Act.

Although the endangered ecological community Eastern Suburbs Banksia Scrub occurs elsewhere on North Head, it has not been recorded in the study area or on the subject site and is not likely to occur due to a lack of suitable habitat.

Pest Fauna Species

The NSW Scientific Committee has listed Predation by the European Red Fox Vulpes vulpes (Linnaeus,1758) as a Key Threatening Process. The fox, along with feral cats, pose a key threat to the endangered Long-nosed bandicoot and Little Penguin populations at North Head including within St Patricks Estate. The owners of the site should cooperate with any integrated feral animal control programs initiated by the NSW National Parks & Wildlife Service or Council.

The tubestock to be installed as part of revegetation should be monitored for evidence of grazing, particularly by the European Rabbit. A Rabbit control program will be developed if required to control rabbits to reduce competition for habitat requirements of the bandicoot population and herbivory of newly installed vegetation.

No dogs or cats are allowed on site. As per DA Condition 103 owners/residents are not allowed to own/house dogs or cats within the Estate.

Weeds

Noxious and environmental weeds make up a significant proportion of total vegetation found on site, particularly in the ground layer. Weed densities are generally high across the site with exotic species present in all vegetation strata, although more dominant in the understory. A high number of exotic species have been previously recorded across the majority of the site and surrounding area, with of exotic grass species (Couch (*Cynodon dactylon*), Kikuyu (*Pennisetum clandestinum*) and Buffalo (*Stenotaphrum secundatum*) dominant. Other moisture and shade tolerant understory species occur including;

- Invasive vine or groundcover species such Madeira Vine, Morning Glory, Asparagus Fern, Trad and Mistflower,
- Woody weeds such as Small leaved Privet, Lantana, Ochna and Senna, and
- Opportunistic, annual or perennial species that have colonised disturbed and/or nutrient rich ground as a result of stormwater influences.

Exotic canopy species include Camphor Laurel (Cinnamomum camphora Coral Trees (*Erythrina crista-galli*) and Phoenix Palms (*Phoenix canariensis*).

Eleven noxious weed species listed under the *NSW Noxious Weeds Act 1993* were recorded within the study area, with a further 3 species highly likely to occur within the area (TEC 2011). Table 1 below contains these listed species.

Table 1 Noxious Weed species recorded within the study area listed under the NW Act for Manly LGA.

Common Name	Scientific Name	Control Class[1]
Crofton Weed	Ageratina adenophora	4
Maderia Vine	Anredera cordifolia	4
Asparagus Fern	Asparagus aethiopicus	4
Bitou Bush*	Chrysanthemoides monilifera	3
Pampas Grass*	Cortaderia selloana	3
Cockspur Coral Tree	Erythrina crista-galli	4
Morning Glory	Ipomoea indica	4
Lantana	Lantana camara	4
Broad Leaf-Privet*	Ligustrum lucidum	4
Small Leaf-Privet	Ligustrum sinense	4
Ochna	Ochna serrulata	4
Asthma Weed/Pellitory	Parietaria judaica	4
Senna	Senna pendula	4
Trad	Tradescantia fluminensis	4

*Species not recorded although highly likely to occur within the area

The Control Class rating determines the actions that must be taken by the land owner or management authority under the Noxious Weeds Act 1993 when a noxious weed is recorded on that land. The following Control Classes and management actions refer to those noxious weed species present at the site;

- Class 3 – The plant must be fully and continuously suppressed and destroyed.
- Class 4 – The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.

Weed removal will occur as part of the enhancement of the vegetated links on the site. All green waste associated with the removal of weeds (including woody weeds) must be removed from the site as soon as possible after each bush regeneration session. The green waste removal should be listed as a condition within the vegetation links tender, and its costs factored into submitted quotations.

If weed propagules are to be left on site then the following weeding techniques should be considered to ensure that weed do not self-propogate.

- The removal of seed from a plant prior to it reaching maturity and prior to its ultimate eradication.
- The composting of weed refuse that is unlikely to re-grow by raising the pile on a raft of woody material to keep stems off the ground and striking / layering.
- The wrapping of weed propagules in a black plastic bundle to create heat and kill the propagules. These bundles also contain the spread of the propagules.

Bushland Rehabilitation and Revegetation

Native Seed Collection

If required, a seed collection programme could be established, using a qualified horticulturalist or member of Australian Association of Bush Regenerators, however minimal suitable vegetation will be cleared from the site. Seed collection from the site, if initiated, will be conducted according to the NPWS (2001a) Draft Guidelines for the Collection of Threatened Plant Material for Propagation for Conservation Purposes

The rehabilitation and revegetation of the vegetated corridors is detailed under the section 'Vegetated Corridors'.

Vegetated Corridors

Due to the presence of the endangered population of Long-nosed Bandicoots a network of vegetated links, or corridors, has been, or will be, established across the Estate and between the National Park and the Estate. This includes vegetated links within the subject site to enhance and create bandicoot shelter habitat. Generally bandicoots forage in areas close to shelter, and corridors increase habitat values for bandicoots allowing individuals to exploit adjacent open areas (Ecosense 2004). Therefore the retention or creation of areas of shelter and adjacent open areas are a critical part of the proposal.

Approved vegetated links south of Darley Road include the enhancement of existing shelter habitat to the north of Precincts 5 and 6 and a 1-3 m strip of shrubby vegetation along the heritage wall that is within the 20-metre wide habitat setback. The proposed planting densities and plant species, based upon the ecological needs of bandicoots, are detailed below.

The conclusions of the SIS, have relied upon in part, that the rehabilitation of bandicoot shelter habitats within adjoining areas will be conducted before and during the construction project. Measures associated with the project include:

- Bush regeneration works (i.e. removal of introduced species and enhancement of existing native vegetation) for bandicoot movement corridors located in Manly Council land (i.e. between the site and Spring Cove) and in a section of the National Park (i.e. 1 hectare area behind Collins Beach).
- Enhancement (i.e. weeding and planting additional understorey species) of existing shelter habitat between Precincts 5 and 10 (Ecosense 2004).

Enhancement (i.e. weeding and planting additional understorey species) of existing shelter habitat is to occur, and as stated the planting densities and plant species selections are to be based upon the ecological needs of bandicoots. The works will also be staged across the site and adjoining areas to ensure that bandicoot habitat is progressively and strategically created and/or enhanced (Ecosense 2004).

Management of the vegetation corridors is further detailed under the section 'Vegetated Corridors'.

It should be noted that the bush regeneration works within the neighbouring Council Reserve and the National Park are detailed in the Habitat Rehabilitation Plan Unnamed Council Reserve Spring Cove Development, Manly Precincts 5, 6 & 10 and Habitat Rehabilitation Plan Spring Cove Developments Pty Ltd Sydney Harbour National Park respectively prepared by Total Earth Care in 2011. The recommendations will be implemented

according to the methodologies detailed in the Plans.

Planting Mixes

Treatment Type	Species
Native Fern Mix 1 [5/m2]	20% Adiantum aethiopicum 10% Blechnum cartilagineum 10% Calochlaena dubia 20% Doodia aspera 10% Oplismenus aemulus 10% Pteridium esculentum 10% Lomandra longifolia 10% Macrozamia communis
Native Fern Mix 2 [5/m2]	20% Adiantum aethiopicum 10% Blechnum cartilagineum 30% Doodia aspera 20%Oplismenus aemulus 10% Pteridium esculentum 10% Themeda australia
Native Fern Mix 3 [5/m2]	20% Blechnum cartilagineum 20% Gahnia clarkei 20% Pteridium esculentum 20% Pultenaea flexilis 20% Macrozamia communis
Native Shrub Mix 1 Max 1.0m high [5/m2]	10% Acacia suaveolens 20% Banksia spinulosa var spinulosa 10% Banksia robur 20% Bauera rubioides 20% Gahnia melanocarpa 20% Melaleuca squamea 10% Westringia fruticosa
Native Shrub Mix 2 [3/m2]	20% Baeckia imbricata 20% Brachyloma daphnoides 20% Epacris microphylla 20% Epacris obtusifolia 20% Leucopogon juniperinus
Native Grass + Shrub Mix 1 Screen planting [5/m2]	20% Bauera rubioides 10% Banksia spinulosa var spinulosa 20% Eragrostis brownii 10% Eriostemon australasius 10% Imperata cylindrical 10% Leucopogon juniperinus 10% Westringia fruticosa
Native Grass + Groundcover Mix 1	30% Actinotus minor 30% Dianella caerulea

Max 0.5m high [5/m2]	20% Eragrostis brownii 10% Panicum simile 10% Themeda australis
Native Grass Mix 1 [7/m2]	100% Microlaena stipoides
Swale Mix 1 [5/m2]	20% Juncus pallidus 30% Juncus usitatus 20% Isolepsis nodosa 30% Lomandra longifolia
Biofiltration Mix 1 [5/m2]	40% Isolepsis nodosa 30% Juncus pallidus 30% Juncus usitatus
Biofiltration Mix 2 [3/m2]	15% Gahnia clarkei 15% Gahnia melanocarpa 30% Isolepsis nodosa 20% Juncus pallidus 20% Juncus usitatus
Climber [5/m2]	50% Cissus hypoglauca 50% Pandorea pandorana
Hydroseeding	Mixture of sterile Japanese Millet and Rye Corn

Hydroseeded Areas

Building platforms resulting from bulk earthworks will be temporarily stabilised against erosion using hydroseeding of sterile grass species. It is the responsibility of the Maintenance Contractor appointed by The Church to maintain these grasses at an acceptable height to conform to the maximum bushfire fuel loads until the lot is developed.

Habitat Trees

Any tree found to be dead should be reported for inspection by an Arborist to review the structural integrity of the tree and to determine if it is hazardous. Dead trees should also be inspected by an Ecologist to determine if the tree contains hollows or is likely to contribute to the habitat available for fauna on the Estate. Tree hollows provide critical roosting and overnight shelter for many fauna species.

In cases where a hollow bearing tree is to be removed, mitigation measures for the replacement of hollows are to be implemented in consultation with an Ecologist.

In general, guidelines for ameliorating the loss of tree hollows are as follows:

- Where possible and practical, hollow bearing trees identified for removal should have the hollow sections collected and re-erected. Where this is not feasible, due to unstable decaying timber, artificial nest boxes providing accommodation of similar size to the removed hollows are to be erected in suitable locations.
- Nest boxes shall be sized and furnished according to the fauna species requirements.
- All replacement nest boxes at a ratio of 2:1 are to be secured to trees at a minimum height of four metres above ground level facing the east to north east direction. Nest boxes and re-erected limbs are not to be placed near locations of public access. All nest boxes and re-erected limbs will be

inspected annually and any damaged, or in danger of falling, are to be repaired or replaced.

An Ecologist is to locate appropriate trees, locations and timing/staging for installation of nest boxes. On-ground refugia should be retained where possible. These may consist of rocks, logs, and any appropriate, dense, under-storey native vegetation.

Tree and Bushland Regrowth

Any tree and/or bushland regrowth resulting from self seeding should be assessed by a Bushfire Consultant to determine if the new plant/s will increase the risk of fire hazard and if so, removed. Where possible, regrowth of species that appear in the planting palettes included in this plan should be retained as a preference if it has been determined that they do not contribute to risk of fire.

Tree Management

The existing tree data was re-assessed by Tree Wise Men Australia Pty Ltd in November 2011 and the revised data summarised into a report titled 'Updated Aboricultural Data' – refer Appendix F. Tree Wise Men Australia Pty Ltd have also prepared a Tree Protection Plan which outlines measures to be implemented to protect existing trees during construction activities – refer Appendix G.

Existing trees are to be regularly monitored for disease/pest infestation and to ensure a 3-5m spacing is maintained between canopies of existing tree groups to be retained on-site and with canopies within the adjacent Sydney Harbour National Park and Council Reserve.

No additional trees, other than those nominated in the planting plans prepared by McGregor Coxall should be planted within the site (with exception to the Private Lots – refer section "Private Lot Landscape Areas").

Where tree planting is required for replacing dead or damaged trees, replacement planting shall be of the same species or where the same species is not available, the replacement planting shall be selected from one of the planting mixes nominated in this BF&VMP and the tree shall have the same or similar mature form, height and spread.

Removal of Trees

With exception of the trees approved for removal under Condition 220 of the Notice of Determination, existing trees may be subject to the Manly Council Tree Preservation Order and may require approval for removal. Any tree nominated for removal should be assessed by the Project Arborist and approval sought from the Church and submit an application to Council if required.

Pruning Practices

Pruning is defined as "the selective removal of branches from a tree to obtain a desired end". In relation to Spring Cove Estate, selective pruning will be required to maintain canopy clearances for bushfire fuel management, amenity and health.

All tree pruning is to comply with AS4373-2007 Pruning of Amenity Trees and Manly Council's Tree Preservation Order and is to be undertaken employing best practice arboricultural techniques.

It should be noted that Manly Council's Tree Preservation Order allows up to 10% of a tree's foliage to be pruned without Council consent within one year.

Maintenance Weeding

After primary and secondary weeding and natural regeneration of the bushland, revegetated areas should be able to resist most weeds. However, weeds will re-establish on the site from bird, wind, water transport and other seed or propagule dispersal mechanisms within the site. Maintenance weeding should thus be undertaken between six to twelve times a year until such time as the resistance of the bushland to weeds increases, then only hand weeding on a needs basis will be required. Weeding works should be carried out by a licensed bushland regeneration company under the direction of the Maintenance Contractor.

The use of herbicides will be needed where hand removal of weeds is impractical. The use of Glyphosate based herbicides is recommended in accordance with the manufacturers labels.

In general, herbicides in non-ecologically sensitive areas should be considered when:

- There are small areas of dense weeds with few or no native plants to protect
- There are large areas of weed coverage
- Weeds are growing too rapidly for physical removal

The potential for destabilising soils and causing erosion on steep slopes as a result of spraying vegetation with herbicide also needs to be considered prior to the commencement of any weed control works.

Only operators with Chemcert or equivalent training must undertake the spraying of weeds. The operator must evaluate the success of each treatment after a set period of time according to the labelled effective treatment of each species for each herbicide. Care must also be taken when applying herbicides near water bodies due to the sensitivity of the waterways, and the sensitivity of resident flora and fauna to runoff containing these herbicides.

All herbicides must be applied according to the herbicide usage label and provisions of the Protection of the Environmental Operations Act (NSW).

Mulching

Mulching is an efficient method to impede the establishment of weed species, soil erosion, compaction and desiccation. Mulching is not to be used in regeneration areas displaying higher natural resilience where the mulch layer is likely to suppress the germination of native plant species resulting from direct seeding. Woodchip or other suitable mulch is to be placed at a depth of 50mm covering any areas of tree replanting or landscape areas. Areas surrounding the stems / trunks of plants are to be kept free from mulch, thereby reducing the incidence of collar rot on retained or planted flora. As preference and where possible, the mulch to be used shall be obtained from the removed vegetation on site. Where this is not possible, mulch is to be certified as weed free from an approved supplier.

Soil Erosion, Sedimentation, Drainage and Stormwater

The site is mapped as occurring within the Gymea Soil Landscape Group (Chapman & Murphy, 1989). The Gymea soil landscape is generally characterised by “undulating to low rolling rises and low hills on Hawkesbury sandstone” (Chapman & Murphy, 1989) with < 25% sandstone outcropping, moderately inclined side slopes with wide benches and localised outcropping. Soils are shallow to moderately deep, and have very high soil erosion potential and very low fertility.

The shallow soils enable rainwater to penetrate to a limited extent, so that it flows down hill over the surface of bedrock. There are no natural permanent or ephemeral drainage lines on the site. The subject site and the whole of the study area drains towards Spring Cove (Ecosense 2004). The soil erosion hazard for concentrated flows is extreme to high (Mott MacDonald Hughes Trueman).

Surface runoff and storm water within the development will be treated in areas referred to as ‘treatment zones’. Stormwater treatment within these zones includes provision of rainwater tanks, vegetated swales, bioretention swales and infiltration areas. Infiltration areas have been designed in areas that are at times already subject to water logging, thereby aiming to maintain the health of existing vegetation. Flows will be directed towards three discharge points along the southern boundary between the Reserve and the development site (Mott MacDonald, 2011), aiming to mimic the existing stormwater flows.

Heritage

The St Patrick's Estate Manly Conservation Management Plan (Tanner and Associates December 2002) states in relation to landscape that the objectives for the site development are:

- conserve and maintain the exceptional built and landscape quality of the site
- conserve and restore the landscape setting and open space

The report also states that "the decline of the grided pattern of the land below the (archbishops) residence accompanied the abandonment of the axial path as an access to the harbour foreshore and wharf, which had previously been the link to the only transport to the Estate". The report supports reinstatement of the axial pathway as a publicly accessible pedestrian link and cultural interpretation of the remnant sandstone stairs and pathway.

Axial Pathway

A 10 metre wide corridor has been incorporated into the design to interpret the original pedestrian axial pathway leading from the Archbishop's Residence to the Harbour. As identified in Manly Council's LEP, this axial pathway creates a visual corridor and physical north/south public pedestrian link through the site. Vegetation within this corridor should be pruned as required following approval from the Church to maintain a clear visual link along this axis.

Heritage Stairs

Within the Spring Cove Estate there are two stone stairs traversing the central east-west vegetated corridor which are to be repaired and made safe for pedestrian use as part of the construction works. To safeguard the long term conservation of these stairs, root growth from adjacent trees should be monitored to ensure any future root growth does not undermine the stability of these stairs. In addition, any vegetation found growing within any crack and/or crevice of the stairs should be removed. Branches that overhang the heritage stairs can potentially cause damage through scrapping and should be pruned following approval from the Church.

Heritage Wall

To ensure the protection of the sandstone heritage wall running along the eastern boundary root growth from adjacent trees should be monitored to ensure any future root growth does not undermine the stability of this wall. In addition, any vegetation found growing within any crack and/or crevice of the wall should be removed. Branches that overhang the heritage wall can potentially cause damage through scrapping and should be pruned following approval from the Church.

Environmental Protection

All spraying is completed by trained and licensed staff in accordance with the NSW Pesticides Act. All spray equipment is to be well maintained so that it can safely and accurately complete very careful spray works.

All herbicides are used in accordance with their labels or NRA approved off label permits.

All rinse water is reused in broad spraying programs on highly disturbed sites.

All spraying is completed in suitable climatic conditions ie not during droughts, high winds or preceding rains. Every effort is made to improve the effectiveness of the herbicides that are applied.

Herbicides are not applied in the immediate proximity of creek lines or permanent water bodies.

Contractors must complete herbicide spray logs that have been developed in accordance with the requirements of the NSW Pesticides Act.

Waste

All waste generated from vegetation management works shall be recycled where possible.

Noise

Vegetation management works shall be carried out in a manner that will minimise any noise pollution to members of the public and the Estate.

Phytophthora cinnamomi Protocols

The Contractor should adopt the principals of the Royal Botanic Gardens protocols for bush regeneration contractors to prevent the spread of Phytophthora root rot. A fact sheet on Phytophthora is available for download from the Royal Botanic Gardens, Sydney website at www.rbgsyd.nsw.gov.au and follow the links to 'info about plants' then 'pests and diseases'.

Access and Signage

Access is provided across the Vegetated Corridors via a series of boardwalks. As part of the construction works, signage will be installed to notify the residents and visiting public of the extent and environmental sensitivity of the bandicoot habitat and corridors across the site. As part of the long term bandicoot preservation measures, it is important that this signage is clearly visible and readable at all times.

Works Impact Mitigation

The Conditions of Consent for Development Application No. 402/04 include Condition 64 which states:

"All of the mitigation measures listed in Chapter 8 of the Species Impact Statement prepared by Eco Sense Consulting Pty Ltd are to be implemented."

Chapter 8 of the SIS recommends mitigation measures aimed at minimising potential impacts on affected flora and fauna including long-term management strategies and compensatory measures. Where relevant these have been incorporated into the vegetated corridor plan and a copy of this chapter has been appended to this document at Appendix D.

Roles and Responsibilities

A contractor with experience in working within remnant bushland areas and able to implement or coordinate with the weed management and bush regeneration activities should be engaged to undertake the vegetated corridor works across the site. This contract for the creation and/or enhancement of existing links should include as a minimum a 12 months maintenance phase following practical completion.

It is the responsibility of the Maintenance Contractor appointed by the Church to undertake bushfire fuel and vegetation management actions required under this plan following completion of the maintenance phase of the vegetated links area. The Maintenance Contractor would also be responsible for all public domain areas outside of the vegetated links upon completion of construction works.

Program of Works (Construction)

The Program of Works is aimed at providing a framework for undertaking relevant rehabilitation, maintenance, monitoring and review works required to meet the objectives of this BF&VMP. The implementation of these works is the responsibility of the developer, bush regenerator/vegetated links contractor, ecologist and Maintenance Contractor appointed by the Church.

Action	Comments
Stage 1 - Construction of all roads and services	
Erection of protective fencing around trees and other vegetation to be protected	Refer to Tree Protection Plan prepared by Tree Wise Men Australia Pty Ltd (Appendix G)
Erection of construction fencing in accordance with the Bandicoot Construction Protocol and constructing site compounds on existing cleared land	Refer to Bandicoot Construction Protocol prepared by Ecosense (Appendix E)
Weed removal, regeneration and revegetation works to the northern, eastern and central	Refer to Vegetated Links Plan prepared by Total Earth Care (Appendix B)

vegetated corridors	
Stage 2 – Construction of apartments and various houses generally including	
Erection of protective fencing around any newly established or enhanced vegetated links	Refer to Bandicoot Construction Protocol prepared by Ecosense (Appendix E)
Erection of construction fencing in accordance with the Bandicoot Construction Protocol	Refer to Bandicoot Construction Protocol prepared by Ecosense (Appendix E)

Monitoring and Maintenance (Post Construction)

As a minimum, the following table summaries the typical monitoring and ongoing maintenance that is required post construction across the Spring Cove Estate:

Activity	Frequency (minimum)
Maintenance report	Monthly
Review Bandicoot monitoring report by Ecologist	As available
Check bandicoot signage is unimpeded by vegetation and able to be clearly read	Biannual
Checking trees for disease and/or pest infestation	Annual
Checking trees for interconnecting canopies	Annual
Checking of tree hollows and/or nest boxes	Annual
Check vegetation on and around heritage items to prevent damage	Biannual
Pruning of trees and vegetation	As required to maintain canopy clearances for bushfire fuel management and general tree amenity and health
Maintenance weeding (in addition to Primary and Secondary weeding)	As required
Maintenance of hydroseeded areas	As required to maintain less than 8 tonnes per hectare
Bushfire fuel load reduction	As required to maintain less than 8 tonnes per hectare

This table has been prepared as a guide and should be reviewed by the Church and agreed with the Maintenance Contractor following completion of construction works.

Reporting

The Maintenance Contractor will be required to submit a short report to the Church on a monthly basis which as a minimum will include general observations/comments on bushfire fuel and vegetation management issues, summary of maintenance carried out since last report and any recommended actions. The Church will review the report and will advise on actions to be undertaken.

Bushfire Fuel Management

This section encompasses the issues and approach relating to bushfire fuel management across the entire Spring Cove Estate.

Fuel Management Plan

As per DA Condition 51:

"The entire property including individual lots and strata title lots shall be managed as an 'Inner Protection Area' as outlined within Planning for Bushfire Protection 2001." The specifications of an IPA are set out Chapter 4 of Planning for Bushfire Protection 2001. The landscape design reflects the requirements of these specifications. Sprinklers are only to be provided in the central east-west vegetated corridor to irrigate this area in a fire occurrence. The plan included in Appendix A delineates the various areas of bushfire fuel and vegetation management approaches referred to this document.

Fuel Load Management

As the site is to be maintained as an Inner Protection Area, fuel loads are to be maintained at less than 8 tonnes per hectare. There are a number of vegetation structures outlined in Appendix 2 of Planning for Bushfire Protection 2001 that are relevant to the Spring Cove Estate. These structures and resulting fuel loads are summarised below:

Vegetation Structure	Fuel Load (tonnes/ha)
Open Woodland	8
Low Woodland	8
Low Open Woodland	8
Tall Shrubland	8
Tall Open Shrubland	8
Low Open Shrubland	6
Closed Tussock Grassland or Closed Sedgeland	6
Tussock Grassland or Sedgeland	6

'Appendix 2, Figure A2.2 Pictorial key to the structural forms of Australian vegetation' from Planning for Bushfire Protection 2001 has been included in this document at Appendix C.

On this site however, there is also the requirement to provide clumps of vegetation for bandicoot habitat. These areas have been designed to minimise fuel loads and maintain the less than 8 tonne per hectare fuel load requirement with exception to the east-west vegetated corridor.

Central East-West Vegetated Corridor

Within the central east-west bandicoot vegetated link shrubs and grasses to reach a maximum 1.0m mature height with emergency sprinklers mounted 0.5m above the vegetation that will be manually activated from one centrally located control point during a fire event.

North-South Corridor (Adjacent to National Park) and Northern East-West Vegetated Corridor (North of Apartments)

Within the 20m wide habitat area running adjacent to eastern boundary heritage wall, a discontinuous 1-3m wide strip of shrubby vegetation (maximum 1.0m high) is to run along the heritage wall together with discontinuous tree canopies and a mosaic of clumped shrubs (at 20% maximum coverage) separated by maintained low-level grasses. Where possible, clumps of shrubby vegetation shall have no direct connection with existing trees and be located on the open spaces between their canopies. Clumps of shrubby vegetation shall have no direct connection with adjacent dwellings.

As the northern east-west corridor is located on adjacent school lands, the Maintenance Contractor will be required to gain access consent for purposes of bushfire fuel and vegetation management prior to works being undertaken.

Existing Trees

During the Development Application phase of the project, specific trees were agreed for removal with the aim of eliminating continuous canopies with the adjacent Sydney Harbour National Park to the east and the Unnamed Council Reserve to the south. Within the site, these tree removals were aimed at creating stands of existing trees with a 3-5m gap between canopies of adjacent stands and/or approved dwellings.

Trees should be monitored on a regular basis and pruned as required to generally ensure the above conditions are maintained.

Fuel Reduction and Clearing Cycles

If required for fuel load reduction, areas of excessive vegetation may be required to be cleared. Clearing cycles will be affected by plant species, regrowth rates, fire risk, climate, conservation/rehabilitation considerations, etc. Any clearing proposed will need to be approved by an Ecologist to ensure flora and/or fauna habitat and ecological communities are not at risk.

It is the responsibility of the appointed Maintenance Contractor to determine when fuel load reduction is required and to submit to the Church for approval the details on the extent and method to be employed.

Fuel Load Reduction Methods

The RFS recommends three main methods of hazard reduction: hand clearing, mechanical clearing and burning. In relation to the Spring Cove Estate, hand and mechanical clearing methods shall be employed. The following is a table of fuel reduction methods recommended by the RFS that may be employed on the site following approval from the Church and applicable authorities.

Method	Description
Raking or manual removal of fine fuels	Removal of fuels such as fallen leaves, twigs and bark on a regular basis.
Mowing grass	Keep grass areas short, green and well watered.
Slashing and trittering	This is an economical and effective method of fuel reduction. However it's best if the cut material is removed or allowed to rot before summer starts. Slashing and mowing may leave grass in rows, increasing fuel loads in some places. Trittering, or turbo mowing, also mulches the vegetation leaving the fuel where it is cut.
Ploughing and grading	These methods can produce effective firebreaks, however, the areas need constant maintenance. Loose soil may erode in steep areas, particularly where there is high rainfall and strong winds. Use of this method should be discussed and approved by the Project Ecologist prior to use.
Removal or pruning of trees and shrubs	Management of existing vegetation involves selective fuel reduction (removal, thinning and pruning) and retention of vegetation, which may have beneficial effects by acting as windbreaks and radiant heat barriers. Reference can be made to *Guidelines for Asset Protection Zones* prepared by the RFS.

Vegetated Corridors

Construction works associated with the development will be staged in order to minimise any potential negative impacts on the long-nosed bandicoot population. Pre-construction works require habitat rehabilitation in the form of bush regeneration and revegetation within the adjoining Manly Council Reserve and a one hectare area of Sydney Harbour National Park behind Collins Beach (which are outlined in other Management Plans). In addition, the staging of habitat mitigation works on site, including creation and enhancement of the vegetated links, is part of the overall development program.

These off site and on site actions are key components of the environmental mitigation measures, and will provide essential habitat resources for the bandicoot population during the construction phase.

The vegetated links habitat establishment and/or enhancement works on the site will be staged throughout the construction, however the establishment of these areas as soon as possible is preferred in order to provide suitable habitat for the bandicoot population as early as possible within the development cycle. At the same time suitable refugia within the site must be available for bandicoots during construction, and therefore the staging of vegetated links works as set out in the SIS (Ecosense 2004) is as follows:

- Weeding and enhancement of the existing southern (central east-west) vegetated link;
- Construction of a westward extension of the southern (central east-west) vegetated link;
- Construction of the habitat along the heritage wall from the northeast corner of the site to Access Way 4; and
- Construction of the western half of the northern vegetated link.

Other habitat enhancement works associated with construction include:

- Construction of the eastern half of the northern vegetated link (now located on adjoining land);
- Construction of the habitat along the heritage wall to the south of Access way 4;
- Landscaping immediately to the east of Lots 5 and 6.

The proposed vegetated links as described above are shown in Appendix B.

Vegetated Corridor Plan

A range of general construction and specific bandicoot mitigation measures were outlined in the Species Impact Statement (Ecosence 2004), and the relevant section of the SIS is attached (Appendix D) to this document. Those measures particularly relevant to the establishment and management of the vegetated links across the site are provided below.

- Protect established vegetated links with barrier fencing incorporated with gaps to allow bandicoot movement.
- Construct, implement and maintain soil erosion and sediment control in accordance with requirements of the stormwater management manual *Managing Urban Stormwater – Soils and Construction* (Landcom 2004).
- Remove temporary soil and water management structures only after the lands are stabilised/rehabilitated.

A Bandicoot Construction Protocol (Appendix E) was also developed in consultation with DEC in order to provide guidelines for minimising the impacts of construction on bandicoots over the entire Estate. In general, the protocol aims to:

- Alert contractors to the presence of the endangered bandicoot population and its habitat;
- Avoid removing and/or damaging any habitat proposed for retention on- or offsite;
- Ensure that the risk of bandicoots being killed or injured as a result of clearing, excavation and/or construction is minimised;
- Maintain permeability to bandicoots in and around the construction site by incorporating gaps into construction and sedimentation fences;
- Restrict potential conflicts between construction times and bandicoot activity periods;

- Provide a reporting mechanism in case any dead or injured bandicoots are found; and
- Continuing to monitor vegetated links during and post-construction.

Works within the vegetated links should follow the Bandicoot Construction Protocol (Appendix E). The following should also be undertaken:

- Clearing of vegetation should be undertaken by hand where possible. If machinery is required, a pre-clearance survey should be undertaken to ensure the area is clear of fauna.
- Works should minimise disturbance by reducing the use of heavy machinery.

However, as identified within the SIS, the current condition of the existing vegetation within sections of the proposed links is degraded and dominated by exotic plant species. While protection of the endangered bandicoot population is paramount, suitable sections of the links may benefit from a different rehabilitation approach, including the use of machinery. In areas where native tree cover is absent, exotic plant species dominant the mid and under storey vegetation strata, and the original soil profile has been altered, then an alternate approach may be warranted. This could be for example the scalping of the first 150mm of top soil that contains the majority of weed propagules, and replacing this with a clean crushed sandstone media.

The crushed sandstone is ideal in that it restricts the regrowth and establishment of weed species, and is suitable as a planting media for revegetation works with native trees shrubs and grasses. This approach also has the potential to reduce the costs associated with the creation of the vegetated corridors as well as the long-term maintenance costs, especially if the crushed sandstone can be sourced from other excavation works within the subject site. A brief methodology is detailed in Appendix B under sandstone capping rehabilitation techniques.

This strategy may be ideal for the vegetation links requiring construction, and well as the enhancement of the eastern half of the northern vegetated link (now located on adjoining land), as this area is dominated by weeds, lacks a native tree canopy and may be in an area in which previous earthworks occur. Previous earthworks on the site may have impacted upon the natural soil strata and thereby reduced the natural resilience of the areas identified as vegetated links, that is, it has reduced the sites ability recover to a natural vegetation community. There may also be additional sections of the southern (central east-west) vegetated link and the habitat along the heritage wall where this strategy may also be applicable.

The long-term management of the vegetated links and fuel-managed corridor, as discussed within the SIS, should be governed by an Environmental Management System or similar. This would address maintenance of the links, and recommends engagement of landscape contractors or similar under long-term contracts.

The implementation of a long-term contract with a bush regeneration or landscaping firm to undertake maintenance regimes in fuel-managed areas would provide a further incentive for leaseholders to avoid disturbing these areas.

In addition to the general requirements outlined above, the following guiding methods are to be undertaken by the Contractor engaged to create and enhance the vegetated links. Again, the protection of fauna and fauna habitat, particularly the endangered population of Long-nosed bandicoots, is paramount when undertaking these works.

Outline Methodology for Undertaking Works within Vegetated Links

Task	Description of Methodology
Preliminaries	Two weeks is allowed for site establishment; contract signing; site inspection and set out with Superintendent; committing resources; delivery of updated construction program; establishment of stockpile areas and equipment compound. Set out and confirm the following prior to commencement of works:- Extent of vegetated links Extent of links to be weeded and cleared Existing trees to be removed Extent of areas of soil works Establish 20m habitat corridor early in project As part of the pre-construction phase a Phytophthora survey is recommended. If the fungus is recorded on site then an appropriate Phytophthora Management Protocol is to be developed and implemented by the Contractor.
Tree protection	Prior to construction, temporary fencing should be erected to delineate the extent of the vegetated links, and fencing erected around existing trees and vegetation to be retained within the links. The fencing should conform to the Bandicoot construction protocol. All machinery use within the vegetated links should be excluded from these tree and vegetation protection zones and access would only be allowed within for hand removal/ spot spraying of weeds and bush regeneration activities. All other safeguards contained within the Arborist report that are related to protection of trees and to works within the root zones of trees should be implemented as part of the vegetated links work.
Soil and Water Management	Install appropriate measures as required and/or directed at outset of project; submit plan if requested. Siltation control measures shall be required as earthworks and soil disturbance is required.
Primary weeding	Primary weeding, targeting noxious and environmental woody, vine and grass weeds is to be undertaken within the vegetated links. Primary weeding works are to commence prior to construction and are to minimise disturbance to the soil and native fauna habitat within the area. Weeding is to be undertaken by hand in close proximity to retained natives. However there are large areas dominated by weeds and mechanical or broadspray primary weed control methods should be considered in combination with fauna protection protocols. Qualified bush regenerators to undertake primary weeding of Vegetated Links. Chainsaw operators to clear vegetative material from IPA to meet specifications. Chainsaw operators to clear trees marked for removal. All clean green waste to be stockpiled for later tub grinding, and reuse as mulch. Any weed propagules or material unsuitable for tub grinding to be bagged and removed off site for disposal.
Secondary/maintenance weeding	Secondary weeding to take place around 8 weeks after primary weeding. Maintenance weeding, including revegetation areas, is to take place periodically from 8

	weeks after secondary, until the end of the defects liability period.
Soil works	Soil works, if required as part of the enhancement and construction of vegetated links, shall be completed as required within designated areas. Appropriate sized machines shall be used with the use of small rubber tracked excavator or similar to prevent damage to surrounding areas. Soil works should operate independently of ongoing primary weeding in order to shorten the construction period. Scalping of weed dominated areas and associated top 150mm of soil should be undertaken followed by sandstone capping via installation of clean crushed sandstone to designated areas (e.g. eastern section of northern link).
Planting	Eradicate weeds and unwanted exotic grass growth from all proposed planting areas by environmentally acceptable methods. This could be via hand weeding, herbicide spraying, ripping, cultivating or a combination. Planting, mulching and staking to take place as soon as practical after primary weed control and soil works to mitigate against site instability. Plants shall be watered weekly for the first month, then as required throughout the plant establishment period. Watering shall be conducted by hand with the aid of a motor sprayer. Alternatively an irrigation system shall be installed, which shall be used to implement a watering regime throughout the plant establishment period. It shall be decommissioned at the appropriate time. Plants are to be grouped as directed on site in accordance with Planting Plan. Ensure no damage to established roots when planting amongst existing vegetation. Marker stakes to be provided and mulch installed to surround plants.
Jute mesh	Jute meshing to be undertaken concurrent with soil works to mitigate against potential erosion.
Working Hours	
Limited to standard construction industry hours as dictated by Council. No work scheduled for Saturday unless required to meet deadlines.	
Control of Noise, Dust, Pollution etc.	
A water cart shall be employed where necessary to minimise dust. Work shall be scheduled as efficiently as possible to minimise disruption to adjoining residents. This shall reduce apparent noise to neighbours. No work to take place following heavy rain to reduce damage to turf, and creation of mud. A tyre scrub shall be maintained at exit gate. Pollution spill kits shall be on site at all times.	

Herbicide Application

Weed control by spray application, cut and paint, frill and fill, long stem scrape will use a chemical that is recommended for the species targeted and reference can be made to *Noxious and Environmental Weed Control Handbook. A guide to weed control in non-crop, Aquatic and Bushland Situations* (NSW DPI, 2007) to ensure that an appropriate herbicide is used for the situation and weed. The use of herbicides on the subject site or in the study area site must be in accordance with labelling instructions, MSDS's and comply with the NSW *Pesticides Act 1999*.

While care should always be taken to ensure that the use of herbicides is in accordance with labelling instructions, MSDS's and comply with the NSW *Pesticides Act 1999,* this is particularly important given the importance of the Reserve to the endangered populations utilising the habitat contained within it. Consequently, the broad scale use of herbicide to control weeds should be avoided. Weeds should be removed manually where ever possible and herbicide use should be limited to situations where manual removal is not possible due to OHS concerns, or previous attempts to control the weed by hand have failed.

Monitoring

A programme of regular monitoring and inspection is required within areas of Bandicoot habitat. The monitoring programme will ensure that the measures outlined in the BF&VMP are implemented and that performance criteria are satisfied. It is recommended that the monitoring within the site should be undertaken by the Spring Cove Development's site ecological consultant. The monitoring programme will commence prior to the commencement of site preparation works and will continue until completion of the Spring Cove development construction works.

The program will make general observations of the nature and progress of the vegetation management works, as well as on the habitat for the Long-nosed Bandicoots:

- Progress of bush regeneration works;
- Changes in the density of weed species;
- Observations of the health and vigour of installed plants;
- Assessment of the sites resilience;
- Assessment of the amount and condition of available Bandicoot sheltering habitat onsite, and modifications to the works programme if necessary; and
- Evidence of erosion and sedimentation.

Bandicoot monitoring should take place quarterly. A brief and concise report will be submitted every six months for the duration of the maintenance period, which will be forwarded to the Client for review, then forwarded to Council. The report will:

- state the findings of the monitoring activities;
- comment on the progress and success of vegetation management works;
- comment of the availability and quality of the bandicoot habitat; and
- recommend corrective measures and/or vegetation management actions, as necessary.

The appointed Contractor will also be required to report if any dead or injured bandicoots are found on the site, and record management measures used for controlling the potential spread of Phytophthora on-site if the fungi were found on site as part of the pre-construction investigations.

Any incidental penguin activity observed should also be recorded as part of the monitoring process.

Common Lot Landscape Areas

This section describes the specific issues and approach relating to bushfire fuel and vegetation management within the Common Lot Landscape Areas.

Roles and Responsibilities

It is the responsibility of the Maintenance Contractor appointed by the Church to undertake bushfire fuel and vegetation management actions required under this plan within the Common Lot Landscape Areas.

Bushfire Fuel Management

Fuel loads with Common Lot Landscape Areas is to be maintained at less than 8 tonnes per hectare. Any amendment to the design of the common lots is to be in accordance with 'Inner Protection Areas' with a fuel load of less than 8 tonnes per hectare.

Landscape and Planting Design

The vegetation in the common lots is to be maintained in accordance with the following:

- No continuous canopies between stands of existing trees to be retained and any canopy of proposed trees (at mature size);
- Canopies of existing or proposed trees to be 3-5m away from buildings;
- Fire retardant plant species (plant species with high salt content) only to be located within 10m of building facades with glazing;
- Planted areas should be discontinuous and clumped with shrubs (at 20% maximum coverage) separated by maintained low-level grasses. Where possible, clumps of shrubby vegetation shall have no direct connection with existing trees and be located on the open spaces between their canopies. Clumps of shrubby vegetation shall have no direct connection with adjacent dwellings;
- Exotic lawn species within common lots to be mown at regular intervals as required.

Plant Species Palette

Any replacement plant species for Common Lot Landscape Areas must be selected from the planting mixes nominated under the Section titled 'Planting Mixes' of this plan to ensure a consistent landscape character is maintained across the whole of the Estate and to promote expansion of the flora and fauna ecosystems.

Private Lot Landscape Areas

This section describes the specific issues and approach relating to bushfire fuel and vegetation management within the Private Lot Landscape Areas.

Roles and Responsibilities

It is the responsibility of the Maintenance Contractor appointed by the Church to undertake bushfire fuel and vegetation management actions required under this plan. It is the responsibility of the Church to notify Lot owners when bushfire fuel and vegetation maintenance will be undertaken on private lots.

Bushfire Fuel Management

As already noted earlier in this document, the entire Spring Cove Estate site is to be managed as an 'Inner Protection Area' with a fuel load of less than 8 tonnes per hectare which shall also apply to the landscape areas within the private lots.

Landscape and Planting Design

As the landscape design and planting layout of the private lots will be generally undertaken on a lot by lot basis, the following design parameters should be applied to any future design:

- No continuous canopies between stands of existing trees to be retained and any canopy of proposed trees (at mature size);
- Canopies of existing or proposed trees to be 3-5m away from dwellings;
- Fire retardant plant species (plant species with high salt content) only to be located within 10m of facades with glazing;
- Planted areas should be discontinuous and clumped with shrubs (at 20% maximum coverage) separated by maintained low-level grasses. Where possible, clumps of shrubby vegetation shall have no direct connection with existing trees and be located on the open spaces between their canopies. Clumps of shrubby vegetation shall have no direct connection with adjacent dwellings.

It should be noted that these design guidelines have been developed in accordance with the site wide bushfire principles that were approved in relation to *'Planning for Bushfire Protection 2001'*. Future development applications for individual dwellings may be subject to approvals required under Section 79BA of the EPA Act and may be rated against *'Planning for Bushfire Protection 2006'* and any amendments.

Plant Species Palette

Any plant species for Private Lot Landscape Areas must be selected from the planting mixes nominated under the Section titled 'Planting Mixes' of this plan to ensure a consistent landscape character is maintained across the whole of the Estate and to promote expansion of the flora and fauna ecosystems.

Appendix A

Site Plan

Axial Pathway

Building Envelopes and Hardscape Elements

Vegetated Corridors

Extent of vegetated cooridor covered by emergency sprinklers in a fire event

Common Lot Landscape Areas

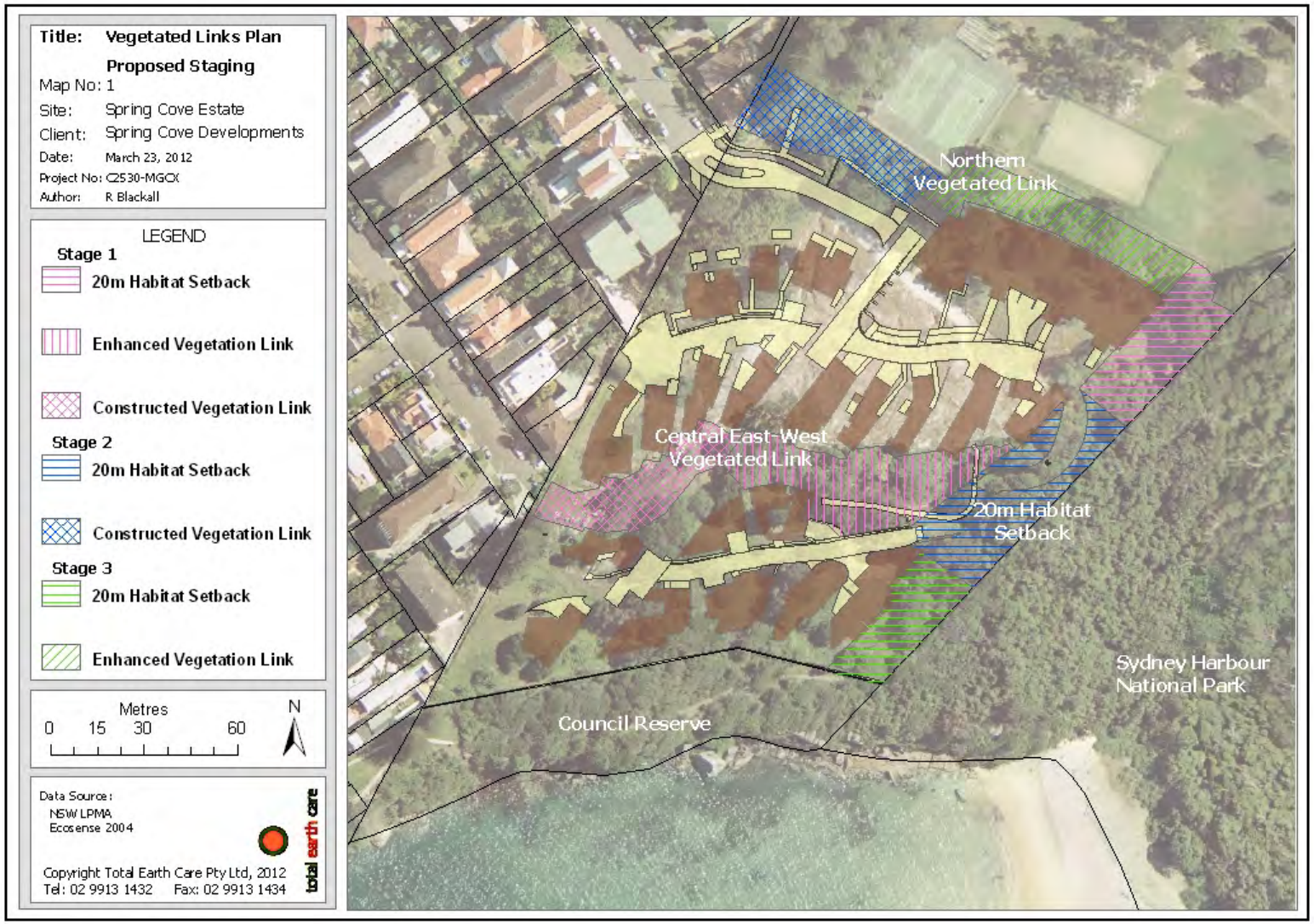
Private Lot Landscape Areas

Existing trees retained

Appendix B

Vegetated Links Plan

The following Vegetated Links Plan and Bush Regeneration Methodology has been prepared by Total Earth Care.


Title: Vegetated Links Plan
Proposed Staging
Map No: 1
Site: Spring Cove Estate
Client: Spring Cove Developments
Date: March 23, 2012
Project No: C2530-MGCX
Author: R Blackall
LEGEND
Stage 1
20m Habitat Setback
Enhanced Vegetation Link
Constructed Vegetation Link
Stage 2
20m Habitat Setback
Constructed Vegetation Link
Stage 3
20m Habitat Setback
Enhanced Vegetation Link
Metres
0 15 30 60
N
Data Source:
NSW LPMA
Ecosense 2004
Copyright Total Earth Care Pty Ltd, 2012
Tel: 02 9913 1432 Fax: 02 9913 1434
total earth care
Northern Vegetated Link
Central East-West Vegetated Link
20m Habitat Setback
Sydney Harbour National Park
Council Reserve

Total Earth Care Bush Regeneration General Methodology Statement

This is a glossary of terms that are relevant to Total Earth Care Pty Ltd bush regeneration operations. Our crews use methodologies that are in accordance with accepted industry standards such as those published in *Bush Regeneration, Recovering Australian Landscapes* (Buchanan, 1989).

Some or all of the following bush regeneration and rehabilitation techniques may be used in the completion of the works. A flexible and adaptable approach to bushland regeneration and rehabilitation is required to respond to dynamic ecosystems.

The revegetation works, including species mixes and densities are identified within the Planting Plan

Weeding Techniques

Type	Definition
Primary weeding	Weeding in bushland that has not been treated in the recent past and which requires the eradication of mature plants of most weed species especially woody, vine and noxious weeds.
Secondary weeding	Weeding in bushland that has been primary treated and requires the eradication of the new season growth of weed propagules. Secondary weeding removes the largest flush of second-generation weeds from soil-stored propagules.
Maintenance weeding	Weeding in bushland that has a received secondary weeding and that has high to moderate resilience and which has no mature deleterious weed species.
Target weeding	The removal of a single species or class of weeds. The purpose of target weeding is to stop the lifecycle of the nominated species.
Assisted seedling recruitment:	The weeding and baring of soil adjacent to a mature native species to create the conditions that is conducive to the seed germination of that native species.
Age class weeding	The removal of an age class of a weed species. By removing the largest seeding plants the lifecycle of a weed monoculture can be interrupted and the seedlings progressively eradicated as they come to maturity.
Access weeding	The removal of a size class of weed to improve; humidity levels; access for fire management; chainsaw use or spot spraying. Removal of a size class can also remove weeds that compete with native plants.
Deseeding	The removal of seed from a plant prior to it reaching maturity and prior to its ultimate eradication.
Composting	The composting of weed refuse that is unlikely to re-grow by raising the pile on a raft of woody material to keep stems off the ground and striking / layering.
Propagule composting	The wrapping of weed propagules in a black plastic bundle to create heat and kill the propagules. These bundles also contain the spread of the propagules.

Rehabilitation Techniques

Type	Definition
Sandstone capping	The installation of clean crushed sandstone over a degraded / weed infested soil. This process requires the following steps: A. The removal of the weed biomass and grading/smoothing of the surface to be capped. B. The eradication, usually through herbicide application, of the next generation

	of weed propagules. C: The selection of weed free, crushed sandstone with varying particle sizes up to 400mm. (Sufficient percentage composition of fines is required to provide adequate plant growing media. The material must also have adequate sand/silt/clay composition to provide free drainage Water Holding capacity (WHC), and nutrient availability. D: The sand /silt clay composition must also provide adequate soil binding characteristics to allow it to gain an adequate angle of repose on the batters to which it is applied. The depth of the capping required depends on the following parameters. i. The contour and surface shape of the ground to be covered. Rough uneven surfaces require deeper capping. ii. Steeper slopes require deep capping at their toe and reduced depths at the top of the slope. iii. The working tolerances of the machinery / labour used to install the capping. (200mm is the minimum suggested capping depth if it is spread by hand and the weed species being suppressed are not intractable stoloniferous or root spreading species.) In general 400mm depth of sandstone capping allows for adequate weed suppression contour/reshaping and is also spreadable by excavator without the teeth of the excavator digging and mixing weedy soil into the clean capping material. E. Mulch, which decomposes to sugars, is required to initiate the establishment of Mycorrhizal fungi. Light mulching (25mm) Native tree wood fibre is suggested in conditions where there is a source of adjacent weed. (Clean crushed sandstone is not conducive to weed growth but decomposing mulch is. Light mulching provides some sugars but not a phosphorous rich and high pH medium that occurs in deeply mulched areas. Light mulching is also suitable to direct seeding applications especially of native tree species. Heavy mulching is suggested where there is not a source of adjacent weed seeds and native canopy species recruitment is not required. F: Installation A track mounted excavator should only be used to spread the sandstone. The excavator's tracks exert less force on the ground per square meter than a tyred vehicle. Their slewing ability and boom reach enable them to spread material without compacting it which is very important for the air filled porosity of the soil and plant growth.
Regeneration coop	The creation of a partially enclosed area with semi permanent physical barriers to; promote the consolidation of native plant cover; exclude further weed invasion; discourage human disturbance such as trampling or machinery encroachment; and define work areas.
Direct seeding	The broadcasting of native seed, that has been prepared / treated, into a bushland area that depauperate of native plants.
Sterile grasses	The broadcasting of sterile seed to either stabilize unstable ground of to out compete weed species in heavily weed infested soil.

Herbicide Use

Herbicide Use

All spraying is completed by trained and licensed staff in accordance with the NSW Pesticides Act. All TEC spray equipment is maintained so that it can safely and accurately complete accurate spray works.

All herbicides are used in accordance with label instructions or NRA approved off label permits.

All rinse water is reused in broad spraying programs on highly disturbed sites.

All spraying is completed in suitable climatic conditions ie not during droughts, high winds or preceding rains. Every effort is made to improve the effectiveness of the herbicides that are applied.

Herbicides are not applied in the immediate proximity of creek lines or permanent water bodies. With the exception of some target weeding.

Total Earth Care Pty Ltd completes herbicide spray logs that have been developed either; in accordance with the requirements of the NSW Pesticides Act; or specified and supplied by the client.

Type	Definition
Spot spraying	The precision application of sprayed herbicide to weed species that are growing in close proximity to native plants. The spraying occurs after the target weeds have been eradicated by hand from around native plants.
Broad spraying:	The application of herbicides in broad areas of weeds. Care is taken to ensure that spray drift does not affect native plants near by. This type of spraying is usually preceded by spot spraying along the native/weed interface.
Vine curtain spraying	The spraying of vine weeds that have formed a dense curtain of foliage over trees and shrubs. These curtains are carefully sprayed and the herbicide translocated into the roots of the plants killing them some distance from the point of herbicide application.
Motorised spraying	The application of herbicide with a motorised pump and large volume reservoir. This means of herbicide application is restricted to large weed polycultures and disturbed sites. Two operators work in tandem with two spray guns or with a single machine mounted boom.
Cut and Painting	The cutting, as close to ground level as possible, of woody weeds and the application of herbicide, within 30 seconds to the phloem ring of the cut stump.
Scrape and painting	The scraping of a stem or root of a weed, close to its roots, to expose the phloem and then painting that stem with Herbicide.
Long stemmed scraping	The scraping of a stem of a weed at a long distance from the roots when the root and stem base are inaccessible.
Bagging and spraying	Bundling of a grass or vine weed and while bagging the bundle while still connected to its roots so that the contents of the bag can be sprayed without fear of applying herbicide to the surrounding bushland.
Chiselling and poisoning	The ringed chiselling of a woody weed close to the ground to apply herbicide to the phloem via an applicator bottle.
Wiping	The application of herbicide by use of a sponge, wick or cloth to the leaves of bulbs or grass weeds.

Other Specific Herbicide Uses

Trounce for Protasparagus aethiopicus.	The use of Trounce mixed with Roundup Biactive to form a slurry for the treatment of Protasparagus aethiopicus has been found to achieve good kill rates by Total Earth Care Pty Ltd. The sprouts are cut and the herbicide slurry applies close to or directly to the crown. This treatment method greatly reduced the strenuous manual handling aspect of Protasparagus aethiopicus treatment. In addition it reduce soil disturbance. This use is covered by the minor use Permit Number 4793.
Dicot Selective	Starane
Monocot Selective	Fusilade
Garlon for Blackberry	We recommend the control of Rubus fruticosus with Garlon 600. We have achieved better kill rates with Garlon 600 than Glyphosate based herbicides that burn the foliage, however fail to kill the plant. The use of Garlon 600 for the control of Rubus fruticosus is a registered use under the controlled droplet application table of on the product label.

Appendix C

Vegetation Structures

Appendix 2, Figure A2.2 Pictorial key to the structural forms of Australian vegetation' from Planning for Bushfire Protection 2001

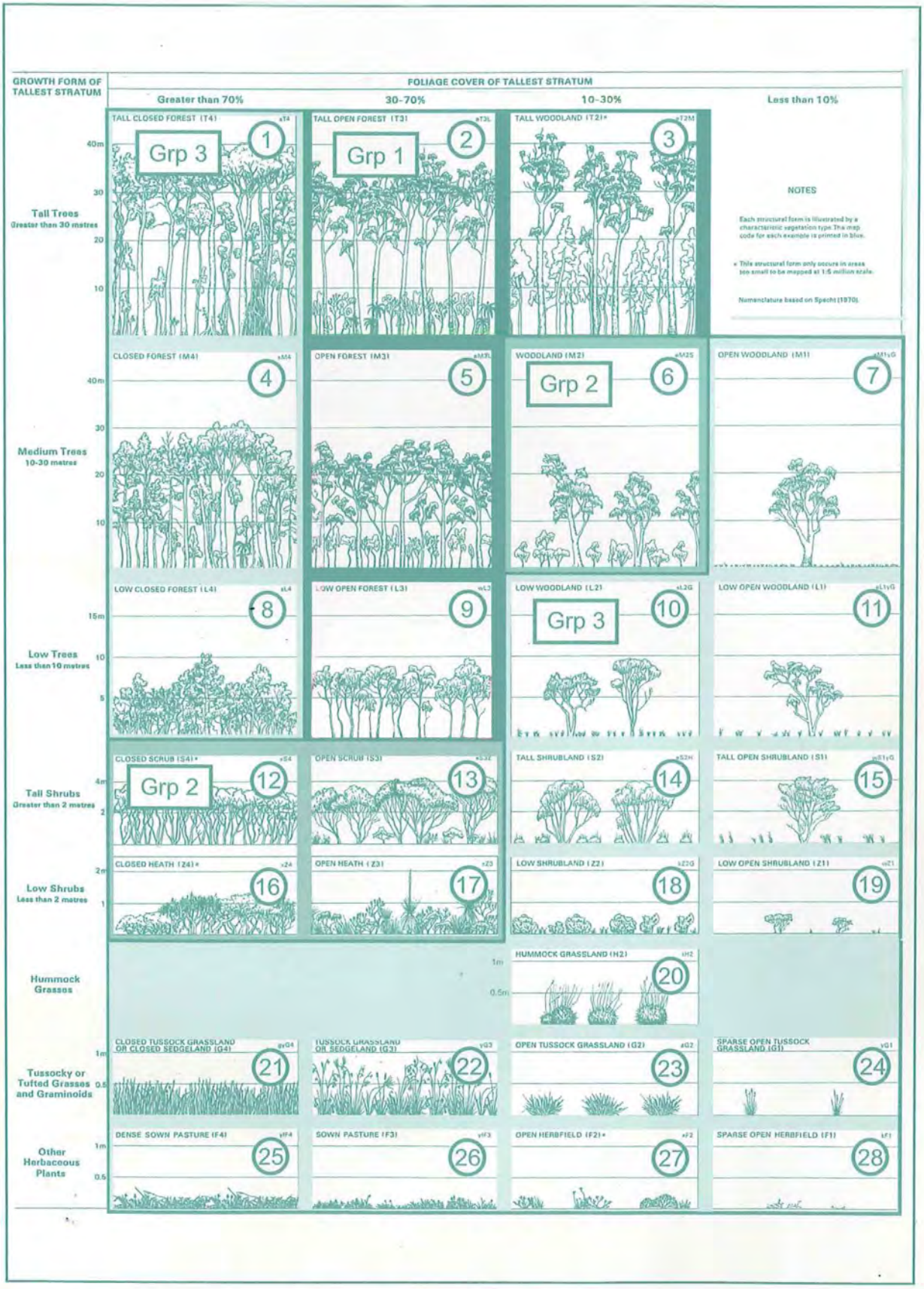


Figure A2.2 Pictorial key to the structural forms of Austalian vegetation

Appendix D

Impact Mitigation/Amelioration Measures

Chapter 8 from Species Impact Statement Proposed Residential Development Precincts 5, 6 & 10 St Patrick's Estate, Manly prepared by Ecosense Consulting Pty Ltd

8 IMPACT MITIGATION/AMELIORATION MEASURES

The proposal incorporates a number of construction and post-construction mitigation measures aimed at minimising impacts on the bandicoot population. It should be noted that mitigation measures pertaining to stormwater flows are based on modeling results obtained by Hughes Trueman (2004a).

8.1 General Mitigation Measures

General management measures are aimed at minimising vegetation loss and implementing erosion and sedimentation controls to minimise any adverse environmental impacts on adjacent terrestrial habitats and on Spring Cove.

8.1.1 Construction

General construction mitigation measures aimed at minimising impacts associated with construction include:

- Erecting barrier fencing to prevent machinery from damaging or removing surrounding vegetation;
- Protecting trees to be retained with barrier fencing and minimising disturbance within the drip line; and
- Protecting established vegetated links with barrier fencing incorporated with gaps to allow bandicoot movement.
- Confining land disturbance to areas of minimum workable size;
- Sprinkling large unprotected areas to keep them moist (not wet) and to control dust, particularly during windy and dry weather;
- Collecting and diverting all stormwater flows within the works area to stormwater detention basins via directional siltation fencing;
- Constructing, implementing and maintaining soil erosion and sediment control in accordance with requirements of the stormwater management manual *Managing Urban Stormwater – Soils and Construction* (Landcom 2004); and
- Removing temporary soil and water management structures only after the lands are stabilised/rehabilitated.

8.2 Bandicoot Mitigation Measures

Bandicoot management measures are aimed at minimising the impacts associated with the proposed residential development on the endangered population of Long-nosed Bandicoots.

8.2.1 Pre-construction (Early Works Program)

Pre-construction mitigation measures aimed at minimising impacts on Long-nosed Bandicoots include:

- Undertaking bush regeneration in the adjoining Manly Council Reserve and National Park behind Collins Beach (see Section 8.5).

8.2.2 Construction

A Bandicoot Construction Protocol (Appendix D) was developed in consultation with DEC in order to provide guidelines for minimising the impacts of construction on bandicoots over the entire Estate. In general, the protocol aims to:

- Alert contractors to the presence of the endangered bandicoot population and its habitat;
- Avoid removing and/or damaging any habitat proposed for retention on- or offsite;
- Ensure that the risk of bandicoots being killed or injured as a result of clearing, excavation and/or construction is minimised;
- Maintain permeability to bandicoots in and around the construction site by incorporating gaps into construction and sedimentation fences;
- Restrict potential conflicts between construction times and bandicoot activity periods; and
- Provide a reporting mechanism in case any dead or injured bandicoots are found.

Construction mitigation measures specifically aimed at minimising impacts of residential development of Precincts 5, 6 and 10 on the bandicoot population include:

- Removing constructed windrows by first trying to flush out any sheltering bandicoots and then removing branches manually;
- Conducting a site induction for contractors to alert them to the presence bandicoots and their habitat;
- Incorporating a 20-30 cm gap under barrier fencing to facilitate bandicoot movements throughout the study area;
- Integrating ‘overlaps’ in sediment fencing to allow bandicoot access;
- Staging construction such that roads, services and various houses north of Access way 4 are constructed first, with the lower terrace being retained as bandicoot habitat;
- Staging enhancement of vegetated links to create additional habitat or enhance existing habitat as soon as practicable and to minimise disturbance in time and space during any one stage of construction;

- Providing a boardwalk along the axial pathway where it transects the southern vegetated link to maintain habitat connectivity for bandicoots; and
- Installing two 300 mm X 800 mm box culverts under Access way 4 to facilitate the movement of bandicoots between the National Park and the Estate.

It should be noted that bandicoots are known to utilise highway underpasses along the Pacific Highway Upgrade. Bandicoots (both the Northern Brown and the Long-nosed) were the most frequent users of 3 m X 3 m box culverts measuring up to 52 m in length between Bulahdelah and Coolongolook (AMBS 2001a). Bandicoots also frequently used smaller 20-m long, 2.4 m X 1.2 m box culverts located at Brunswick Heads (AMBS 2001b). As a general rule of thumb, culvert size should increase with its length. Therefore the smaller culverts to be installed as part of the present project are likely to be suitable to cross under the 4-m wide Access way 3. The use of box culverts incorporating the natural substrate may further enhance their use by bandicoots. Natural rock work would assist in directing bandicoots into the underpasses.

8.2.3 Post-construction

Post-construction mitigation measures aimed at minimising impacts on Long-nosed Bandicoots include:

- Minimising road mortality through provision of strategically placed bandicoot warning signage;
- Removing existing weeds and regenerating 15,590 m^2 of open space using mainly endemic species;
- Including a convenant prohibiting future leaseholders from owning dogs and cats to minimise the risk of bandicoot predation;
- Preparing a Bandicoot Amelioration Strategy and Management Plan for the entire Estate (see Section 8.4.1);
- Implementing monitoring and educational programs consistent with the Recovery Plan (see Section 8.4.2); and
- Continuing to monitor vegetated links during and post-construction (see Section 8.6).

8.3 Management of Bandicoot Habitat

The subdivision of the subject site would be of direct relevance to the management of bandicoot habitat on Precincts 5, 6 and 10. It is proposed to subdivide Lot 2 DP544297 (i.e. Precincts 4, 5, 6, 10 and 11) into 25 allotments (Figure 8.1), including:

- 22 lots (Lots 1-4, 6-23) for each of the proposed detached dwellings;
- one lot (Lot 5) for the proposed apartment building;

- a communal lot (Lot 24) containing the road network and open space that would be jointly controlled and managed by the individual leaseholders; and
- a residual lot (Lot 25) comprising Precincts 4 and 11.

The ongoing management of the site would be embodied in the titling of the land. It is proposed to create an incorporated association comprising the owners of the house lots and the owners' corporation of the apartment lot (or possibly the individual apartment owners). The association would lease the communal lot from the Catholic Church and would be:

- responsible for the upkeep, repair and maintenance of the Common Property Lot;
- responsible for compliance with the Environmental Management System (EMS); and
- required to ensure that the repair and maintenance obligations are carried out which pertain to the Common Property Lot (as set out in the lease).

Management is of particular concern with respect to vegetated links and the fuel-managed corridor as these are important in maintaining habitat connectivity both within the subject site and outside it. As these areas are linear in configuration, they transect several different lots and may therefore be subject to varying management regimes. To avoid this, maintenance of vegetated links would be centrally managed as part of the EMS to ensure that their management is consistent and predictable over time.

The agreed southern vegetated link is contained within the Common Property Lot (Lot 24) and the rear (south) of Lots 7-10. Shelter habitat comprising the vegetated link would be demarcated (e.g. using bollards with plaques) and the alteration or removal of vegetation would be prohibited by means of a covenant included in the lease agreement. The implementation of a long-term contract with a landscaping firm to undertake maintenance regimes in fuel-managed areas would provide a further incentive for leaseholders to avoid disturbing these areas.

The additional southern vegetated link (i.e. to the west of the heritage or axial pathway) is contained within Lots 11-15. Although these would not be protected under the lease agreement, the steepness and relative inaccessibility of this additional link would discourage access by residents.

The northern vegetated link is included in the Common Property Lot (Lot 24) and the area surrounding the Popov apartments (Lot 5). The implementation of a long-term contract with a landscaping firm to undertake maintenance regimes in fuel-managed areas would provide a further incentive for leaseholders to avoid disturbing these areas.

The 20-m wide APZ is partly contained within Lots 24 and 5. In addition to providing bandicoot habitat, this fuel-reduced zone requires management in order to minimise the risk of bushfires. Management would involve initiating

a long-term contract with a landscaping firm to undertake a maintenance regime aimed at reducing fuel loads to 3-5 tonnes/ha (Building Code & Bushfire Hazard Solutions 2004).

The proposed residential development would be essentially self-sustaining with respect to irrigation of lots and communal areas (mcgregor + partners 2004). First flush road and pavement water would be sent directly to the swales where it would be filtered under low flow conditions. Each stormwater pit in the road swale system would divert low flow water to soakage flow spreaders between the houses to naturally irrigate the site in rain events. Higher flows would be directed to the site boundaries and heritage axis where stone-filled gabion walls would dissipate flows and capture water for minor detention.

8.4 Long-term Management Strategies

A summary of long-term management measures and strategies relevant to the protection and maintenance of bandicoot habitat on St Patrick's Estate is presented below.

8.4.1 Bandicoot Amelioration Strategy

Since 1996 the Trustees of the Catholic Church and Lend Lease, together with their consultants and the DEC, have developed a range of amelioration measures to ensure that foraging and shelter habitat and movement corridors are maintained and/or enhanced during the development of various precincts on the Estate. These are described in the updated report *Ongoing Bandicoot Amelioration Measures St Patrick's Estate* (Bali 2004e) and have been incorporated into an overall Bandicoot Amelioration Strategy and Management Plan for the entire Estate (Bali in prep.).

8.4.2 Education and Awareness

It is anticipated that a package of information on threatened plants and endangered populations would be distributed to leaseholders as part of their lease agreements.

Recommendations for education and awareness programs will be incorporated into the Environmental Management System for the Estate. In addition, interpretive material and signage will be incorporated into the Public Walkways Plan that is currently being prepared.

8.4.3 Recovery Plan

The Draft Long-nosed Bandicoot Recovery Plan is presently being prepared by the DEC. The Catholic Church and Lend Lease are committed to cooperation with the DEC in the implementation of the Plan through cooperation in the North Head bandicoot monitoring program, financial contributions towards the enhancement of bandicoot habitat within the National Park and through comments made on early drafts of the plan.

8.4.4 Threat Abatement Plan

A *Threat Abatement Plan* setting out fox control priorities in New South Wales has been prepared by NPWS (2001). The plan nominates the population of Long-nosed Bandicoots at North Head as a high priority target and North Head as a high priority site for fox control activities. Fox baiting is presently being undertaken as a precautionary measure. The Catholic Church and Lend Lease are presently cooperating and will continue to cooperate in any fox control activities undertaken on North Head.

8.5 Compensatory Mitigation Measures

On 8 November 2002, the NSW Government gazetted Amendment No 24 to the *Manly Local Environment Plan* (LEP), which considered development in St Patrick's Estate and included the rezoning of Precincts 12 and 13 for residential purposes. In order to mitigate the loss of bandicoot habitat associated with the development, the DEC, Catholic Church and Lend Lease agreed to implement additional amelioration measures for bandicoots. These are described in letters from the NPWS (now DEC) to Lend Lease Development dated 20 November 2000 and 3 November 2003 and are shown on the attached Vegetated Links Summary Plan (Appendix C). All but the $10,000/year contribution would be incorporated as part of specific DAs that have already been submitted or will be submitted to Council in the future. Progress for each of these additional measures is reported briefly below. All works would be undertaken to the satisfaction of the DEC:

- Enhancement of shelter habitat (i.e. weeding and planting additional understorey species) including a 10-m wide strip to the south of Precinct 13 lots. The 10-m setback has been incorporated into the design for Lots 1-8 as per the DA Nos. 277-84/04 submitted to Council on 8 June 2004. Although the northern half of this strip would be disturbed by excavation and construction works, the steeper southern section would be retained as shelter habitat throughout construction. Post-construction, it would be hand-weeded, topsoiled and mulched (if necessary) and planted in conjunction with other landscaping onsite.
- Enhancement of shelter habitat (i.e. weeding and planting additional understorey species) thereby linking Precincts 1, 12 and 13 and maintaining a 3-m strip of vegetation along the Estate side of the wall. This has been incorporated into the proposal for development of Precincts 3 and 12 and is discussed in TEC & Ecosense Consulting (2004). However, its location within the Inner Protection Area for the subject site requires removal of some trees and the management of dense shrubs in order to minimise the risk of fire. Lack of suitable shelter habitat in this area would act as a partial barrier to bandicoot movement.
- Establishment of shelter habitat by enhancing/planting a 2-m wide strip along the inside of the perimeter wall (southern boundary) from Precinct 3 to immediately east of the main Darley Road entrance. This would create a movement corridor between the National Park and the

approved vegetated link to the west of Block A. This has been widened to 4 m between Block A and the main entrance to Darley Road to provide additional shelter habitat.

- Bush regeneration works (i.e. removal of introduced species and enhancement of existing native vegetation) for bandicoot movement corridors located in Manly Council Reserve (i.e. between Precinct 10 and Spring Cove) and in National Park and (i.e. behind Collins Beach). The area under consideration is shown in the Vegetated Links Summary Plan (Appendix C) and would be undertaken as part of the early works program for the development of Precincts 5, 6 and 10. Bush regeneration works would be undertaken in consultation with DEC and taking into consideration in the relevant bushfire hazard assessment (Building Code & Bushfire Hazard Solutions 2004).
- Enhancement of shelter habitat between Precincts 5 and 10. This would be undertaken as part of Stage 1B construction as discussed in this report (see Section 2.2.3). This link has also been extended so that it transects Darley South from east to west. It ranges from 6-50 m wide with the maximum width incorporating the 20-m wide fuel-managed corridor along the heritage wall.
- Enhancement of shelter habitat (i.e. addition of understorey species) in Conservation Area garden beds. This would be undertaken as part of the early works program associated with the construction of houses on Lots 1-8, Precinct 13 proposed to commence in late August 2004.
- Contribution of $10,000 per each of the 5 years of the Recovery Plan. The funds will contribute to management of bandicoots and their habitat within the adjacent National Park, including monitoring, weed control, predator control and habitat enhancement. The Catholic Church has already contributed the first $10,000 instalment as part of its ongoing commitment to implementation of the Recovery Plan.

8.6 Bandicoot Monitoring

The following bandicoot monitoring programs for North Head and the Estate vegetated links are ongoing and will continue during and after construction of Precincts 5, 6 and 10.

8.6.1 North Head (DEC)

NPWS has been monitoring the North Head endangered population of Long-nosed Bandicoots since January 1998. Quarterly monitoring involves trapping 20 transects (including four on St Patrick's Estate) over a 3-night period. In addition, a more intensive survey is undertaken every two years; this involves trapping 43-46 transects over a 5-night period. Since August 2002, the Catholic Church and Lend Lease have participated in the program by allowing DEC to monitor four transects on St Patrick's Estate and by encouraging its consultants to assist with trapping activities. Transects

within the Estate were included in the most recent intensive monitoring session held in May 2004.

During intensive trapping on North Head in May 2002, 64 individuals were trapped 117 times over 5 days. Using Population Viability Analysis (PVA), DEC estimated the North Head bandicoot population to be approximately 94 individuals. However, St Patrick's Estate was not included in that estimate. In May 2004, 116 individuals were captured 211 times and the population was estimated at 130-160 bandicoots using PVA. The DEC attributes the apparent population increase to the effectiveness of various mitigation measures implemented across North Head including traffic calming measures, fox control and burning (see Appendix J).

The Catholic Church and Lend Lease will continue to cooperate with DEC in relation to population monitoring on North Head as part of its commitment to implementation of the Recovery Plan.

8.6.2 St Patrick's Estate Vegetated Links

Quarterly monitoring of foraging activity and bandicoot numbers was undertaken for vegetated links P12, P1 and P13 (upper) from April 2002 to February 2003 (see Bali 2002a-c; 2003a, b). The aim of vegetated links monitoring is to demonstrate use of the vegetated links for foraging and sheltering throughout the construction process. The methodology used was designed in order to be simple and repeatable and to allow the systematic collection of data by relatively unskilled observers while minimising impacts to individual bandicoots. It involves the following procedures:

- recording all diggings encountered along a 2-m wide transect (one metre either side of the walker) during a 20 minute transect along the length of the vegetated links;
- undertaking transect walks close to the centre line of all existing links and within five metres of either edge (this is where foraging is most likely to occur);
- undertaking walking transects along both sides of the links to account for any differences in foraging activity related to natural variation in slope, moisture levels and availability of shelter;
- locating a suitable vantage point (where most or all of the vegetated link is visible) at dusk and spending 20 minutes observing for bandicoot activity;
- spotlighting while walking 10-20 m from one edge of each vegetated link and counting all bandicoots observed in and adjacent to it; and
- walking and spotlighting over a fixed time period of about 20 minutes per vegetated link (based on a walking rate of approximately one kilometre per hour).

Data collected would be compared to baseline data to detect any changes in bandicoot foraging and sheltering activity.

DEC will continue to trap bandicoots along four transects within the Estate as part of its North Head population monitoring program. This data will be used to confirm any changes in foraging activity or bandicoot observations detected during vegetated links monitoring. The Catholic Church and Lend Lease will continue to cooperate with DEC in relation to population monitoring on North Head as part of its commitment to cooperating with the implementation the Recovery Plan.

8.6.3 Precincts 5, 6 and 10

In April 2004, an Estate-wide monitoring program was initiated with the aim of collecting baseline data prior to decontamination/construction in the vicinity of existing shelter link P10 and to determine if bandicoots will continue to use established/future vegetated links for foraging and sheltering throughout the construction process (Bali 2004b-d, f; 2005a, b). Vegetated links monitoring will be undertaken throughout the construction process.

Appendix E

Bandicoot Construction Protocol

Appendix C from Species Impact Statement Proposed Residential Development Precincts 5, 6 & 10 St Patrick's Estate, Manly prepared by Ecosense Consulting Pty Ltd

APPENDIX C - BANDICOOT CONSTRUCTION PROTOCOL

Aim: To minimise bandicoot mortality and injury and to protect bandicoot habitat in areas not subject to construction activity.

- Ensure that all retained areas are clearly identified and marked to avoid any accidental damage/destruction
- Erect temporary chain wire fencing around the construction site. Gaps of at least 20-30 cm are to be provided at the bottom of the fencing, so as not to impede bandicoot movement around and through the construction site.
- All construction workers on the site, including sub contractors and visitors to the work site, are to be made aware of the presence of bandicoots through induction training by a suitably qualified and experienced person.
- A systematic clearing approach must be determined by a suitably qualified and experienced person prior to the commencement of clearing that is to include progression of clearing in one direction towards areas of retained habitat.
- Vegetation clearing to be undertaken using hand tools in the first instance and checking or likely shelter sites (at the base of vegetation and under deep litter) so as to cause bandicoots to be flushed from sheltering sites to other retained areas. Ideally all clearance to be completed within one day so that bandicoots do not re occupy partially cleared areas overnight.
- Earth moving or other large machinery is not to be used until the level of vegetation clearance achieved cannot support a bandicoot sheltering or nesting. Appropriate level of clearance to be determined by a suitably qualified person.
- If cleared vegetation is stockpiled on the site temporarily, then its removal from the site must be undertaken by hand, not large machinery.
- Operating hours are to be confined to 0700 to 1800 on weekdays and 0700 to 1300 on Saturdays to limit disturbance. No machinery is to be used within one half hour of dusk.
- All machinery and construction material stock piles are to be inspected daily prior to operations commencing to ensure that no bandicoots are sheltering.
- If an injured bandicoot is found, it must be reported to the NPWS Harbour North Office on 9977 6732, or if unavailable contact the Sydney Metropolitan Wildlife Service on 9413 4300.
- If a dead bandicoot is found, it must be reported to NPWS on the above number. A NPWS Ranger will need to check the body for a microchip, therefore, if possible put the body in a plastic bag and refrigerate or keep cool.
- Undertake monitoring of the vegetated links throughout construction as per Monitoring Protocol.

Appendix F

Existing Tree Schedule

Updated Arboricultural Data for Construction Certificate prepared by Tree Wise Men Australia Pty Ltd

TREE WISE MEN®
AUSTRALIA PTY LTD

Updated Arboricultural Data for Construction Certificate
Oakstand Property Group Development
of
Spring Cove
106 Darley Road
Manly

Prepared for:

Spring Cove Developments Pty Ltd
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SYDNEY NSW 2000

Ref: 1045Oakstand2011

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Peter Castor
Director

BSc (For.)
Member: IACA, AA, PIA, UDIA, LTRA, MAE (UK)
17 November 2011

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ATTACHMENTS

1. PROJECT BACKGROUND

1.1 INTRODUCTION

1.1.1 This document has been prepared to accompany the updated Tree Schedule (1045OakstandTabV5) and Tree Protection Plan prepared for Oakstand Property Group on behalf of Spring Cove Developments Pty Ltd in relation to proposed development of Spring Cove, 106 Darley Road, Manly (the subject site). This document serves as Certification of tree protection and removal requirements for Construction Certificate, subject to the resolution of Consent inconsistencies detailed at 1.3 below.

1.1.2 Oakstand Property Group has recently acquired development rights to the site from Lend Lease Development and are preparing CC documentation as per the Consent (DA 482/04). The attached Tree Schedule and Tree Protection Plan are based on the construction layout contained in the Masterplan SK05, prepared by McGregor Coxall, tree related conditions in Notice of Determination, 81(1)(a) s96(1) and s(96(2) of DA 482/04 and site inspection findings of 1st, 2nd and 7th November, 2011.

1.1.3 The brief to Tree Wise Men® Australia Pty Ltd was to update the Tree Schedule from 2007 (Ref: 1045SpringCoveTabV4Amend [as at 6/08/2007]) and to prepare a Tree Protection Plan based on the Masterplan SK05.

1.2 THE SUBJECT TREES

1.2.1 Two hundred and twenty four (224) subject trees were assessed. These trees included planted exotics and planted Australian natives. The tree population assessed varied in species, age, vigour and condition.

1.2.2 The *Consent Status* column in the Tree Schedule indicates whether trees were to be Conditioned to be retained (R) or removed (Rm) in C220 (s96(2)).

1.2.3 Trees which have been removed since 2007 are noted as *Previously Removed* in the Tree Schedule. *Previously Removed* trees are not depicted in the Tree Protection Plan (unless to be retained under C220).

1.2.4 The following trees Conditioned to be retained (Condition 220) have been previously removed: Tree 5/29 and Tree 5/96.

1.2.5 The *Recommendation* column in the Tree Schedule confirms the status of the site trees at the time of inspection and their retention or removal treatment as per C220.

1.3 INCONSISTENCIES IN CONDITIONS OF CONSENT

1.3.1 The following Conditions of Consent contradict C220 (s96(2)):

- Condition 294 (s96(1)): Tree 10/38
- Condition 66 (s81(1)(a)): Tree 10/51 and Tree 10/102
- Condition 298 (s96(2)): Tree 10/38, Tree 10/102 and Tree 10/53

1.3.2 We recommend that clarification be sought from Council or Certifier by the developer in relation to these inconsistencies, prior to commencement of site works.

2. METHODOLOGY

2.1 DATA COLLECTION

2.1.1 In preparation of this document ground level, visual tree assessments (VTA)[1] were undertaken on 1st, 2nd and 7th November, 2011. No aerial (climbing) inspections, woody tissue testing or tree root mapping were undertaken as part of this assessment.

2.1.2 The two hundred and twenty four (224) subject trees are those indicated at Attachment A the Tree Schedule. Tree data was validated and trees were retagged where necessary. Trunk diameter at breast height (DBH) was estimated at 1.4 metres above ground level and rounded to the nearest 0.1 metre. The vigour of the trees was rated Good, Fair or Poor and a Safe Useful Life Expectancy (SULE) estimated. The terms, Diameter at Breast Height (DBH), Tree Protection Zone (TPZ), ©Significance Rating, ©Retention Index and Safe Useful Life Expectancy (SULE) have been used when describing the site trees. Attachment A provides a detailed explanation of each.

2.1.3 All tree offsets mentioned in this document are to centre of trunk unless otherwise stated.

2.1.4 The accompanying Tree Schedule (Ref 1045OakstandTabV5) supersedes that dated 6.8.2007 submitted with the DA (482/04). Primary Root Zone (PRZ) has been changed to Tree Protection Zone (TPZ) and Critical Root Zone (CRZ) has been changed to Structural Root Zone (SRZ) to comply with *AS4970-2009 Protection of trees on development sites*.

2.2 CONSTRUCTION IMPACTS

2.2.1 Additional construction impact analysis to comply with 3.3.3 of *AS4970-2009* has NOT been undertaken.

2.2.2 All trees with Recommendation of "***R+***" have construction works (encroachments) within TPZs. All "***R+***" trees will require further review during grading/bulk earthworks and site establishment to confirm the feasibility of retention.

2.2.3 No hydraulic services plans or grading plans have been reviewed.

2.2.4 It has not been confirmed why some trees conditioned for removal in C220 are being removed

[1] VTA – Visual Tree Assessment, undertaken by tree professionals, is a recognised (International Society of Arboriculture, Journal of Arboriculture, Vol. 22 No. 6, Nov. 1996) systematic method of identifying tree characteristics and hazard potential. VTA is also an assessment method described by Claus Mattheck in *The Body Language of Trees – A handbook for failure analysis*. The Stationary Office, London (1994)

Attachment A: Tree Schedule

Tree Schedule - Oakstand Spring Cove Development, Manly

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
5/ 1	Norfolk Island Pine, *Araucaria heterophylla*	0.6	12	5	M	F	F	2.7	7.2	L	2	A	R	R+	*Top missing. Minor trunk wound north side. Located 1m S of existing drive and 3m W of masonry wall. Bedrock exposed within dripline. Road to be elevated within TPZ to allow for retention.*
5/ 2	Sydney Red Gum, *Angophora costata*	0.4, 0.5	12	7	M	G	G	2.9	7.8	L	2	A	R	R+	*Co-dominant stems. Epicormic growth. Located 2m from boundary line masonry wall. Major crack in boundary wall adjacent, suggesting roots have breached footing. Growing on floater. Proposed road within TPZ*
5/ 3	Sydney Red Gum, *Angophora costata*	0.4	10	7	M	G	F	2.3	4.8	L	3	B	R	R	*Canopy skewed to N. Shallow soil. Mower damage to surface roots.*
5/ 4	Sydney Red Gum, *Angophora costata*	0.3, 0.3	10	6	M	F	F	2.5	5.2	L	3	B	R	R+	*Epicormic growth. Surface roots, shallow soil. Minor defect in base, west side. Forms single canopy within T5/3 and T5/5. Construction within TPZ.*
5/ 5	Sydney Red Gum, *Angophora costata*	0.3, 0.3, 0.3	10	6	M	G	G	2.7	6.2	L	3	B	R	R	
5/ 6	Blueberry Ash, *Elaeocarpus reticulatus*	0.1	10										R	Rm	*DEAD*
5/ 7	Camphor Laurel, *Cinnamomum camphora*	0.2, 0.1											Rm	PR	*PREVIOUSLY REMOVED*
5/ 8	Hills Fig, *Ficus microcarpa var. Hillii*	0.6 @ 0.5m	9	7	SM	F	F	2.7	7.2	L	3	B	R	R+	*Possum damage. Construction within TPZ.*
5/ 9	Sydney Red Gum, *Angophora costata*	0.1, 0.2, 0.2, 0.4	9	5	SM	F	F	2.6	6.0	L	3	B	R	R+	*Three stems, twig dieback, epicormic growth. Regrading within TPZ.*
5/ 10	Monterey Cypress, *Cupressus macrocarpa 'cv.'*	0.2, 0.2, 0.3, 0.4, 0.4, 0.5	13	4	M	F	F	3.2	9.8	M	3	B	Rm	Rm	*Pruned limbs, twig dieback. Within building footprint.*
5/ 12	Swamp Sheoak, Casuarina glauca	0.3	9	2	SM	P	P	2.0	3.6	S	4	C	Rm	Rm	*Within building footprint.*
5/ 14	River Sheoak, *Casuarina cunninghamiana*	0.5	14	5	SM	G	G	2.5	6.0	L	3	B	Rm	Rm	*Planted form Good. Forms single canopy with Trees 5/15, 5/18 and 5/19. Minor trunk defect. Within construction footprint.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
5/ 15	Coast Banksia, *Banksia integrifolia*	0.6	11	4	M	F	P	2.7	7.2	S	3	C	Rm	Rm	*Other Banksia adjacent recently removed. Significant canopy skewed and trunk lean to east. Borer activity. Shallow roots. Canopy thinning and borer monitoring required. Within construction footprint.*
5/ 16	Southern Mahogany, *Eucalyptus botryoides*	0.6 @ 0.5m	12	4	M	F	F	2.7	7.2	M	3	B	Rm	Rm	*Leaf beetle damage. Epicormic growth. Within construction footprint.*
5/ 19	Cheese Tree, *Glochidion ferdinandi*	0.2 @ 0.5m	6	3	SM	F	F	1.7	2.4	M	4	C	Rm	Rm	*Co-dominant. Located on top of embankment, 3m W of drive. Within construction footprint*
5/ 25	Cheese Tree, *Glochidion ferdinandi*	0.3, 0.3, 0.4	7	5	SM	G	G	2.8	7.1	L	3	B	Rm	Rm	*Within construction footprint.*
5/ 29	Cheese Tree, *Glochidion ferdinandi (X2)*	0.2, 0.3											R	PR	*PREVIOUSLY REMOVED. Native Daphne at base of western stem. Conditioned to be retained.*
5/ 30	Native Daphne, *Pittosporum undulatum*	0.4, @g	6	3	SM	F	F	2.3	4.8	M	4	C	R	R	
5/ 31	Moreton Bay Fig, *Ficus macrophylla*	0.7	13	7	M	F	F	2.8	8.4	L	2	A	R	R+	*Previous works undertaken within SRZ. Canopy skew to N. 5m tall Port Jackson Fig at base. Dwelling 7 within TPZ. Crown pruning may be required.*
5/ 32	Moreton Bay Fig, *Ficus macrophylla*	0.8	13	7	M	F	F	3.0	9.6	L	2	A	R	R+	*Previous works undertaken within SRZ. Canopy skew to NE away from Tree 5/31. Ivy to top of canopy. Deck of Dwelling 7 within SRZ. Crown pruning required.*
5/ 40	Coast Banksia, *Banksia integrifolia*	0.5	11	5	M	F	F	2.5	6.0	M	3	B	R	R+	*Minor construction within TPZ.*
5/ 42	Coast Banksia, *Banksia integrifolia*	0.4	11	4	OM	F	P	2.3	4.8	S	3	C	Rm	Rm	*Overmature Age Class.*
5/ 43	Native Daphne, *Pittosporum undulatum (X2)*	0.2, 0.3											Rm	PR	*PREVIOUSLY REMOVED*
5/ 48	Native Daphne, *Pittosporum undulatum*	0.2											Rm	PR	*PREVIOUSLY REMOVED*
5/ 49	Cheese Tree, *Glochidion ferdinandi*	0.1, 0.3, 0.3	10	4	M	G	F	2.5	5.3	L	3	B	R	R	
5/ 50	Cheese Tree, *Glochidion ferdinandi*	0.3	10	6	SM	G	F	2.0	3.6	L	3	B	R	R	*Epicormic growth. Native Daphne 4 m tall, to E.*
5/ 51	Cheese Tree, *Glochidion ferdinandi*	0.1, 0.2	10	3	SM	F	F	1.9	2.8	M	3	B	R	R	*Native Daphne 10m tall, 3m to S.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
5/ 52	Cheese Tree, *Glochidion ferdinandi*	0.1, 0.4, 0.4, 0.4, 0.4	11	4	M	F	F	3.2	9.6	M	3	B	R	R	*Canopy suppressed by vines. Cheese Tree, 12m tall, 3m to E.*
5/ 53	Cheese Tree, *Glochidion ferdinandi*	0.5 @ grade	11	4	SM	G	F	2.5	6.0	M	3	B	R	R	*Native Daphne, 10m tall, 2m to E. Native Daphne, 10m tall, 1m to N.*
5/ 54	Cheese Tree, *Glochidion ferdinandi*	0.3	12	4	M	G	F	2.0	3.6	M	3	B	R	R	*Co-dominant stems. Two Cheese Trees, 10m tall, 4m to NE.*
5/ 55	Cheese Tree, *Glochidion ferdinandi*	0.3, 0.4	10	4	SM	F	F	2.6	6.0	M	3	B	Rm	Rm	*Garbage dumped at base. Cheese Tree, 10m tall, 4m to E. Canopy suppressed by vines. Removed for bushfire safety.*
5/ 61	Cheese Tree, *Glochidion ferdinandi*	0.3	10	6	SM	F	F	2.0	3.6	M	3	B	Rm	Rm	*Vine entanglement. Removed for bushfire safety.*
5/ 62	Cheese Tree, *Glochidion ferdinandi* (X2)	0.4	9	6	SM	F	F	2.3	4.8	M	3	B	R	R	*Vine entanglement.*
5/ 65	Port Jackson Fig, *Ficus rubiginosa*	0.2, 0.3, 0.3	8	4	SM	G	F	2.6	5.6	L	3	B	Rm	Rm	*Young, bird-propagated tree, growing on 1 m high rocky outcrop. Within construction footprint.*
5/ 68	Scentless Rosewood, *Synoum spp.*	0.3	8	4	SM	F	F	2.0	3.6	M	4	C	Rm	Rm	*Previously identified as Native Daphne. Three Tree Ferns 6m tall to W. Cheese Tree 5m to N on top of embankment. Scentless Rosewood, 5m tall, 3m to N.*
5/ 71	Native Daphne, *Pittosporum undulatum*	0.1, 0.2, 0.2	7	2	SM	F	F	2.1	3.6	M	4	C	R	R	
5/ 72	Native Daphne, *Pittosporum undulatum*	0.3											Rm	PR	*PREVIOUSLY REMOVED*
5/ 74	Blueberry Ash, *Elaeocarpus reticulatus*	0.2											Rm	PR	*PREVIOUSLY REMOVED*
5/ 77	Native Daphne, *Pittosporum undulatum*	0.3	7	4	SM	G	G	2.0	3.6	M	4	C	R	R+	*Dwelling 15 within TPZ.*
5/ 79	Native Daphne, *Pittosporum undulatum*	0.2	6	3	SM	G	G	1.7	2.4	L	4	C	R	R	
5/ 80	Native Daphne, *Pittosporum undulatum*	0.3											Rm	PR	*PREVIOUSLY REMOVED*
5/ 83	Cheese Tree, *Glochidion ferdinandi*	0.3											Rm	PR	*PREVIOUSLY REMOVED*
5/ 84	Blueberry Ash, *Elaeocarpus reticulatus*	0.2											Rm	PR	*PREVIOUSLY REMOVED*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
5/ 85	Cheese Tree, *Glochidion ferdinandi*	0.1, 0.1, 0.1	5	3	SM	F	F	1.7	2.2	L	4	C	R	R	*1.5 m NE of T5/88 (Port Jackson Fig).*
5/ 86	Cheese Tree, *Glochidion ferdinandi*	0.3	10	4	M	G	G	2.0	3.6	L	3	B	R	R	*Co-dominant stems from 2 m. Native Daphne 2m to N.*
5/ 87	Cheese Tree, *Glochidion ferdinandi*	0.1, 0.1	6	3	SM	G	F	1.6	1.8	L	4	C	R	R	
5/ 88	Port Jackson Fig, *Ficus rubiginosa*	0.3	7	3	SM	G	F	2.0	3.6	L	4	C	Rm	Rm	*Growing on edge of drop off to path. Trunk collapse*
5/ 89	Native Daphne, *Pittosporum undulatum (X15)*	0.1 to 0.2											Rm	PR	*PREVIOUSLY REMOVED.*
5/ 91	Native Daphne, *Pittosporum undulatum*	0.1, 0.2	6	3	SM	F	F	1.9	2.8	L	4	C	R	R	
5/ 92	Coral Tree, *Erythrina x sykesii*	0.8, 0.8, 0.8											Rm	PR	*PREVIOUSLY REMOVED*
5/ 93	Port Jackson Fig, *Ficus rubiginosa*	1.0 @g	14	9	M	G	G	3.4	10.0	L	2	A	R	R+	*Growing on embankment. Rubbish dumped adjacent. Minor construction within TPZ.*
5/ 95	Cheese Tree, *Glochidion ferdinandi*	0.3	8	3	SM	G	G	2.0	3.6	L	3	B	R	R	
5/ 96	Native Daphne, *Pittosporum undulatum*	0.2											R	PR	*PREVIOUSLY REMOVED*
5/ 97	Cheese Tree, *Glochidion ferdinandi*	0.2	7	3	SM	G	F	1.7	2.4	M	4	C	R	R+	*Skew to E. Dwelling 6 within TPZ.*
5/ 98	Scentless Rosewood, *Synoum spp.*	0.1, 0.1, 0.2	6	3	SM	G	F	2.0	3.0	L	4	C	R	R	*Suppressed by adjacent trees.*
5/ 100	Native Daphne, *Pittosporum undulatum*	0.3											Rm	PR	*PREVIOUSLY REMOVED.*
5/ 101	Coral Tree, *Erythrina x sykesii*	0.2, 0.3											Rm	PR	*PREVIOUSLY REMOVED.*
5/ 102	Coral Tree, *Erythrina x sykesii*	0.2, 0.2, 0.2											Rm	PR	*PREVIOUSLY REMOVED.*
5/ 103	Native Daphne, *Pittosporum undulatum (X2)* Cheese Tree *Glochidion ferdinandi (x2)*	0.1 to 0.2	8 to 10	3 to 4	SM	G-F	F-P	1.7	2.4	M	4	C	Rm	Rm	*Group of 4. Vine entanglement of canopy. Small dead tree adjacent. Primary tree nearly dead. Within construction footprint.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
6/ 100	Norfolk Island Pine, *Araucaria heterophylla*	0.9	25	5	M	G	G	3.2	10.8	L	1	A	R	R	*Lower limbs pruned. Slight damage to trunk. Significant trees on adjoining Precinct to be considered during construction. Several Native Daphnes within 5m.*
6/ 101	Moreton Bay Fig, *Ficus macrophylla*	1.2	18	10	M	G	F	3.6	14.4	L	1	A	R	R	*Some branch wounding.*
6/ 102	Norfolk Island Pine, *Araucaria heterophylla*	0.8	22	8	M	F	F	3.0	9.6	L	2	A	R	R	*Top missing.*
6/ 103	Canary Island Date Palm, *Phoenix canariensis*	0.5	5	6	SM	G	F	2.0	3.0	L	4	C	R	R	*Suppressed by Tree 6/102. Consider for removal to favour Tree 6/102*
6/ 105	Canary Island Date Palm, *Phoenix canariensis*	0.7	8	3	SM	G	G	2.0	3.0	L	4	C	R	R	
6/ 106	Port Jackson Fig, *Ficus rubiginosa*	1.0 @g	12	8	M	F	G	3.4	10.0	L	2	A	R	R	*Highly visible from entrance gate.*
6/ 107	Coast Banksia, *Banksia integrifolia*	0.4, 0.5, 0.6	10	4	OM	F	F	3.3	10.6	S	3	C	R	R	*Major limb drop in past. Shallow roots. Major trunk lean to N.*
6/ 108	Hills Fig, *Ficus microcarpa var. Hillii*	1.0 @g	9	8	M	G	G	3.4	10.0	L	3	B	R	R+	*Currently prominent, visible from Osborne Street. Road works within TPZ.*
6/ 109	WA Weeping Myrtle, *Agonis flexuosa*	0.4 @g	6	3	OM	P	P	2.3	4.8	R	4	D	Rm	Rm	*Main trunks with decay pockets. Dieback west side. Poor vigour and condition.*
6/ 110	Coral Tree, *Erythrina x sykesii*	0.7, 0.7	13	14	M	G	F	3.5	11.9	R	4	D	Rm	Rm	*Currently prominent. Located 8 metres N of drive. Hazardous species.*
6/ 111	Brushbox, *Lophostemon confertus*	0.4	12	5	M	F	F	2.3	4.8	L	3	B	R	R	*Twig dieback. Suppressed by adjacent trees.*
6/ 112	Monterey Pine, *Pinus radiata*	0.3	6	4	SM	F	F	2.0	3.6	M	4	C	R	R	*Skewed canopy.*
6/ 113	Cheese Tree, *Glochidion ferdinandi*	0.3	7	3	SM	F	G	2.0	3.6	M	4	C	R	R	*Suppressed, upright canopy. African Olive at base.*
6/ 115	Cheese Tree, *Glochidion ferdinandi*	0.2	7	2	SM	G	F	1.7	2.4	L	4	C	R	R	*Competition from African Olive.*
6/ 116	Brushbox, *Lophostemon confertus*	0.4	10	3	SM	F	G	2.3	4.8	L	4	C	R	R	*Located on edge of drainage channel.*
6/ 117	Coral Tree, *Erythrina x sykesii*	0.4, 0.5											Rm	PR	*PREVIOUSLY REMOVED*
6/ 118	Brushbox, *Lophostemon confertus*	0.3	9	5	SM	F	F	2.0	3.6	M	4	C	R	R+	*Skewed canopy to N. On edge of drain channel. Proposed stairs within TPZ.*
6/ 120	Monterey Pine, *Pinus radiata*	0.5	12	6	SM	F	F	2.5	6.0	M	4	C	R	R+	*Lean to W. Skewed canopy. Proposed stairs within TPZ.*
6/ 121	Moreton Bay Fig, *Ficus macrophylla*	0.8	14	10	M	G	F	3.0	9.6	L	3	B	R	R+	*Heavily suppressed by Monterey Pine to N (T6/124). Major construction within TPZ.*
6/ 124	Monterey Pine, *Pinus radiata*	1.0	18	14	M	F	F	3.3	12.0	M	2	A	R	R+	*Major construction within TPZ.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
6/ 125	Canary Island Date Palm, *Phoenix canariensis*	0.5	7	6	SM	F	G	2.0	3.0	L	4	C	Rm	Rm	*Suppressed by T6/124.*
6/ 127	Native Daphne, *Pittosporum undulatum*	0.2, 0.2, 0.2	7	6	M	F	F	1.5	4.0	M	4	C	Rm	Rm	*Within building footprint.*
6/ 128	Coast Banksia, *Banksia integrifolia*	0.4	8	3	M	F	F	2.3	4.8	S	3	C	Rm	Rm	*Growing on top of rock shelf. Canopy skewed to south-west away from Native Daphne (T6/127). Cheese Tree, 5m tall, 6m to E. Within building footprint.*
6/ 129	Banksia, *Banksia sp.*	0.3	7	2	M	G	F	2.0	3.6	M	4	C	Rm	Rm	*Within building footprint.*
6/ 130	Coast Banksia, *Banksia integrifolia*	0.3	7	5	OM	P	P	2.0	3.6	R	4	D	Rm	Rm	*Heavy mistletoe growth, borers in main trunk. Heavy trunk lean to W. Removal recommended. Poor vigour and borer-related defects at base. Dieback. Within building footprint.*
6/ 131	Coast Banksia, *Banksia integrifolia*	0.7	NA							R	4	D	Rm	PR	*PREVIOUSLY REMOVED*
6/ 132	Coral Tree, *Erythrina x sykesii*	0.8	10	10	M	F	F	3.0	9.6	M	4	C	Rm	PR	*PREVIOUSLY REMOVED*
10/ 1	Cheese Tree, *Glochidion ferdinandi*	0.4	11	3	M	F	P	2.3	4.8	M	3	B	Rm	Rm	*Vine entanglement in canopy. Within road footpath.*
10/ 2	Cheese Tree, *Glochidion ferdinandi (X2)*	0.2, 0.3	8 to 10	3	M	F	P	2.3	4.4	L	4	C	R	R	*Two in group, vine entanglement and suppressed form.*
10/ 3	Cheese Tree, *Glochidion ferdinandi*	0.3	11	5	M	G	G	2.0	3.6	L	3	B	Rm	Rm	*Road within SRZ.*
10/ 3 A	Cheese Tree, *Glochidion ferdinandi*	0.3	10	3	SM	G	F	2.0	3.6	L	4	C	Rm	R	*Six Native Daphne, 10m high within 5m.*
10/ 4	Cheese Tree, *Glochidion ferdinandi*	0.3	7	3	M	G	F	2.0	3.6	L	4	C	Rm	Rm	*Canopy skewed to N. Road within SRZ.*
10/ 5	Cheese Tree, *Glochidion ferdinandi*	0.3	10	4	M	G	F	2.0	3.6	L	4	C	Rm	Rm	*Suppressed by adjoining trees. Road within SRZ.*
10/ 6	Cheese Tree, *Glochidion ferdinandi*	0.3	11	3	M	G	F	2.0	3.6	L	4	C	Rm	Rm	*Co-dominant stems from 2m. Road within SRZ.*
10/ 7	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.4, 0.4	11	6	M	F	F	2.8	6.8	M	3	B	Rm	Rm	*Co-dominant stems. Dead tree to N. Road within SRZ.*
10/ 8	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.6	9	2	M	P	P	2.7	7.2	S	4	C	Rm	Rm	*Vine entanglement in canopy.*
10/ 9	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.2, 0.3 0.3	10	8	M	P	P	2.3	4.4	M	4	C	Rm	Rm	*Vine entanglement in canopy. Small Native Daphne adjacent, heavy skew on each of the trunks. Unknown reason for removal.*
10/ 9 A	Cheese Tree, *Glochidion ferdinandi*	0.1, 0.2	9	8	SM	F	F	1.9	2.8	L	4	C	R	R	*Canopy skew to S.*

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10/ 10	Cheese Tree, *Glochidion ferdinandi*	0.4	9	4	M	F	G	2.3	4.8	L	3	B	Rm	Rm	*Proposed path within SRZ.*
10/ 11	Cheese Tree, *Glochidion ferdinandi*	0.4	9	5	M	F	G	2.3	4.8	L	3	B	Rm	Rm	*Unknown reason for removal.*
10/ 12	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.2, 0.4	16	5	M	G	F	2.5	5.4	L	3	B	Rm	Rm	*Unknown reason for removal.*
10/ 13	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.1, 0.4	15	4	M	G	F	2.4	5.0	L	3	B	Rm	Rm	*Unknown reason for removal.*
10/ 14	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.4, 0.5	16	5	M	G	F	2.8	7.8	M	3	B	R	R+	*Co-dominant stems from 1m. Road within TPZ.*
10/ 15	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.4, 0.5	11	6	M	G	G	2.8	7.8	L	3	B	Rm	Rm	*Within footprint of Dwelling 19.*
10/ 16	Broad-leaved Paperbark, *Melaleuca quinquenervia (X5)*	0.4, 0.7 @g	13 to 15	4 to 5	M	G	G-F	2.9	8.4	L	3	B	R	R+	*Group of 5. One tree leaning. Dwelling 19 within footprint.*
10/ 20	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.3, 0.4, 0.7	16	8	M	G	F	3.3	10.4	M	3	B	R	R	*One Broad-leaved Paperbark and 1x Native Daphne 2m to NW.*
10/ 21	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.2, 0.5	15	7	M	F	F	2.7	6.5	M	3	B	Rm	Rm	*Suppressed by adjoining trees. Skew to SE. Remove for bushfire safety.*
10/ 22	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.4, 0.4	15	5	M	F	F	2.8	6.8	M	3	B	R	R	*Co-dominant stems. Vine entanglement in canopy. Two Sweet Daphne, 7m tall, 5m to S.*
10/ 23	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.5, 0.6	15	6	M	G	F	3.2	9.5	M	3	B	R	R	*Co-dominant stems.*
10/ 24	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.3, 0.3, 0.4	12	5	M	F	F	2.8	7.1	M	3	B	R	R	
10/ 25	Coast Banksia, *Banksia integrifolia*	0.2, 0.4	10	6	SM	F	F	2.5	5.4	M	3	B	Rm	Rm	*Heavy skew to S. Remove for bushfire safety.*
10/ 26	Cheese Tree, *Glochidion ferdinandi*	0.4 @g	8	4	M	G	F	2.3	4.8	L	4	C	R	R	*Suppressed by Tree 10/25.*
10/ 27	Cheese Tree, *Glochidion ferdinandi*	0.1, 0.1, 0.3	8	4	M	G	F	2.2	4.1	L	3	B	R	R	*Dead tree to the N.*
10/ 28	Cheese Tree, *Glochidion ferdinandi*	0.3, 0.3, 0.3	7	5	M	G	F	2.7	6.2	L	4	C	R	R	*Dead tree DT14 to W. Native Daphne 6m to W. Coast Banksia 8m tall, 8m to N.*
10/ 29	Cheese Tree, *Glochidion ferdinandi*	0.4 @ 0.5m	6	5	M	G	G	2.5	6.0	L	4	C	Rm	Rm	*Within Dwelling 19 footprint.U139*
10/ 30	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.6	10	6	M	G	G	2.7	7.2	L	3	B	Rm	Rm	*Within Dwelling 17 footprint.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
10/ 31	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.7 @g	10	4	M	G	F	2.9	8.4	M	3	B	Rm	Rm	*Within Dwelling 17 footprint.*
10/ 32	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.4	11	4	M	G	G	2.3	4.8	L	3	B	Rm	Rm	*Within Dwelling 17 footprint.*
10/ 33	Broad-leaved Paperbark, *Melaleuca quinquenervia (X3)*	0.3, 0.5, 0.5	8 to11	5 to 6	M	G	G	2.8	7.1	L	3	B	R	R+	*Dwellings 17 & 18 within TPZ.*
10/ 34	Broad-leaved Paperbark, *Melaleuca quinquenervia*	1.0	17	9	M	G	G	3.3	12.0	L	1	A	R	R+	*Road within TPZ.*
10/ 35	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.8	16	10	M	G	G	3.0	9.6	L	1	A	R	R+	*Road within TPZ.*
10/ 36	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.2, 0.6, 0.6	14	10	M	G	F	2.9	7.7	L	2	A	R	R+	*Driveway within TPZ.*
10/ 37	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.9	16	9	M	G	G	3.2	10.8	L	1	A	R	R+	*Dwelling 15 within TPZ.*
10/ 38	Broad-leaved Paperbark, *Melaleuca quinquenervia (X4)*	0.5, 0.5, 0.5, 0.5	13 to 15	4 to 5	SM	G	G	3.5	12.0	L	2	A	Rm	Rm	*Dwelling15 within SRZ. Dwelling 14 within TPZ.*
10/ 42	Coast Banksia, *Banksia integrifolia (X4)*	0.3, 0.3, 0.4, 0.4, 0.4											Rm	PR	*PREVIOUSLY REMOVED.*
10/ 43	Cheese Tree, *Glochidion ferdinandi*	0.7 @g	8	5	M	G	F	2.9	8.4	L	3	B	Rm	Rm	*Eight trunks. Native Daphne adjacent previously removed. Within Dwelling 14 footprint.*
10/ 44	Cheese Tree, *Glochidion ferdinandi*	0.4	9	5	M	G	G	2.3	4.8	L	3	B	Rm	Rm	*Skewed canopy to N. Small Native Daphne 2m S. Within Dwelling 17 footprint.*
10/ 45	Cheese Tree, *Glochidion ferdinandi*	0.2, 0.3	8	3									Rm	Rm	*DEAD*
10/ 46	Cheese Tree, *Glochidion ferdinandi*	0.2	8	3	SM	F	F	1.7	2.4	M	4	C	R	R	
10/ 47	Cheese Tree, *Glochidion ferdinandi*	0.3	7	3	SM	F	F	2.0	3.6	M	4	C	Rm	Rm	*Canopy skew to N. Within Dwelling 17 footprint.*
10/ 48	Native Daphne, Pittosporum undulatum (x2) Cheese Tree, Glochidion ferdinandi (x1)	0.2, 0.3, 0.3	6 to 8	4 to 6	SM	F	F	2.6	5.6	M	4	C	R	R+	*One Cheese Tree and 2 Native Daphne within 2 metres. Dwelling 17 within TPZ. Proposed Path to be elevated within SRZ.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
10/ 49	Cheese Tree, *Glochidion ferdinandi*	0.2, 0.2, 0.2	7	4	SM	F	G	2.3	4.2	L	4	C	Rm	Rm	*Co-dominant stems from 0.5m. Bark inclusion. Within Dwelling 16 footprint.*
10/ 50	Cheese Tree, *Glochidion ferdinandi*	0.6 @ 0.5	7	4	SM	F	F	2.7	7.2	M	4	C	Rm	Rm	*Co-dominant stems from ground level. Bark inclusion. Within construction footprint.*
10/ 51	Broad-leaved Paperbark, *Melaleuca quinquenervia (X4)*	0.1, 0.1, 0.1, 0.3	10 to 12	3 to 4	SM	G	F	2.3	4.2	L	3	B	Rm	Rm	*Upright form due to competition. Largest stem only to remain. Within Dwelling 16 footprint.*
10/ 52	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.4, 0.4, 0.6	11	9	M	G	P	3.2	10.0	M	3	B	R	R+	*Limb collapse and split out. Remedial works required. Proposed stairs & Dwelling 16 to be elevated within SRZ.*
10/ 53	Broad-leaved Paperbark, Melaleuca quinquenervia (X4) Cheese Tree, Glochidian ferdinandi (x1)	0.2 - 0.5	10 to 12	2 to 7	SM-M	G	G	2.5	6.0	L	3	B	Rm	Rm	*Northern most stem to be removed. Within Dwelling 16 footprint.*
10/ 54	Broad-leaved Paperbark, *Melaleuca quinquenervia (X3)*	0.2-0.5	9 to 14	1 to 6	M	G	G	2.5	6.0	L	3	B	R	R+	*Dwelling 16 & road within TPZ.*
10/ 55	Cheese Tree, *Glochidion ferdinandi*	0.6 @ 0.5m	8	6	M	G	G	2.7	7.2	L	3	B	Rm	Rm	*Bark inclusion at 1m. Canopy to ground to W and N. Within construction footprint.*
10/ 56	Norfolk Island Pine, *Araucaria heterophylla*	0.9	27	6	M	G	G	3.2	10.8	L	1	A	R	R+	*Top missing. Cockatoo damage. Clump of Native Daphne, 6m tall, 6m to S. Road within TPZ.*
10/ 57	Norfolk Island Pine, *Araucaria heterophylla*	1.3	27	7	M	G	G	3.7	15.0	L	1	A	R	R+	*Proposed stairs within TPZ.*
10/ 59	Cheese Tree, *Glochidion ferdinandi*	0.6 @g	11	5	M	F	F	2.7	7.2	M	3	B	Rm	Rm	*Native Daphne, 9m tall, 4m to S. Within construction footprint.*
10/ 61	Cheese Tree, *Glochidion ferdinandi*	0.4	12	6	M	G	F	2.3	4.8	L	3	B	R	R+	*Skewed canopy to W. Stair upgrade & Dwelling 12 within TPZ. Major encroachment.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
10/ 63	Coast Banksia, *Banksia integrifolia*	0.5											Rm	PR	*PREVIOUSLY REMOVED.*
10/ 64	Coast Banksia, *Banksia integrifolia (X2)*	0.5, 0.6	13 to 15	4 to 5	M	F	F	3.2	9.5	S	3	C	R	R+	*Suppressed upright form. Stair upgrade within TPZ.*
10/ 65	Norfolk Island Pine, *Araucaria heterophylla*	0.5	13	4	SM	G	F	2.5	6.0	L	3	B	R	R+	*Top missing. Lean to N. Major construction within TPZ.*
10/ 66	Norfolk Island Pine, *Araucaria heterophylla*	0.4	12	2	SM	G	G	2.3	4.8	L	3	B	Rm	Rm	*Within construction footprint.*
10/ 67	Sydney Red Gum, *Angophora costata*	0.4, 0.5	8	4	M	F	F	2.8	7.8	M	3	B	Rm	Rm	*Apical dieback. Within construction footprint.*
10/ 68	Norfolk Island Pine, *Araucaria heterophylla*	0.8	19	6	M	G	G	3.0	9.6	L	1	A	R	R	
10/ 69	Norfolk Island Pine, *Araucaria heterophylla*	0.8	18	6	M	F	G	3.0	9.6	L	2	A	R	R+	*Top missing. Minor TPZ encroachment Lot 1.*
10/ 70	Sydney Red Gum, *Angophora costata*	0.5	10	8	M	G	F	2.5	6.0	L	3	B	R	R	*Lean and heavy skew to W.*
10/ 71	Monterey Pine, *Pinus radiata*	0.6	15	5	M	F	F	2.7	7.2	M	3	B	R	R+	*Lean to the E. Major TPZ encroachment Dwelling Lot 1.*
10/ 72	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.3	8	3	SM	F	G	2.0	3.6	L	4	C	R	R+	*Major TPZ encroachment Dwelling Lot 1.*
10/ 73	Sydney Red Gum, *Angophora costata*	0.3, 0.3	10	6	SM	G	F	2.5	5.2	L	3	B	R	R+	*Co-dominant leader. Trunk lean to the W. Major TPZ encroachment Dwelling Lot 1.*
10/ 74	Sydney Red Gum, *Angophora costata*	0.3	8	8	SM	F	F	2.0	3.6	L	4	C	R	R+	*Heavy lean to NW. Minor TPZ encroachment Dwelling Lot 1.*
10/ 76	Canary Island Date Palm, *Phoenix canariensis*	0.8	6	4	SM	G	G	2.0	3.0	L	4	C	Rm	Rm	*Two smaller Canary Island Date Palms adjacent. Two small Native Daphne to the south. Remove to favour T10/57.*
10/ 77	Canary Island Date Palm, *Phoenix canariensis*	0.9	5	4	SM	G	G	2.0	3.0	L	4	C	Rm	Rm	*Remove to favour adjacent tree.*
10/ 78	Cheese Tree, *Glochidion ferdinandi*	0.3 @ 1m	5	3	SM	G	G	3.0	3.6	L	4	C	Rm	Rm	*Bark inclusion. Construction within SRZ.*
10/ 81	Native Daphne, *Pittosporum undulatum*	Multi											Rm	PR	*PREVIOUSLY REMOVED*
10/ 82	Native Daphne, *Pittosporum undulatum (X4)*	0.1, 0.2											Rm	PR	*PREVIOUSLY REMOVED*
10/ 85	Cheese Tree, *Glochidion ferdinandi* (X2)	0.3 @g											Rm	PR	*PREVIOUSLY REMOVED*
10/ 86	Cheese Tree, *Glochidion ferdinandi*	0.4	8	5	M	G	G	2.3	4.8	L	3	B	R	R	

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
10/ 88	Cheese Tree, *Glochidion ferdinandi*	0.1, 0.1, 0.1, 0.2	6	4	M	G	F	2.0	3.2	L	4	C	Rm	Rm	*Within Dwelling 17 footprint.*
10/ 89	Cheese Tree, *Glochidion ferdinandi*	0.2								R	4	D	Rm	Rm	*DEAD. Native Daphne, 8m tall and Privet adjacent.*
10/ 90	Cheese Tree, *Glochidion ferdinandi*	0.2, 0.2	6	3	M	G	G	2.1	3.5	M	4	C	R	R+	*Co-dominant trunks. Dwelling 17 within TPZ.*
10/ 91	Cheese Tree, *Glochidion ferdinandi*	0.3	8	4	SM	G	G	2.0	3.6	L	3	B	Rm	Rm	*Unknown reason for removal.*
10/ 92	Cheese Tree, *Glochidion ferdinandi*	0.3	8	3	SM	F	F	2.0	3.6	L	4	C	Rm	Rm	*Suppressed. Removed for bushfire safety.*
10/ 93	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.7	12	6	M	G	F	2.8	8.4	L	3	B	R	R+	*Lean to SE. Pruning for bushfire. Dwelling 16 within TPZ.*
10/ 94	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.4	10	6	SM	F	F	2.3	4.8	M	4	C	Rm	Rm	*Suppressed by Tree 10/93. Lean to the N. Within Dwelling 16 footprint.*
10/ 95	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.4	10	6	SM	F	F	2.3	4.8	M	4	C	Rm	Rm	*Suppressed by Tree 10/93. Lean to the NW. Within Dwelling 16 footprint.*
10/ 96	Broad-leaved Paperbark, Melaleuca quinquenervia (x1) Cheese Tree, Glochidion ferdinandi (x1)	0.1, 0.1, 0.1	6 to 7	3 to 5	SM	F	F	1.7	2.2	S	4	C	Rm	Rm	*Cheese tree in poor condition. Broad-leaved Paperbark has heavy skew to north. Dwelling 16 within SRZ.*
10/ 97	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.5	12	6	M	G	G	2.5	6.0	L	3	B	Rm	Rm	*Twig dieback. Within Dwelling 16 footprint.*
10/ 98	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.2, 0.2, 0.3	10	4	SM	G	F	2.4	5.0	L	4	C	Rm	Rm	*Within Dwelling 16 footprint.*
10/ 99	Cheese Tree, *Glochidion ferdinandi*	0.4 @g	7	4	SM	G	F	2.3	4.8	L	4	C	Rm	Rm	*Within Dwelling 16 footprint.*
10/ 100	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.1 to 0.4	12	6	SM-M	G-F	F	2.3	4.8	M	3	B	Rm	Rm	*Canopy skew to S. Cheese Tree previously removed. Within Dwelling 16 footprint*
10/ 101	Broad-leaved Paperbark, Melaleuca quinquenervia (x1) Cheese Tree, Glochidion ferdinandi (x2)	0.1 to 0.4	7 to 10	2 to 4	SM	F	F	2.3	4.8	M	3	B	Rm	Rm	*Dead tree in group. Paperbark leaning to the east. Within Dwelling 16 footprint.*
10/ 102	Broad-leaved Paperbark, *Melaleuca quinquenervia*	0.4	8 to 10	4 to 5	SM	G	G	2.3	4.8	L	3	B	Rm	Rm	*Small Paperbark adjacent 2m to S. Stem removed for bushfire. Within Dwelling 16 footprint.*

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10/ 103	Norfolk Island Pine, *Araucaria heterophylla*	0.3	9	4	SM	G	G	2.0	3.6	L	4	C	Rm	Rm	*Small Umbrella Tree to the E. Within construction footprint*
10/ 103 A	Norfolk Island Pine, *Araucaria heterophylla*	0.2	6	3	SM	G	F	1.7	2.4	L	4	C	Rm	Rm	*Within construction footprint.*
10/ 103 B	Native Daphne, *Pittosporum undulatum*	0.1, 0.1											Rm	PR	*PREVIOUSLY REMOVED*
10/ 104	Coast Banksia, *Banksia integrifolia*	NI											Rm	PR	*PREVIOUSLY REMOVED*
10/ 106	Cheese Tree, Glochidion ferdinandi Native Daphne, Pittosporum undulatum	0.4	12	5	M	G	G	2.3	4.8	L	3	B	R	R+	*Small Native Daphne at base to be removed. Stair upgrade within TPZ.*
10/ 107	Cheese Tree, *Glochidion ferdinandi*	0.4	10	3	M	G	F	2.3	4.8	L	3	B	R	R+	*Canopy skew to NE. Cheese Tree, 8m tall, 4m to S to be retained. Stair upgrade within TPZ.*
10/ 109	Port Jackson Fig, *Ficus rubiginosa*	0.2, 0.3, 0.4	9	6	SM	G	G	2.7	6.5	L	3	B	R	R+	*Minor construction within TPZ.*
10/ 111	Cheese Tree, *Glochidion ferdinandi*	0.2	7	3	SM	F	F	1.7	2.4	M	4	C	R	R	*Suppressed by adjacent trees.*
10/ 113	Coast Banksia, *Banksia integrifolia*	0.3	9	2	SM	F	F	2.0	3.6	M	4	C	R	R	*Trunk lean to the W. Native Daphne, 2m tall to NE.*
10/ 114	Native Daphne, *Pittosporum undulatum*	0.1, 0.1, 0.1	6	3	SM	F	F	1.7	2.2	S	4	C	R	R	
10/ 116	Native Daphne, *Pittosporum undulatum*	0.1, 0.1, 0.1, 0.1											Rm	PR	*PREVIOUSLY REMOVED*
10/ 118	Native Daphne, *Pittosporum undulatum*	0.2											Rm	PR	*PREVIOUSLY REMOVED*
10/ 119	Native Daphne, *Pittosporum undulatum*	0.2											Rm	PR	*PREVIOUSLY REMOVED*
10/ 127	Native Daphne, *Pittosporum undulatum*	0.2											Rm	PR	*PREVIOUSLY REMOVED*
10/ 128	Native Daphne, *Pittosporum undulatum (X2)*	0.2, 0.2											Rm	PR	*PREVIOUSLY REMOVED*
10/ 130	Native Daphne, *Pittosporum undulatum*	0.3 @ grade	5	2	SM								R	Rm	*Advanced decline. Virtually dead*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
10/ 132	Native Daphne, *Pittosporum undulatum*	0.3											Rm	PR	*PREVIOUSLY REMOVED*
10/ 133	Native Daphne, *Pittosporum undulatum (X4)*	0.1 to 0.3	5 to 6	2 to 3	SM	F	F	2.2	3.8	L	4	C	Rm	Rm	*Within Dwelling 13 footprint.*
10/ 134	Jacaranda, *Jacaranda mimosifolia*	0.2, 0.2	5	6	SM	G	F	2.1	3.5	L	4	C	R	R	*Car tyre around trunk. Canopy skew to E.*
10/ 138	Native Daphne, *Pittosporum undulatum*	0.1, 0.1, 0.1, 0.1	5	6	SM	P	P	1.8	2.4	S	4	C	Rm	Rm	*Significant dieback. Two smaller Native Daphne to the S.*
10/ 140	Native Daphne, *Pittosporum undulatum (X3)*	0.3 to 0.4											Rm	PR	*PREVIOUSLY REMOVED*
10/ 142	Stringybark, *Eucalyptus umbra*	0.1, 0.4	8	4	M	P	F	2.4	5.0	M	3	B	Rm	Rm	*Dieback. Epicormic growth. Within construction footprint*
10/ 143	Native Daphne, *Pittosporum undulatum*	0.3											Rm	PR	*PREVIOUSLY REMOVED*
10/ 144	Native Daphne, *Pittosporum undulatum (X6)*	0.2 to 0.3											Rm	PR	*PREVIOUSLY REMOVED*
10/ 145	Native Daphne, *Pittosporum undulatum*	0.1 to 0.3											Rm	PR	*PREVIOUSLY REMOVED*
10/ 146	Native Daphne, *Pittosporum undulatum (X3)*	0.2 to 0.1											Rm	PR	*PREVIOUSLY REMOVED*
10/ 147	Giant Bird of Paradise, *Strelitzia nicolai*	Multi											Rm	PR	*PREVIOUSLY REMOVED*
10/ 148	Cheese Tree, Glochidion ferdinandi (x3) Native Daphne, Pittosporum undulatum	0.1 to 0.2	7	3	SM-IM	G	G-F	1.7	2.4	L	4	C	R	R+	*Group of 4 stems. Stair upgrade within TPZ.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS
10/ 149	Native Daphne, *Pittosporum undulatum*	0.1, 0.1, 0.1											Rm	PR	*PREVIOUSLY REMOVED*
10/ 150	Native Daphne, *Pittosporum undulatum*	0.3	10	3	SM	F	F	2.0	3.6	S	4	C	Rm	Rm	*Wound in base. Within road footprint.*
10/ 151	Native Daphne, *Pittosporum undulatum*	0.3	10	3	SM	G	F	2.0	3.6	S	4	C	R	R	*T10/DT2 adjacent. Heavy vine entanglement.*
10/ 152	Native Daphne, *Pittosporum undulatum*	02, 0.2	12	3	SM	F	F	2.1	3.5	S	4	C	Rm	Rm	*Vine entanglement in canopy. Small Cheese Tree adjacent.*
10/ 153	Cheese Tree, *Glochidion ferdinandi*	0.1, 0.1, 0.3	8	2	SM	G	F	2.2	4.1	L	4	C	R	R	*Suppressed by adjoining trees.*
10/ 154	Native Daphne, *Pittosporum undulatum*	0.1, 0.1, 0.1, 0.2	7	4	SM	F	F	2.0	3.2	L	4	C	R	R	
10/ 1 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
10/ 2 DT	DEAD												R	Rm	*Adjacent T10/151*
10/ 3 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
10/ 4 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
5/ 5 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
10/ 6 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
10/ 7 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
5/ 8 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
5/ 9 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
5/ 10 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
10/ 11 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
10/ 12 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
10/ 13 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
10/ 14 DT	DEAD												R	Rm	*Adjacent T10/28 on Lot 20.*
10/ 15 DT	DEAD												Rm	PR	*PREVIOUSLY REMOVED*
224															

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	CONSENT STATUS	RECOMMENDATION	COMMENTS

©SIG. RATING	NO. OF TREES
1	8
2	11
3	77
4	74

©RETENTION INDEX	NO. OF TREES
A	19
B	72
C	74
D	5

CONSENT STATUS	NO. OF TREES
R	98
Rm	126

RECOMMENDATION	NO. OF TREES
R	51
R+	42
PR	51
Rm	80

COMMON NAME/GENUS SPECIES CULTIVAR - Common names can vary with selected texts. Where species is unknown, "*sp.*" indicated after genus. Where cultivar is unknown "*cv*" indicated after species. The number in brackets e.g. (x9) after the species indicates the number of trees in this tree group.

DBH - Diameter at Breast Height. Tree trunk diameter measured at breast height (1.4 metres above ground level). Fabric diameter tape is used which assumes a circular cross section. Multiple measurements indicate multiple trunks. Where more than three trunks exist, the DBH may be indicated as the diameter "@ grade". Where DBH measurement cannot be taken at 1.4m, the height at which it has been taken, is indicated.

CANOPY SPREAD RADIUS – Average canopy radius (widest + narrowest ÷ 2). Circular canopy depictions on Tree Plan/Survey are indicative only. Where canopy spread was significantly skewed, all four cardinal point measurements were recorded.

AGE CLASS - **Immature (IM), Semi-mature (SM), Mature (M), Over-mature (OM).** Assessment of the tree's current Age. A **Mature (M)** tree has reached a near stable size (biomass) above and below ground. Trees can have a Mature age class for >90% of life span. **Over-mature (OM)** trees show symptoms of irreversible decline and decreasing biomass.

VIGOUR - Good (G), Fair (F) or Poor (P). The general appearance of the canopy/foliage of the tree at the time of inspection. Vigour can vary with the season and rainfall frequency. A tree can have Good vigour but be hazardous due to Poor condition. A tree in Good vigour has the ability to sustain its life processes. Vigour is synonymous with health.

CONDITION - **Good (G), Fair (F) or Poor (P).** The general form and structure of the trunk/s and branching. Trunk lean, trunk/branch structural defects, canopy skewness or other hazard features are considered.

SRZ RADIUS (m) - Structural Root Zone. The area around a tree required for tree stability. Earthworks should be prohibited within the SRZ. The SRZ is calculated from the formula and graph at Figure 1 of AS4970-2009. The SRZ graph has been adapted from the work of Claus Mattheck (1994). DBH has been used for the calculation of SRZ.. Where DBH is measured at grade of at heights other than 1.4m above grade, 10% has not been added. Composite DBH calculations for trees with more than 4 trunks have been based on the four largest stem diameters at breast height.

TPZ RADIUS (m) – Tree Protection Zone. Radial offset (m) of twelve times (12X) trunk DBH measured from centre of trunk (for trees less than 0.2 metre DBH minimum TPZ is 2.0 metres). Composite DBH calculations for trees with more than 4 trunks have been based on the four largest stem diameters at breast height. To satisfactorily retain a tree construction activity (both soil cut and fill) must be restricted within this offset. TPZ offsets are rounded to the nearest 0.1 metre. Existing constraints to root spread can vary TPZ. Generally an area equivalent to the TPZ should be available to the tree post development. Encroachment occupying up to 10% of the TPZ area is acceptable without detailed rootzone assessment. Encroachments greater than 10% require specific arboricultural assessment. Encroachments up to 25% may be justified depending upon tree species and type of encroachment.

SULE - Safe Useful Life Expectancy. A systematic pre-development tree assessment procedure developed by Jeremy Barrell, Hampshire, England. The SULE method used in this assessment has been adapted for simplified use within the field. It gives a length of time that the Arborist feels a particular tree can be retained with an acceptable level of risk based on the information available at the time of the inspection. SULE ratings are **Long** (retainable for 40 years or more with an acceptable level of risk), **Medium** (retainable for 16-39 years), **Short** (retainable for 5-15 years) and **Removal** (tree requiring immediate removal due to imminent hazard or absolute unsuitability).

©SIG. RATING - ©Significance Rating Scale (see notes over)

©RETENTION INDEX (see notes over)

CONSENT STATUS – Retain (R) or Remove (Rm) Tree removal or retention status as per Condition 220, s96(2)

RECOMMENDATIONS - Retain (R), **Retain Plus (R+ -** Trees to be retained with construction impacting on TPZ area: specific construction monitoring required to facilitate retention), **Remove (Rm -** either as specified in Consent or if dead, dying or dangerous at time of inspection) or **Previously Removed (PR -** those trees removed prior to site inspection of 1.11.11.)

COMMENTS - Comments relating to the location, surroundings and hazard potential of the trees at the time of inspection and where applicable the reason for removal.

©SIG. RATING - ©Significance Rating Scale. A site specific qualitative evaluation of a tree relative to the existing landuse developed by Tree Wise Men® Australia Pty Ltd. Takes into consideration the impact of the tree on the surrounding landscape, streetscape and bushland. Rarity, habitat value, historical/cultural value and structural form of the tree are considered in this rating system. It is possible for a tree to have a Short SULE and a ©Significance Rating of 1. Likewise it is possible for a tree to be given a Long SULE and a ©Significance Rating of 4 (e.g. weed species). The ©Significance Ratings used in this Report are as outlined in Table 1.

Table 1: ©Significance Rating Characteristics

Rating	Significance	Characteristics (some or all)
©Sig. Rating 1	**Exceptional**	▪ Major contribution to site amenity ▪ Remnant specimen ▪ Heritage Listed ▪ Listed on Significant Tree Register ▪ Threatened Species ▪ Good vigour and condition ▪ Cultural significance ▪ Possible habitat for threatened fauna ▪ Excellent, well formed specimen ▪ Rare or unusual species ▪ Large above ground biomass ▪ Unique within the site and surrounds
©Sig. Rating 2	**High**	▪ Considerable contribution to site amenity ▪ Remnant specimen ▪ Good vigour and condition ▪ Threatened Species ▪ Cultural significance ▪ Possible habitat tree for threatened fauna ▪ Well formed specimen ▪ Rare or unusual species ▪ Large or moderate above ground biomass ▪ Other specimens with similar characteristics within the site and surrounds
©Sig. Rating 3	**Moderate**	▪ Minor contribution to site amenity ▪ Remnant or planted ▪ Fair or Poor vigour and condition ▪ Potential for growth ▪ Well formed or asymmetrical form ▪ Other specimens with similar characteristics within the site and surrounds
©Sig. Rating 4	**Low**	▪ Small/poor specimen ▪ Poor vigour and condition ▪ Inappropriate for the location ▪ Minor contribution to landscape amenity ▪ Easily replaced ▪ Weed species or TPO Exempt ▪ Hazardous ▪ Previously ©Sig. Rating 5 tree

©RETENTION INDEX. A site specific assessment of an individual tree's retention value developed by Tree Wise Men® Australia Pty Ltd. Incorporating SULE and ©Significance Rating each tree is allocated a retention value of A, B, C or D. The ©Retention Index values can be described as follows:

©Retention Value A	**Should be retained**	▪ Major redesign may be required (e.g. movement of building footprint, re-alignment of roadway).
©Retention Value B	**Could be retained**	▪ Minor redesign may be required (e.g. level changes, pavement detail).
©Retention Value C	**Could be removed**	▪ Should not constrain proposed development.
©Retention Value D	**Should be removed or permanently fenced off (irrespective of development layout**.)	▪ Imminently dangerous. ▪ In an irreversible state of decline.

©Retention Index		**©Significance Rating**			
		1	**2**	**3**	**4**
SULE Rating	**Long (40+ years)**	**A**		**B**	**C**
	Medium (15-40 years)				
	Short (5-15 years)	**B**			
	Remove (< 5 years)	**D**			

Appendix G

Tree Protection Plan

Tree Protection Plan prepared by Tree Wise Men Australia Pty Ltd

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treewise@treewisemen.com.au
www.treewisemen.com.au

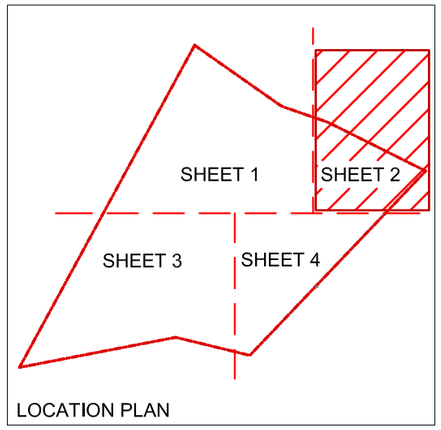
LEGEND

Item	Symbol
Lot boundaries:	red line
Tree number with trunk as plotted on Site Survey:	T34 •
©Retention Value A TPZ:	green circle
©Retention Value B TPZ:	blue circle
©Retention Value C TPZ:	purple circle
©Retention Value D TPZ:	orange circle
Trees Conditioned to be retained but require removal because dead, dying or dangerous.	black cross
Trees Conditioned for removal to facilitate development:	red cross
Trees Conditioned to be retained but previously removed (T5/29, T5/26):	blue cross
Protective fencing:	blue dashed line

TITLE:	©TREE PROTECTION PLAN
CLIENT:	SPRING COVE DEVELOPMENTS PTY LTD.
PROJECT:	OAKSTAND SPRING COVE DEVELOPMENT, MANLY
DRAWING NO:	1045OAKSTANDTPP
SHEET NO:	1 OF 5
DRAWN BY:	TH
BASED ON:	Masterplan by McGregor Coxall Spring Cove | Precints 5, 6 + 10 sk05-10, 18-23, 25_StPats_ver.dwg Dated: 2007
DATE:	22.11.2011
REV:	A
SCALE:	1:500@A3

0 5 10 25 meters

N



LOCATION PLAN

TREE WISE MEN®
AUSTRALIA PTY LTD

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Phone +61 2 9981 5219 Fax +61 2 9971 0881
treewise@treewisemen.com.au
www.treewisemen.com.au

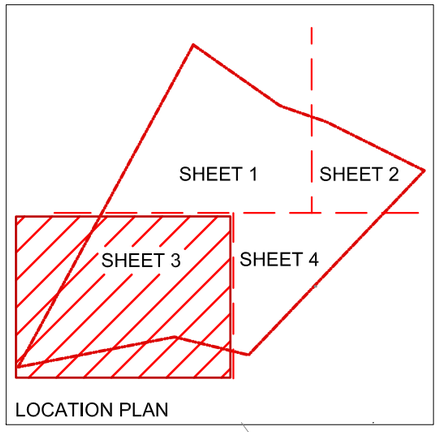
LEGEND

Lot boundaries:	
Tree number with trunk as plotted on Site Survey:	T34
©Retention Value A TPZ:	
©Retention Value B TPZ:	
©Retention Value C TPZ:	
©Retention Value D TPZ:	
Trees Conditioned to be retained but require removal because dead, dying or dangerous.	
Trees Conditioned for removal to facilitate development:	
Trees Conditioned to be retained but previously removed (T5/29, T5/26):	
Protective fencing:	

TITLE:	**©TREE PROTECTION PLAN**
CLIENT:	SPRING COVE DEVELOPMENTS PTY LTD.
PROJECT:	OAKSTAND SPRING COVE DEVELOPMENT, MANLY
DRAWING NO:	1045OAKSTANDTPP
SHEET NO:	2 OF 5
DRAWN BY:	TH
BASED ON:	Masterplan by McGregor Coxall Spring Cove | Precints 5, 6 + 10 sk05-10, 18-23, 25_StPats_ver.dwg Dated: 2007
DATE:	22.11.2011 REV: A
SCALE:	1:500@A3

0 5 10 25 meters

N



LOCATION PLAN

Retention of T10/38 to be reviewed as per C294(s96(1)) & C298(s96(2)).

Retention of T10/51, T10/53, T10/102 to be reviewed as per C66(s81(1)(a)) and C298(s96(2)).

ADJOINS SHEET 1

ADJOINS SHEET 4

UNNAMED MANLY COUNCIL RESERVE

LOT 12 LOT 13 LOT 14 LOT 15 LOT 17 LOT 18

T10/138 T10/109 T10/64 T10/43 T10/107 T10/106 T10/63 T10/130 T10/59 T10/50 T10/57 T10/77 T10/76 T10/56 T10/78 T10/103A T10/103 T10/55 T10/133 T10/134 T10/54 T10/53 T10/98 T10/97 T10/96 T10/102 T10/52 T10/51 T10/100 T10/94 T10/95 T10/93 T10/99 T10/101 T10/92 T10/49 T10/44 T10/91 T10/47 T10/45 T10/46 T10/90 T10/89 T10/88 T10/30 T10/33 T10/32 T10/31 T10/29 T10/37 T10/36 T10/35 T10/D14 T5/31 T5/32 T5/29 T5/30 T5/7 T5/98 T5/96 T5/97 T5/95 T5/77 T10/153 T10/154

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www.treewisemen.com.au

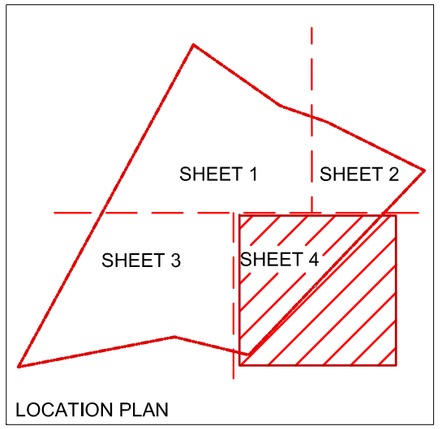
LEGEND

Lot boundaries:	
Tree number with trunk as plotted on Site Survey:	T34
©Retention Value A TPZ:	
©Retention Value B TPZ:	
©Retention Value C TPZ:	
©Retention Value D TPZ:	
Trees Conditioned to be retained but require removal because dead, dying or dangerous.	
Trees Conditioned for removal to facilitate development:	
Trees Conditioned to be retained but previously removed (T5/29, T5/26):	
Protective fencing:	

TITLE:	©TREE PROTECTION PLAN
CLIENT:	SPRING COVE DEVELOPMENTS PTY LTD.
PROJECT:	OAKSTAND SPRING COVE DEVELOPMENT, MANLY
DRAWING NO:	1045OAKSTANDTPP
SHEET NO:	3 OF 5
DRAWN BY:	TH
BASED ON:	Masterplan by McGregor Coxall Spring Cove | Precints 5, 6 + 10 sk05-10, 18-23, 25_StPats_ver.dwg Dated: 2007
DATE:	22.11.2011 REV: A
SCALE:	1:500@A3

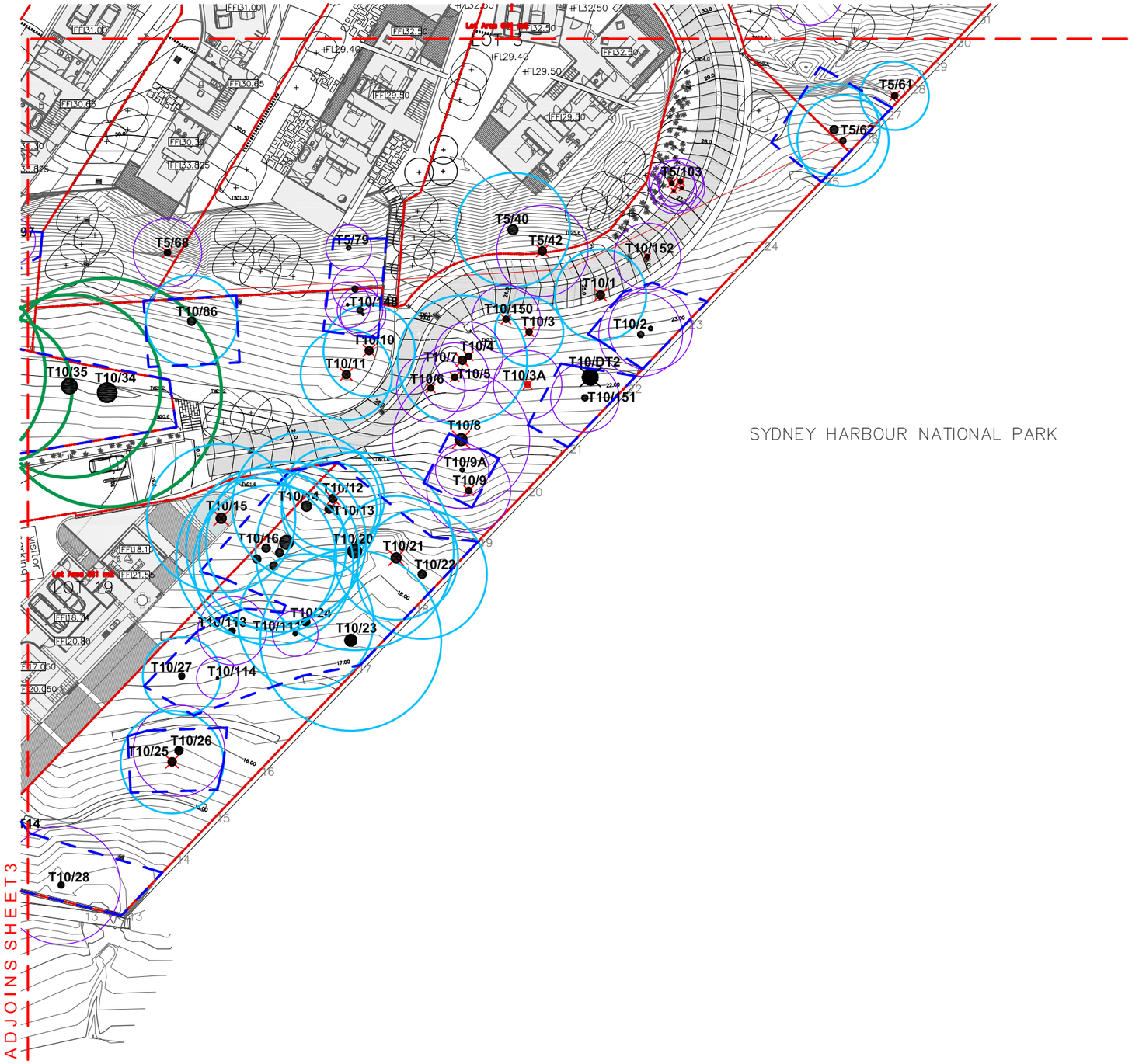
0 5 10 25 meters

N



LOCATION PLAN

ADJOINS SHEET2



SYDNEY HARBOUR NATIONAL PARK

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www.treewisemen.com.au

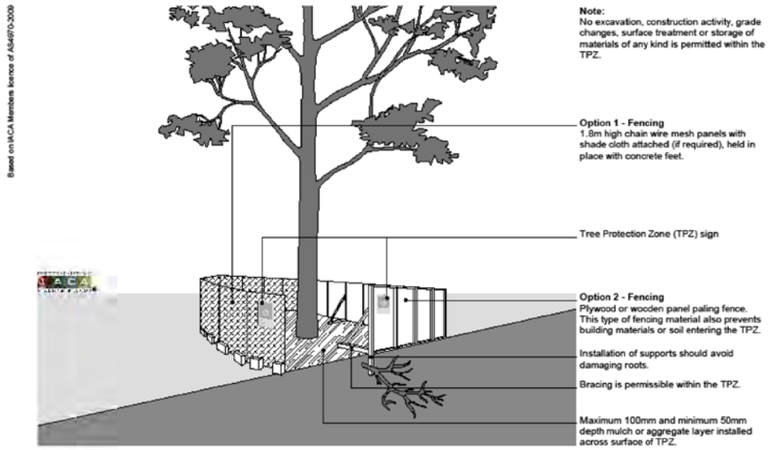
LEGEND

Lot boundaries:	
Tree number with trunk as plotted on Site Survey:	T34
©Retention Value A TPZ:	
©Retention Value B TPZ:	
©Retention Value C TPZ:	
©Retention Value D TPZ:	
Trees Conditioned to be retained but require removal because dead, dying or dangerous.	
Trees Conditioned for removal to facilitate development:	
Trees Conditioned to be retained but previously removed (T5/29, T5/26):	
Protective fencing:	

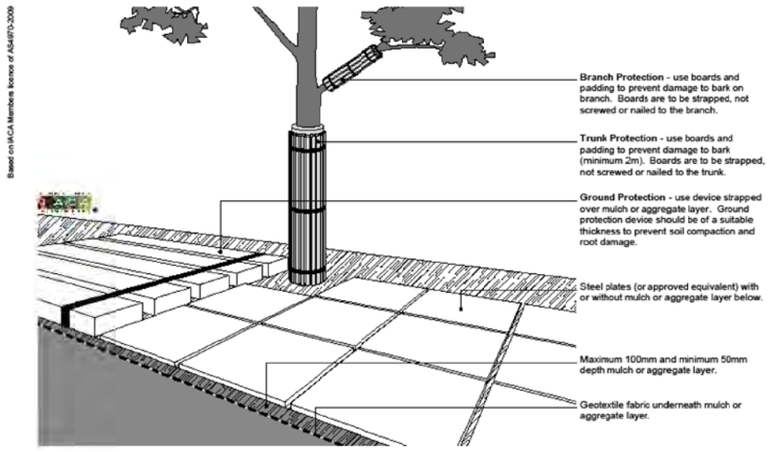
TITLE:	©TREE PROTECTION PLAN
CLIENT:	SPRING COVE DEVELOPMENTS PTY LTD.
PROJECT:	OAKSTAND SPRING COVE DEVELOPMENT, MANLY
DRAWING NO:	1045OAKSTANDTPP
SHEET NO:	4 OF 5
DRAWN BY:	TH
BASED ON:	Masterplan by McGregor Coxall Spring Cove | Precints 5, 6 + 10 sk05-10, 18-23, 25_StPats_ver.dwg Dated: 2007
DATE:	22.11.2011 REV: A
SCALE:	1:500@A3

0 5 10 25 meters

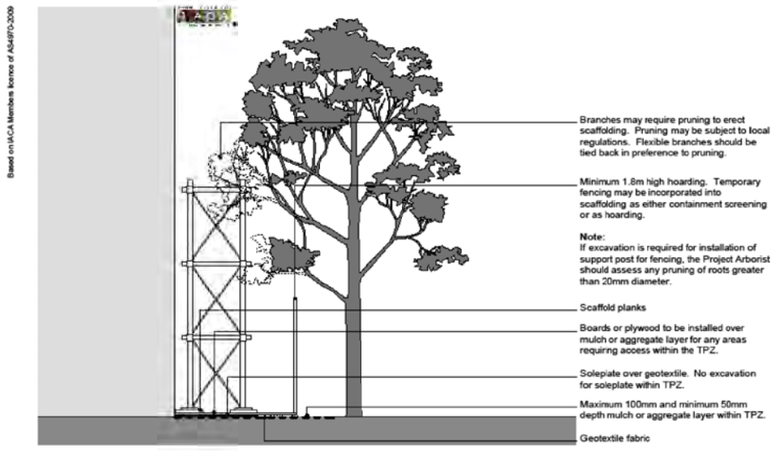
N



03 Tree Protection Fencing — Not to Scale



04 Examples of Branch, Trunk and Ground Protection — Not to Scale



05 Indicative Scaffolding within a Tree Protection Zone (TPZ) — Not to Scale

1. GENERIC TREE PROTECTION SPECIFICATIONS:

1.1 The Tree Protection Zones (TPZ) indicated areas as per *AS4970-2009 Protection of trees on development sites*.

1.2 This ***Tree Protection Plan*** should be incorporated into the site Construction Management Plan and the Sediment Control Plan.

1.3 Tree impact assessment includes likely impacts from development including: building platforms, driveways/accessways.

1.4 The extent of TPZ shown on this Plan does not reflect any actual confinement of roots by existing structures, buildings, walls, bedrock.

1.5 A ***Project Arborist*** with minimum AQF Level 5 qualifications is to be engaged to monitor and report regularly on works adjacent to trees.

1.6 ***Tree Protection Fencing*** as indicated, should be installed prior to commencement of bulk earthworks or other site preparation works. Tree Protection Fencing should comprise of chainlink wire or wire mesh panels as per Figure 3 of *AS4970-2009*. The following activities are to be prohibited within Tree Protection Fencing: topsoil stripping, excavation, placement of soil fill, stockpiling of any materials, placement of site sheds/offices, parking of heavy machinery, placement of machinery haul roads.

1.7 If ***scaffolding*** is required within TPZ, install as shown in Figure 5 of *AS4970-2009*.

1.8 Services installation should be supervised by the ***Project Arborist***. No roots greater than 50mm diameter are to be cut or damaged. Services should be routed beyond TPZ wherever possible. No hydraulic services plans have been assessed.

1.9 ***Trunk battening*** to be installed to trees where works are required within Tree Protection Fencing. Battening to comply with Figure 4 of *AS4970-2009*.

1.10 All ***tree pruning*** is to comply with ***AS4373-2007, Pruning of Amenity Trees***. All Approved tree removal is to comply with WorkCover Code of Practice for the Amenity Tree Industry.

1.11 ***Mulch*** is to be spread to a depth of 100mm within the TPZs. Where TPZs are greater than 5 metres of where native seedling regeneration would be prohibited, seek advice from the ***Project Arborist and Ecologist***.

1.12 ***Over-excavation*** or battering towards trees is to be avoided unless indicated on approved earthworks or services drawings.

1.13 Contiguous ***strip footings*** are to be avoided wherever possible. Use discontinuous pier and beam type footings or other lightweight construction for walling and fencing within TPZs.

1.14 ***Temporary irrigation***, hand watering or water cart may be required during drought periods. The ***Project Arborist*** is to monitor soil moisture levels and advise on delivery volumes and frequency.

1.15 Temporary ***haul roads*** may be required to be installed where heavy machinery movements are proposed within TPZs of trees to minimize compaction. Woodchip mulch should be used as a minimum. Recycled concrete or other aggregate placed over a geofabric may be required for heavy use areas.

2. PROJECT SPECIFIC BACKGROUND NOTES:

2.1 Primary Root Zone (PRZ) has been changed to Tree Protection Zone (TPZ) and Critical Root Zone (CRZ) has been changed to Structural Root Zone (SRZ) to comply with *AS4970-2009 Protection of trees on development sites*.

2.2 Additional construction impact analysis to comply with *AS4970-2009* has NOT been undertaken.

2.3 The accompanying Tree Schedule (Ref 1045OakstandTabV/5) supersedes that dated 6.8.2007 submitted with the DA (482/04).

2.4 Trees which have been removed since 2007 are noted as *Previously Removed* in the Tree Schedule. *Previously Removed* trees have been deleted from TPP (unless to be retained under C220).
The following trees Conditioned to be retained (Condition 220) have been *Previously Removed*: T5/29, T5/96.

2.5 All trees with Recommendation of "***R+***" have construction works (encroachments) within TPZs. All "***R+***" trees will require further review during grading/bulk earthworks and site establishment to confirm retainability.

2.6 No hydraulic services grading plans have been reviewed.

2.7 This TPP is based on the construction layout contained in the Masterplan SK05, prepared by McGregor Coxall, tree related conditions in Notice of Determination, 81(1)(a) s96(1) and s(96(2) of DA 482/04 and site inspection findings of 1.11.11.

2.8 It has not been confirmed why some trees conditioned for removal in C220 are being removed.

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TITLE:	**©TREE PROTECTION PLAN**		
CLIENT:	SPRING COVE DEVELOPMENTS PTY LTD.		
PROJECT:	OAKSTAND SPRING COVE DEVELOPMENT, MANLY		
DRAWING NO:	1045OAKSTANDTPP		
SHEET NO:	5 OF 5		
DRAWN BY:	TH		
BASED ON:	IACA Licence of *AS4970-2009 Protection of trees on development sites*		
DATE:	22.11.2011	REV:	A