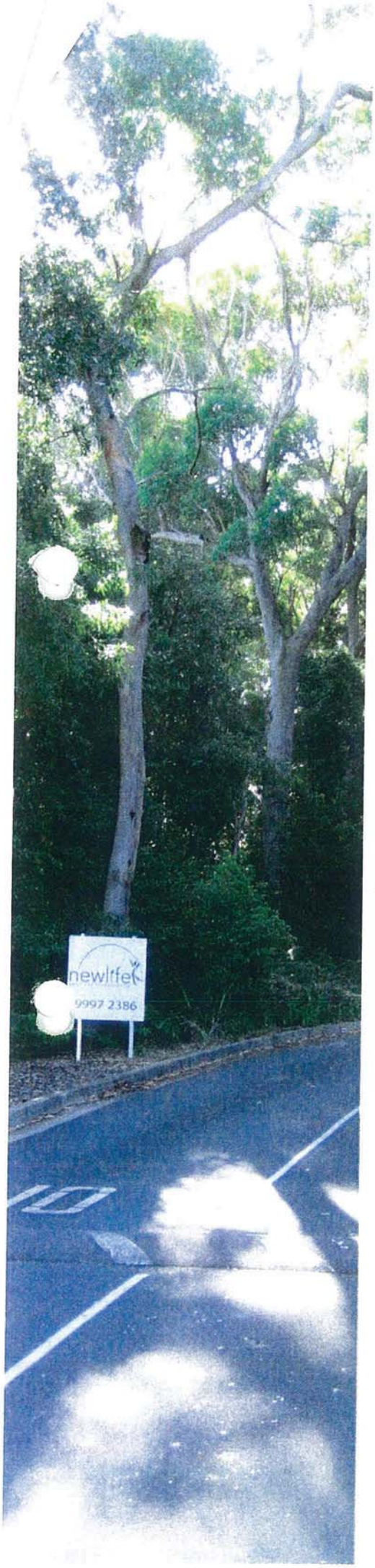
APPENDICES



Flora & Fauna Assessment, Impact of Proposed Private Road

for use by land known as 120 Mona Vale Road, Warriewood

29th January 2010

prepared by

Mark Couston CPESC. - Ass. Dip. Env. Ctrl. (CSU), Grad. Dip. Env. Mgmt. (CSU),
Cert. Soil & Water Mgmt. (UWS), MESA, MECA , MRBIA
DECCW - Scientific Licence No. S11031, DA - Animal Research Authority 04-4786

Footprint Green Pty Ltd
Arboricultural, Environmental & Horticultural Consultants
5 Watkins Road, Avalon Beach, NSW 2107
Email: mail@footprintgreen.com.au
Ph: (02) 99188877
Fax: (02) 99188876
ABN 34 097 138 817

Contents

Footprint Green Pty Ltd
Arboricultural, Environmental & Horticultural Consultants
5 Watkins Road, Avalon Beach, NSW 2107
Email: mail@footprintgreen.com.au
Ph: (02) 99185877
Fax: (02) 99182878
ABN 34 097 138 813

1. Introduction

1.1 Background

This flora and fauna assessment has been prepared in conjunction with the proposed construction of a private road providing access to the allotment known as 120 Mona Vale Road, Warriewood.

Specific assessment of the properties has been undertaken to identify habitats of threatened species, populations and ecological communities listed in the schedules of the *Threatened Species Conservation Act (NSW) 1995*. The report has been commissioned by Vogue Agency who have also provided site instructions. Subsequent site inspections and field work were conducted between the 7th December 2010 and 29th January 2011. For the purposes of this report the southern half of the allotment known as 10 Jubilee Avenue and the northern half of 4 Boundary Street, Warriewood will be referred to as the site.

1.2 Existing site & proposed development

The site is located between Jubilee Avenue and Boundary Street and the topography ranges from moderately- steeply sloping to undulating slopes.

The portion on 10 Jubilee Avenue is undeveloped and contains indigenous vegetation whilst the section within 4 Boundary Street is landscaped and consists of mown grass areas with individual specimen trees. The proposed development involves removal of the vegetation and construction of a private road providing access to the allotment known as 120 Mona Vale Road, Warriewood

Figure 1.1 Existing site and location of proposed roadway looking west from Jubilee Avenue.

1.3 NSW Environmental planning & assessment

Whilst there are a several State Acts and planning instruments that relate to flora and fauna issues, those covered in this report include:

- relevant species, populations and communities listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW);*
- S. 5A(2) (7-part test) Environmental Planning and Assessment Act 1979 (NSW);

Should this report conclude that the proposed development will have a significant impact on species, communities or populations listed in the schedules of *Threatened Species Conservation Act 1995 (NSW)* a more detailed Species Impact Statement will need to be prepared in accordance with the requirements of the *Threatened Species Conservation Act 1995 (NSW).*

1.4 Commonwealth context

This report identifies flora and fauna species or communities, relevant to the site, that are listed under Part 13 Division 1 of the *Environment Protection & Biodiversity Act 1999 (Cwlth)* (EPBC) as being of "matters of national environmental significance". Consideration must be given as to whether the proposed development will, or is likely to have a "significant impact" on "matters of national environmental significance".

A bilateral agreement was made in January 2007 between the Commonwealth & NSW Governments whereby the Commonwealth Government recognised the NSW assessment process in the *Environmental Planning and Assessment Act 1979 (NSW).*

In accordance with this agreement "controlled actions" as defined in the *Environment Protection & Biodiversity Act 1999 (Cwlth)* relating to threatened species, do not require assessment under Part 8 of the *Environment Protection & Biodiversity Act 1999 (Cwlth)* where they are assessed or approved under Part 3A, 4 or 5 of the *Environmental Planning and Assessment Act 1979 (NSW).*

2. The site

2.1 General information

The subject site part of Lot 10 in DP 5055 (10 Jubilee Avenue) and Lot 2 in DP 186070, (4 Boundary Street), Warriewood, with the reference co-ordinates of AMG (56) 334090E and 62722500N. The subject sites are currently zoned Non Urban "B".

Local aerial photo showing the site at 10 Jubilee Avenue & 4 Boundary Street Warriewood
not to scale

2.2 Geology

2.2.1 Site geology

Although no exploratory excavation was conducted, based upon site and local observations, rock outcrops and soil types, the geology associated with the site appears to be consistent with that described as Hawkesbury Sandstone (Herbert, 1983).

2.2.2 Hawkesbury Sandstone

Hawkesbury Sandstone consists of sediments laid down during the mid Triassic Period, some 230 million years ago.

During the mid Triassic period a major shift in the watershed pattern occurred and the Sydney basin experienced the deposition of quartz sediments from the south west (Herbert, 1983). These quartz sediments were deposited by vigorous braided streams and they deposited a thick blanket of Hawkesbury Sandstone over the earlier Newport Formation sediments.

2.3 Soil landscape

2.3.1 Subject site

The site is in a landscape that consists of moderately inclined slopes, crests, and waxing upper slopes. The site has a predominately easterly aspect with slope / gradients between 9.5^0 (17%) and 0^0. The natural soils over the easterly parts of the site appear to retain the natural soil profiles although there are some signs of disturbance. Towards the western end of the site the soil profiles on 4 Boundary Street have been disturbed.

Where the natural soils are evident the natural soils are considered to be derived from Hawkesbury sandstone being brown sandy loam with some siliceous sands. Based upon this information and the geology it is considered that the site is consistent with that described as the Hawkesbury Soil Landscape (Chapman & Murphy 1989).

2.3.2 Hawkesbury Soil Landscape

The Hawkesbury Soil Landscape described as having local relief of 40m – 200m, slopes > 25%, rock outcrops occurring >50% and comprising of either narrow crests and ridges, narrow incised valleys, steep side slopes with rocky benches, broken scarps and boulders. The soils are described as shallow discontinuous lithosols / siliceous sands associated with rock outcrops, earthy sands with yellow earths and some yellow podsolic soils on the inside of benches, yellow and red podsolic soils associated with shale lenses; and siliceous sands with yellow earths along drainage lines (Chapman & Murphy 1989).

2.4 Catchment

There is no defined watercourse on the site and the local topography over the eastern portion of the site falls to the east and the topography over the western portion of the site falls to the south. To the east of the site, stormwater drains as overland flows, in road kerbs and in inter-allotment drainage lines. At the rear of the site stormwater overland flows are likely to run through an open vegetated channel. Both systems eventually discharge into Narrabeen Creek.

Down stream of the site Narrabeen Creek is an open channel meandering through residential and commercial land uses to join Mullet Creek and in turn Narrabeen lakes and the Tasman Sea.

2.5 Vegetation & Habitats

2.5.1 Vegetation & habitat units

The site has been considered in 2 main habitat units based upon similarities in the vegetation's physical structure, floristic composition, level of disturbance and the current land use.

- Area A – Open Forest (10 Jubilee Avenue), and
- Area B – Modified Habitats (4 Boundary Street).

3. Flora & fauna survey

3.1 Flora species survey methods

3.1.1 Flora literature search

Records of threatened flora species were obtained from the Department of Environment, Climate Change & Water's (DECCW, 2010) Wildlife Atlas database searching a 10km grid square centred on the site (AMG(56) 334090E and 62722500N).

3.1.2 Flora field surveys

The flora survey covered an area of approximately 1.2ha over the site using the Random Meander Method described by Cropper (1993). The main flora field survey was conducted on the 07/12/10. Where there was some taxonomic species uncertainty, samples were taken for verification using recognised floristic keys.

Specific effort was undertaken to identify optimal and sub-optimal habitats of threatened species and communities and in these areas detailed searches were undertaken.

Species identifications are consistent with the nomenclature in Harden (1992, 1993, 2000 & 2002) with recent name changes as amended in the Royal Botanic Gardens Sydney publication *Cunninghamia*.

3.2 Fauna species survey methods

3.2.1 Fauna Literature search

Records of threatened fauna species and populations were obtained from the Department of Environment, Climate Change & Water's (DECCW, 2009) Wildlife Atlas database searching a 10km grid square centred on the site (AMG(56) 334090E and 62722500N).

3.2.2 Fauna field surveys

3.2.2.1 Habitat assessment

Because of the extent of disturbance and modifications to the site, a habitat assessment was conducted to identify potential habitats where threatened and other fauna species could reside or forage as well as noting key habitat features.

3.2.2.2 Herpetofauna diurnal observations

A 45 minute herpetofauna survey was conducted during daylight hours in conjunction with the flora survey on the 07/12/10. This was an active survey involving identifying differing microhabitats such as leaf litter, logs, dense ground cover vegetation and rubble and each microhabitat was searched by hand. This survey focussed on the rear portion of the site and the sandstone rock outcrops.

3.2.2.3 Nocturnal fauna sightings

Spotlighting was conducted to identify frogs, bats, mammals and nocturnal birds and reptiles and specifically targeted small ground mammals, possums, gliders, and owls. Two (2) 60-minute surveys were undertaken on the site using a 100-watt hand held spotlights. This survey was conducted on dusk extending for 60 minutes into the early evening on the 21/12/10 & 22/12/10.

3.2.2.4 Diurnal bird observations and call recognition

Two (2), 60 minute surveys were undertaken, of which 1 was conducted in the mornings on 22/12/10 and 23/12/10 and 2 were conducted in the afternoon of 21/12/10 and 22/12/10.

3.2.2.5 Ultrasonic bat detection

Ultrasonic bat detection was undertaken over 2 nights commencing on the evening of the 22/12/10 and again on the 23/12/10. Recording equipment was activated before dusk, running throughout the night until the following morning. Bat ultrasonic recordings were taken using an Anabat II detector with a digital ZCAIM storage unit and recordings were identified by Ray Williams from Ecotone Environmental Consultants.

3.2.2.6 Nocturnal Call playback

No nocturnal call play back was conducted as it disrupts the activities of nocturnal mammals.

3.2.2.7 Hair tube traps

Seven (7) hair tube traps were deployed to identify mammals such as rodents, gliders, bandicoots and possums. Of the 7 hair tubes, 5 were larger tubes with 90mm diameter and 2 were smaller tubes with a 50mm diameter. Five (5) hair tubes were placed on the ground, (4 large & 1 small) and 2 (1 large & 1 small) hair tubes were located in trees/shrubs at 1.5m -2m above ground level. Hair tubes were baited with a mixture consisting of peanut butter, rolled oats, honey, canola oil, almond essence, aniseed essence and left for 6 nights between the 09/12/10 and 15/12/10. Hair samples collected were identified using the method outlined by Brunner & Coleman (1974).

3.2.2.8 Aerial inspection of nest boxes and hollows

There are 4 manufactured nest boxes erected in trees on the site. The trees were climbed and the nest boxes were inspected on the 23/12/11 for signs of resident fauna.

3.2.2.9 Opportunistic sighting, calls, scats and scratchings

During the course of individual surveys opportunistic observations, calls, scats, tracks and scratchings were also recorded both within the study area and locally off site.

3.3 Survey findings

3.3.1 Flora species data

The following table identifies flora species:

- listed in the schedules of the *Environment Protection & Biodiversity Conservation Act 1999 (Cwth)* and recorded within a 10km grid square centred on the site in the Wildlife Atlas (DECCW, 2010);
- listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* and recorded within a 10km grid square centred on the site in the Wildlife Atlas (DECCW 2010);
- listed in Schedule 13 of the *National Parks & Wildlife Act 1974 (NSW)* and recorded on site; and
- recorded on the site as part of field surveys.

DECCW Wildlife Atlas (2010)	Recorded On Site	Genus species	Common Name	Autochthony	Conservation Status
✔ - Recorded, 🌲 - Planted Native Species. **Unprotected / Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), Vulnerable **NSW / Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwth / Endangered Cwth** / Vulnerable **Cwth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwth).					
	✔	*Acacia floribunda*	White Sally Wattle	Indigenous	Unprotected
	✔	*Acacia longissima*	Narrow-leaved Wattle	Indigenous	Unprotected
	✔	*Acacia ulicifolia*	Prickly Moses Wattle	Indigenous	Unprotected
	✔	*Actinotus helianthi*	Flannel Flower	Indigenous	Protected
	✔	*Ageratina adenophora*	Crofton Weed	Exotic	Unprotected
	✔	*Allocasuarina littoralis*	Black She-oak	Indigenous	Unprotected
	✔	*Allocasuarina torulosa*	Forest Oak	Indigenous	Unprotected
	✔	*Angophora costata*	Sydney Red/Rusty Gum	Indigenous	Unprotected
	✔	*Angophora floribunda*	Rough-barked Apple	Indigenous	Unprotected
	✔🌲	*Araucaria heterophylla*	Norfolk Island Pine	Native	Unprotected
	✔	*Asparagus aethiopicus*	Asparagus Fern	Exotic	Noxious
	✔	*Asparagus plumosus*	Climbing Asparagus	Exotic	Unprotected
	✔	*Banksia integrifolia*	Coastal Banksia	Indigenous	Unprotected
	✔	*Banksia serrata*	Old Man Banksia	Indigenous	Unprotected
	✔	*Billardiera scandens*	Appleberry	Indigenous	Unprotected
	✔	*Blechnum cartilagineum*	Gristle Fern	Indigenous	Unprotected
	✔	*Breynia oblongifolia*	Coffee Bush Shrub	Indigenous	Unprotected

DECCW Wildlife Atlas (2010)	Recorded On Site	Genus species	Common Name	Autochthony	Conservation Status
✔ - Recorded, 🌲 - Planted Native Species. **Unprotected / Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), Vulnerable **NSW / Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwth / Endangered Cwth** / Vulnerable **Cwth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwth).					
	✔	*Bursaria spinosa*	Native Blackthorn	Indigenous	Unprotected
✔		*Callistemon linearifolius*	Netted Bottle Brush	Indigenous	Vulnerable NSW
	✔	*Canna sp.*	Canna Lilly	Exotic	Unprotected
	✔	*Cassytha pubescens*	Downy dodder-laurel	Indigenous	Unprotected
	✔	*Chlorophytum comosum*	Ribbon / Spider Plant	Exotic	Unprotected
	✔	*Cinnamomum camphora*	Camphor Laurel	Exotic	Noxious
	✔	*Cissus hypoglauca*	Giant Water Vine	Indigenous	Unprotected
	✔	*Commelina cyanea*	Scurvy Weed / Native Wandering Jew	Indigenous	Unprotected
	✔	*Corymbia gummifera*	Red Bloodwood	Indigenous	Protected
✔		*Darwinia biflora*	-	Indigenous	Vulnerable NSW, Cwth
	✔	*Dianella caerulea*	Blue Flax Lily	Indigenous	Unprotected
	✔	*Dodonaea triquetra*	Hop Bush	Indigenous	Unprotected
	✔	*Echinopogon caespitosus*	Tufted Hedgehog Grass	Indigenous	Unprotected
	✔	*Echinopogon ovatus*	Forest Hedgehog Grass	Indigenous	Unprotected
	✔	*Elaeocarpus reticulatus*	Blueberry Ash	Indigenous	Unprotected
	✔	*Entolasia marginata*	Bordered Panic	Indigenous	Unprotected
	✔	*Entolasia stricta*	Wiry Panic	Indigenous	Unprotected
✔		*Epacris purpurascens var. purpurascens*	-	Indigenous	Vulnerable NSW
	✔	*Eragrostis brownii*	Brown's Lovegrass	Indigenous	Unprotected
	✔	*Eucalyptus botryoides*	Bangalay	Indigenous	Unprotected
✔		*Eucalyptus camfieldii*	Heart-Leaved Stringybark	Indigenous	Vulnerable NSW, Cwth
✔🌲		*Eucalyptus nicholii*	Narrow-Leaf Peppermint	Native	Vulnerable NSW
	✔	*Eucalyptus paniculata*	Grey Ironbark	Indigenous	Unprotected
	✔	*Eucalyptus piperita*	Sydney Peppermint	Indigenous	Unprotected
✔🌲		*Eucalyptus scoparia*	Willow Gum	Native	Endangered NSW, Vulnerable Cwth
	✔	*Eustrephus latifolius*	Wombat Berry	Indigenous	Unprotected
	✔	*Geitonoplesium cymosum*	Scrambling Lilly	Indigenous	Unprotected

DECCW Wildlife Atlas (2010)	Recorded On Site	Genus species	Common Name	Autochthony	Conservation Status
✔ - Recorded, 🌲 - Planted Native Species. **Unprotected / Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), Vulnerable **NSW / Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwth / Endangered Cwth** / Vulnerable **Cwth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwth).					
	✔	*Glochidion ferdinandi*	Cheese Tree	Indigenous	Unprotected
	✔	*Glycine clandestina*	Twining Glycine	Indigenous	Unprotected
✔		*Grammitis stenophylla*	Narrow-leaf Finger Fern	Indigenous	Endangered NSW
✔		*Grevillea caleyi*	Caley's Grevillea	Indigenous	Endangered NSW, Cwlth
	✔	*Hakea sericea*	Willow-leaved Hakea	Indigenous	Unprotected
	✔	*Hardenbergia violacea*	False Sarsaparilla	Indigenous	Unprotected
	✔	*Hibbertia dentata*	Twining Guinea Flower	Indigenous	Unprotected
	✔	*Imperata cylindrica*	Blady Grass	Indigenous	Unprotected
	✔	*Lantana camara*	Lantana	Exotic	Noxious
	✔	*Lepidosperma laterale*	Variable Sword-sedge	Indigenous	Unprotected
✔		*Leptospermum deanei*	-	Indigenous	Vulnerable NSW, Cwth
	✔	*Leucopogon lanceolatus*	Lance-leaf Beard-heath	Indigenous	Unprotected
	✔	*Lilium formosanum*	Formosan Lily	Exotic	Unprotected
	✔	*Liquidambar styraciflua*	Sweet Gum	Exotic	Unprotected
	✔	*Livistona australis*	Cabbage Palm / Fan Palm	Indigenous	Protected
	✔	*Lomandra longifolia*	Spiny-headed Mat-rush	Indigenous	Unprotected
	✔	*Microlaena stipoides*	Weeping Grass	Indigenous	Unprotected
✔		*Microtis angusii*	Angus's Onion Orchid	Indigenous	Endangered NSW, Cwlth
	✔	*Monotoca elliptica*	Tree Broom-heath	Indigenous	Unprotected
	✔	*Murraya paniculata*	Orange Blossom	Exotic	Unprotected
	✔	*Nephrolepis cordifolia*	Fishbone Fern	Exotic	Unprotected
	✔	*Notelaea longifolia*	Large Mock-olive	Indigenous	Unprotected
	✔	*Oxalis corniculata*	Yellow Wood Sorrel / Creeping Oxalis	Exotic	Unprotected
	✔	*Ozothamnus diosmifolius*	White Dogwood	Indigenous	Unprotected
	✔	*Pandorea pandorana*	Wonga Wonga Vine	Indigenous	Unprotected
	✔	*Pennisetum clandestinum*	Kikuyu Grass	Exotic	Unprotected
	✔	*Persoonia linearis*	Narrow-Leaved Geebung	Indigenous	Unprotected

DECCW Wildlife Atlas (2010)	Recorded On Site	Genus species	Common Name	Autochthony	Conservation Status
✔ - Recorded, 🌲 - Planted Native Species. **Unprotected / Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), Vulnerable **NSW / Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwth / Endangered Cwth / Vulnerable Cwth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwth).					
✔		*Pimelea curviflora var. curviflora*	Curved Rice-flower	Indigenous	Vulnerable NSW, Cwlth
	✔	*Pimelea linifolia*	Slender Rice-flower	Indigenous	Unprotected
	✔	*Pittosporum undulatum*	Native Daphne	Indigenous	Unprotected
	✔	*Platylobium formosum*	Handsome Flat-pea	Indigenous	Unprotected
	✔	*Polyscias sambucifolia*	Elderberry Panax	Indigenous	Unprotected
	✔	*Pomax umbellata*	Pomax	Indigenous	Unprotected
	✔	*Pseuderanthemum variabile*	Pastel Flower	Indigenous	Unprotected
	✔	*Pteridium esculentum*	Bracken Common	Indigenous	Unprotected
	✔	*Rapanea variabilis*	Muttonwood	Indigenous	Unprotected
	✔	*Smilax glyciphylla*	Sweet Sarsaparilla	Indigenous	Unprotected
	✔	*Stephania japonica*	Snake Vine	Indigenous	Unprotected
	✔	*Syncarpia glomulifera*	Turpentine	Indigenous	Unprotected
	✔	*Synoum glandulosum*	Scentless Rosewood	Indigenous	Unprotected
✔		*Syzygium paniculatum*	Magenta Lillypilly	Indigenous	Vulnerable NSW, Cwlth
✔		*Tetratheca glandulosa*	Glandular Pink-bell	Indigenous	Vulnerable NSW, Cwth
	✔	*Themeda australis*	Kangaroo Grass	Indigenous	Unprotected
	✔	*Tradescantia fluminernsis*	Wandering Jew	Exotic	Noxious
	✔	*Wilkiea huegeliana*	Veiny Wilkiea	Indigenous	Unprotected
	✔	*Xanthosia tridentata*	-	Indigenous	Unprotected

3.3.2 Fauna species data

The following table identifies flora species:

- listed in the schedules of the *Environment Protection & Biodiversity Conservation Act 1999 (Cwth)* and recorded within a 10km grid square centred on the site in the Wildlife Atlas (DECCW, 2010), and
- listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* and recorded within a 10km grid square centred on the site in the Wildlife Atlas (DECCW 2010), and
- recorded on the site as part of field surveys.

Wildlife Atlas DECC (2010	Recorded on Site	Class	Genus species	Common Name	Autochthony	Conservation Status
✔ - Recorded / Identified, ✔ ☆ Record Highly Probable, ✔ ? Record Probable, ✔ ·/· Record Possible. **Unprotected / Protected** - National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW / Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Critically Endangered Cwlth / Endangered Cwlth / Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)						
✔		Amphibia	*Heleioporus australiacus*	Giant Burrowing Frog	Native	Vulnerable NSW, Cwth
✔		Amphibia	*Pseudophryne australis*	Red-crowned Toadlet	Native	Vulnerable NSW
	✔	Arachnida	*Argiope keyserlingi*	St Andrews Cross Spider	Native	Unprotected
	✔	Arachnida	*Eriophora biapicata*	Garden Orb-weaving Spider	Native	Unprotected
	✔	Arachnida	*Isopedella sp.*	Common Huntsman	Native	Unprotected
	✔	Arachnida	*Ixodes holocyclus*	Paralysis Tick	Native	Unprotected
	✔	Arachnida	*Phonognatha graeffei*	Leaf-curling Spider	Native	Unprotected
	✔	Aves	*Acridotheres tristis*	Indian Mynah	Introduced	Unprotected
	✔	Aves	*Cacatua galerita*	Sulphur-crested Cockatoo	Native	Protected
✔		Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	Native	Vulnerable NSW
✔		Aves	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	Native	Vulnerable NSW
	✔	Aves	*Corvus coronoides*	Australian Raven	Native	Protected
	✔	Aves	*Cracticus torquatus*	Grey Butcherbird	Native	Protected
	✔	Aves	*Dacelo novaeguineae*	Laughing Kookaburra	Native	Protected
	✔	Aves	*Eolophus roseicapillus*	Galah	Native	Protected
	✔	Aves	*Eurystomus orientalis*	Dollarbird	Native	Protected
	✔	Aves	*Gymnorhina tibicen*	Australian Magpie	Native	Protected
	✔	Aves	*Hirundo neoxena*	Welcome Swallow	Native	Protected

Wildlife Atlas DECC (2010	Recorded on Site	Class	Genus species	Common Name	Autochthony	Conservation Status
✔ - Recorded / Identified, ✔ ☆ Record Highly Probable, ✔ ? Record Probable, ✔ ·.·. Record Possible. **Unprotected / Protected** - National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW / Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Critically Endangered Cwlth / Endangered Cwlth / Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)						
✔		Aves	*Ixobrychus flavicollis*	Black Bittern	Native	Vulnerable NSW
✔		Aves	*Lathamus discolor*	Swift Parrot	Native	Endangered NSW, Cwlth
	✔	Aves	*Manorina melanocephala*	Noisy Miner	Native	Protected
✔		Aves	*Melithreptus gularis*	Black-chinned Honeyeater	Native	Vulnerable NSW
✔		Aves	*Ninox connivens*	Barking Owl	Native	Vulnerable NSW
✔		Aves	*Ninox strenua*	Powerful Owl	Native	Vulnerable NSW
	✔	Aves	*Oriolus sagittatus*	Olive-backed Oriole	Native	Protected
	✔	Aves	*Platycercus elegans/eximius*	Crimson/Eastern Rosella	Native	Protected
	✔	Aves	*Psophodes olivaceus*	Eastern Whipbird	Native	Protected
	✔	Aves	*Trichoglossus haematodus*	Rainbow Lorikeet	Native	Protected
✔		Aves	*Tyto novaehollandiae*	Masked Owl	Native	Vulnerable NSW
	✔	Insecta	*Apis mellifera*	European Honey Bee	Introduced	Unprotected
	✔	Insecta	*Myrmecia brevinoda*	Giant Bullant (red/orange)	Native	Unprotected
	✔	Insecta	*Nasutitermes walkeri*	Niggerhead Termite	Native	Unprotected
✔		Mammalia	*Cercartetus nanus*	Eastern Pigmy-possum	Native	Vulnerable NSW
	✔	Mammalia	*Chalinolobus gouldii*	Gould's Wattled Bat	Native	Protected
	✔ ·.·.	Mammalia	*Chalinolobus morio*	Chocolate Wattled Bat	Native	Protected
✔		Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	Native	Vulnerable NSW, Endangered Cwth
✔		Mammalia	*Isoodon obesulus obesulus*	Southern Brown Bandicoot	Native	Endangered NSW, Cwlth
✔		Mammalia	*Miniopterus schreibersii oceanensis*	Eastern Bent-wing Bat	Native	Vulnerable NSW, Cwth
	✔	Mammalia	*Perameles nasuta*	Long-nosed Bandicoot	Native	Protected
✔		Mammalia	*Phascolarctos cinereus*	Koala	Native	Vulnerable NSW
✔		Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	Native	Vulnerable NSW, Cwth
	✔	Mammalia	*Pseudocheirus peregrinus*	Common Ringtail Possum	Native	Protected
	✔	Mammalia	*Rattus rattus*	Black Rat	Introduced	Unprotected
	✔	Mammalia	*Tadarida australis*	White-striped Mastif/Freetail Bat	Native	Protected
	✔	Mammalia	*Trichosurus vulpecula*	Common Brushtail Possum	Native	Protected

Wildlife Atlas DECC (2010	Recorded on Site	Class	Genus species	Common Name	Autochthony	Conservation Status
✔ - Recorded / Identified, ✔☆ Record Highly Probable, ✔ Record Probable, ✔ Record Possible. **Unprotected / Protected** - National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW / Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Critically Endangered Cwlth / Endangered Cwlth / Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)						
	✔☆	Mammalia	*Vespadelus vulturnus*	Little Forest Bat	Native	Protected
	✔	Mammalia	*Wallabia bicolor*	Swamp Wallaby	Native	Protected
	✔	Reptilia	*Lampropholis delicata*	Delicate Skink	Native	Protected
	✔	Reptilia	*Phyllurus platurus*	Broad-tailed Gecko	Native	Protected
✔		Reptilia	*Varanus rosenbergi*	Rosenberg's Goanna /Heath Monitor	Native	Vulnerable NSW

3.3.3 Ecological Communities

Based upon the vegetation community descriptions identified by the National Parks & Wildlife Service (2000) and supplemented by those identified by Benson & Howell (1994), the following table identifies vegetation communities:

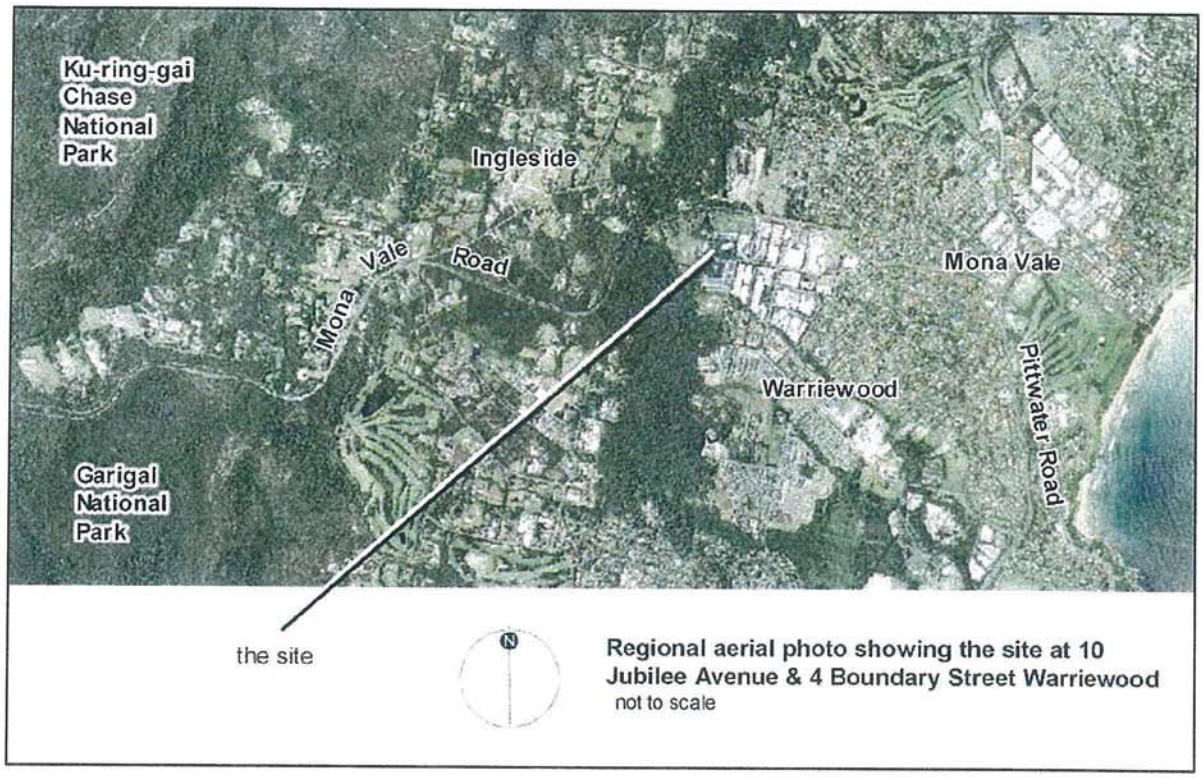
- listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* as endangered ecological communities and are found in the Pittwater area (DECC, Threatened Species Information & Environmental Assessment Guidelines Central Region NSW NP&WS 2000 as amended),
- recorded on the site from field surveys and where possible the description is consistent with those described by Benson & Howell (1994).

DECC	Recorded On Site	Community name	Brief Description	Conservation Status
Vulnerable NSW / Endangered NSW - Threatened Species Conservation Act 1995 (NSW), **Critically Endangered Cwlth / Endangered Cwlth / Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)				
✔		Pittwater Spotted Gum Forest	The forest occurs on shale-derived soils from the Newport Formation geology of the Narrabeen group in Pittwater. Characteristic species include *Corymbia maculata, Eucalyptus punctata, Eucalyptus umbra, Angophora floribunda and Corymbia gummifera.* (NSW Scientific Committee 1998),	Endangered
✔		Duffy's Forest	The forest occurs on lateritic soils and deeply weathered shale soils typically found on lower ridges in Ku-ring-gai. Characteristic tree species include *Eucalyptus capitellata, Eucalyptus sieberi, Eucalyptus oblonga, and Angophora costata.* (NSW Scientific Committee 1998),	Endangered
✔		Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	The ecological community associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Swamp Sclerophyll Forest on Coastal Floodplains generally occurs below 20 m (though sometimes up to 50 m) elevation. The structure of the community is typically open forest and the dominant trees include *Eucalyptus robusta* (Swamp Mahogany), *Melaleuca quinquenervia* (Paperbark) and, south from Sydney, *Eucalyptus botryoides* (Bangalay) and *Eucalyptus longifolia* (Woollybut) (NSW Scientific Committee 2005).	Endangered
✔		Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner bioregions	The Forest Littoral Rainforest generally is a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this ecological community are predominantly rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy. The community comprises the *Cupaniopsis anacardioides - Acmena* spp. alliance of Floyd (1990) which includes five sub-alliances which include *Syzygium leuhmannii, Acmena smithii, Ficus sp, Livistona sp, & Podocarpus sp.* (NSW Scientific Committee 2004).	Endangered
	✔	Sydney Sandstone Gully Forest	The Sydney Sandstone Gully Forest is comprised of 3 recognised sub-units including; - Open forest / woodland dominated by *Eucalyptus piperita* (Sydney Peppermint), *Angophora costata* (Sydney Red Gum) and *Eucalyptus pilularis* (Blackbutt) - Tall open forest dominated by *Eucalyptus pilularis* (Blackbutt) and *Syncarpia glomulifera* (Turpentine) - Closed Forest dominated by *Ceratopetalum apetalum* (Coachwood Tree) (Benson & Howell 1994).	Relatively Common

4. Habitat assessment

4.1 Local & regional context

The site is on the on the foot slopes of the Warriewood / Ingleside escarpment and is set in a landscape consisting of commercial developments, rural land residential dwellings and remnant bushland. To the east of the site the land is extensively developed with commercial buildings. The land immediately to the rear, western end, the site is developed rural land.



Regional aerial photo showing the site at 10 Jubilee Avenue & 4 Boundary Street Warriewood
not to scale

The site is within 200m, north east from the bushland reserves that form the Warriewood escarpment, is within 2.5km, east of Garigal National Park and is within 2.5km south east from Ku-ring-gai Chase National Park. .

4.2 Site habitats

4.2.1 Habitats on the site

For the purposes of this report the site has been considered in 2 main habitat units based upon similarities in the vegetation's physical structure, floristic composition, level of disturbance and the current land use.

- Area A – Open Forest (10 Jubilee Avenue), and
- Area B – Modified Habitats (4 Boundary Street).

4.2.2 Open Forest habitats

The open forest habitats cover the undeveloped portions of 10 Jubilee Avenue and the species composition is typical of Sydney Sandstone Gully Forest grading into Sydney Sandstone Ridgetop Woodland.

The vegetation in the lower more sheltered parts of the 10 Jubilee Avenue are dominated by Sydney Peppermint (*Eucalyptus piperita*), Bangalay (*Eucalyptus botryoides*), Sydney Red Gum (*Angophora costata*), Red Bloodwood (*Corymbia gummifera*) with a sub-canopy of Turpentine (*Syncarpia glomulifera*) Cheese Tree (*Glochidion ferdinandi*), Forest Oak (*Allocasuarina torulosa*) and Blueberry Ash (*Elaeocarpus reticulatus*) and .

Figure 4.1 Vegetation & habitats on the lower slopes.

Above the sheltered habitats of the slopes, the habitats are drier with canopy species of Sydney Red Gum (*Angophora costata*), Grey Ironbark (*Eucalyptus paniculata*) becoming more dominant along with other understorey species such as Tree Broom-heath (*Monotoca elliptica*). The structure of the vegetation in the upper forested area appears to be modified for the purposes of providing a bushfire asset protection zone and consists of ground covers and canopy species with little or no understorey.

Figure 4.2 Vegetation & habitats upper forested areas.

4.2.3 Modified Habitats

The modified habitats are those within 4 Boundary Street and whilst some of the indigenous trees including Grey Ironbark (*Eucalyptus paniculata*) and Sydney Red Gum (*Angophora costata*) remain the site is developed as a residential allotment with a horse adjistment and training area.

, **Figure 4.3 Vegetation & modified habitats on 4 Boundary Road.**

4.2.4 Fauna habitats

Within 10 Jubilee Avenue, the habitats on the site are typical of Sydney Sandstone Gully Forest and Ridgetop Woodland. On the allotment of 4 Boundary Road scattered indigenous trees existing in mown exotic grass areas.

Within the study area there is no defined watercourse, no caves or rock overhangs. There are several large mature trees with habitat hollows, primarily within the open forest habitats of the site.

There are 4 manufactured nest boxes located with trees in the lower parts of open forest area. These consist of 3 glider / possum nest boxes and 1 micro-bat nest box. These were inspected for signs of resident fauna.

Figure 4.4 Aerial inspection of manufactured nest boxes.

The inspection of the nest boxes revealed that there were no resident fauna with exception of a Common Huntsman Spider (*Isopedella sp.*). The micro-bat nest box did have and an abandoned bee hive.

Figure 4.4 Roosting box on the site designed for microchiropteran bats with evidence of an abandoned bee hive.

Although 1 semi-mature Red Bloodwood (*Corymbia gummifera*) did have feeding scars typically formed by Sugar Gliders (*Petaurus breviceps*) none were detected using hair tube traps or during spotlight surveys.

The avifauna on the site was typically dominated by a colony of resident Noisy Miner (Manorina melanocephala). Other species frequently found in urban / bushland edge habitats such as Sulphur-crested Cockatoo (*Cacatua galerita*), Rainbow Lorikeet (*Trichoglossus haematodus*), Australian Magpie (*Gymnorhina tibicen*) were observed on the site. Other species more commonly found in bushland habitats that occurred on the site include Olive-backed Oriole (*Oriolus sagittatus*), Eastern Whipbird (*Psophodes olivaceus*) and Dollarbird (*Eurystomus orientalis*). With the site having only small patches of dense understorey none of the smaller insectivorous bird species were observed.

The range and population size of several native hollow-using species such as Sulphur-crested Cockatoo (*Cacatua galerita*) and Rainbow Lorikeet (*Trichoglossus haematodus*) has increased significantly since European settlement (Gibbons & Lindenmayer, 2002). These species are known to displace other more sensitive species that use small hollows as refuge and/ or breeding. Aggressive species such as Noisy Miners (*Manorina melanocephala*) have also been known to displace more sensitive species (Franklin et al., 1989, Grey et al., 1998).

Several microchiropteran bat species were recorded foraging on the site, with 8 calls recorded overnight on the 21-22/12/10 and 12 calls recorded on the 22-23/12/10. The majority of the calls recorded were Gould's Wattled Bat (*Chalinolobus gouldii*) which commonly occurs within the region. It was observed that the external lights of the adjoining commercial development remained on during the night attracting flying insects and providing foraging opportunities for microchiropteran bats.

Other mammal activity was considered to be low with Swamp Wallaby (*Wallabia bicolour)*, Common Brushtail Possum (*Trichosurus vulpecula*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and Long-nosed Bandicoot (*Perameles nasuta*) observed on the site.

The faunal composition in the study area is considered to be typical of that found in the local urban areas and in particular those areas where tree hollows could occur locally. The faunal compositions in these areas tend to be:

- aggressive species such as Pied Currawong (*Strepera graculina*) and Noisy Miner (*Manorina melanocephala*);
- resilient and adaptable species such as Common Brushtail Possum (*Trichosurus vulpecular);*
- species that reside off site in larger bushland reserves and have broad foraging ranges such as Powerful Owl (*Ninox strenua*) and Grey-headed Flying-fox (*Pteropus poliocephalus)*, and
- occasional species that seasonally migrate from other areas and take advantage of foraging opportunities such as Swift Parrot (*Lathamus discolour)* and Superb Fruit-Dove (*Ptilinopus superbus).*

4.3 External influences affecting habitat potential

Being in close proximity with urban and commercial areas the potential habitat on the site is influenced by the adjacent activities. These external influences include vehicular movements, noise, modified habitats and the presence of domestic pets all of which limit the site's potential as habitat for ground native dwelling fauna.

4.4 Critical habitat

Critical habitat is declared under the provisions of the Threatened Species Conservation Act 1995. This site is not listed as being part of any gazetted critical habitat. Currently the critical habitats listed in the schedules of the Act are

- Gould's Petrel;
- Little Penguin habitat in Sydney's North Harbour;
- Mitchell's Rainforest Snail in Stott's Island Nature Reserve;
- *Wollemia nobilis* (The Wollemi Pine):
- *Bomaderry zieria* within the Bomaderry bushland - critical habitat recommendation;
- Eastern Suburbs Banksia Scrub Endangered Ecological Community - critical habitat recommendation, and

The site is not considered to be critical habitat for the purposes of the *Threatened Species Conservation Act 1995 (NSW).*

5. Proposed private road

5.1 Nature of development impacts

In terms of the ecology, biophysical changes to the site can have impacts that are:

- direct, affecting the site, or
- indirect, affecting the down stream or adjacent environment.

These impacts can also be considered as being:

- short term, during construction / demolition activities
- long term, extending over the life of the development and are influenced by the development design.

Impacts on the natural environment, whether direct or indirect, short term or long term are also considered generally in the context of having either a negative or positive effect.

5.2 Scope of development impact

The scope of the development impact is based upon the roadway plans (Mepstead, 2010), the field work and habitat assessments in this report, and the arboricultural impact assessment (Footprint Green, 2011).

Although it is difficult, if not impossible, to consider ecological boundaries at such a small scale, for the purposes of this assessment the scope of the impacts are summarised in the following sub-sections.

5.2.1 Proposed development

The proposed roadway involves removal of vegetation and disturbance to the existing habitats part way along the southern side boundary of 10 Jubilee Avenue and along the northern side boundary of 4 Boundary Street, Warriewood.

5.2.2 Direct long term negative impacts

The proposed subdivision involves removal of:

- 1,670m^2 of Sydney Sandstone Gully Forest / Ridgetop Woodland within 10 Jubilee Avenue, Warriewood.
- 2,265m^2 of modified habitats within 4 Boundary Street, Warriewood.
- removal of 88 trees which are over 3m in height.

Details of the tree species and their condition are identified in the arboricultural report (Footprint Green, 2011).

The detailed assessment on the impact on threatened communities and species are considered in the following sections.

5.2.3 Direct long term positive aspects

The proposed road way will retain approximately 4,500m^2 of Sandstone Gully Forest / Ridgetop Woodland within 10 Jubilee Avenue and approximately 2,500m^2 of the bushland vegetation within 4 Boundary Street, Warriewood.

5.2.4 Indirect long term negative impacts

With the increase of impervious surface area there may be some corresponding increase in the stormwater peak flows however given the nature of the catchment and current land uses, the ecological impact down stream and in the receiving waters is considered to be negligible.

5.2.5 Potential indirect short term negative impacts

Development of the site will have some short-term impacts associated with building activities including noise and soil disturbance. The detailed assessment on the impact on threatened communities and species are considered in the following sections.

5.2.5.1 Noise during construction

Taking into account the fauna found on site and within the surrounding areas, there may be some displacement of native fauna whilst works are in progress. The ecological impact is however considered to be minimal after considering the duration of the noise levels and the ability of typical urban fauna species to recolonise the site or use habitats for foraging during the night. A detailed assessment on the impact on threatened species is considered in the following sections.

5.2.5.2 Soil disturbance during construction

During construction soil disturbance will occur. To minimise the impact on the natural environment and the receiving waters down stream it is imperative that standard industry erosion & sediment controls must be implemented and maintained and works are undertaken in a conscious and prescribed order.

6. Measures to minimise the development impact on the local ecology

6.1 Recommendations

The following recommendations are made to minimise the impact on the local ecology & threatened species, populations & communities;

(a) All trees not identified as being removed in the arboricultural report (Footprint Green, 2011) are to be retained and protected prior to and during construction.

(b) All vegetation with the exception of noxious and environmental weeds within 2m of the proposed development footprint is to be protected and retained prior to and during construction.

(c) All noxious and environmental weeds within 10m of the proposed works and within the works areas are to be removed using standard bush regeneration techniques.

(d) The nest / roosting boxes currently on the site are to be relocated to trees that are to be retained within the allotment known as 10 Jubilee Avenue.

(e) An additional 3 microchiropteran bat roosting boxes are to be installed in trees to be retained within allotment known as 10 Jubilee Avenue

(f) Subject to engineering designs where earthen road batters are constructed they shall be revegetated using species currently recorded on the site.

7. Consideration of the development & habitats of threatened species

7.1 Threatened species habitat assessment

The following assessment is made with regards to threatened species, populations and ecological communities identified in the survey data tables in this report despite whether they were recorded on the site as part of the field assessments or whether they have been recorded previously within 5 kilometres of the site (DECCW, 2011). The following habitat assessment takes into account;

- the extent of the proposed development (refer section 5);
- the potential habitats on the site, and
- the relationship between the habitats of species, communities and populations to the habitats on this site.

Figure 5.1 Large habitat trees with hollows to be retained within 10 Jubilee Avenue, Warriewood.

(g) " whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process."
Currently there are 34 Key Threatening Processes listed in Schedule 3 of the *Threatened Species Conservation Act 1995 (NSW)*. Key Threatening Processes relevant for the species include:

- Clearing of Native Vegetation

Although the Clearing of Native Vegetation is listed as a threatening process, it is considered that the proposed development will not be a significant threatening process in relation to this species.

8.11.1 Summary Species – *Isoodon obesulus* (Southern Brown Bandicoot)

Based upon the nature and scope of the proposed development (refer section 5) and this assessment, it is considered that the proposed development is unlikely to have a significant impact on the species – Southern Brown Bandicoot (*Isoodon obesulus*).

8.12 Species – East Coast Freetail-bat (*Mormopterus norfolkensis*)

(a) " in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that viable local population of the species is likely to be placed at risk of extinction. "
The East Coast Freetail-bat (*Mormopterus norfolkensis*) occurs east of the Great Dividing Range from south of Sydney to south eastern Queensland (Churchill, 1989). East Coast Freetail-bat (*Mormopterus norfolkensis*) have generally been recorded as solitary animals (Allison & Hoye, 1995). There are 19 records of the species occurring in the Sydney area with: 1 record of the species occurring in Warringah, 1 record in Pittwater, 1 record in Ku-ring-gai and 3 in Hornsby (DECCW, 2010). East Coast Freetail-bats (*Mormopterus norfolkensis*) are also known to occur in maternal colonies in mangroves in the Hunter Estuary where they have been recorded in their hundreds (McConville, 2010).

East Coast Freetail-bat (*Mormopterus norfolkensis*) is known to occur in a variety of habitats including sclerophyll forest, woodland and mangroves. The species has a life span of approximately 5-7 years (Richards & Pennay, 2008).

The species has a greater forearm length than other Australian species of *Mormopterus* (Allison & Hoye 1995) and its morphology indicates that the species is a fast flyer adapted to foraging for insects in open areas. They are known to forage above the tops of forest trees, along the edges of forests, along tracks and trails and along more open riparian areas and have been recorded as regularly travelling up to 8km to forage (McConville, 2010). The species roosts in tree hollows and or under the loose bark of trees and has been recorded roosting in the roof of a hut with several Gould's Wattle Bats (*Chalinolobus gouldii*) (Allison, & Hoye 1995). The species was also found roosting in the roof of Picton Primary School again with a colony of Gould's Wattle Bats (*Chalinolobus gouldii*) (Robinson 1985) and is known to utilise artificial nest boxes.

Despite targeted surveys the species was not recorded on the site and the microchiropteran roosting box erected on the site was not used by the species; therefore it is considered that the proposed development will not have an adverse impact on a local population.

(b) " in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction. "

Endangered populations are listed in Schedule 1 Part 2 of the Threatened Species Conservation Act 1995. - Not applicable.

(c) " in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to be substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Endangered ecological communities are listed in Schedule 1 Part 3 of the Threatened Species Conservation Act 1995 and critically endangered ecological communities are listed in Schedule 1a Part 2 of the Threatened Species Conservation Act 1995. - Not applicable.

(d) " in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed and,

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality".

The species was not recorded on the site or adjacent the site. The extent of proposed development and habitat removal/modification is outlined in section 5 of this report.

The site contains a number of trees which provide roosting opportunities the majority of which are to be retained.

Taking into account the home range of the species and its mobility, the proposed development will not fragment of isolate other areas of habitat.

The site is not considered to be core breeding habitat but may provide some limited roosting and foraging potential. Taking into account the home range of the species, and provided that the recommendations in section 6 of this report are implemented, the site is not considered to be important to the long term survival of the species.

(e) " whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly."

The area is not listed as critical habitat under Part 3 Division 1 of the Threatened Species Conservation Act 1995. There is no critical habitat within the site or in close proximity to the proposed development.

(f) " whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan".

Recovery plans are prepared under the provisions of Part 4, Division 1 of the Threatened Species Conservation Act 1995. There is no recovery or draft recovery plan prepared for the species.

Threat Abatement Plans are prepared under the provisions of Part 5, Division 1 of the Threatened Species Conservation Act 1995. There is no threat abatement or draft threat abatement plan prepared for the species.

(g) " whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process."
Currently there are 34 Key Threatening Processes listed in Schedule 3 of the *Threatened Species Conservation Act 1995 (NSW)*. Key Threatening Processes relevant for the species include:

- Clearing of Native Vegetation
- Loss of Hollow-bearing Trees

Although the Clearing of Native Vegetation is listed as a threatening process, it is considered that the proposed development will not be a significant threatening process in relation to this species.

The site contains some trees with smaller hollows (<50mm diameter) and despite targeted surveys the species was not detected on the site. Notwithstanding the absence of the species the Loss of Hollow-bearing Trees required consideration in context of the surrounding habitats in the locality.

8.12.1 Summary Species – East Coast Freetail-bat (*Mormopterus norfolkensis*)

Based upon the nature and scope of the proposed development (refer section 5) and this assessment, it is considered that provided that the recommendations in section 6 of this report are implemented, the proposed development is unlikely to have a significant impact on the species – East Coast Freetail-bat (*Mormopterus norfolkensis*).

8.13 Species & Pittwater Population – Koala, (*Phascolarctos cinereus)*

(a) " in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that viable local population of the species is likely to be placed at risk of extinction. "
Koalas are generally solitary except during the mating season and have a home range of about 3 hectares. They can roam considerable distances in search of a mate or new food (Phillips 1990) and adolescent males can travel up to 10km in search for a mate. The breeding season begins around September when males commence calling and searching for reproductive females.

Koalas have been recorded feeding on tree species from *Eucalyptus, Corymbia* and *Angophora* genera. The preferred species of tree varies from region to region (Callaghan & Phillips 1995) and even within a region alternate species of trees may be favoured when growing on different soil landscapes (Jurskis 1996).

Typical Koala feed trees in the Pittwater area include Grey Gum *(Eucalyptus punctata),* Narrow-Leaved Scribbly Gum (*Eucalyptus racemosa*) and White Stringybark (*Eucalyptus globoidea*) and the non endemic planted Narrow-Leaf Peppermint *(Eucalyptus nicholli*). Other species such as Spotted Gum *(Corymbia maculata,),* Scribbly Gum (*Eucalyptus haemastoma*), Swamp Mahogany *(Eucalyptus robusta*), Red Bloodwood (*Corymbia gummifera*) Sydney Red Gum (*Angophora costata*), and Sydney Peppermints (*Eucalyptus piperita*) are also known to be foraging trees (Smith & Smith 2000).

Sightings of Koalas have been recorded in Ku-ring-gai Chase National Park particularly in the Cottage Point area, Muogamarra National Park and in Berowra Valley Bushland Park (Smith & Smith 1990). There have been extremely limited sightings of Koalas after the 1994 bushfires. Philips & Callaghan (1997) note that bush fires can potentially result in a mortality rate as high as 60%-70% in a breeding population of a local area, with recovery of the population dependent upon factors such as the size and composition of the remaining population, recruitment levels from adjoining populations and the intensity and frequency of subsequent fires.

Whilst the site is not currently known core breeding or foraging habitat, taking into account the foraging range of the species, the unexploited foraging opportunities both on and adjacent the site and the habitats being retained on the site, it is considered that the proposed development will not result in the loss of significant foraging resources on the site.

There is foraging potential on the site in particular the foraging opportunities provided by the Sydney Red Gum (*Angophora costata*) and Red Bloodwood (*Corymbia gummifera*). Whilst the site and surrounding areas have unexploited foraging opportunities, other factors such as dog attacks, bushfires and motor vehicle accidents appear to be substantial influences that limit the potential local population.

Taking into account the scope of proposed development (refer section 5) and the current unexploited foraging opportunities, it is unlikely that the proposed development will place a viable local population of the species at risk of extinction.

(b) " in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction. "
Endangered populations are listed in Schedule 1 Part 2 of the Threatened Species Conservation Act 1995.

Refer comments above (section 10.8 (a).

(c) " in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to be substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Endangered ecological communities are listed in Schedule 1 Part 3 of the Threatened Species Conservation Act 1995 and critically endangered ecological communities are listed in Schedule 1a Part 2 of the Threatened Species Conservation Act 1995. - Not applicable.

(d) " in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed and,

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality".

There is no evidence of Koala activity on the site however there are foraging opportunities provided by the Sydney Red Gum (*Angophora costata*) and Red Bloodwood (*Corymbia gummifera*). Currently the foraging opportunities are unexploited.

Taking into account the size and configuration of the surrounding bushland and the adjacent reserves, it is considered that the proposed development will not further isolate or fragment foraging habitats of the species.

In considering the unexploited foraging opportunities on and adjacent the site together with the habitats to be retained, it is considered that the proposed development (refer section 5) is unlikely to place a viable local population at risk of extinction.

(e) " whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly."

The area is not listed as critical habitat under Part 3 Division 1 of the Threatened Species Conservation Act 1995. There is no critical habitat within the site or in close proximity to the proposed development.

(f) " whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan".

Recovery plans are prepared under the provisions of Part 4, Division 1 of the Threatened Species Conservation Act 1995. The Recovery Plan for Koala, *Phascolarctos cinereus* (DECCW, 2008) has been prepared and although the site is not considered to be core breeding habitat, the proposed development is not inconsistent with the draft recovery plan's objectives and actions.

(g) " whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process."

Key Threatening Processes are listed in Schedule 3 of the Threatened Species Conservation Act. Whilst there are 32 key threatening processes listed, the relevant threatening processes in relation to the community include:

- Clearing of Native Vegetation

Although the Clearing of Native Vegetation is listed as a threatening process, it is considered that the proposed development (refer section 5) will not be a significant threatening process in relation to this species or population.

8.13.1 Summary: Species & Pittwater Population – Koala, *Phascolarctos cinereus*

In considering the scope of the proposed development (refer 5) and the above assessment of significance, it is considered that the proposed development will not have a significant impact on the Species & Population – Koala, (*Phascolarctos cinereus*).

8.14 Species – Rosenberg's Goanna (*Varanus rosenbergi*)

(a) " in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that viable local population of the species is likely to be placed at risk of extinction. "
Rosenberg's Goanna (*Varanus rosenbergi)* is found throughout southern Australia; in Western Australia, South Australia, New South Wales and the western edge of Victoria.

The species can be found in heath, open forest and woodland on Sydney sandstone and have an average foraging range of approximately 20 hectares (King & Green, 1999) and the species typically preys on insects, spiders, snakes, lizards, small birds and small mammals but will also take larger prey such as possums. Rosenberg's Goanna (*Varanus rosenbergi)* shelter in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.

The species digs holes in termite nests where it lays up to 14 eggs and relies on the termites to cover the hole. The nest helps the incubation of the eggs by maintaining a constant temperature and humidity levels.

The site is not considered to be core breeding habit and there are no termite nests for the incubation of eggs. The site may however provide some limited foraging opportunities. Similar habitats occur on and adjacent the site and despite targeted surveys the species was not recorded on the site or adjacent the site; therefore it is considered that the proposed development will not have an adverse impact on a local population.

(b) " in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction. "
Endangered populations are listed in Schedule 1 Part 2 of the Threatened Species Conservation Act 1995. - Not applicable.

(c) " in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to be substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Endangered ecological communities are listed in Schedule 1 Part 3 of the Threatened Species Conservation Act 1995 and critically endangered ecological communities are listed in Schedule 1a Part 2 of the Threatened Species Conservation Act 1995. - Not applicable.

(d) " in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed and,

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality".

The species was not recorded on the site or adjacent the site. The extent of proposed development and habitat removal/modification is outlined in section 5 of this report.

The site is within a landscape of fragmented habitats and taking into account the foraging range and mobility of the species, it is considered that the proposed development will not further isolate habitat of the species.

The site is not considered to be core breeding habitat but may provide some limited foraging potential. Taking into account the home range of the species, the site is not considered to be important to the long term survival of the species.

(e) "whether the action proposed is likely to have an adverse effect on critical habitat either directly or indirectly."
The area is not listed as critical habitat under Part 3 Division 1 of the Threatened Species Conservation Act 1995. There is no critical habitat within the site or in close proximity to the proposed development.

(f) "whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan".
Recovery plans are prepared under the provisions of Part 4, Division 1 of the Threatened Species Conservation Act 1995. There is no recovery or draft recovery plan prepared for the species.

Threat Abatement Plans are prepared under the provisions of Part 5, Division 1 of the Threatened Species Conservation Act 1995. There is no final or draft Threat Abatement Plans relevant to this species.

(g) "whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process."
Currently there are 34 Key Threatening Processes listed in Schedule 3 of the *Threatened Species Conservation Act 1995 (NSW)*. Key Threatening Processes relevant for the species include:

- Clearing of Native Vegetation

Although the Clearing of Native Vegetation is listed as a threatening process, it is considered that the proposed development will not be a significant threatening process in relation to this species.

8.14.1 Summary Species – Rosenberg's Goanna (*Varanus rosenbergi)*

Based upon the nature and scope of the proposed development (refer section 5) and this assessment, it is considered that the proposed development is unlikely to have a significant impact on the species – Rosenberg's Goanna (*Varanus rosenbergi).*

9. Summary

9.1 Conclusion

This flora and fauna assessment has been prepared in conjunction with the proposed construction of a private road providing access to the allotment known as 120 Mona Vale Road, Warriewood.

Specific assessment of the properties has been undertaken to identify habitats of threatened species, populations and ecological communities listed in the schedules of the *Threatened Species Conservation Act (NSW) 1995*. The report has been commissioned by Vogue Agency who have also provided site instructions. For the purposes of this report the southern half of the allotment known as 10 Jubilee Avenue and the northern half of 4 Boundary Street, Warriewood will be referred to as the site.

The site is located between Jubilee Avenue and Boundary Street and the topography ranges from moderately- steeply sloping to undulating slopes.

The portion on 10 Jubilee Avenue is undeveloped and contains indigenous vegetation whilst the section within 4 Boundary Street is landscaped and consists of mown grass areas with individual specimen trees. The proposed development involves removal of the vegetation and construction of a private road providing access to the allotment known as 120 Mona Vale Road, Warriewood

A detailed flora survey was conducted on the site and a range of fauna survey techniques have been carried out on and adjacent the site. In addition to this a habitat assessment and database / literature search has been carried out to identify threatened flora and fauna that potentially could occur on the site.

The vegetation on and adjacent the site is typical of Sydney Sandstone Gully Forest / Ridgetop Woodland and specific targeted surveys were carried out to identify threatened species that occur within these habitats.

In assessing the impact on threatened fauna species, consideration has been given to the species recorded or potentially occurring on the site and the relationships between the habitats on and adjacent the site and the essential habitat requirements of specific threatened fauna. This process has highlighted that 11 threatened flora or fauna species require assessment in accordance with Part 1, section 5A of the *Environmental Planning and Assessment Act 1979 (NSW)*. These species are:

- Magenta Lilly Pilly (*Syzygium paniculatum*);
- Glandular Pink-bell (*Tetratheca glandulosa*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black-Cockatoos (*Calyptorhynchus lathami*);
- Barking Owl (*Ninox connivens*);
- Powerful Owl (*Ninox strenua*);
- Masked Owl (Tyto novaehollandiae);
- Southern Brown Bandicoot (*Isoodon obesulus*);
- East Coast Freetail Bat (*Mormopterus norfolkensis*);
- Koala (*Phascolarctos cinereus*) – species & population
- Rosenberg's Goanna (*Varanus rosenberg)*

Based upon the assessment criteria outlined in Part 1, section 5A of the *Environmental Planning and Assessment Act 1979 (NSW)* it is considered that the proposed development will not have a significant impact on threatened species listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* provided that the following recommendations are implemented.

To minimise the impact on the local ecology and threatened species, populations & communities it is recommended that:

(a) All trees not identified as being removed in the arboricultural report (Footprint Green, 2011) are to be retained and protected prior to and during construction.

(b) All vegetation with the exception of noxious and environmental weeds within 2m of the proposed development footprint is to be protected and retained prior to and during construction.

(c) All noxious and environmental weeds within 10m of the proposed works and within the works areas are to be removed using standard bush regeneration techniques.

(d) The nest / roosting boxes currently on the site are to be relocated to trees that are to be retained within the allotment known as 10 Jubilee Avenue.

(e) An additional 3 microchiropteran bat roosting boxes are to be installed in trees to be retained within allotment known as 10 Jubilee Avenue

(f) Subject to engineering designs where earthen road batters are constructed they shall be revegetated using species currently recorded on the site.

References

Allison, F.R. and Hoye, G.A. (1995) Eastern Freetail-bat Mormopterus norfolkensis pp 484-5 in Strahan, R. (ed.). The Mammals of Australia. Reed Books, Sydney.

Atkins, K. (1998). Habitat and distribution of *Perameles nasuta* and *Isoodon obesulus* in Bushland Remnants in Sydney. MSc Thesis, School of Biological Sciences, Macquarie University.

Australian Museum, (2000) *The Mammals of Australia*, Revised Edition, Reed New Holland, Ed. R. Strahan

Benson, D. & Howell, J. (1994) *Cunninghamia,* The natural vegetation of the Sydney 1:100 000 map sheet, Volume 3(4) 1994 Royal Botanical Gardens Sydney.

Braithwait R, W. (1995), Southern Brown Bandicoot, pp176-177in *Mammals of Australia*. Ed. R Strahan, Australian Museum & Reed Books.

Brooker M.I & Keleinig D.A. (1999) *Field Guide to Eucalypts, Volume 1 South-eastern Australia*, Bloomings Books, Victoria.

Chapman, G.A., & Murphy, C.L. (1989), *Soil Landscapes of the Sydney 1:100 000 sheet,* Soil Conservation Service of NSW., Sydney

Cogger H.G. (2000), *Reptiles & Amphibians of Australia 6th ed*. Reed Holland, Sydney.

Cooper, R.M. (1990), (1986) New South Wales Bird Report. *Australian Birds* 23: 68-101.

Cropper (1993) *Management of Endangered Plants*. CSIRO Publishing, Melbourne

Davey S M (1993). Notes on the habitat of four Australian owl species. Pp. 126-142 in Olsen, P (ed.),*Australian Raptor Studies*. Australasian Raptor Association, RAOU, Melbourne.

Debus S.J.S. & Rose, A.B. (1994) The Masked Owl - Tyto novaehollandiae in New South Wales. *Australian Birds 28 (supplement),* pp40-64)

DECCW, (1994). Fauna of north-east NSW forests. North East Forests Biodiversity Study Report No. 3. National Parks & Wildlife Service, Hurstville.

DECCW (1999) *Threatened Species Information* Spotted-tailed Quoll, Department of Environment & Climate Change, September 1999, NSW National Parks & Wildlife Service, Hurstville

DECCW, (2000) *Threatened Species Information Tetratheca glandulosa,* New South Wales, Department of Environment Climate Change & Water, May 2000, NSW National Parks & Wildlife Service, Hurstville.

DECC (2001) *Red-crowned Toadlet Pseudophryne australis (Gray 1835)* – profile, Department of Environment & Climate Change, May 2001, NSW National Parks & Wildlife Service, Hurstville.

DECCW (2002) *Threatened Species Information Epacris purpurascens var. purpurascens*, May 2002, NSW Department of Environment, Climate Change & Water

DECCW, (2003) *Threatened Species Information Darwinia biflora*, May 2003, NSW Department of Environment, Climate Change & Water, NSW National Parks & Wildlife Service.

DECCW (2004), *Glossy Black-cockatoo Feed Trees*, Resource Management Advisory Services: Note 2, Northern New South Wales, Department of Environment Climate Change & Water.

DECCW (2006), *Southern Brown Bandicoot Isoodon obesulus, Recovery Plan*, November 2006, Department of Environment & Climate Change, Sydney

DECCW (2006) Recovery Plan for the Large Forest Owls: Powerful Owl Ninox strenua, Sooty Owl Tyto tenebricosa, Masked Owl Tyto novaehollandiae, NSW Department of Environment, Climate Change & Water, October 2006

DECCW (2007) *Threatened Species Assessment Guidelines*, NSW Department of Environment, Climate Change & Water, August 2007

DECCW (2010), *Wildlife Atlas*, (search within 5km of AMG co-ordinates AMG(56) 334090E and 62722500N), Department of Environment Climate Change & Water, NSW National Parks & Wildlife Service, Hurstville.

Footprint Green (2009) Arboricultural Impact Assessment – Private Road for Use by Land Known as 120 Mona Vale Road, Warriewood, 21/11/11, Footprint Green Pty Ltd, Avalon Beach, NSW

Forshaw, J.M. & Cooper, W.T. (1981) *Australian Parrots*. 2nd edition, Lansdown Editions, Melbourne.

Franklin, D.C., Menkhorst, P.W. & Robinson, J.L. (1989). Ecology of the Regent Honeyeater *Xanthomyza phrygia. Emu* 89:140-154.

Garnett, S. (1992) Threatened and Extinct Birds of Australia. *RAOU Report No.82*, Royal Ornithologists Union of Australia & Australian National Parks & Wildlife Service.

Geering, D. & French, K. (1998). Breeding biology of the Regent Honeyeater *Xanthomyza phrygia* in the Capertee Valley, New South Wales. *Emu* 98:104-116.

Gibbons P. & Lindenmayer D. (2002) *Tree Hollows and Wildlife Conservation in Australia*, CSIRO Publishing, Collingwood, Vic.

Grey, M.J., Clarke, M.F. & Loyn, R.H. (1998). Influence of the Noisy Miner *Manorina melanocephala* on avian biodiversity and abundance in remnant Grey Box woodland. *Pac. Conserv. Biol.* 4:55-69.

Harden, G. (2000) *Flora of NSW: Volume 1,* New South Wales University Press, Kensington.

Harden, G. (2002) *Flora of NSW: Volume 2,* New South Wales University Press, Kensington.

Harden, G. (1992) *Flora of NSW Volume 3,* New South Wales University Press, Kensington.

Harden, G. (1993) *Flora of NSW Volume 4,* New South Wales University Press, Kensington.

Herbert, C. (1983), *Geology of the Sydney 1:100 000 Sheet 9130,* New South Wales Department of Mineral Resources, Sydney

Herr A. 1998. *Aspects of the ecology of insectivorous forest-dwelling bats (Microchiroptera) in the western slopes of the Australian alps*. PhD thesis, Charles Sturt University

Higgins, P.J. (ed.) 1999. Handbook of Australian, New Zealand and Antarctic Birds. Vol. 4. Parrots to Dollarbird. Oxford University Press, Melbourne.

Hindwood, K.A. (1939). Nectar-feeding birds near Sydney. *Emu* **34**; 40-44.

Kavanagh, R.P. & Murray, M. (1996) Home range, habitat and behaviour of the Masked Olw *Tyto novaehollandiae* near Newcastle, New South Wales. *Emu* 96: pp 250 – 257 Birds Austraila.

King, D. & Green, B. (1999) Goannas - The biology of varanid lizards, 2nd edition, University of New South Wales Press, Sydney

McConville, A. (2010) Mangroves a Hotspot for Threatened Microbats in the Hunter, *Consulting Ecology*, Ecological Consultants Association of NSW, .p7, Vol 24, Feb 2010.

Mahoney, M.J. (1993), The Status of Frogs in the Watagan Mountains area, the Central Coast of N.S.W. pp 257 –264, *Herpetology in Australia – A Diverse Discipline*, ed D. Lunney & D. Ayres, Trans. Of the Royal Zool. Soc. NSW, Mosman

Major, R., Christie, F. and Gowing, G. (1998). 'The Value of Remnant Vegetation for Birds in the New South Wales Wheatbelt'. Australian Museum: Sydney.

Mepstead (2010) *Plan of Proposed Private Road Between Boundary Road & Jubilee Avenue*, Dwg No. 4034DES, Dated 23/12/10, Mepstead & Associated, Thornleigh, NSW

NSW Scientific Committee (2000) *Final Determinations 2000, Sydney Coastal Estuary Swamp Forest Complex in the Sydney Basin Bioregion*, 22/12/2000, NSW National Parks & Wildlife Service.

NSW Scientific Committee (2002) *Final Determinations, Eucalyptus scoparia* (a tree) - vulnerable species listing, NSW National Parks & Wildlife Service, August 2002.

NSW Scientific Committee (2001) Black-chinned honeyeater (eastern subspecies) - vulnerable species listing NSW Scientific Committee - final determination, 30/11/01

NSW Scientific Committee (2001) Gang-gang Cockatoo, Callocephalon fimbriatum in the Hornsby and Ku-ring-gai Local Government Areas – endangered population listing, 23/02/01 NSW National Parks & Wildlife Service

NSW Scientific Committee (2002) *FInal Determination Duffys Forest vegetation community in the Sydney Basin Bioregion- Endangered ecological communityl,* NSW National Parks & Wildlife Service, June 2002

NSW Scientific Committee (2004) *Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions – endangered ecological community listing*, 04/06/04 NSW National Parks & Wildlife Service.

NSW Scientific Committee (2004) River-flat Eucalypt Forest on Coastal Floodplains on the North Coast, Sydney basin and South Eastern Corner Bioregions - endangered ecological community listing, 17/12/04, NSW Scientific Committee, Department of Environment, Climate Change & Water.

NSW Scientific Committee (2005) *Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* - endangered ecological listing, 28/01/05 NSW Department of Environment & Climate Change, Sydney NSW.

NSW Scientific Committee (2005) Listing Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions - endangered ecological community

Payne, R. (1991) New findings of the rare tree *Syzygium paniculatum* (Myrtaceae) in the Wyong area, New South Wales. *Cunninghamia* 2(3): 495-498.

Payne, R. (1997) *The Distribution and Reproductive Ecology of Syzygium paniculatum and Syzygium australe (Myrtaceae) in the Gosford-Wyong Region*. Unpublished Thesis prepared for the award of Masters of Natural Resources, University of New England. Armidale NSW.

Phillips, W.R. (1990) Koalas – the little Australians we would hate to loose. Australian National Parks & Wildlife Service, Canberra.

Phillips, W. (1995) Eastern False Pipistrelle *Falsistrellus tasmaniensis*, pp 520-1 in Strahan, R. (ed.). The Mammals of Australia. Reed Books, Sydney.

Schedvin, N. (2007) Distributional ecology of the barking owl *Ninox connivens connivens* in Victoria. PhD Thesis, Charles Sturt Univesity

Slater, P., Slater P. & Slater R. (1993) The *Slater field guide to Australian Birds*. Revised edition Reed New Holland.

Smith, J. & Smith, P. (2000) *Management Plan for Threatened Fauna & Flora in Pittwater*, prepared for Pittwater Council.

Turner, V. & Ward, S.J. (2000), Eastern Pygmy Possum, pp217-218in *Mammals of Australia*. Ed. R Strahan, Australian Museum & Reed New Holland.

Advanced
Bushfire Performance Solutions

Bushfire Assessment Report

(Masterplan - Subdivision)

Lot 1 DP 383009, Lots 3-5 DP124602 & Lot 2 DP816070
120 Mona Vale Road & 4 Boundary Street, Warriewood NSW

Pittwater LGA

Prepared for
Opera Properties P/L

September 2012

Prepared by Terence O'Toole
B.App.Sc Environmental Health
Grad. Dip. Design for Bushfire Prone Areas

Advanced Bushfire Performance Solutions P/L
43 Pagoda Crescent Quakers Hill, NSW 2763
T: (02) 9837 6464 M: 0417 483 438
terryo@advancedbps.com.au www.advancedbps.com.au

BPAD-A Certified Practitioner BPD-PA-13734
Corporate Member No 13734 Fire Protection Association Australia

Terms & conditions of use

Disclaimer

The analysis, assessment and recommendations contained in the following Bushfire Assessment Report, are the sole views of Advanced Bushfire Performance Solutions Pty Ltd. The bushfire protection assessment, recommendations and strategies contained in this report are intended to address the submission requirements for DAs on bush fire prone land as outlined in appendix 4 of *Planning for Bush Fire Protection* 2006.

While the utmost care is taken in the assessment and reporting process, Advanced Bushfire Performance Solutions Pty Ltd does not warrant that the information contained in this report will be free from error or omission. Also there is no implied assurance nor guarantee that compliance with the strategies and recommendations contained in this report will result in a development application consent being granted by a local government body; nor will Advanced Bushfire Performance Solutions Pty Ltd be liable for any financial losses incurred throughout the development planning and application process, should an application not be successful.

Because the nature of bushfires is unpredictable and in many cases immeasurable the information contained in this report, if used, in part or in whole, should reduce the risk of a bushfire hazard occurring. But in no way can the information contained in this report be used as a guarantee against any damages or losses resulting from any bushfire events.

The customer's exclusive remedy against Advanced Bushfire Performance Solutions Pty Ltd for any act or omission, including negligence, or failure in any service delivered (including under strict liability in tort) shall be, at Advanced Bushfire Performance Solutions Pty Ltd option, the return, replacement or reimbursement for credit of such services provided.

In no event shall Advanced Bushfire Performance Solutions Pty Ltd be liable to the customer or to any other person for direct or indirect, consequential, incidental or special damages beyond the limitation contained in the preceding paragraph.

Document Control

Document Name	Project Ref	Date	Author	Status
20120617MUS BAR 1.0	20120617MUS	26-Jul-12	TO	Draft Version 1
20120617MUS BAR 2.0	20120617MUS	14-Sep-12	TO	Revision A
20120617MUS BAR 2.1	20120617MUS	20-Sep-12	TO	Revision B

Abbreviations/definitions

APZ	Asset protection zone
AS3959	Australian Standard AS3959-2009 *Construction of buildings in bushfire-prone areas*
BCA	*Building Code of Australia*
BFSA	Bush fire safety authority
BPLM	Bushfire Prone Land Map
BPM	Bushfire protection measures
EP&A Act	*Environmental Planning and Assessment Act 1979*
FDI	Fire danger index
IPA	Inner protection area
kW/m^2	Kilowatts per metre squared (measure of radiant heat)
OPA	Outer protection area
PBP2006	*Planning for Bush Fire Protection* 2006
RF Act	*Rural Fires Act 1997*
RFS	NSW Rural Fire Service
RHF	Radiant heat flux

Table of contents

1 Executive summary

This report was prepared by ABPS for Opera Properties P/L to address the bushfire matters relating to the proposed subdivision masterplan.

The proposed development is either a 5 lot into 77 lot (option 1) or 5 lot into 73 lot (option 2) residential subdivision masterplan.

The subject site is identified as bushfire prone land due its proximity to bushfire hazard vegetation on the property and adjoining lots.

This report aims to address the performance criteria within *Planning for Bush Fire Protection* 2006 for subdivision and assess the potential bushfire behaviour of the vegetation to the north, east, south and west of the subject lots. The report also determines the likely bushfire attack level for each proposed lot and identifies which lots may no longer be subject to bushfire regulations.

Assessment of the proposal demonstrates that the proposed setbacks and managed areas provide adequate mitigation to the effects of radiant heat and flame contact such that each residential lot has adequate space for a building footprint that will meet or exceed the PBP2006 29kWm^{-2} performance criteria and subdivision intent of measures.

The entire area of all lots (excluding vegetated riparian corridor) is to be managed to asset protection zone (APZ) standards. A Vegetation Management Plan will detail the management regime for all APZs

Proposed road and services infrastructure supports compliance with the provisions within the RFS guideline.

All other bushfire protection measures required within the performance criteria for subdivision development are provided or not required.

---

2 Legislative context

On 1 August 2002 the NSW Government enacted amendments to the Environmental Planning and Assessment Act 1979 (EP&A Act) and the Rural Fires Act 1997 (RF Act) to enhance bushfire protection through the development assessment process. The amendments;

- Introduced Bushfire Prone Land Maps as a 'trigger' for the application of bushfire legislation and the application of BCA standards
- It mandated Rural Fire Service concurrence for development applications subject to section 100B of the RF Act (Subdivisions and Special Fire Protection Purposes)
- Required compliance with the provisions of Planning for Bush Fire Protection
- Required identification of bushfire prone land on section 149 certificates

The section 149 certificate for this property should identify the lot as bushfire prone land (see 3.5). Subsequent to this development, some of the created lots should also be identified as bushfire prone land.

As this lot is identified as bush fire prone land, any application to subdivide the lot is an 'integrated development' (s.91 EP&A Act) and subject to section 100B of the *Rural Fires Act 1997* and must comply with *Planning for Bush Fire Protection* 2006 for the NSW Rural Fire Service to grant a bush fire safety authority.

On 1 May 2010 the ABCB released the updated BCA which calls up AS3959-2009. Whilst this has no impact on the PBP2006 compliance assessment for this subdivision development application, it will impact on the subsequent development applications (of bushfire prone land) to construct residential dwellings on each created lot.

3 Background

3.1 Description of property

The property subject to this development proposal is described as

- Lot 1 DP383009, Lots 3-5 DP124602 and Lot 2 DP816070
- 120 Mona Vale Road and 4 Boundary Street, Warriewood NSW
- Within Pittwater local government area
- Currently rural agricultural land with an existing house and multiple sheds
- Mostly open pastural land with dense bushland along the creek to the west
- 4 Boundary St is currently occupied by an existing private residence
- Falling to the drainage corridors to the east, south and west
- Adjoining bushland to the southwest, Mona Vale Rd to the north and mixed commercial and residential land to the south and east

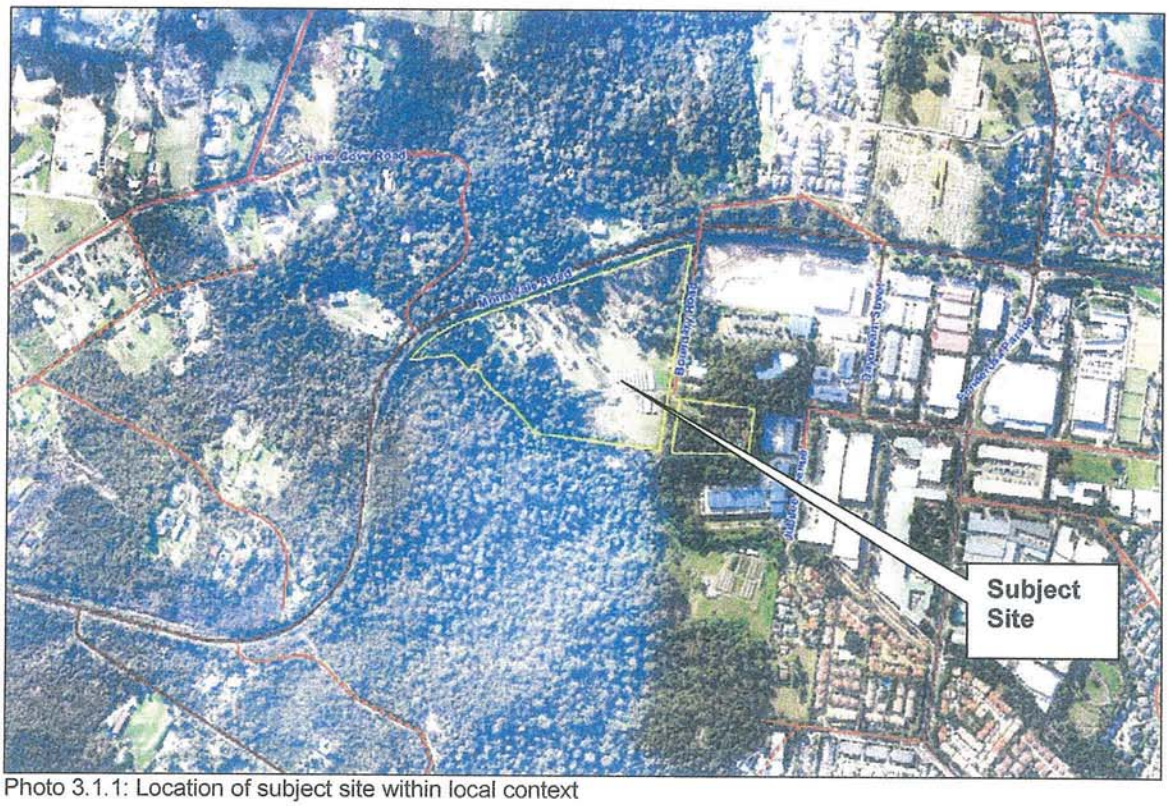
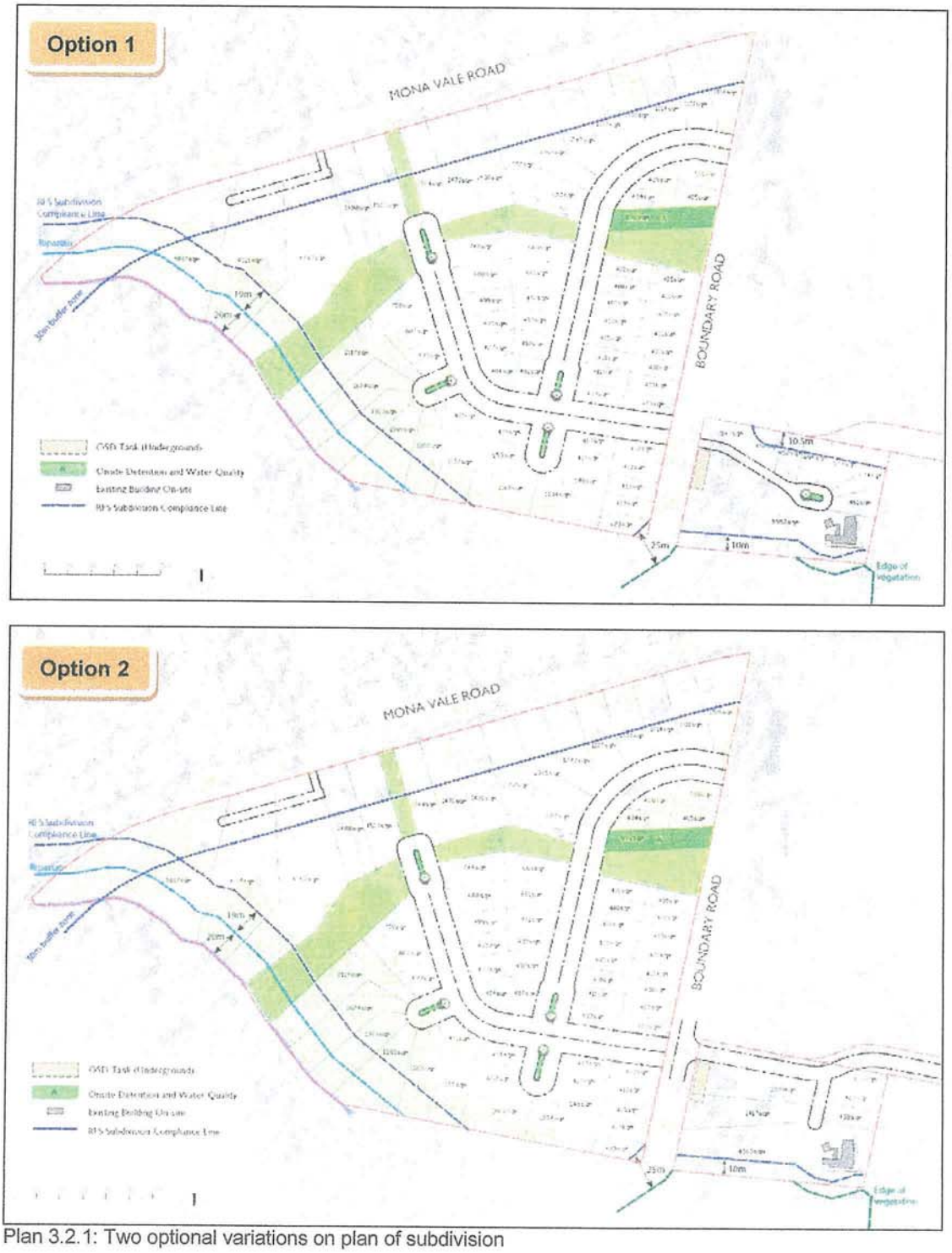


Photo 3.1.1: Location of subject site within local context

3.2 Proposed development

The proposed development is either a 5 lot into 77 lot (option 1) or 5 lot into 73 lot (option 2) residential subdivision masterplan.

This development is classified as 'subdivision' within the definitions provided by *Planning for Bush Fire Protection* 2006.



Plan 3.2.1: Two optional variations on plan of subdivision

3.3 Specific objectives for 'subdivision' within PBP2006

The specific objectives for residential and rural residential subdivision are to:

- minimise perimeters of the subdivision exposed to the bush fire hazard. Hourglass shapes, which maximise perimeters and create bottlenecks, should be avoided.
- minimise bushland corridors that permit the passage of bush fire.
- provide for the siting of future dwellings away from ridge-tops and steep slopes - particularly up-slopes, within saddles and narrow ridge crests.
- ensure that separation distances (APZ) between a bush fire hazard and future dwellings enable conformity with the deemed- to-satisfy requirements of the BCA. In a staged development, the APZ may be absorbed by future stages.
- provide and locate, where the scale of development permits, open space and public recreation areas as accessible public refuge areas or buffers (APZs).
- ensure the ongoing maintenance of asset protection zones.
- provide clear and ready access from all properties to the public road system for residents and emergency services.
- ensure the provision of and adequate supply of water and other services to facilitate effective firefighting.

3.4 Special considerations

- A vegetated riparian corridor (20m from top of bank) is to be provided along Narrabeen Creek to the west of the site.
- A road corridor expansion buffer (30m) is provided along Mona Vale Road to the north of the site.

3.5 Bushfire prone land

The site is within the bushfire prone land on the Pittwater LGA Bush Fire Prone Land Map and is identified as category 1 vegetation and buffer zone.

- Category 1 vegetation (orange) is generally heavily wooded native vegetation
- Category 2 vegetation (yellow) is generally remnant vegetation, riparian corridors and rainforest
- Buffer Zone (red) is land in proximity to the most significant impacts of bushfire (within 100m of Cat 1 or within 30m of Cat 2)

Plan 3.5.1: Bushfire prone land map

4 Assessment

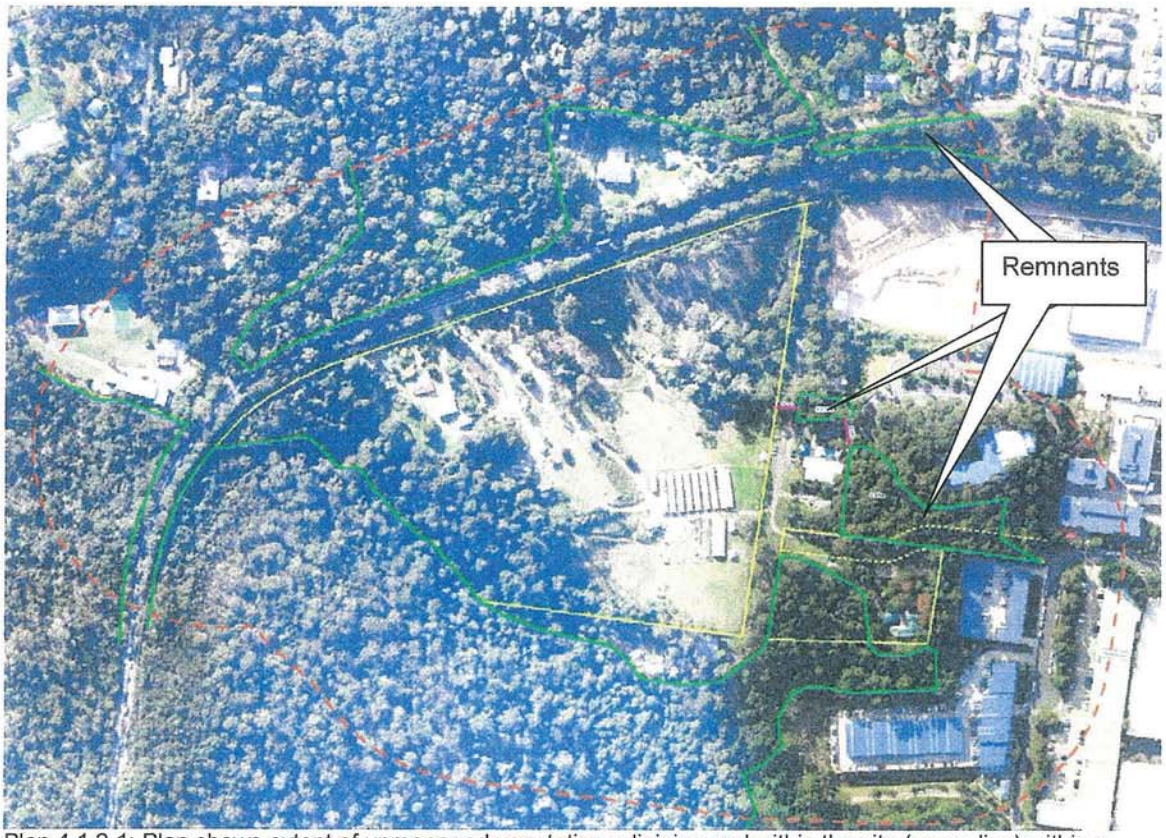
4.1 Vegetation

4.1.1 Explanation

The predominant vegetation that will influence the behaviour of a bushfire impacting on the site is classified by structure using the system adopted by Keith (2004) and by the general description using table A2.1 of *Planning for Bush Fire Protection* 2006.

The vegetation assessed is that vegetation that is unmanaged or presents a structure and fuel load with the potential to support a bushfire.

4.1.2 Assessment



Plan 4.1.2.1: Plan shows extent of unmanaged vegetation adjoining and within the site (green line) within a 140m study zone (red dashed line)

The subject site is surrounded to the north, west and south by extensive, contiguous bushland and to the east (north of Lot 4) by remnant fragments of the same type of bushland. All of this vegetation is classified as forest as defined by PBP2006.

The contiguous northern and western bushland is disturbed by roads, driveways and residential intrusions. It is separated from the subject site by Mona Vale Road and powerline easements. The vegetation is generally upslope from the site.

The south western to southern vegetation presents the most significant bushfire threat due to its proximity and the extent of the forest. This vegetation is upslope to the site beyond Narrabeen Creek with a small portion occupying the downslope within the proposed riparian buffer along the

western portion of the site. This small downslope portion is not significant enough to dominate the bushfire behaviour.

Narrabeen Creek will be protected by a 20m riparian corridor along the north eastern bank (within the subject site). The proposed APZ will be located immediately adjacent to the riparian corridor. Although the APZ is permitted to extend up to 10m into the riparian corridor, this proposal does not seek to intrude into the zone.

The south eastern bushland follows a narrow gully between the site and a commercial building. This vegetation narrows to approximately 40m at this point before expanding into the gully further north (within Lot 4).

The eastern vegetation is fragmented forest due to predominantly commercial and some residential development. This vegetation is separated from the western portion of the subject site by Boundary Road.

The smallest remnant is 0.07ha and separated from the nearest other vegetation by 24m and any potential dwelling on the site by >20m. This allows it to be excluded from this assessment (Refer to AS3959-2009 2.2.3.2(c)).

The larger remnant is 0.5ha. The dense trees adjacent to this remnant cover a driveway and parking network and well managed understorey (Church grounds). This area is assessed as similar to Rainforest (PBP2006) due to its limited bushfire behaviour potential.

The northern remnant (along Mona Vale Rd) is not assessed further in this report as its extent and isolation limit its bushfire behaviour and impacts and any assessment would be overshadowed by the impacts of the immediately adjacent larger bushfire hazard vegetation to the north of the site (west of this remnant).

Plan 4.1.2.2: Plan depicts separation of remnants from each other and the site.

Table 4.1.2.1: Vegetation assessment for each aspect in relation to the subject site (fuel loads from PBP2006)

Aspect	Formation	Surface fuel (t/ha)	Overall fuel (t/ha)	Height (m)
North	Forest	20	25	20
East	Remnant forest	10*	12*	20
South east	Forest	20	25	20
South	Forest	20	25	20
South west	Forest	20	25	20
West	Forest	20	25	20

*Fuel load derived from AS3959-2009 to present a more conservative assessment

4.2 Slope

4.2.1 Explanation

Slope is a significant factor in determining bushfire behaviour. The slope influences the rate of preheating. A fire moving up a steep slope will direct the greater quantity of heat directly into the preceding vegetation with the convective air currents. This means the fuel will combust faster and with a greater intensity. Whereas a fire moving down a slope will lose a great deal of heat to the atmosphere and subsequently burn slower and with a lesser intensity

The predominant slope is measured over a distance of up to 140m from the building envelope and is taken as the slope that will most influence the bushfire behaviour rather than a simple average.

Planning for Bush Fire Protection 2006 provides five (5) classes of slope to simplify assessment.

4.2.2 Assessment

The subject lots are located on a hill side where the site and hazard fall to a network of drainage lines to the west, south and east that form Narrabeen Creek and drain to the southeast.

The western portion of the site contains large areas of terrain that exceed 18 degrees. The guidelines (PBP2006) provides performance criteria to demonstrate that the application of APZs over steep slopes will not affect soil stability, promote crown fire progress or be inherently difficult to maintain to APZ standards.

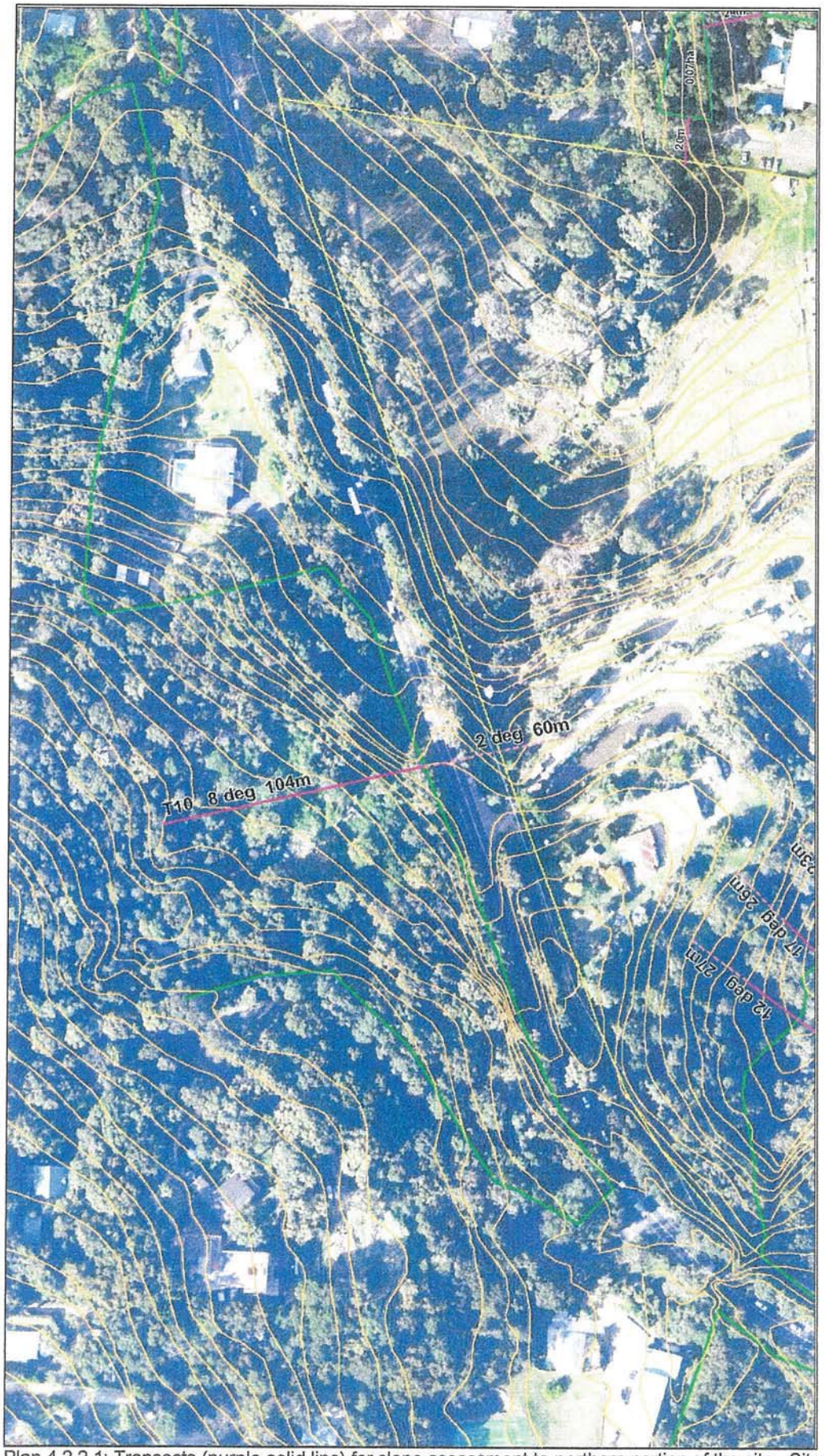
The proposed application of asset protection zones to these areas does not present any issues of soil stability as many trees will be retained and soils will be held by managed grasses. Geotechnical reports support the application of asset protection zone management over these portions of the site.

The upslope bushfire behaviour, wind eddies, boundary creek and narrow riparian corridor will inhibit the potential for a crown fire to progress through the asset protection zone.

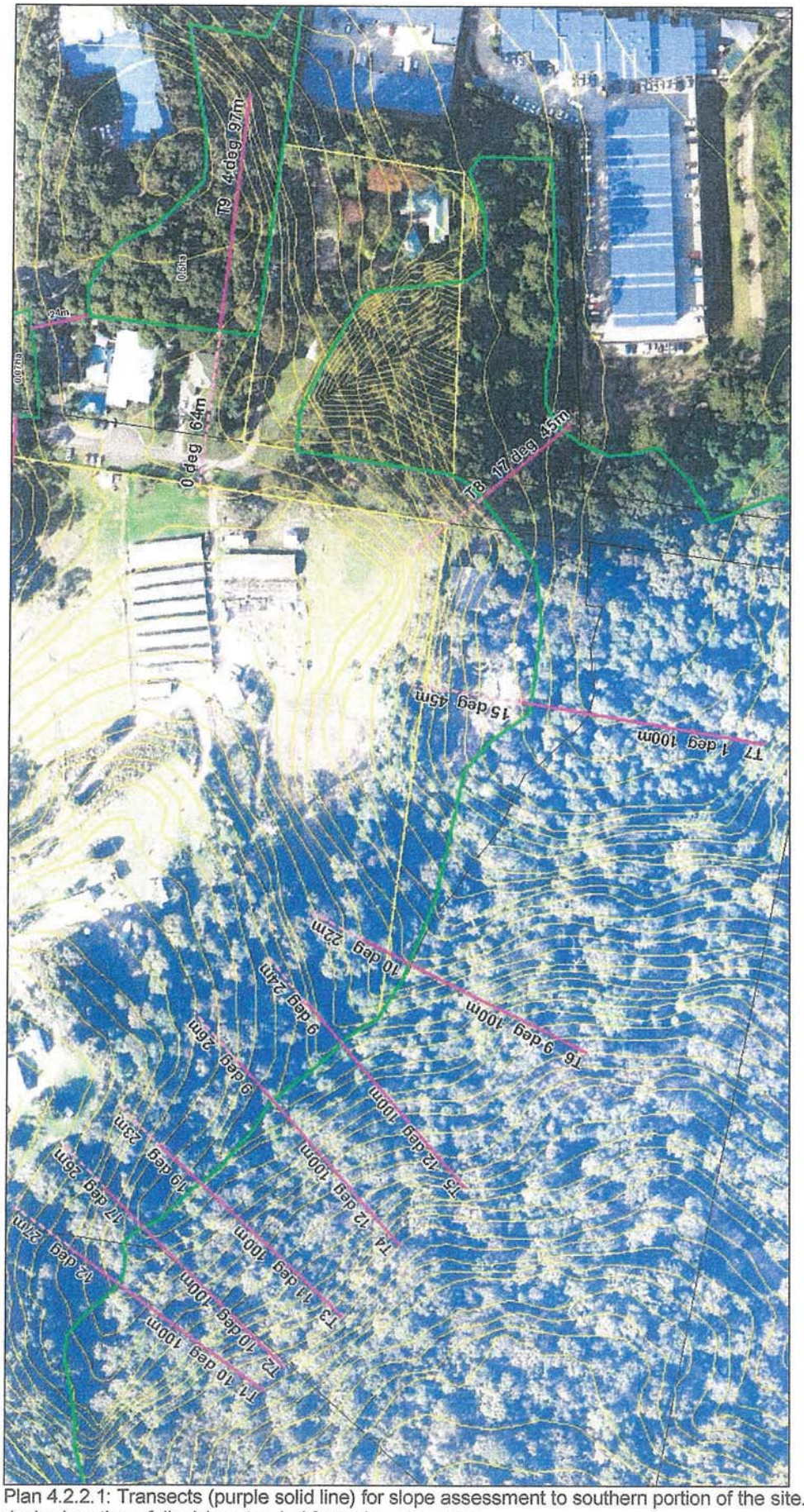
All portions of the proposed asset protection zone are accessible from across the slopes. This will promote the ease of maintenance. There will be a network of pedestrian paths through the APZ and riparian corridor. There is only a small portion of large exposed rocks; but this area is easily accessed from the flanks. Managers will be able to carry hand tools and light machinery to all areas identified as APZs.

The slope to the north is predominantly upslope and rising to the north northwest (NNW) at 8 degrees.

The slope to the southwest is predominantly upslope at between 9-12 degrees; however a conservative level slope was used in the assessment to mitigate the influence of the short downslope adjacent to the APZ and any fires approaching along the direction of the creek.



Plan 4.2.2.1: Transects (purple solid line) for slope assessment to northern portion of the site. Site slope (pink dashed portion of line) is extended from slope transect.



Plan 4.2.2.1: Transects (purple solid line) for slope assessment to southern portion of the site. Site slope (pink dashed portion of line) is extended from slope transect.

The slope to the south falls within the drainage depression at the base of the surrounding hills and is characterised by a down slope at 1 degree.

The slope to the east within the drainage gully is averaged at 4 degrees.

The slope within the larger remnant (containing the church facilities) is 4 degrees to the east/west (up slope) or 0 degrees (cross slope) to the north/south.

The slope within the gully of Lot 2 is 20 degrees to the south west or 17 degrees to the south east. This area is to be managed and represents APZ rather than hazard.

The slope within the lot to the south of Lot 2 (8 Jubilee Ave) was not surveyed and as such conservative estimates of slope have been adopted for this report. The slope to the south west over 80m would be cross slope following the drainage line. The slope impacting on Lot 5 from the south east (45m) has been estimated at 17 degrees as surveyed along the same slope within the gully in Lot 2.

Ten (10) transects were assessed to represent all significant bushfire attach vectors about the site. The slopes were generalised in the table below to provide a conservative assessment.

Table 4.2.2.1: Slope influencing bushfire behaviour about the site

Aspect	Description	Distance measured (m)	Angle (degree)	Class
North	Up slope	100	8°	0°
South East	Down slope	45	17°	>15-18°
South	Down slope	100	1°	>0-5°
West	Cross slope	100	0°	0°
North (Lot 2)	Cross slope	60	0°	0°
South (Lot 2)	Cross slope	80	0°	0°

For the purposes of modelling bushfire behaviour onsite slope has been assessed as 16° to the east and 9° to the west (although site slopes are between 9-19°, the lower site slopes provide the higher fire exposure and consequently the more conservative setback).

4.3 Fire danger index

4.3.1 Explanation

Also known as Forest Fire Danger Index is a bushfire behaviour factor derived from environmental conditions particular to a weather region in NSW. It rates the credible worst case scenario conditions assumed for a 1:50 year bushfire event.

Table A2.3 of *Planning for Bush Fire Protection* 2006 provides a list of regions and local government areas.

4.3.2 Assessment

Pittwater LGA falls within Region 4 – Greater Sydney Region (100)

4.4 Setback

4.4.1 Explanation

The setback is the actual distance provided by the development between the building line and the bushfire hazard vegetation.

4.4.2 Assessment

See section 4.6

4.5 Asset protection zone

4.5.1 Explanation

The asset protection zone is a bushfire fuel and vegetation structure managed space between the assets of the development and the unmanaged bushfire hazard vegetation or native bushland.

- It provides a safe space for firefighters to conduct bushfire mitigation measures in the defence of a dwelling or other asset
- It reduces the intensity of radiant heat impacting on the dwelling or asset
- It reduces the turbulence of convection driven winds in the vicinity of the dwelling
- It reduces ember viability limiting impact of ember attack on the dwelling or asset
- It permits the dispersal of smoke that may otherwise severely impact on occupants health

For subdivision developments, APZs are based on achieving compliance with 29kWm^{-2} performance criteria in PBP2006.

APZs may be increased to reduce the intensity of RHF impacting on the dwelling or asset to achieve lower construction levels under AS3959.

4.5.2 Assessment

Assessment for the required APZ for compliance with PBP2006 performance criteria followed the steps outlined in appendix 2 of PBP2006 and the methodology 2 described in AS3959-2009.

The result of the assessment for Lot 5 determined that a modelled 19.155m APZ is required to meet the 29kWm^{-2} performance criteria to the west and a standard 25m setback is required to meet the acceptable solutions to the east. This eastern setback is mostly contained within the Boundary Rd road reserve/private driveway. This will provide an inner protection area standard of maintenance between the building and the hazard to no less than 20m with the balance being contained within the site.

The setback to the southwest varies between 18.6m and 19.155m. To simplify its application a setback of 19m should be applied broadly along the vegetated riparian corridor.

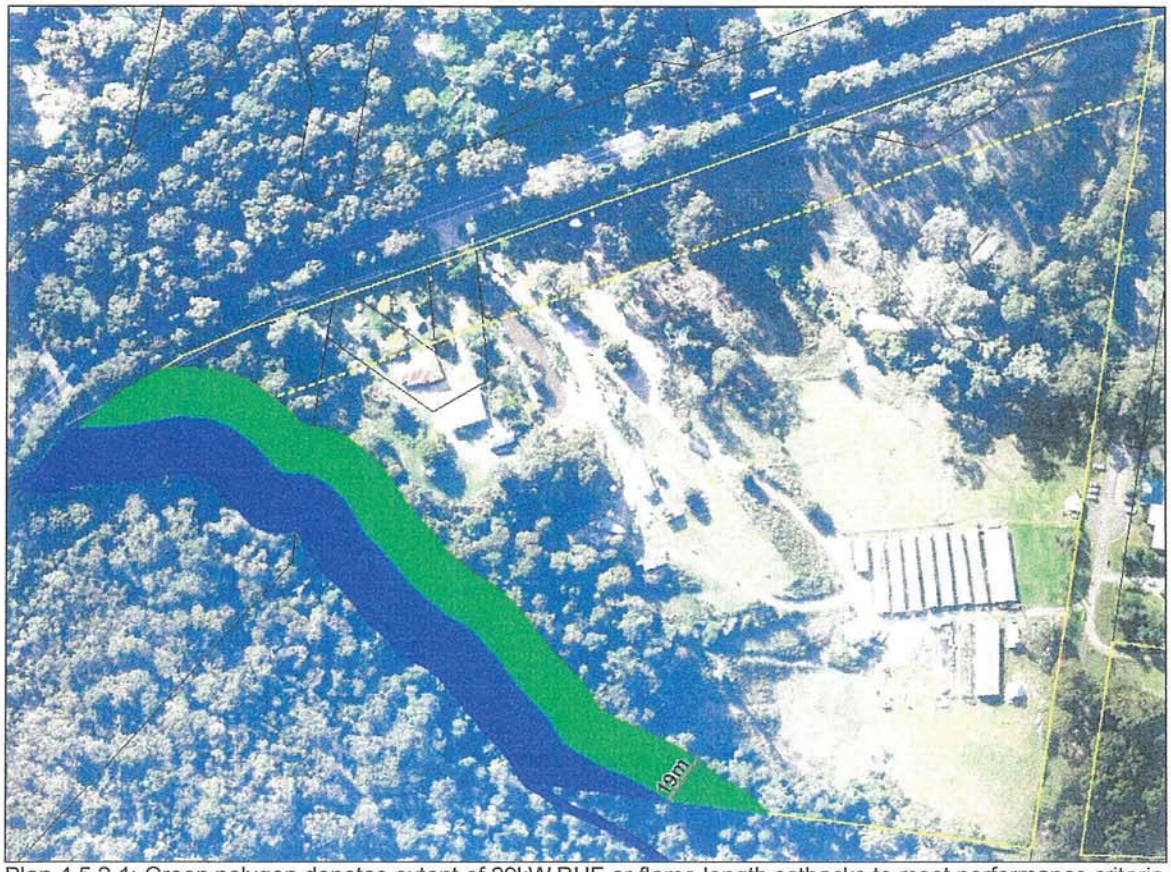
The southern setbacks are currently contained and maintained within the adjoining residential lot (Lot 2 DP383009).

The northern setbacks are contained within the Mona Vale Rd road reserve. An additional 30m within the lot is reserved for future road widening and will be maintained as an APZ.

The assessment for Lot 2 has determined a setback to the north of 10m and a setback to the south of 10m is required. This is based on management of the entire lot to APZ standards. The currently vegetated gully in the SW portion of the lot will support a bioswale. The western portion is currently managed to IPA standards.

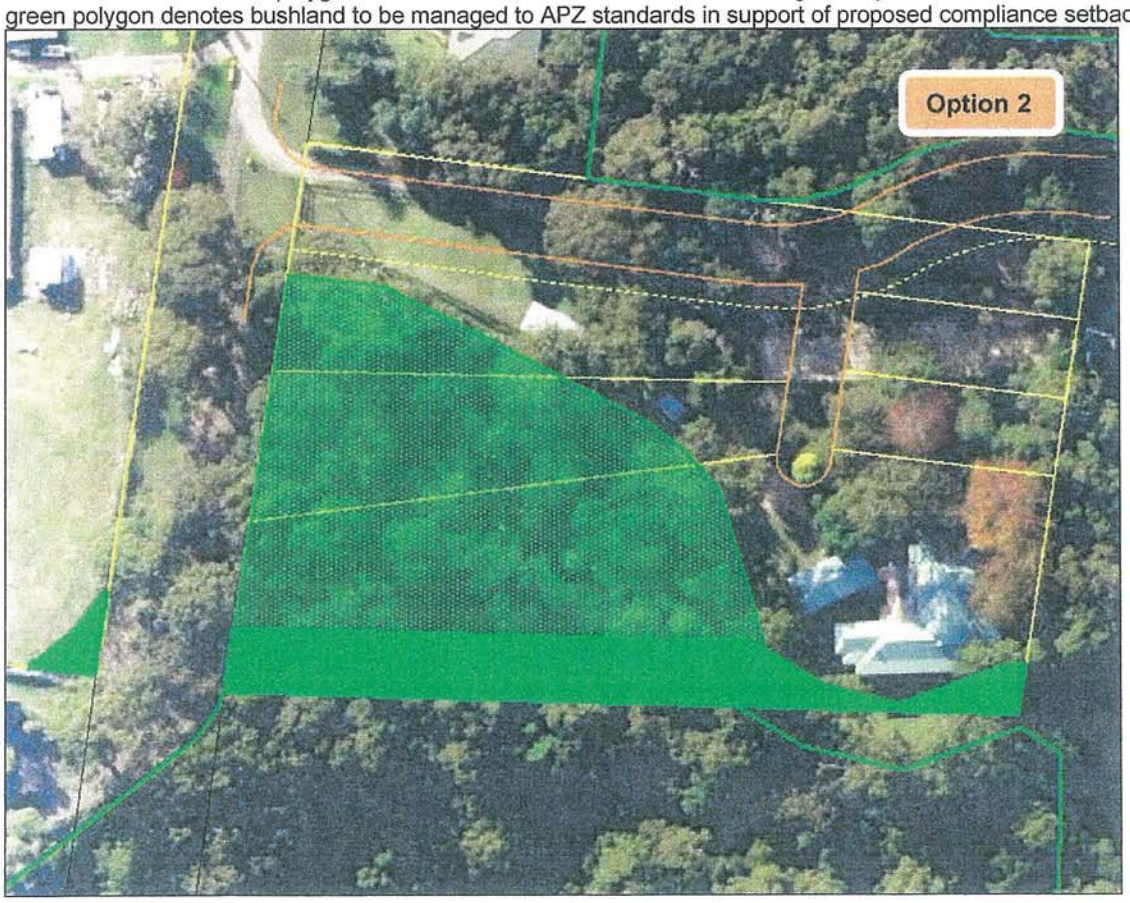
Table 4.5.2.1: APZ for compliance with PBP2006 for subdivision development

Transect	Aspect	FDI	Slope	Vegetation Class	Modelled setback	PBP2006 Appendix 2 Distance
T10	North	100	-8° (0°)	Forest	13.3m	20m
T9	East	100	4° (>0-5°)	Rainforest	13.08m	10m
Lot 2	North	100	0°	Rainforest		10m
Lot 2	South	100	0°	Rainforest		10m
T8	South East	100	17° (>15-18°)	Rainforest	-	25m
T7	South	100	1° (>0.5)	Forest	19.71m	25m
T1-6	SW	100	0°	Forest	19.155m	20m



Plan 4.5.2.1: Green polygon denotes extent of 29kW RHF or flame length setbacks to meet performance criteria

Plan 4.5.2.2: Green solid polygon denotes extent of 29kW RHF or flame length compliance over Lot 2. Shaded green polygon denotes bushland to be managed to APZ standards in support of proposed compliance setback.



Plan 4.5.2.3: Green solid polygon denotes extent of 29kW RHF or flame length compliance over Lot 2. Shaded green polygon denotes bushland to be managed to APZ standards in support of proposed compliance setback. APZ to the north is supported fully within the proposed road reserve.

4.5.3 Recommendation

No requirement exists to impose covenants over the lot titles to provide for asset protection zones. APZs are determined when building construction standards are set.

4.6 *Alternative modelling assessment*

4.6.1 Explanation

Planning for Bush Fire Protection 2006 allows submissions proposing variations to acceptable solutions where they provide substantial evidence that the specific objectives (see 3.2) and performance criteria can be met.

4.6.2 Assessment

Radiant Heat Flux (RHF) modeling for each lot was prepared following Method 2 as described in AS3959-2009, to provide an indicator of the flame length and radiant heat load from any potential bushfire attack based on compliance with PBP2006 performance criteria.

Modelling of the predicted bushfire behaviour uses the following environmental and site specific parameters for the subject lots to assess the potential radiant heat flux and flame length at the building line from an approaching potential bushfire.

Fuel loads were derived from Table 2.1 of PBP2006 as used in determining setbacks in Table A2.4 with the exception of rainforest fuel loads which were derived from AS3959-2009 (for a conservative assessment).

Transect T8 falls outside accurate surveyed areas. There is a conflict between extrapolated surveys (2m contour dataset) and actual surveys over Lot 2. The survey of Lot 2 suggests a steeper slope along the south west drainage line. A conservative slope estimate has been used for this assessment but has not been modelled due to the uncertainty. Standard PBP2006 Appendix 2 setbacks will be applied in lieu.

Table 4.6.2.1: bushfire attack modeling parameters and resulting radiant heat fluxes

Parameter	Input									
Aspect	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Vegetation Class	Forest	Forest	Forest	Forest	Forest	Forest	Forest	Rainforest	Rainforest	Forest
Surface Available Fuel Load (t/ha)	20	20	20	20	20	20	20	10	10	20
Overall Fuel Load (t/ha)	25	25	25	25	25	25	25	12	12	25
Vegetation Height (m)	20	20	20	20	20	20	20	20	20	20
Effective Slope (deg)	0	0	0	0	0	0	1	17	4	-8
Separation Distance (m)	18.835	18.375	18.22	19.155	19.155	19.045	19.555	-	13.08	13.285
Flame Angle (deg)	72	77	79	69	69	70	74	-	62	65
Elevation of Receiver (m)	4.84	3.44	2.86	5.65	5.65	5.38	4.24	-	5.17	4.97
Site Slope (deg)	12	17	19	9	9	10	15	-	0	2
Flame Width (m)	100	100	100	100	100	100	100	-	66	100
Flame	1090	1090	1090	1090	1090	1090	1090	1090	1090	1090

Temperature (K)										
Flame Emissivity	0.95	0.95	0.95	0.95	0.95	0.95	0.95	-	0.95	0.95
Transmissivity	0.843	0.842	0.842	0.844	0.844	0.844	0.841	-	0.863	0.861
Fire Danger Index	100	100	100	100	100	100	100	100	100	100
View Factor 100%	0.4522	0.4528	0.4531	0.4520	0.4520	0.4520	0.4537	0.4582	0.4421	0.4429
Reduced View Factor	-	-	-	-	-	-	-	-	-	-
Flame Length (m)	18.6	18.6	18.6	18.6	18.6	18.6	19.71	-	11.72	11.98
RHF (kWm^{-2})	29	29	29	29	29	29	29	-	29	29

Distances highlighted in red denote the minimum distance for PBP2006 compliance.

Modelling of the predicted bushfire behaviour follows the methodology described by Grahame Douglas, Zhenxiang Tan and Stuart Midgley in *a verification method for evaluating alternative building solutions in bushfire-prone areas.*

Any lot greater than 100m from the bushfire hazard is outside the scope of AS3959-2009 (BAL-Low) and subsequently not subject to the construction requirements of the standard.

4.7 Construction

4.7.1 Explanation

The BCA calls up AS3959 to prescribe construction standards for class 1, 2 and 3 buildings on designated bushfire prone land.

These construction levels are based on increasing levels of protection to mitigate the increased level of bushfire attack and the various forms of bushfire impact. (Smoke, Wind, Ember, Heat, Flame).

The BCA provides a NSW variation to adopt the assessment methodology detailed within appendix 3 of *Planning for Bush Fire Protection* 2006 rather than the methodology within AS3959.

4.7.2 Assessment

Determination of specific construction standards is not assessed in this report. Specific construction standards can only be assessed accurately following determination of building footprints. Potential BALs have been determined for each lot (Table 4.7.2.1).

Table 4.7.2.1: Minimum setbacks required to meet each AS3959-2009 BAL construction standard

	Transect Setback (m)									
Aspect	T1	T2	T3	T4	T5	T6	T7	T8*	T9	T10
BAL-FZ	<13.856	<13.332	<13.143	<14.184	<14.184	<14.07	<14.305	<22-	<9.75	<9.824
BAL-40	13.856	13.332	13.143	14.184	14.184	14.07	14.305	22	9.75	9.824
BAL-29	18.835	18.375	18.22	19.155	19.155	19.045	19.555	29	13.08	13.285
BAL-19	27.558	27.24	27.154	27.83	27.83	27.74	28.68	42	18.825	19.54
BAL-12.5	38.63	38.259	38	38.826	38.826	38.75	40.14	56	26.104	27.98
BAL-Low	100	100	100	100	100	100	100	100	100	100

*setbacks derived from AS3959-2009 Table 2.4.2

Plan 4.7.2.1: Red dashed lines denote transitions from each BAL

Plan 4.7.2.1: Red dashed lines denote transitions from each BAL for option 1

Building footprints may be proposed at the building construction stage (subject to s.79BA of the EP&A Act) where separate assessment as described in PBP2006 Addendum Appendix 3 and AS3959-2009 will be applied.

Created lots wholly contained within the BAL-Low area will not be required to meet AS3959-2009 construction standards but may be required to address bushfire issues if their s.149 certificate identifies them as bushfire prone land.

Created lots wholly excluded from the Category 1 and Buffer Zone on the Pittwater will not be identified as bushfire prone properties under the current Pittwater LGA Bush Fire Prone Land Map and as a consequence will not be subject to bushfire regulations.

4.8 Water and services

4.8.1 Explanation

Access to sufficient water supplies may be critical for the effective defence of a property during a bushfire event. Consideration should be given to the distances between hydrants or tanks and the building or asset to be protected.

Planning for Bush Fire Protection 2006 (Table 4.2) provides a specification for onsite water storage capacities where reticulated water is unavailable or unreliable.

4.8.2 Assessment

A 100mm reticulated mains water supply line is currently installed along Mona Vale Road within the road reserve in front of the subject lot.

Hydrants are in place along the existing network. The nearest existing hydrants is on the road reserve in front of property (at intersection with Boundary Road). The development will extend the reticulated mains into the site and meet PBP2006 provisions.

All proposed lots should be within 70m of a hydrant to comply with PBP2006 provisions.

4.8.3 Recommendation

Comply with water supply requirements in 4.1.3 of PBP2006, specifically the location of hydrants within 70m of all parts of each proposed building.

4.9 Access

4.9.1 Explanation

Roads to new developments should facilitate rapid and safe access for fire fighters and emergency services vehicles. These should also permit evacuation of the residential population without obstructing the passage of emergency services vehicles.

Sections 4.1.3(1-3) and 4.2.7 of *Planning for Bush Fire Protection* 2006 detail the requirements for safe access.

4.9.2 Assessment

The existing public access road (Mona Vale Road) meets the specifications of PBP2006. The road is sealed. The cleared width is approx 7m.

The existing public access road (Boundary Street) is a single lane paved road approx. 5m wide without guttering. Any proposal to utilise this road would require upgrading to comply with s.4.1.3 (1) of PBP2006 access standards.

The subdivision masterplan proposes a new road network. Roads will have a minimum paved width of approx. 8m or 4m per lane where lanes are split. The proposed road reserves are designed to accommodate complying roads. All new roads have been designed to comply with PBP2006 access standards.

Access to the four (4) northern lots will be directly off Mona Vale Road and utilise a shared property access road. The road reserve is 6m wide to accommodate a complying driveway.

Option 2 proposes a road linking Boundary Street with Jubilee Ave to the east. This road will be required to meet s.4.1.3 (1) of PBP2006 access standards. A 9m wide paved road is proposed within a 17m wide reserve.

The building envelopes for the proposed lots will be within 70 metres of the road and as such would not necessitate tanker access.

All parts of the proposed building envelopes will be within 70 metres of the public access road which will be less than a 70 speed zone; therefore property access has no specific requirements.

4.9.3 Recommendation

None

4.10 Landscaping

4.10.1 Explanation

The impact of bushfires on property and life can be reduced by the responsible preparation and management of bushfire hazards. Effective strategies will involve maintenance of properties to limit the impact of ember, radiant heat and flame attack.

Appendix 5 of *Planning for Bush Fire Protection* 2006 provides principles for landscaping in bushfire prone areas but provides no specific requirements.

4.10.2 Assessment

The residential lots will be cleared of bushfire hazard vegetation and landscaped as typical urban residential lots (excluding VRC).

The reserves corridor will be managed to APZ standards with a management regime detailed within a Plan of Management.

4.10.3 Recommendation

1. A Plan of Management should be prepared to detail the management regime within the Public Spaces/Reserves to maintain an asset protection zone standard.

2. Landscaping within the road reserves and any other public areas should adopt (where practical) the principles in Appendix 5 of PBP2006:

- Moisture content of leaves should be high (250-400% of dry oven weight)
- Volatile oil content of leaves should be low
- Mineral content of leaves should be high
- Leaves should be thick (broad) with low area to volume ratio
- Density of foliage should be high and less permeable to air flow
- Continuity of plant form should be broken or separated
- Height of lowest foliage above ground should be maximised
- Size of plant should be wide spread rather than tall and narrow
- Dead foliage on the plant should be minimal
- Bark texture should be tight and smooth
- Quantity of ground fuels should be minimised
- Fineness of ground fuels should be minimised
- Compaction ability of ground fuels should be maximised
- Mineral content of ground fuel should be maximised

4.11 Emergency planning

4.11.1 Explanation

The decision to stay and defend a property or to relocate to a safe refuge during the fire should be made early. The most effective way to make and implement this decision is by pre planning. The RFS provide a guideline to assist development of a comprehensive emergency and evacuation management plan.

Special Fire Protection Purposes developments are required to prepare an emergency/evacuation plan that is approved by the RFS as detailed in section 4.2.7 of *Planning for Bush Fire Protection* 2006

4.11.2 Assessment

Not applicable to this development

4.11.3 Recommendation

No additional recommendations

4.12 Threatened species and aboriginal relics

4.12.1 Explanation

Although threatened species and communities or aboriginal relics do not contribute to the bushfire risk they may impose a constraint to the application of bushfire protection measures and bushfire management strategies adopted for the development.

4.12.2 Assessment

No advice regarding threatened species or aboriginal relics was provided for the site.

4.12.3 Recommendation

None

5 Conclusion

This assessment has demonstrated that the proposal meets the performance criteria in PBP2006 by providing minimum setbacks to the bushland to the north, east, south and west. These setbacks are wholly located within the proposed development or within adjacent road reserves and managed properties.

The created lots will be maintained as typical landscaped urban curtilage to satisfy the outcomes for an asset protection zone (excluding VRC). This provides both a suitable APZ and a defendable space about any future proposed dwelling.

The subdivision supports compliance with the access provisions specified within s.4.1.3 (1) PBP2006.

The reticulated mains water supply network will be required to meet s.4.1.3 of PBP2006. Hydrants will need to be located within 70m of proposed buildings.

There are no other bushfire protection measures are required.

5.1 Summary of BPM recommendations

Performance Criteria	Recommendation	Compliance
Max exposure 29kWm^{-2}	None – all lots assessed to receive less	Yes
APZ managed	None - 29kWm^{-2} setback contained onsite or in road reserve and managed adjoining properties	Yes
APZ practical	None - No slopes are inaccessible for maintenance	Yes
Access	None – roads comply with s.4.1.3(1)	Yes
Water	Mains water supply to comply with s.4.1.3 (1) of PBP2006	Yes
Landscaping	Manage lots and road reserve designed as typical urban curtilage	Yes
Emergency	NA	

6 References

Australian Building Codes Board (2011) *Building Code of Australia*. Commonwealth of Australia

Keith D. (2004) *Ocean Shores to Desert Dunes*. Department of Environment and Conservation, Sydney

Rural Fire Service NSW (2005) *Standards for asset Protection Zones*

Rural Fire Service NSW (2006) *Planning for Bush Fire Protection*

Standards Australia (2009) AS3959 *Construction of buildings in bushfire-prone areas*

Footprint Green Pty Ltd
Arboricultural, Environmental & Horticultural Consultants
5 Watkins Road, Avalon Beach, NSW 2107
Email: mail@footprintgreen.com.au
Ph: (02) 99188877
Fax: (02) 99188876
ABN 34 097 138 817

16th June 2011

Mr Sam Mustaca
Vogue Agency
4 Vuko Place

WARRIEWOOD NSW 2102

Dear Mr Mustaca,

Re: Comments in Reply to Pittwater Council's Concerns – N0052/11 - 4 Boundary Street, Warriewood (Lot 2 DP 816070), 10 Jubilee Avenue, Warriewood (Lot 10 DP 5055) Construction of a new private road to access 120 Mona Vale Rd Warriewood

In response to your request to review Pittwater Council's concerns raised in the Report to the Development Unit, dated 06 June 2011, the following information is provided.

Council concerns – road kill

"Based upon the assessment criteria, it was considered that the proposed development would not have a significant impact on threatened species, subject to the adoption of several recommendations listed on Page 60 of the report. All discussion and recommendations within the report are supported. However, the report makes no mention of the potential impact of road kill caused by the expected increase in traffic on the proposed road which will bisect the forested area"

Comment

The impact of the vehicle movements and potential for the road kill of native fauna is expected to be similar to that associated with many local roads in the Ingleside area and is expected to be less that that associated with the thoroughfare roads such as Lane Cove Road and the upper sections of Powder Works Road. The potential for native fauna road kill is expected to be substantially less than that associated with Mona Vale Road where there are higher volumes of traffic travelling at higher speed limits.

The movement of native fauna is influenced by the types of the adjacent habitats and development. On the southern side of the proposed road, towards Jubilee Ave, the adjacent land consists of a commercial / industrial complex which contains no natural habitats. Therefore there are no expected faunal movements across the proposed road towards in the lower sections towards Jubilee Avenue. On the southern side of the proposed road, towards Boundary Street, the adjacent property contains open grass areas with isolated trees and beyond this there are natural bushland habitats.

The fauna that potentially could be subject to road kill are ground dwelling mammals such as Long-nosed Bandicoot (*Perameles nasuta*) and Swamp Wallaby (*Wallabia bicolour),* and arboreal mammals such as Common Brushtail Possum (*Trichosurus vulpecula*), Common Ringtail Possum (*Pseudocheirus peregrinus*). Reptiles & amphibians such as Black-bellied Swamp Snake (*Hemiaspis signata*) and Striped Marsh Frog (*Limnodynastes peronii*) are less likely to be affected and bird road kills are scarce.

The proposed road will only service a limited number of dwellings and is not a thoroughfare linking large suburban areas. Its is expected that speed limits would typically be 50km /hr and fauna movements would also be influenced by the adjacent habitats and developments. Taking this into account the potential level of road kill would expected to be low and less than that associated with Lane Cove Road

at Ingleside and substantially less than Mona Vale Road. It is considered that the proposed road would not create a significant "population sink" affecting the local fauna populations.

Council concerns – tree loss
The assessment and determinations of the arborist report are supported, however there are a number of issues. The loss of 85 protected trees from the area is considered to be a significant impact, particularly with the high proportion of trees of either Significant or High landscape significance.

Seven (7) trees are recommended for removal from the Council road reserve on Boundary Street which are located south and west of the proposed new road where it meets the existing Boundary Street, and it is unclear as to why this is necessary. Discussions with Council's Road and Traffic Engineer have come to the same conclusion that this small section of road heading south from the intersection is unnecessary and unjustified at this point in time, therefore the removal of the seven trees in this area is unnecessary.

Comment
With construction of the proposed road there will be some tree loss. The extent of tree loss and impact on adjacent trees has been considered in accordance with the Australian Standard for Protection of Trees on Development Sites, AS 4970 – 2009 and is detailed in the Arboricultural Impact Assessment (Footprint Green, 21/01/11).

In reviewing the proposed road, the 7 trees within Boundary Street (Tree No's 60, 82, 1057, 1058, 1059 & 1060) road reserve could be retained if the Boundary Street intersection was not proposed. Depending upon the subdivision configuration and road layout these 7 trees may not need to be removed. Therefore it may be prudent to consider these trees in conjunction with the proposed development masterplan for 120 Mona Vale Road rather than this application.

Council concerns – tree loss & road design
" The Council engineers have also indicated the proposed road should be required to be designed to the local road specifications of the WVRMP and adjust the levels of the intersection. The cuts will therefore be around 5.5 m deep and overall width of area directly impacted by construction works (not including significant trees outside this area whose roots would be affected and maybe necessitate their removal , maybe another 6 m either side of the road) would be approximately 25 m . They would not be able to narrow down the WVRMP dimensions to stay within the 20m road reserve as currently proposed. Therefore the overall impact on canopy trees is unknown however is highly likely to be greater than that currently indicated by the arborist report which bases its assessment on the 20m road width."

Comment
Not being engineers we are not in a position to provide comment on the adequacy of the road design.

Council concerns – tree loss & visual impact
"In terms of visual impact, the proposal is considered to cause a highly detrimental visual impact with a long straight swathe of vegetation and tall canopy trees removed. This combined with the required cut to attain the necessary road gradient will leave a massive empty corridor with high steep embankments which cannot be effectively screened and this will be prominent from a landscape perspective particularly when viewed from Jubilee Avenue".

Comment
We believe that the visual impact of the proposed road is subject to the design of the road which takes into account the site constraints and compliance with engineering criteria. Whilst the lower portions of the proposed road will be visually apparent from Jubilee Avenue looking west, the proposed road has been designed with a "dog leg" offset, to retain vegetation as a backdrop which will also provide a continuous tree line when viewed from the broader landscape.

Should you or others require clarification of any comments made in this correspondence please do not hesitate to contact us on 9918 8877.

Yours sincerely

Melanie Howden
Director & Principal Arboriculturalist

Yours sincerely

Mark Couston
Director & Principal Ecologist CPESC

glendinning minto & associates p/l
planning & development control consultants abn 68 091 465 271

STATEMENT OF ENVIRONMENTAL EFFECTS

CONSTRUCTION OF A PRIVATE ROAD

10 JUBILEE AVENUE & 4 BOUNDARY STREET, WARRIEWOOD

On behalf of
Opera Developments P/L

February 2011

www.glendinningminto.com.au
address: 14/265-271 pennant hills road, thornleigh postal address: po box 225 thornleigh 2120
telephone: 9875 4788 facsimile: 9875 4799 e-mail: planning@glendinningminto.com.au

STATEMENT OF ENVIRONMENTAL EFFECTS

Construction of a Private Road

10 JUBILEE AVENUE & 4 BOUNDARY STREET, WARRIEWOOD

Prepared under instructions from

Opera Developments P/L

Glendinning Minto & Associates Pty Ltd ABN 68 091 465 271
Planning & Development Control Consultants
14/265-271 Pennant Hills Road
Thornleigh NSW 2120
Tel: (02) 9875 4788
Email: planning@glendinningminto.com.au

TABLE OF CONTENTS

1. INTRODUCTION

This Statement of Environmental Effects accompanies a Development Application lodged on behalf of Opera Developments P/L. The proposal seeks approval for the construction of a private road over parts of land known as 10 Jubilee Avenue & 4 Boundary Street, Warriewood.

The consent of both property owners is provided in support of the subject application.

The subject application is made in response to a resolution of the Council who on the 18th September 2006 formally resolved to include land known as 120 Mona Vale Road, Warriewood within the Warriewood Land Release for the purpose of residential development on the basis that *"the applicant, his advisors and Council staff consult as to the land capability, the potential yield and the securing of adequate access for the site."*

This application seeks to provide adequate access to the site known as 120 Mona Vale Road, Warriewood.

In assessing this application consideration has been given to the following documents:

- *Environmental Planning & Assessment Act 1979, as amended*
- *Pittwater Local Environmental Plan 1993*
- *Pittwater 21 Development Control Plan*

In addition to this Statement of Environmental Effects, the proposal is described in the following documentation:

- Site Survey Plan prepared by Mepstead & Associates P/L, Reference No.4034 and dated 26/11/10;
- Proposed Road Design prepared by Mepstead & Associates P/L, Reference No.4034, Sheets 1 to 4 and dated 23/12/10;
- Arboricultural Impact Assessment Report prepared by Footprint Green P/L and dated 21/1/11;
- Flora & Fauna Assessment Report prepared by Footprint Green P/L and dated 29/2/11;
- Traffic Report prepared by TAR Technologies and dated February 2011.
- Report on Geotechnical Investigation prepared by Crozier Geotechnical Consultants, Project No. 2011-023 and dated February 2011.

This Statement describes the subject site and the surrounding area, together with the relevant planning controls and policies relating to the site and the type of development proposed. It provides an assessment of the proposed development against the heads of consideration as set out in Section 79C(1) of the Environmental Planning and Assessment Act 1979.

As a result of that assessment it is concluded that the development of the site in the manner proposed is considered to be acceptable and is worthy of the support of the Council.

2. THE SITE

The lands the subject of this application are identified as Lot 10 in DP 5055 and which is known as 10 Jubilee Avenue, Warriewood and Lot 2 in DP 816070 and which is known as 4 Boundary Street, Warriewood. Access to Jubilee Avenue is provided via Ponderosa Parade to the east. Boundary Street is currently not provided with any direct access to a public road with access to Mona Vale Road having previously been closed. Access to Boundary Street is currently provided via a right of carriageway over the existing access driveway to 10 Jubilee Avenue, although noting that this right of carriageway is limited by the terms of an existing 88B Instrument.

Site Location Plan

The land at 10 Jubilee Avenue is currently occupied by the Uniting Church and contains a number of buildings comprising a church, child care centre and recreation centre and carparks and which are set within a generally bushland setting. The portion of that site to be occupied by the proposed road is undeveloped and contains indigenous vegetation. This portion of the site is generally moderate to steeply sloping and falls towards Jubilee Avenue. The site then becomes gently undulating towards its centre at which point the proposed road transfers across onto the land known as 4 Boundary Street.

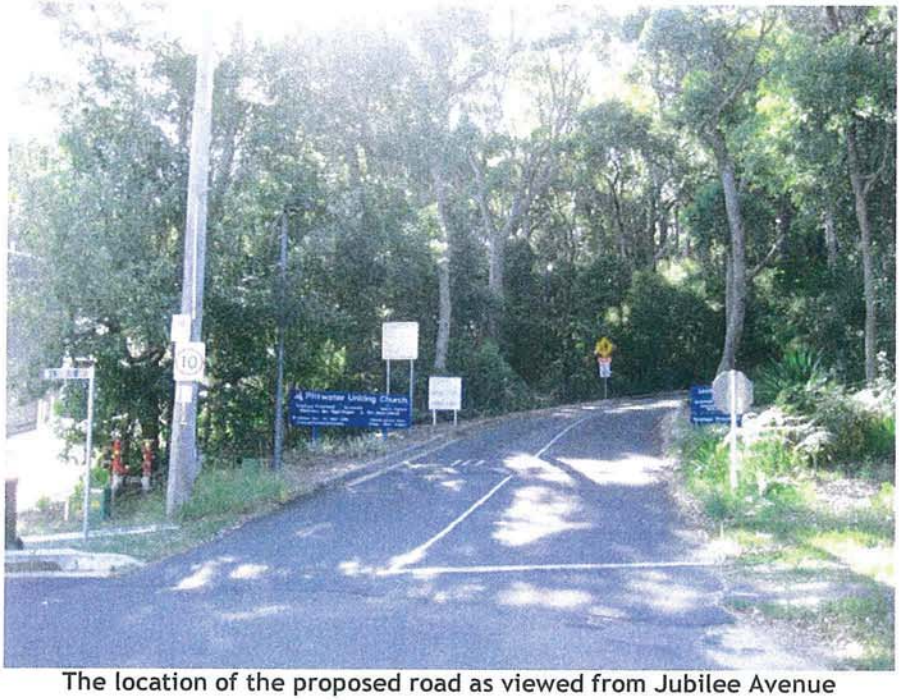
The land at 4 Boundary Street upon which the proposed road is to be erected is also gently undulating and comprises an altered landscape comprising of a horse exercise yard, mown lawns and individual tree specimens. A dwelling house and ancillary structures are also located upon this property towards its south eastern corner.

An aerial view of the subject sites

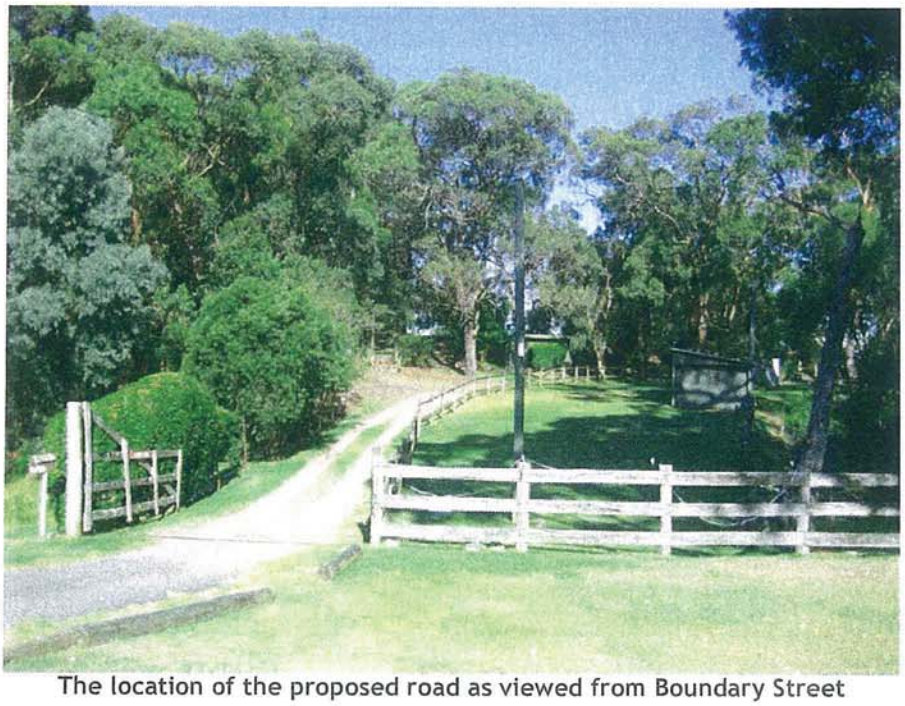
An assessment of the subject sites in relation to existing vegetation and potential flora and fauna issues has been undertaken by Footprint Green P/L. Their reports form part of the information accompanying this application.

In relation to the issue of tree removal their report found that the proposed road construction would result in the removal of a total of 88 trees of which 52 were identified as having a landscape significance of Moderate or Less with the remaining 36 trees comprising of 19 High landscape significant trees and 17 Significant landscape significant trees. In addition to the above their report notes that the subject sites both support a considerable number of trees many of which are beyond the influence of the development proposal.

As detailed an assessment of the sites has also been undertaken by Footprint Green to determine whether the proposed road construction will result in any significant impacts upon flora and fauna. In this regard that report found that subject to the adoption of a number of recommendations that the proposal would not result in any unreasonable flora or fauna impacts.



The location of the proposed road as viewed from Jubilee Avenue



The location of the proposed road as viewed from Boundary Street

3. THE SURROUNDING ENVIRONMENT

The area surrounding the subject sites as evidenced in the aerial photograph below and the extract from Council's Zoning Map contained at Section 5 of this report comprises a range of land uses. Those land uses are generally as follows:

North	3(e) Office Business E - Currently Vacant
West	1(a) Non Urban - 120 Mona Vale Road
South	1(b) Non Urban & 4(b) Light Industrial
East	4(b) Light Industrial

Of additional note is that further to the south east of the site exists a number of existing light industrial/warehouse developments with a number of existing and proposed small lot housing estates located beyond these.

4. THE PROPOSAL

The proposal seeks approval for the construction of a new private road. The proposed roadway is to be located within a right of carriageway to be created over each of the subject allotments. The right of carriageway once created will be in favour of 120 Mona Vale Road and will provide access for vehicles with unrestricted access from Jubilee Avenue to Boundary Street and then in turn to 120 Mona Vale Road.

The road as detailed on the accompanying plans prepared by Mepstead & Associates is to have a carriageway width of approximately 9m with a total right of carriageway width of 17m comprising of a 4m landscape/buffer zone located on either side.

Retaining walls required to accommodate the proposed road construction will be generally located adjacent to the extremities of the right of carriageway.

It is advised that the proposed road is required:

1. So as to provide appropriate access to 120 Mona Vale Road, Warriewood noting that additional/increased access to that site from Mona Vale Road is not permitted.
2. So as to provide appropriate access to 120 Mona Vale Road, Warriewood noting that Boundary Street has been closed at its intersection with Mona Vale Road.
3. So as to provide appropriate access to 120 Mona Vale Road, Warriewood noting that 120 Mona Vale Road can currently only be accessed via a right of carriageway over the existing Uniting Church driveway. Such access is limited by the terms of the existing Section 88B Instrument and existing physical limitations such as speed humps and other traffic calming devices.

It is also advised that the proposed road is required so as to allow for the orderly and economic development of the adjoining property at 120 Mona Vale Road as reflected by the resolution of the Council who on the 18th September 2006 formally resolved to include land known as 120 Mona Vale Road, Warriewood within the Warriewood Land Release for the purpose of residential development on the basis that *"the applicant, his advisors and Council staff consult as to the land capability, the potential yield and the securing of adequate access for the site."*

5. ZONING AND DEVELOPMENT CONTROLS

The proposed development is identified as local development under the provisions of the Environmental Planning and Assessment Act 1979, as amended. The following is an assessment of the proposal against the relevant provisions of the Act and all of the relevant planning instruments and policies of Pittwater Council.

5.1 Pittwater Local Environmental Plan 1993

The subject lands are both zoned 1(b) Non-Urban B under the provisions of the Pittwater Local Environmental Plan 1993.

Extract from Council Zoning Map

Under the development control table contained at Clause 9 of the LEP the construction of a private road is considered to be permissible with the consent of Council as an innominate use.

There are no other provisions of the Pittwater LEP 1993 which are considered to be specifically applicable to the proposal.

5.2 Pittwater 21 Development Control Plan

Council's Pittwater 21 DCP applies to the subject site and the proposed development. An assessment of the DCP has been undertaken and it is considered that Part B (General Controls), Part C (Design Criteria) and Part D14 Warriewood Locality Statement apply to the construction of a proposed private road upon the site. These controls form the primary criteria and controls for development within the subject locality.

The following is an assessment of the proposal against the relevant provisions of the DCP.

Part B General Controls

B1.3 Heritage Conservation

It is not considered that there are any items of heritage significance located on or adjacent to the subject sites and which would be impacted upon by the proposal.

B1.4 Aboriginal Heritage Significance

It is not considered that there are any items of aboriginal heritage significance located upon the sites and which would be impacted upon the proposal. In this regard it is noted that detailed inspections of the site have been undertaken as part of the preparation of the site survey plan, the arboricultural report and the flora and fauna report none of which identified any items of significance.

B3 Hazard Controls

The subject site is identified as being affected by the following hazards:

B3.1 - Landslip

The subject site is identified as partly containing Geotechnical Hazard Zone - H1.

An assessment of this constraint has been undertaken by Crozier Geotechnical Consultants. That report within its conclusion found that:

> *The existing site has been assessed as per the AGS 2007 and Pittwater Council interim Geotechnical Risk Management Policy 2009 and achieves the "Acceptable" risk criteria in its current state. It is therefore suitable for the proposed development and can continue to achieve the "Acceptable" risk criteria required by Council's Policy during and following the proposed new*

road development provided that any recommendations outlined in this report are followed.

B4.18 Heathland/Woodland Vegetation

The subject lands are identified as containing heathland/woodland vegetation.

An assessment of the sites in relation to proposed tree removal and flora and fauna issues has been undertaken by Footprint Green P/L.

In relation to the issue of impact upon threatened species and the like their report within its conclusion states that:

Based upon the assessment criteria outlined in Part 1, section 5A of the Environmental Planning and Assessment Act 1979 (NSW) it is considered that the proposed development will not have a significant impact on threatened species listed in the schedules of the Threatened Species Conservation Act 1995 (NSW) provided that the following recommendations are implemented.

To minimise the impact on the local ecology and threatened species, populations & communities it is recommended that:

(a) All trees not identified as being removed in the arboricultural report (Footprint Green, 2011) are to be retained and protected prior to and during construction.

(b) All vegetation with the exception of noxious and environmental weeds within 2m of the proposed development footprint is to be protected and retained prior to and during construction.

(c) All noxious and environmental weeds within 10m of the proposed works and within the works areas are to be removed using standard bush regeneration techniques.

(d) The nest / roosting boxes currently on the site are to be relocated to trees that are to be retained within the allotment known as 10 Jubilee Avenue.

(e) An additional 3 microchiropteran bat roosting boxes are to be installed in trees to be retained within allotment known as 10 Jubilee Avenue

(f) Subject to engineering designs where earthen road batters are constructed they shall be revegetated using species currently recorded on the site.

On this basis it is my opinion that the proposal will not result in any unreasonable impacts upon existing vegetation communities or the like.

B6.2 Access Driveways & Works on the Public Road Reserve

All works are to be carried out in accordance with the requirements of the Council.

B6.4 Internal Driveways

The proposed private road has been designed so as to comply with the requirements of the Council together with the requirements of the applicable Australian Standards.

B8.1 Construction & Demolition - Excavation and Landfill

This clause aims to ensure that site disturbance is minimised. In this regard the development is located with appropriate setbacks to all boundaries so as to ensure that the excavation has no impact on adjoining properties. It is also considered that tree removal proposed as part of this application is acceptable having regard to the significance of the trees proposed for removal and the significant numbers of trees to be retained elsewhere on the property.

B8.2 Construction & Demolition - Erosion and Sediment Management

This clause aims to protect waterways, coastal areas, watercourses, drainage systems and the public domain from the transportation of sedimentation.

Erosion and sedimentation controls will be installed prior to commencement of works on site in accordance Council requirements.

Part C5 - Design Controls for Other Development

The proposal is considered to be capable of compliance with the applicable design controls of Council.

It is not considered that there are any specific controls applicable to this development.

Part D - Locality Specific Controls

D14 Warriewood Locality

The proposed construction of a private road upon the subject allotments in the manner proposed will in my opinion result in development which it is considered to be consistent with surrounding development and the outcomes envisaged for this locality.

D14.1 Character as Viewed from a Public Space

It is considered that the proposed development which will result in the construction of a private road upon the sites will be visible from each of the respective street frontages. It is considered that such an outcome will be consistent with the appearance and form of the existing roads which they will adjoin and in this regard will not unreasonably impact upon the character of the locality when viewed from a public space.

It is noted that the proposal will result in a the removal of a number of trees from the properties however it is not considered that the proposed tree removal will result in any unreasonable impacts upon either the environment or upon the character of the locality.

6. SECTION 79C(1) ASSESSMENT

Environmental Planning Instruments - Section 79C(1)(a)(i)

The subject site is zoned Rural 1(b) under the provisions of the Pittwater Local Environmental Plan. The construction of a private road upon the lots is permissible with the consent of Council as an innominate use. The proposal has been assessed against the objectives and provisions of both the Pittwater Local Environmental Plan and Pittwater DCP 21 as detailed within this report. In this regard it is considered that the proposal generally satisfies the requirements of both documents.

Any Draft Environmental Planning Instrument - Section 79C(1)(a)(ii)

There are no draft Environmental Planning instruments applicable to the subject site.

Impacts of the Development - Section 79C(1)(b)

It is my opinion that the proposed construction of a private road will not result in any unreasonable impacts.

In forming this opinion the following specific comments are made.

Tree Removal

A detailed assessment of the proposal in relation to its impact upon existing trees has been undertaken by Footprint Green P/L.

Based upon their report it is not considered that the proposed removal of trees from the site associated with the proposed road construction will result in any unreasonable impacts. In forming this opinion it is noted that of the total of 88 trees proposed to be removed that 52 are identified as having a landscape significance of Moderate or Less with the remaining 36 trees comprising of 19 High landscape significant trees and 17 Significant landscape significant trees. In addition to the above it is noted that the subject sites both support a considerable number of trees many of which are beyond the influence of the development proposal.

Flora & Fauna Impacts

It is also noted via the Flora and Fauna Report prepared by Footprint Green P/L that the proposal will not result in any unreasonable flora or fauna impacts.

Traffic

A detailed assessment of the traffic impacts associated with the proposed road and in particular its relationship to the surrounding land uses and road network has been undertaken by TAR Technologies. Importantly in terms of assessing the impact of the road and its future use it is noted that TAR have based their findings on the adjoining land at 120 Mona Vale Road supporting a dwelling yield of 104 dwellings.

Based upon their findings it is my understanding that:

1. The proposed road will not unreasonably interfere with the surrounding road network or land uses, and
2. The proposed road and surrounding road network are capable of supporting a minimum dwelling yield upon the adjoining 120 Mona Vale Road of 104 dwellings.

Suitability of the Site - Section 79C(1)(c)

The subject sites are considered to be suitable for the proposed road construction given that both owners have consented to the proposed development and given that the construction of a private road is permissible with the consent of the Council.

It is also noted that the proposed road construction will not result in any unreasonable impacts and will allow for the potential future redevelopment of the adjoining land at 120 Mona Vale Road consistent with the objectives of the Council.

Public Interest - Section 79C(1)(e)

It is considered that the proposed construction of a private road upon the subject sites is in the public interest as it will provide an opportunity for the potential future redevelopment of the adjoining land at 120 Mona Vale Road for residential purposes consistent with the objectives of the State Government and Council in a manner which will not result in any unreasonable impacts.

7. CONCLUSION

The proposed development is Local Development under the terms of the Environmental Planning and Assessment Act 1979 and has been assessed against the requirements of Section 79C(1) of the Act, the Pittwater Local Environmental Plan and Council's policies including DCP 21. In this regard it is considered that this Statement of Environmental Effects has demonstrated that the proposal satisfies the aims and objectives as well as the prescriptive requirements of the above controls.

It is considered that the proposal will not unreasonably impact upon the amenity of adjoining properties or upon the character of the surrounding area.

It is my opinion that this proposal for the construction of a new private road upon property at 10 Jubilee Avenue and 4 Boundary Street, Warriewood is worthy of the support of Council.

Andrew Minto
Graduate Diploma (Urban & Regional Planning), Associate Diploma (Health & Building Surveying). CPP, MPIA, MAIBS.
GLENDINNING MINTO & ASSOCIATES PTY LTD
February 2011

PRIVATE ROAD TO
120 MONA VALE ROAD;
WARRIEWOOD

Traffic Report

For:
ROY MUSTACA

February 2011

2010326rp6.doc

Report No. 2010326rp5.doc

This report has been prepared in accordance with the scope of services described in the contract or agreement between TAR Technologies Pty Ltd ACN 099 564 995 (TAR) and the Client. The report relies upon data, surveys, measurements and results taken at or under the particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client and TAR accepts no responsibility for its use by other parties.

t 02 9614 7449
f 02 9639 2696
m 0419 338 081
e tartech@tpg.com.au
p PO BOX 67
Northmead 2152

TABLE OF CONTENTS

Page No.

Chapter 1

INTRODUCTION

TAR Technologies Pty Ltd (TAR) has been commissioned by Roy Mustaca to assess the layout of a proposed private road to provide alternative access to 120 Mona Vale Road, Warriewood.

Access to 120 Mona Vale Road, Warriewood land is currently available via an existing roadway which also services Treetops Preschool, Pittwater Uniting Church and a sport and recreational centre. This study examines a proposal to provide an alternative access road around the church to the subject site.

The assessment has considered the potential traffic generation of 120 Mona Vale Road which is currently vacant.

The traffic report has been prepared with reference to generations contained within the Roads and Traffic Authority's (RTA) *Guide to Traffic Generating Developments*.

Chapter 3

PRIVATE ROAD PROPOSAL

A new private road is proposed from Jubilee Lane, at Jubilee Avenue extending west for 200 metres until it meets Boundary Road. The proposed road would have a 17 metre road reserve with a pavement measuring 9 metres wide.

Jubilee Lane, which connects to Boundary Street, is a six metre wide road that services the Pittwater Uniting Church, a preschool and a sport and recreation centre.

Boundary Street runs in a north-south direction in an undulating and narrow manner. It will meet the proposed private road at right angles and currently provides access to a single dwelling to the south. It does not connect to Mona Vale Road.

3.1 EXISTING TRAFFIC

Intersection turning movement surveys were undertaken at the intersection of Jubilee Lane and Jubilee Avenue between 8:00 - 9:30am and 2:30 - 5:30pm on Thursday 1 December 2005. Survey results indicate that the highest peak hour volumes occur in the mornings between 8:15 - 9:15am and in the afternoon between 3:00 - 4:00pm. These time periods are referred to in the assessment as the AM and PM peak hour periods.

3.2 MID BLOCK PERFORMANCE

Mid block flows for the four approach legs of Jubilee Avenue and Jubilee Lane intersection have been calculated from the survey data collected for the AM and PM peak hour periods.

The existing mid block performance of the Jubilee Avenue and Jubilee Lane traffic routes on the direct approach to the development site, have been assessed by comparing existing traffic volumes with the environmental capacity of the road carriageway. Environmental capacity (EC) has been adopted by both the RTA (1993) and DUAP (1992) for density and land use planning on minor roads. It is not related to the physical capacity of the road network, but is a measure of the volume of traffic that a local or collector road can carry before residential amenity and pedestrian safety start to be significantly reduced.

The EC of a street is a function of its road geometry, speed, frontage land use, road surface, and building setbacks. The RTA provides general guidelines for appropriate traffic volumes (Guide to Traffic Generating Developments, 1993), and these are widely used in the analysis of traffic impacts. More specific values of EC can be determined when the individual characteristics of a road are known. The parameters to calculate environmental capacity are listed in the RTA's Guide to Traffic Generating Developments under:

- Traffic characteristics
- Road characteristics
- Locality characteristics

The work of Song (1993) can be used to assess the environmental capacity of an individual road. Song's method considers variations in road width, pedestrian safety and delay, and traffic noise. It incorporates the factors affecting environmental capacity described in the RTA guidelines.

Once the EC of a street has been calculated, it is possible to assess the level of traffic overload which may exist, expressed as an Environmental Deficiency Index (EDI), by consideration of the actual traffic flow on the street. The EDI is the ratio of actual traffic volume to EC.

Where the EDI value is less than 1.0, it may be considered that no environmental detriment due to traffic volume exists. Where the EDI equals or exceeds 1.0, environmental degradation is occurring.

Roads near the site that provide direct access to local properties include Jubilee Avenue and Jubilee Lane. The peak hour flows recorded in December 2005, the environmental capacities and their ratios, are summarised in *Table 3.1*. The results show that the existing volumes are well below the roads' environmental capacities and below the level where community dissatisfaction might to develop.

Table 3.1 ENVIRONMENTAL CAPACITY - EXISTING SITUATION

Street	Peak traffic flow (vehicles per hour)	Environmental capacity (vehicles per hour)	EC ratio
Jubilee Avenue (west of Ponderosa)	283	409	0.69
Jubilee Avenue (east of Ponderosa)	289	367	0.79
Jubilee Lane	103	320[1]	0.32

Notes: 1. Assumes 50/50 distribution and one parking hindrance.

3.3 INTERSECTION PERFORMANCE

In addition to the mid block performance assessment described in the preceding section, the operation of Jubilee Avenue/Jubilee Lane and the proposed road has been assessed based on physical capacity considerations, using the aaSIDRA (or SIDRA) junction modelling program. The program reports on the performance of the junction in terms of the average delay and Level of Service (LOS), for each individual junction movement.

The LOS reported by SIDRA is related to the average delay, measured in seconds/vehicle (sec/veh) experienced by vehicles waiting to perform a movement. *Table 3.2* sets out the criteria.

Table 3.2 INTERSECTION LEVEL OF SERVICE CRITERIA

LOS	Average delay (secs/veh)	Traffic signals, roundabout	Give way and stop signs
A	Less than 14	Good.	Good.
B	15 to 28	Good, with acceptable delays and spare capacity.	Acceptable delays and spare capacity.
C	29 to 42	Satisfactory.	Satisfactory, but accident study required.
D	43 to 56	Satisfactory, but operating near capacity.	Near capacity and accident study required.
E	57 to 70	At capacity and incidents will cause excessive delays; roundabouts require other control mode.	At capacity and requires other control mode.
F	Greater than 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode.

Adapted from RTA Guide to Traffic Generating Developments, 1993

3.3.1 Jubilee Avenue/Jubilee Lane

SIDRA results for Jubilee Avenue/Jubilee Lane are summarised in *Table 3.3*

Table 3.3 JUBILEE AVENUE/ JUBILEE LANE - EXISTING SITUATION

Approach	AM		PM	
	Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
Jubilee Avenue (east)	8.3	A	8.2	A
Jubilee Lane	7.9	A	8.2	A
Jubilee Avenue (south)	8.8	A	9.5	A

The results for peak hours show that all approaches operate at a "GOOD" level of service with only minor delays currently experienced.

Chapter 4

IMPACTS OF NEW ROAD

4.1 GENERAL

120 Mona Vale Road is triangular in shape covering approximately 11.33 hectares. Vehicular access to the property is currently only available from Jubilee Lane. At present the site is zoned Non-Urban 1(a) under the Pittwater Local Environmental Plan 1993.

Assuming 104 single dwelling allotments could be accommodated on this land, a proposed private road has been designed to accommodate potential traffic generations. This road would prevent future traffic to 120 Mona Vale Road interfering with traffic movements and other activities in Jubilee Lane as it will be exclusively for residential vehicles. Jubilee Lane would remain clear for other traffic.

As seen in the detailed site plan in Appendix A, the proposed road will join Jubilee Lane near Jubilee Avenue on the easterly side, and run approximately 233 metres west connecting with 2 Boundary Street. It is envisaged that the proposed road would be controlled by a STOP or Give WAY sign.

4.2 TRIP GENERATION AND DISTRIBUTION

Based on the RTA Guide to Traffic Generating Developments (1993) the potential traffic generation of the proposed development at 120 Mona Vale Road is estimated at 89 trips per weekday peak hour, based on 0.85 trips per dwelling for 104 lots.

Traffic generation associated with the rezoning to allow 104 lots is based on the assumption that one hundred percent of trips leaving the site in the morning would travel along the proposed road to Jubilee Avenue in an easterly direction and one hundred percent of trips in the afternoon would travel in a westerly direction.

There may be occasions where a small proportion of trips would travel against the peak direction however, for the purposes of the assessment, the worst case scenario has been assumed, i.e. one hundred percent.

It is expected that traffic leaving and entering the site would generally occur in the morning peak of 7:00 - 8:00am to allow commuters sufficient time to arrive at their

destination before 9:00am. Similarly the afternoon arrival time to the site would occur between 6:00 - 7:00pm.

Consequently these times are generally outside the operating hours of the preschool (open from 9:00am - 3:00pm, Monday – Friday), and the activities of the sport and recreation centre and the church.

The addition of the proposed private road will separate any of the new traffic to the site, thereby maintaining the existing road environment.

4.3 IMPACTS OF THE DEVELOPMENT ON THE EXISTING ROAD NETWORK

To assess the environmental capacity of the nearby local street network, the additional traffic generated by the site has been added to the existing traffic volumes. The results of the assessment are contained in *Table 4.1*

Table 4.1 ENVIRONMENTAL CAPACITY - FUTURE SITUATION

Street	Peak traffic flow (vehicles per hour)	Environmental capacity (vehicles per hour)	EC ratio
Jubilee Avenue (west)	372	409	0.91
Jubilee Avenue (east)	309	367	0.84
Jubilee Lane	103	320	0.32
Proposed road	89	223	0.40

The table indicates additional traffic from the proposed redevelopment of the site would not be detrimental to road safety and amenity in Jubilee Avenue or the proposed road. The forecast volumes remain below the environmental capacity of the roads.

4.4 INTERSECTION PERFORMANCE

To assess the future operation of the proposed road and Jubilee Avenue/Jubilee Lane/proposed road, the SIDRA model has been rerun incorporating the additional traffic generated by the development. The results of the analysis are contained in *Table 4.2*

Table 4.2 JUBILEE AVENUE/JUBILEE LANE/PROPOSED ROAD - FUTURE SITUATION

Approach	AM		PM	
	Average delay (sec/veh)	LOS	Average delay (sec/veh)	LOS
Jubilee Avenue (east)	8.7	A	5.9	A
Jubilee Lane	7.9	A	8.2	A
Proposed road	7.2	A	9.2	A
Jubilee Avenue (south)	10.0	A	10.5	A

Chapter 5

CONCLUSIONS

This traffic study assessed the impacts of providing a new private road servicing 120 Mona Vale Road. The assessment was carried out in accordance with generations contained within the RTA's Guide to Traffic Generating Developments. The findings of the study are summarised below.

- Jubilee Lane is currently the only road available to access vacant land at 120 Mona Vale Road. It also provides access to a Church, preschool and a single dwelling.

- The proposal includes the construction of a private road used exclusively by future residents of 120 Mona Vale Road. The road will allow residents' vehicles to drive to Boundary Road without needing to access Jubilee Lane.

- For the purposes of assessing the adequacy of the proposed road, it was assumed that the site area could accommodate a minimum of 104 single dwellings which would generate 89 trips per hour during the morning and afternoon commuter peak periods.

- The impact of this traffic on the proposed junction of the new road and Jubilee Lane has been assessed for the AM and PM peak hour periods. The results indicate the additional traffic will have a negligible impact on the existing operation of Jubilee Lane and that the site has the potential to accommodate more than 104 dwellings.

- The proposed road ensures that any development of 120 Mona Vale Road would not impact on Pittwater Uniting Church, Treetops Preschool and other nearby amenities off Jubilee Lane.

- The environmental capacity, which is a measure of road safety and amenity, has been considered in the study for the proposed road, Jubilee Lane and Jubilee Avenue. The results show that future traffic volumes are within the roads' environmental capacity, which is acceptable.

In summary, with the addition of the new road to service the development, there are no significant traffic issues that could preclude the construction of the proposed road.