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Vegetation Community Assessment of Bushfire hazard in central and eastern section of Lot 17/DP 1210621, for proposed Seniors Living development site:

Lot 17/DP 1210621
2 Caliope Street, Kiama NSW 2533
Kiama Municipal Council LGA

Prepared for:

Graham Werry
(WERITON PROPERTIES)

January 2019
Updated November 2019

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BUSINESS PROFILE

Principal – Andrew Horton

- Accredited Biodiversity Assessment Method Assessor. Accreditation Number: **BAAS19012**
- Bachelor of Applied Science in Urban Horticulture. This degree is environmental and ecology based and provided training in fauna and flora assessment, survey methodology and techniques and covered units of competency with equivalency to Level 5 Arboriculture certification for tree risk assessment and reporting.
- Planning for Bushfire Prone Areas Post-Graduate Certificate. Assessment of the Legal issues and Requirements of AS 3959 (Buildings in Bushfire Prone Areas). National Accreditation in Burn planning and Burn Implementation.
- Fire Management Plans (Hazard Reduction and Reserve Management- TYPE 2) for NPWS, OEH.
- Coastal Resource Management Post-Graduate Certificate. Including GIS and Resource Management.
- Bush Regeneration Supervisors Certificate.
- Horticulture Certificate IV.
- Employed in various roles with NSW, NPWS (OEH) including Senior Technical Officer (Scientific), Ranger and Acting Area Manager. Prepared and implemented: **Park Reserve Plans of Management, Plans of Management (various),** for restoration of bushland and bushfire fuel management in the Sydney Basin, and NSW North Coast for National Parks and Wildlife Service (1995 to 2015); and **Fire Management Planning** - Hazard Reduction and Reserve Management (TYPE 2) for NPWS, OEH in SYD, NNC bioregions.
- Consulting on Environmental and Ecological matters to Bushfire Professionals undertaking assessments and reporting on Compliant Development within Bushfire Prone Lands (Planning for Bushfire Protection), eg: *Bushfire Vegetation & Fire Management Zone Plan, Proposed Redevelopment of the Australian Institute of Police Management, Collins Beach Rd Manly (20/07/08).* Prepared for GEOSPATIAL INTEGRITY PTY LTD.

- 40 yrs experience conducting Flora and Fauna surveys supporting:
  - Comprehensive surveys of National Park Estate and native environments (NSW North Coast, Sydney Basin, South East Coast, South East Highlands);
  - Contributed to listing of *Herbivory and environmental degradation caused by feral deer* as a key threatening process;
  - Reviews of Environmental factors for NSW, NPWS;
  - Environmental Management Plans; Bushland Restoration; Pest and Weed management; Fire Planning; Precinct Planning and Infrastructure construction in natural environments (eg: Burragorang Lookout, Burragorang SCA, and Pebbly Beach Camping, Yuraygir NP precinct for NSW NPWS).

- Experience with the assessment, recording, preservation, repatriation and rehabilitation of aboriginal and cultural heritage sites of significance.

- Restoration ecologist developing and implementing Bushland and Environmental Management Plans for public reserves/open space for Councils in the greater Sydney Basin and various Sydney Metropolitan Councils, (1985 to 1996). Plan of Management for Bushland, SE section of CSIRO Corporate Business Park, Delhi Rd North Ryde. July 1996.

- Plans of Management (various), for restoration of bushland and bushfire fuel management in the Metropolitan South West Region of NSW, National Parks and Wildlife Service. 1995 to 2015.

Abbreviations and terms

APZ	Asset protection zone
Abaxial	Underside of leaf
Adaxial	Upper surface of leaf
BC Act 2016	NSW, Biodiversity Conservation Act, 2016
DBH	Diameter of tree trunk at breast height
DCP	Development Control Plan
Ecotone	Area where two ecological communities converge
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GRID	UTM map co-ordinates utilizing datum - GDA94
Insolation	Exposure to light
IPA	Inner Protection Area
LEP	Local Environment Plan
OEH	NSW, Office of Environment and Heritage
OPA	Outer Protection Area
PCT	Plant Community Type (as per Keith 2004, NSW vegetation classification hierarchy which includes NSW Vegetation Formations and Classes and Plant Community Types), and as listed and described in OEH BIONET.
PBP2018	Planning for Bushfire Protection 2018
SEPP	State Environmental Planning Policies
SYB12	Sydney Basin, Illawarra IBRA Sub-Bioregion 12
SYB	Sydney Basin, IBRA Region
Subject property	Proposed Seniors Living development over for Lot 17/DP 1210621, 2 Caliope Street, Kiama NSW 2533
TEC	Threatened Ecological Community

1 Legislative context

In regards to the proposed development application, for Lot 17/DP 1210621, 2 Caliope Street, Kiama NSW 2533, this Vegetation Community Assessment, has considered the following legislation and relevant planning instruments:

- Australian Standard, AS 4970-2009, *Protection of Trees on Development sites.*
- SEPP (Senior Living) 2004.
- *Kiama Local Environmental Plan, 2011* and *Development Control Plan, 2012*. Environmental and Planning Instrument requirements for new development and Tree Management on development sites.
- *Rural Fires Regulation 2013, clause 44, Bushfire Assessment; Rural Fires Act 1997 Section 100b.*
- *Rural Fires Regulation 2013, clause 47, Application for a Bushfire Hazard Reduction Certificate.*
- *EP&A Act,1979*. Part 5 considerations with respect to environment assessment of impacts on threatened species, Endangered Ecological Communities (EEC's), critical habitat. SEPP considerations.
- *EP&A Act,1979, Section 79BA*.
- *NSW, Biodiversity Conservation Act 2016*. Species, Communities and Key Threatening Processes listed in Schedules 1, 1a, 2 and 3. Clearing of Native Vegetation.
- *Local Land Services Act, 2013.* Clearing of Native Vegetation.
- *EPBC Act, 1999*. Federally listed threatened species, Endangered Ecological Communities (EEC's), critical habitat considerations.
- *NPW Act 1974*. Native fauna/flora and environmental protection.
- *Biosecurity Act 2015.* The property is situated within the South East Region of the Local Land Services (LLS). The pertinent weed control strategies for this LLS region are: *South East Regional Strategic Weed Management Plan 2017-2022*. Priority weeds for this region can be found at: https://southeast.lls.nsw.gov.au/data/assets/pdf_file/0006/722706/South-East-Regional-Weed-Mgmt-Plan.pdf
- *Planning for Bush Fire Protection*. A guide for councils, planners, fire authorities & developers (2018) – NSW Rural Fire Service. In particular - Appendix 2 Determining Asset Protection Zones supplied in the Appendix of this document.
- *Standards for Asset Protections Zones* (2006) - NSW Rural Fire Service.
- *Australian Standard AS 3959 - 2018.*
- *10/50 Vegetation Clearing Code of Practice for NSW (10/50),* in accordance with Section 100Q of the Rural Fires Act 1997.

2 Aim

The following Vegetation Community Assessment has been prepared for a proposed Seniors Living development over Lot 17/DP 1210621, 2 Caliope Street, Kiama NSW, 2533, which will be referred to from this point as the subject property.

The report primarily provides comment and advice on vegetation, identified as a Bushfire Hazard, located in the central and eastern portions of the subject property, and extending north and south into adjacent properties. It also provides comment on the risk level of available Bushfire Fuels in the Bushfire Hazard, and potential modification/removal of vegetation to establish Asset Protection Zones (APZ's), to the proposed development.

The dominant vegetation community/formation will be determined within a 140m radius of the proposed development on the subject property, and as per guidelines provided in Planning for Bushfire Protection 2018 (PBP).

This report is summary advice and does not satisfy the requirements of flora and fauna assessment as outlined/recommended in Part 5a of the EPA Act 1979 and other statutory planning requirements regards Development consent.

3 Background

3.1 Description of property

The subject lot is identified as

- Lot 17/DP 1210621, 2 Caliope Street, Kiama NSW, 2533, Kiama Municipal Council LGA, see Plan 2.1 following.
- The subject property is approximately 5.673 ha in size, and its general location is shown on Plan 2.1 following. The topography is dominated by Saddleback Mountain (altitude, 535m), 3km to the south west. The subject property features rolling hills benching down to coastal flatlands surrounding the township of Kiama.
- A Wooded area occurs in the central and eastern section to the east of the proposed development on the subject property and extends north and south into adjoining lots. The wooded area represents the identified Bushfire Hazard. The western portion of the subject property is predominantly grassland and is mostly cleared of woody species.
- Dry stone walls throughout the subject property are a listed Environmental heritage item in Schedule 5 of the Kiama LEP, 2011.
- The subject property slopes downward from 112m altitude at the NW boundary to 40m on the creek running through the SE corner of the block.
- The subject property is zoned: RU2 Rural Landscape under Kiama LEP (Kiama Local Environment Plan, 2011, Map LZN 012 - 4400_COM_LZN_012_020_20170215; and the vegetated area identified as a Bushfire Hazard is zoned E2 Environmental Protection.
- The subject property is located in bushfire prone land and in lands identified under the 10/50 Vegetation Clearing Code of Practice.
- The subject property is located west and less than 2km from the coast at Kendalls Beach, Kiama. The subject property is at an elevation where it would be exposed to marine/coastal influences from the east.

Plan 3.1: General location

3.1.1 Geology and soils

A search of ESPADE, identified that two (2), soil types are found on the subject property.

Kiama 9028ka, occurs over the central and eastern sections of the subject property.

Bombo 9028bo, occurs over the western sections of the subject property.

Both soil types are Krasnozems, derived from weathered latites, a volcanic rock similar to basalt in structure. The surface soils consist of a dark loamy A horizon, overlying heavy dark brown and red clays containing numerous latite rock fragments.

These soils are nutrient rich.

3.1.2 Climate

Climate statistics for the nearest weather station to the subject property, are provided for Kiama Bowling Club at: http://www.bom.gov.au/climate/averages/tables/cw_068038.shtml

Mean annual rainfall for the Kiama Bowling Club weather station is 1248.2mm.

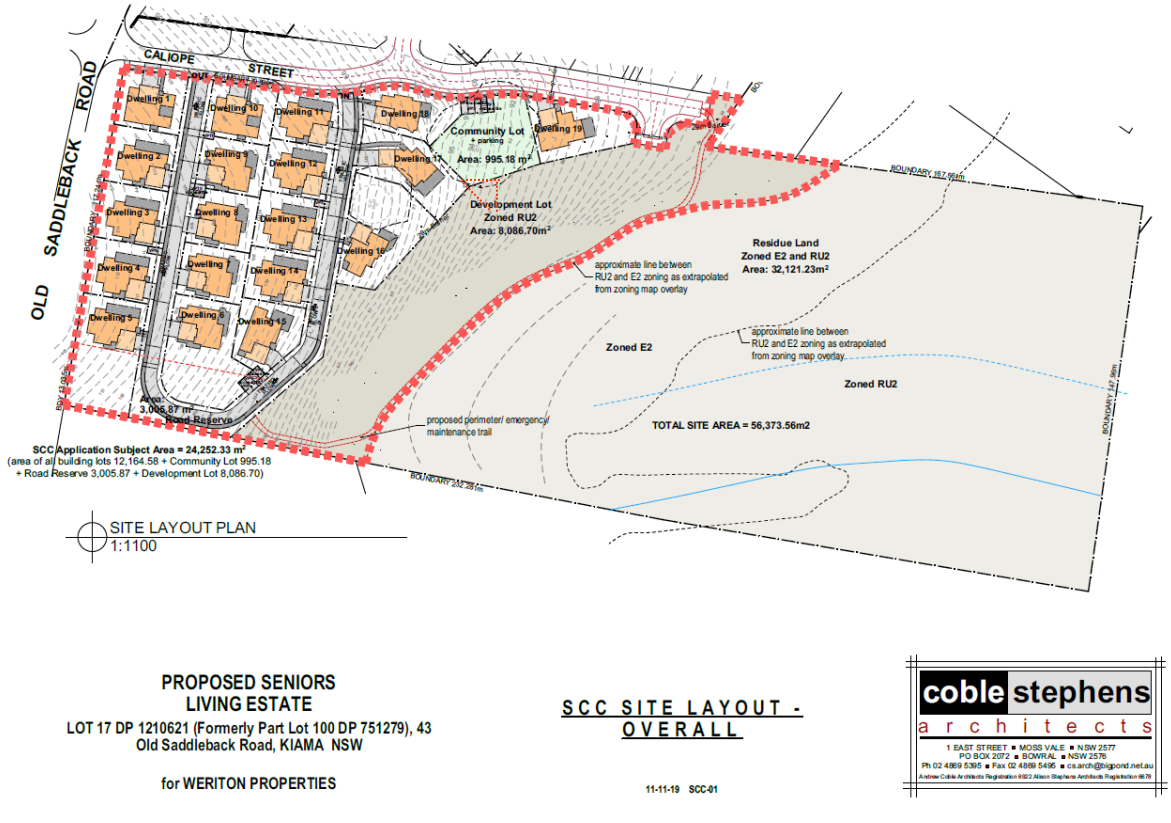
3.2 Type of development

The development application involves the construction of a Seniors Living development over the subject lot. A preliminary site plan (Plan 3.2.1), is included following.

It does not involve any activity or the construction of built structures abutting a creekline, drainage line or riparian zone.

It also includes the creation of APZ's on the subject property, and may involve clearing/modification of existing vegetation. It is estimated that the maximum total area of vegetation clearing/modification to accommodate proposed APZ's on the subject property, does not exceed 0.18ha, and that weed species comprise 60% of the total area.

It is the authors understanding that construction methods for footings for dwellings located on the proposed development of the subject lot are to be raised pier and beam.



Plan 3.2.1: Site Layout

3.3 Desktop Research

Involved searching of data held on available databases and reports and relevant legislation such as:

- Kiama Municipal Council LEP and DCP.
- Australian Standard, AS 4970-2009, *Protection of Trees on Development sites.*
- Office of Environment and Heritage (OEH), Wildlife Atlas.
- Publicly available Environmental Reports/databases
- Environmental Planning and Assessment (EPA) Act, 1979.
- EPBC Act, 1999.
- NPW Act 1974
- *Biosecurity Act 2015.* The property is situated within the South East Region of the Local Land Services (LLS). The pertinent weed control strategies for this LLS region are: *South East Regional Strategic Weed Management Plan 2017-2022*. Priority weeds for this region can be found at: https://southeast.lls.nsw.gov.au/data/assets/pdf_file/0006/722706/South-East-Regional-Weed-Mgmt-Plan.pdf
- RFS, Online tool for identifying lands covered by the 10/50 Vegetation Clearing Code of Practice for New South Wales (10/50 Code).
- Google Earth Spatial Information. Imagery dated 20160224. Build date: 20180723
- NSW Government, Spatial Services, SIXMAPS online, accessed January, 2019. Spatial Services, NSW Department of Finance and Services.http://maps.six.nsw.gov.au/

❶ Historical records and descriptions for vegetation communities were obtained via, Mills, K. (March 2006), *The natural vegetation in the municipality of Kiama New South Wales Final report*, by Kevin Mills & Associates, Ecological and Environmental consultants; OEH, ATLAS; NSW Government SEED PORTAL, Vegetation descriptions in soil landscape reports in ESPADE.

❷ Geology and Soil descriptions were obtained from: R. W. Young. (1980). 'Soils of the Illawarra Region'. Wollongong Studies in Geography No.10, Department of Geography, University of Wollongong.

❸ Descriptions for vegetation communities and Plant Community Types (PCTs), were obtained via, BIONET Vegetation Classification application, and other published literature.

❹ Notifiable weeds obtained from:
NSW DPI – NSW Weedwise, https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=3

❺ Nomenclature for species names: referenced from the NSW FLORA ONLINE, where possible and OEH, BIONET ATLAS.

❻ Description of Vegetation Formations and Structure followed: Table A1.2, PBP2018, *Classification of Vegetation Formations (after Keith, 2004)*; Specht, R.L. (1981) *Major vegetation formations in Australia*; and Specht, R.L. (1972) *Chapter 2*, *Vegetation.* In *The Australian Environment 4th edn*; and BIONET Vegetation Classification application.

3.4 Field assessment

3.4.1 Overview

Assessment of the subject property and the vegetation identified as a Bushfire Hazard to the east of the proposed development, occurred over a period of 2 days (4th and 5th of January 2019).

Assessment comprised and was limited to:

❶ Walkthroughs (10hrs), of the vegetation identified as a Bushfire Hazard, detailing form, habit and condition; noting site characteristics including topography and soils; and characterizing the vegetation and plant species using parallel transects and the 'random meander' method documented by Cropper (1993).

❷ Measurements of canopy height, coverage and litter depth, were also undertaken and GRID references taken.

❸ Anecdotal recordings of fauna.

❹ GRID references were plotted for the edge of the dominant vegetation community/formation comprising the Bushfire Hazard.

❺ Data transfer and post survey identification/verification of flora species present.

3.4.2 Methodology

❶ Grids were obtained using a handheld GARMIN OREGON 650 GPS set to Zone 56 and datum GDA94;, and spatial data from: Google Earth Spatial Information. Imagery dated 20160224. Build date: 20180723; and NSW Government, Spatial Services, SIXMAPS online, accessed Jan, 2019. http://maps.six.nsw.gov.au/

❷ Survey methodology as per *OEH guidelines for Threatened Species and Biodiversity Assessment.*

❸ Height of tree was obtained using a handheld clinometer and pythagorus' theorem.

❹ Available fuels were estimated according to the *Overall Fuel Hazard Guide for South Australia (2010).* Department of Environment and Natural Resources. Govt. of South Australia and checked against the *Overall Fuel Hazard assessment Guide, 4th edition July 2010, State Government of Victoria.*

❺ Canopy coverage in the vegetation identified as a Bushfire Hazard, was obtained by photographing the under-canopy at 5m intervals, along transects that traversed the upper and mid slope.

3.5 Vegetation community floristics and structure

The study area is located in the Sydney Basin (SYB12), Illawarra IBRA Sub-Bioregion 12.

3.5.1 Vegetation Community distribution

Provided following, are a general description of the vegetation occurring over the subject property and the bushfire hazard, as well as Plan 3.6.1, showing a location reference for vegetation descriptions.

The western section of the subject property is dominated by: fields of kikuyu (*Pennisetum clandestinum*); various pasture grasses and soft wooded weeds including fireweed (*Senecio madagascarensis*); copses of woody weed species such as African olive (*Olea Africana*), blackberry (*Rubus fruiticosus sp. aggregate*), Lantana (*Lantana camara*), Large-leaved privet (*Ligustrum lucidum*), and Coral trees (*Erythrina x sykesii*); and small pockets of remnant native vegetation dominated by wattles co-occurring with mesophyllous native tree species. This area comprises gently undulating lands on the crest of a ridge.

An open grassland also covers the north eastern and eastern corner of the subject property, dominated by kikuyu (*Pennisetum clandestinum*), lantana, and various pasture grasses and soft wooded weeds including fireweed (*Senecio madagascarensis*).

The central and south eastern sections of the subject property, as well as the neighbouring properties to the N (Lot 17/DP1210621), and S (Lots 32 and 33/DP709582), contain a vegetated area (approx. 4.2ha), comprised predominantly of native species. This vegetated area represents the Bushfire Hazard, and occupies both slopes of a gully, containing an ephemeral watercourse, running from the SE to the NE and the Princes Highway.

The vegetated area that represents the Bushfire Hazard, comprises:

- WOODED AREA. A treed area which represents the bulk of the Bushfire Hazard (approximately 3.2ha). The canopy of this area is highest in the steeper sections of the gully, and tapers in height towards the periphery; and possesses a closed canopy. There are isolated patches where lantana have invaded.

- PERIMETER of vegetation that includes copses of weeds and native wattles co-occurring with mesophyllous native tree species and kikuyu grassland. The perimeter represents approximately 1ha of the Bushfire Hazard. The perimeter has a reduced canopy height (averaging under 5m), and the canopy is generally closed. The perimeter is widest on the western edge and varies between 4m and 30m in width.

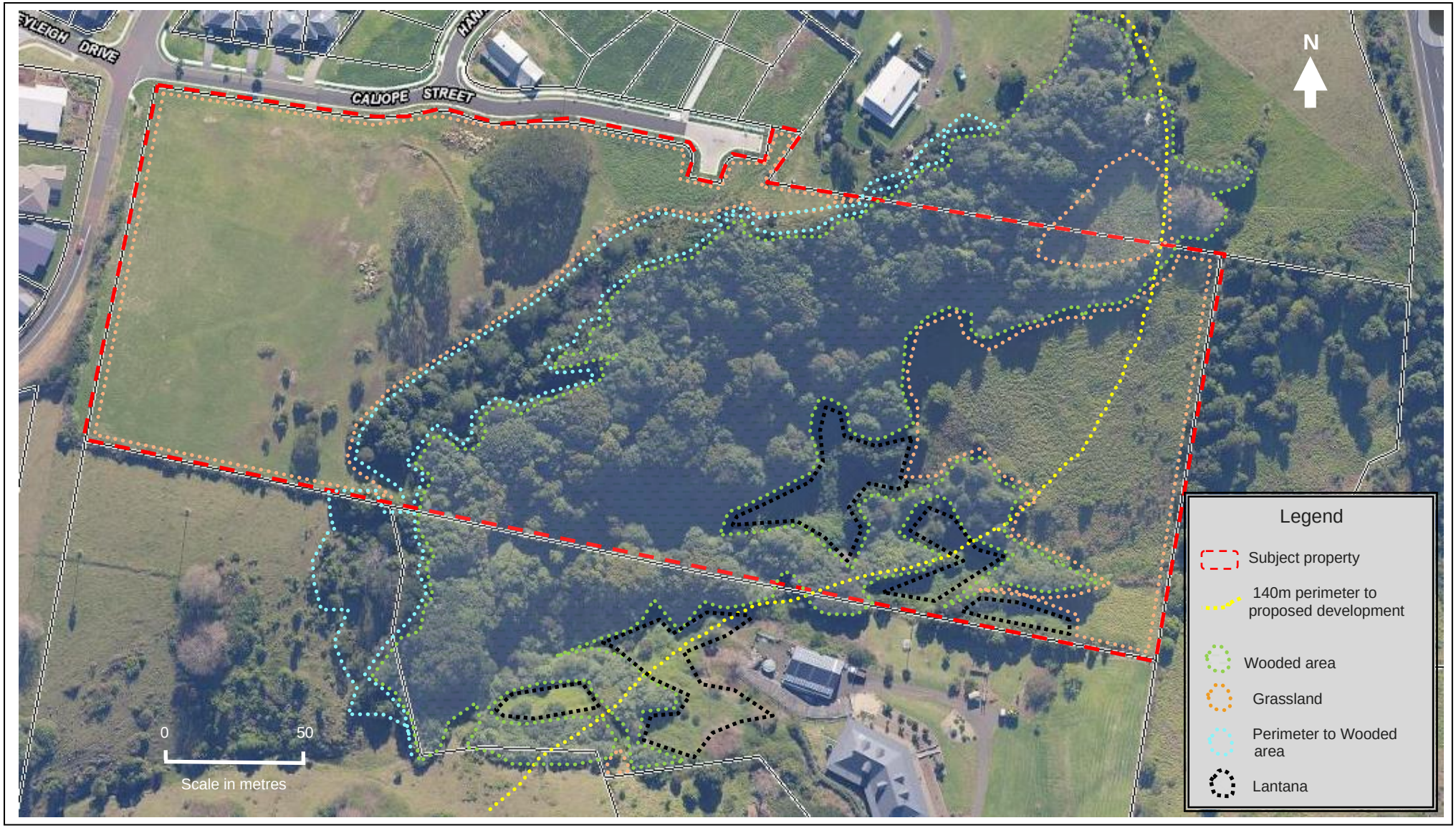
  The western perimeter is dominated by native Wattle species, Lantana, Large-leaved privet and kikuyu.

  The northern perimeter is dominated by mesophyllous native tree species. The exception is a couple of Coral trees (*Erythrina x sykesii*) at the northern tip, GRID 302354, 6160488.

  The north eastern, and south eastern perimeters are edged and dominated by mesophyllous native tree species.

  The southern perimeter is composed of mesophyllous native tree species and patches of weeds including Coral trees, that occur to the SSW.

  Lantana (*Lantana camara*), has invaded and established on sections of the south eastern slope, and lines the banks of the watercourse where it emerges downslope. Native vegetation dominates the upper sections of the watercourse to the SW. These areas of Lantana invasion represent 0.3ha of the Bushfire Hazard.



Plan 3.6.1
Vegetation communities/formations occurring over and contiguous to subject property within the Bushfire Hazard

3.5.2 Floristics

Targeted surveys and/or monitoring, were conducted for the six (6) threatened flora (listed following), noted in OEH ATLAS search in a 5km radius of the subject property (20190125), and whose habitat requirements were met by the environment present on the subject property and the area identified as a Bushfire Hazard.

- White-flowered Wax Plant (*Cynanchum elegans*);
- Illawarra Socketwood (*Daphnandra johnsonii*);
- Gossia acmenoides population in the Sydney Basin Bioregion south of the Georges River (*Gossia acmenoides*);
- Illawarra Zieria (*Zieria granulata*);
- *Solanum celatum*;
- Spiked Rice-flower (*Pimelea spicata*).

A copy of the OEH ATLAS search, is provided in Appendix 1, which also includes a list of threatened fauna recorded in a 5km radius of the subject property (20190125).

A mature specimen of the State and Commonwealth listed threatened species; Illawarra Socketwood (*Daphnandra johnsonii*), shown below, was located at GRID 302149, 6160419, in the central section of the Bushfire Hazard.

Figure 1: Illawarra Socketwood (*Daphnandra johnsonii*), located at GRID 302149, 6160419

137 stems of the Commonwealth and State listed threatened species, Illawarra Zieria (*Zieria granulata*), occur in the perimeter to, and in the Wooded Area. A stem count has been provided, as coppicing and multi-stemmed growth confounded an exact count of individual plants. An exact count would have required invasive investigation of the root plate, deemed detrimental to the well-being of this species.

In total ninety (90), native plant species were identified in the area identified as a Bushfire Hazard on the subject site. This comprised, thirty three (33) tree, fifty seven (57) shrub/herb/forb/graminoid species.

There were twenty seven (27), weed species identified in the area identified as a Bushfire Hazard on the subject site. Four weed species, African boxthorn, Blackberry, Fireweed, African olive, are listed as Priority Weeds for the South East Region of the Local Land Services (LLS).

The characteristic flora noted within the Bushfire Hazard, are listed following according to the stratum that species occupy, and independently for the two vegetation communities/formations, ❶ Wooded area, and ❷ Perimeter to Wooded area. Weed species are shown in red.

A full list of plant species noted on site are provided in Appendix 2 – Tables: 3.5.2.1; 3.5.2.2; and 3.5.2.3.

Canopy stratum

❶ Wooded area

The dominant canopy species are:

- Red Cedar (*Toona ciliata*) – also occurs as a canopy emergent.
- White euodia (*Melicope micrococca*).
- Sassafras (*Doryphora sassafras*) - also occurs as a canopy emergent.
- Cabbage fan palm (*Livistona australis*) - also occurs as a canopy emergent.
- Small-leaved fig (*Ficus obliqua*).
- Wonga Wonga vine (*Pandorea pandorana*), occurs as a liana.
- Giant pepper vine (*Piper hederaceum var. hederaceum*), occurs as a liana.

Other species include:

- Sweet pittosporum (*Pittospoum undulatum*).
- Moreton Bay fig (*Ficus macrophylla*).
- Brush cherry (*Syzygium australe*) – large specimen on creekline.
- Cheese tree (*Glochidion ferdinandi*).
- Large-leaved privet (*Ligustrum lucidum*).
- Guioa (*Guioa semi-glauca*).
- Brush bloodwood (*Baloghia inophylla*).

❷ Perimeter to Wooded area

The dominant canopy species are:

- Guioa (*Guioa semi-glauca*).
- Red olive plum (*Elaeodendron australe syn. Cassine australe*).
- Lily pilly (*Acmena smithii*).
- Cheese tree (*Glochidion ferdinandi*).
- Muttonwood (*Myrsine variabilis*).
- Brush muttonwood (*Myrsine howittiana*).
- Maiden's wattle (*Acacia maidenii*).
- Large-leaved privet (*Ligustrum lucidum*).
- Black wattle (*Acacia mearnsii*).
- Hickory wattle (*Acacia implexa*).
- Red ash (*Alphitonia excelsa*).
- Coral tree (*Erythrina sykesii*).
- African olive (*Olea africana*).

Sub-canopy stratum

❶ Wooded area

The dominant sub-canopy species are:

- Sweet pittosporum (*Pittospoum undulatum*).
- Guioa (*Guioa semi-glauca*).
- Cabbage fan palm (*Livistona australis*).
- Large-leaved privet (*Ligustrum lucidum*).
- Brush bloodwood (*Baloghia inophylla*).
- Red olive plum (*Elaeodendron australe syn. Cassine australe*).
- Scrub beefwood (*Stenocarpus salignus*).
- Cheese tree (*Glochidion ferdinandi*).
- Native peach (*Trema tomentosa var. Aspera*).
- Whalebone tree (*Streblus brunonianus*).
- Lantana (*Lantana camara*).
- Bolwarra (*Eupomatia laurina*).

Other species include:

- Illawarra socketwood (*Daphnandra johnsonii*).
- Native rosella (*Hibiscus heterophyllous ssp heterophyllous*).

❷ Perimeter to Wooded area - The majority of the perimeter, is characterised by native tree species that possess dense foliage to ground level, co-existing with vine thicket that interlaces with the foliage of perimeter trees and extends into the Wooded area, excluding the formation of a separate sub-canopy. Lantana has also penetrated in areas under and into the canopy of the perimeter tree species.

The dominant sub-canopy species are:

- Wong Wonga vine (*Pandorea pandorana*).
- Sweet morinda (*Morinda jasminoides*).
- Scrambling lily (*Geitonoplesium cymosum*)
- Lantana (*Lantana camara*).
- Wombat berry (*Eustrephus latifolius*).
- Water vine (*Cissus antarctica*).

Other species include:

- Illawarra Zieria (*Zieria granulata*).

Shrub stratum

❶ Wooded area – This stratum is extremely depauperate and virtually absent.

Shrub species are:

- Bolwarra (*Eupomatia laurina*)**.**
- Large mock olive (*Notelaea longifolia*).
- Veined mock olive (*Notelaea venosa*).
- Orange thorn (*Pittosporum multiflorum*).
- Native rosella (*Hibiscus heterophyllous ssp heterophyllous*).
- Rainbow fern (*Calochlaena dubia*).
- Rose leaf bramble (*Rubus rosifolius*).

❷ Perimeter to Wooded area

The dominant shrub species are:

- Coastal wattle (*Acacia longifolia ssp. sopharae*).
- Large mock olive (*Notelaea longifolia*).
- Veined mock olive (*Notelaea venosa*).
- Lantana (*Lantana camara*).
- Blackberry (*Rubus fruiticosus sp. Aggregate*).

Ground stratum, vines/twiners, graminoides and forb species

❶ Wooded area – This stratum is dominated by large drifts of ferns and vines, Grasses are virtually absent.

The dominant species are:

- Giant pepper vine (*Piper hederaceum var. Hederaceum*).
- Necklace fern (*Asplenium flabellifolium*).
- Fragrant fern (*Microsorum scandens*).
- *Arthropteris tenella*
- Rough maidenhair (*Adiantum hispidulum*).
- Sickle fern (*Pellaea falcata*).
- Rainbow fern (*Calochlaena dubia*).

Other species include:

- Native violet (*Viola hereraceae*).
- Kidney weed (*Dichondra repens*).
- Pastel flower (*Pseuderanthemum variabile*).
- Cockspur (*Plectranthus parviflorus*)

❷ Perimeter to Wooded area - This stratum is dominated by vines and ferns, lawn grasses, and pasture and environmental weed species.

The dominant species are:

- Kikuyu (*Pennisetum clandestinum*).
- Fireweed (*Senecio madagascarensis*).
- Cape ivy (*Delairia odorata*).
- Panic veldt grass (*Ehrharta erecta*).
- Kidney weed (*Dichondra repens*).
- Cockspur (*Plectranthus parviflorus*)

3.5.3 Structure

The vegetation assessed in the identified Bushfire Hazard, represents a predominantly native wooded area of approximately 4.2ha in size, with a perimeter of vegetation that includes copses of weeds and native wattles co-occurring with mesophyllous native tree species and kikuyu grassland. This perimeter vegetation, represents approximately 1ha of the wooded area.

The wooded area, contains a variety of plant species as described in Section 3.5.2 and listed in Appendix 2, which are predominantly rainforest species.

In general, there is a complex array of rainforest tree species comprising the canopy and sub-canopy stratum, supporting epiphytic ferns and interconnected by lianas. The shrub stratum is virtually absent. The ground stratum is dominated by fern and vine species.

The vegetation on the perimeter, despite a reduced height, also contains a variety of rainforest tree species, as well as native wattles, kikuyu, and weed species.

Canopy coverage in the vegetation identified as a Bushfire Hazard, was obtained by photographing the under-canopy at 5m intervals along transects that traversed the upper and mid slope. See Figures 2 to 7, next page.

Canopy coverage was estimated at >85%.

Average height of canopy of various strata, within the vegetation that comprises the wooded area and the perimeter of the wooded area, are provided following.

Stratum	**Location**	**Average height (m)**
Canopy	Wooded area - central	19.1
	Wooded area - peripheries	12.4
	Perimeter vegetation	3.9
Sub-canopy	Wooded area -central	13
	Wooded area - peripheries	Non-existent
	Perimeter vegetation	Non-existent

The tallest canopy emergent discovered in the Woodland, was a Sassafras (*Doryphora sassafras*), measuring 23.2m in height.

Structurally and floristically, the vegetation occupying the area identified as a Bushfire Hazard, conforms to the NSW vegetation formation RAINFOREST, as described in Keith, 2004.

Figure 2.

Figure 3.

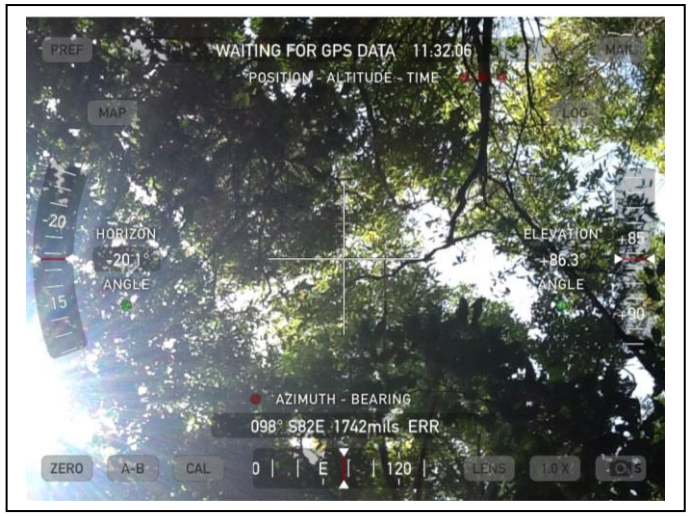


Figure 4.

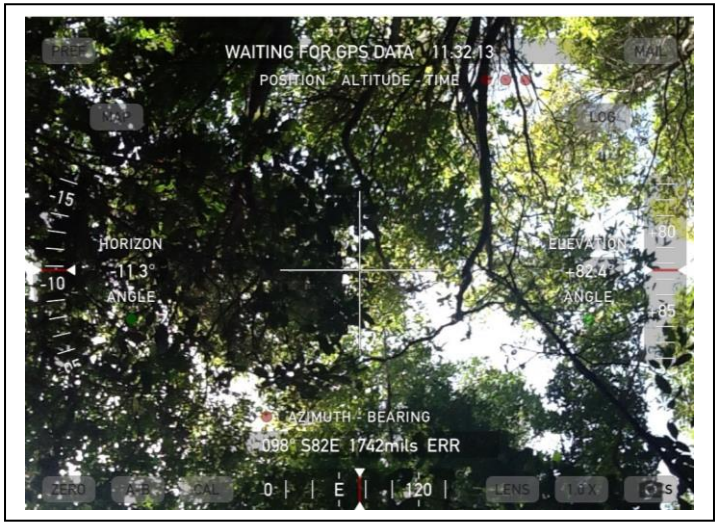


Figure 5.

Figure 6

Figure 7.

3.6 Bushfire fuels

3.6.1 Surface fuels and litter

Litter depth, and coverage estimation of bushfire fuels, was undertaken at 4 separate sites across the identified Bushfire Hazard as shown in Plan 3.6.1 following.

3 x 1m, randomly placed quadrats were sampled at each site location, for litter depth and photographed and the results presented following.

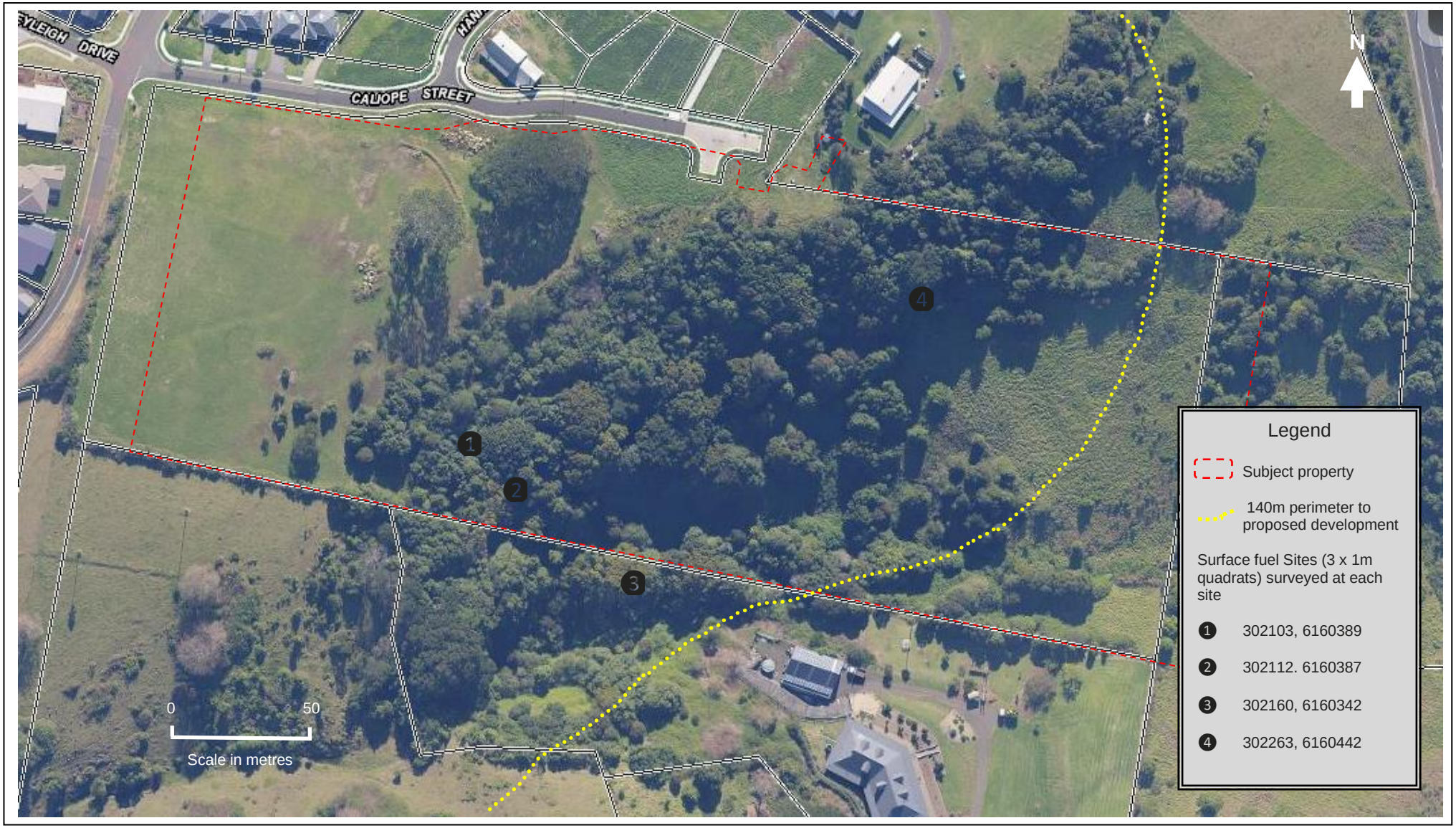
No fire scarring was noted, which is indicative that there have been no recent fire events. There is also no history of bushfires impacting the subject property, or general area, within the past 25 years, noted in the *Illawarra Bush Fire Management Committee Bush Fire Risk Management Plan 2015 to 2020*.

In general, the ground stratum was characterized by large boulder scree/cobbling, and large tracts covered by ferns and vines estimated to cover approximately 30 to 40% of the total ground surface. See Figures 8 to 10, below.

Figure 8. Mid slope

Figure 9: Lower slope

Figure 10. Upper slope on the periphery of Wooded area



Plan 3.6.1.1
Bushfire surface fuels sampling sites

SITE 1 – GRID 302103, 6160389, Upper slope on western side of gully

Replicate	Average Litter depth (cm)	Litter coverage (%)
❶	2	65
❷	3	85
❸	1.5	55
average	**2.16**	**68**

Replicate 2

Replicate 1

Replicate 3

SITE 2 – GRID 302112, 6160387, Lower slope on western side of gully

Replicate	Average litter depth (cm)	Litter coverage (%)
❶	1	70
❷	0.5	50
❸	1.5	70
average	**1**	**63**

Replicate 2

Replicate 1

Replicate 3

SITE 3 – GRID 302160, 6160342, lower slope on eastern side of gully

Replicate	Litter depth (cm)	Litter coverage (%)
❶	1	40
❷	2.5	70
❸	1.5	40
average	**1.7**	**50**

Replicate 2

Replicate 1

Replicate 3

SITE 4 – GRID 302263, 6160442, Mid-slope 15m inside edge of forest, on western side of gully, north

Replicate	Litter depth (cm)	Litter coverage (%)
❶	1	80
❷	0.5	30
❸	1	55
average	**0.8**	**55**

Replicate 2

Replicate 1

Replicate 3

Litter depth averaged at 1.42cm, and coverage averaged at 59% and assessed as LOW to MODERATE.

Litter coverage and surface fuels were discontinuous throughout the identified Bushfire Hazard due to outcroppings of boulder scree and cobbles, and expanses of native vines/lianas and ferns covering ground surfaces as shown in Figures 8 to 10.

3.6.2 Elevated and ladder fuels

Shrubs are virtually absent. Lianas/vines, ferns, sapling mesophyllous rainforest species, and lantana, represent the predominant vegetation in the shrub stratum. This stratum provides minimal fuels, or connectivity between the surface fuels and sub-canopy and canopy fuels.

In this respect, ladder and elevated fuels were virtually absent and assessed as LOW.

3.6.3 Bark Hazard

The majority of tree species possess smooth or corky bark which does not shed in strips, and resists immolation. The bark hazard was assessed as LOW.

3.6.4 Overall Bushfire Fuel Hazard

Overall Bushfire Fuel Hazard was assessed as LOW and total available fuels as less than 5 tonnes/ha.

In summary, the LOW Overall Bushfire Fuel Hazard assessment, is also supported by the predominance of mesophyllous rainforest species whose foliage generally resists immolation, the absence of any known historical fire event, and proximity to the coast and prevailing NE to SE moist air currents.

4 Discussion and Conclusion

Published Vegetation mapping datasets, for the patch of wooded vegetation identified as a Bushfire Hazard in the Central and eastern sections of the subject property, in the NSW Government SEED portal, describes the dominant vegetation community/formation as follows:

❶ *Forest Ecosystems: Native Vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west Slopes, and SE Corner bioregions. Pre-1750. VIS ID 3859,*

NSW Formations: Rainforests, NSW Classes: Warm Temperate/Sub-Tropical, Rainforests
Vegetation Group: Illawarra Lowland Sub-Tropical Rainforest

❷ *Southeast NSW Native Vegetation Classification and Mapping - SCIVI. VIS_ID 2230,* describes the vegetation covering the subject property as -

NSW Formations: Rainforests, NSW Classes: Dry Rainforest, Class: p111, Map Unit: Subtropical Dry Rainforest

With a small patch at the south western end of Class: p110, Map Unit: Warm Temperate Layered Forest

The remainder of the subject property is identified as CLEARED or MODIFIED vegetation.

Field assessment by the author identified the following:

- Extant native vegetation dominates the identified Bushfire Hazard.
- The structural components and floristics are consistent with descriptions for RAINFOREST as per Specht, R.L. (1972), *Planning for Bushfire Protection 2018* (PBP2018), and the OEH BIONET Vegetation Classification database.
- The canopy stratum is dominated by Red Cedar (*Toona ciliata*), Sassafras (*Doryphora sassafras*), Small-leaved fig (*Ficus obliqua*), White euodia (*Melicope micrococca*), Cabbage palm (*Livistona australis*), and native lianas.

There is strong correlation between plant species identified in field surveys (Appendix 2), and the diagnostic species listed in:

- Floyd, A.G. (1990). *Australian rainforests in New South Wales. Vol 1 and 2. Surrey Beatty and Sons*, for Subtropical Rainforest, *Suballiance No. 14: Doryphora-Daphnandra micrantha-Dendrochnide-Ficus-Toona.*
- Appendix 3 of this document – *MU1, Illawarra Escarpment Sub-Tropical Rainforest*, taken from *Wollongong LGA Bioregional Assessment (Part I): Native Vegetation of the Illawarra Escarpment and Coastal Plain (NPWS, 2002).*
- The dominant vegetation community/formation also conforms to PCT 906, *Lilly Pilly - Sassafras - Stinging Tree subtropical/warm temperate rainforest on moist fertile lowlands, southern Sydney Basin Bioregion.*

It is the authors considered opinion that the vegetation community that dominates the area identified as a Bushfire Hazard in the central and eastern section of the subject property is: *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion.*

This community is listed as an EEC (as described in the determination of the Scientific Committee), in Schedule 2, Threatened Ecological Communities, NSW Biodiversity Conservation Act 2016, and a Commonwealth listed Critically Endangered Ecological Community in Part 2 EEC, of the EPBC Act.

The vegetation identified as a Bushfire Hazard, based on Bushfire Fuel sampling, structure and arrangement, presents a LOW Bushfire Hazard or risk. The structure and low flammability of vegetation in the Bushfire Hazard, would generally impede the development of a bush fire and act as a natural advantage in impeding the progress of a bushfire outside of the Bushfire Hazard.

5 Management Recommendations

As previously mentioned in Section 3.2, the establishment of APZ's, may require removal or modification of trees and vegetation.

Based on the footprint of the proposed development as shown in Plan 3.2.1, Section 3.2, it is proposed that the western perimeter of the identified Bushfire Hazard is the area of most likely impact for the establishment of APZ's.

In respect to managing vegetation on the subject property, it is highly recommended:

- The following weed species are removed as a priority: Large-leaved privet (*Ligustrum lucidum*), Lantana (*Lantana camara*), Blackberry (*Rubus fruiticosus sp. Aggregate*); African olive (*Olea Africana*); African boxthorn (*Lycium ferocissimum*).
- That grasslands are regularly slashed/mown and maintained at a height not exceeding 10cm. This will remove a percentage of accumulated thatch and reduce available fuels.
- Where necessary and practical, preferentially remove sclerophyllous native species such as wattles and retain any native rainforest species. Rainforest species have foliage that resist immolation and provide a barrier to air borne embers.
- Preserve all 137 specimens of Illawarra Zieria (*Zieria granulata*), identified on the subject property, and establish a 2.5m buffer to all specimens.

Following, are listed some key principles to guide in the establishment of proposed APZ's.

1. Adherence to the requirements of PBP2018 (tables in Appendix 4), *Standards for Asset Protection Zones, NSW RFS,* and recommendations in Bushfire Reports prepared for the proposed development.

2. Engage a suitably qualified arborist to advise on removal of any trees. Visually check for presence of any fauna habituating in trees prior to removal, and arrange for removal and relocation of any fauna dislocated during tree removal. If necessary, contact WIRES or other approved local wildlife organization prior to tree removal operations and arrange for potential assistance in removal and relocation of native fauna.

3. During clearing of native vegetation for proposed APZ's: ❶ remove any weed species prior to clearing native vegetation; ❷ retain and relocate fallen dead limbs containing hollows (where practical and safe), and any lopped hollow sections of trees to provide habitat for native fauna; ❸ minimise disturbance to existing soil profiles to avoid disturbing terrestrial species and the potential for erosion; ❹ minimise disturbance to any rock formations if discovered, to prevent disturbing harbor sites for native fauna (lizards, snakes, small mammals); ❺ visually check for presence of any fauna habituating in proposed APZ's, prior to mulch/slash native vegetation and retain on site; ❻ retain any mulched/slashed native vegetation, although the biomass of slashed /mulched vegetation should not exceed ground fuel parameters for an APZ. Mulched vegetation will provide runways and harbor for potential small native mammalian fauna if present or egressing the subject property, and will assist in retaining any soil stored native seed on site. Ensure mulched vegetation is compacted against existing soil profile to reduce capacity for immolation by excluding air.

4. The area of the subject property, west of the Sub-Tropical Rainforest, shall be identified and maintained as an APZ or else shall be maintained / landscaped as low threat or excluded vegetation in accordance with clause 2.2.3.2 of AS3959,

5. Vegetation and landscape management for APZ compliance should also consider the principals of the document *Landscape and Building Design for Bushfire Areas, by Caird Ramsay and Lisle Rudolph published November 2003*.

6. Any internal vegetated landscaping (retained or re-introduced) should ensure any readily combustible dry garden mulching, litter and/or combustible trees or shrubs are separated away from building lines, or else should be entirely excluded from the site.

7. Any internal landscaping shall ensure trees retained or planted directly adjacent to internal roadway areas do not significantly overhang or obstruct access of larger vehicle's entering the proposed development and subject property. Any overhanging vegetation shall be maintained to ensure a minimum height of 4m above the road at all times.

8. Any internal landscaping should ensure only fire-retardant trees, shrubs or ground layers are reintroduced.

9. Maintain recommended clearances around powerlines to minimize risk of arcing initiating ignition.

10. As a suggested principle for the landscaping works, there should be no net gain from the existing landscaped vegetation to be retained as part of the proposed development. If any new vegetated landscaping is essential for other reasons of aesthetics, shading, heritage, then selected vegetation for landscaping works should only use species identified from a recognised list of fire-retardant species or else consistent with recommended plant types for bushfire prone gardens as described in *Standards for Asset Protection Zones, NSW RFS,* and *Planning for Bush Fire Protection, 2018, Appendix 4.*

11. Re-introducing dry native tree / shrub species (particularly where concentrated) such as Banksia, Melaleuca & Acacia species should be avoided, particularly if located directly adjacent to a building line.

12. Where new or re-introduced vegetation will be incorporated as part of the subject development, the same or equivalent area / number of species or biomass should be removed elsewhere from the site.

13. As far as practicable, all larger or mature trees to be retained as part of the proposed development should be selectively pruned to limit overhanging any building structures or be within 2m of any combustible or glazed building element.

14. Taller trees and shrubs (>2m high) to be retained, should be selectively pruned and/or thinned to ensure a discontinuous vegetation canopy where practicable.

15. Vegetation management in areas adjacent to and containing Illawarra Zieria (*Zieria granulata*), and *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion,* should comply with the Department of Environment and Conservation (2005) *Zieria granulata (Illawarra Zieria) Recovery Plan*, and NSW Government, OEH, *Saving our Species Programme Recovery Strategy for: Illawarra Subtropical Rainforest in the Sydney Basin Bioregion.*

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APPENDIX 1

OEH Atlas search in a 5km radius of subject property

Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria: Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -34.62 West: 150.79 East: 150.89 South: -34.72] returned a total of 260 records of 27 species.

Explanation of terms: E = endangered; V = vulnerable; P = protected; C = Critical
Likelihood of occurrence: Known = recorded in 1km radius of subject property; Likely = records exist within 2km radius of subject property or site characteristics meet specific requirements; Possible = habitat/species requirements suitable/species utilises site opportunistically; Unlikely - habitat/species requirements unsuitable

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status	Records	Habitat description	Likelihood of occurrence	Potential for impact	Assessment of significance required
Animalia	Amphibia	Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E1,P	V	7	Suitable habitat along watercourse	Possible	Nil	No
Animalia	Reptilia	Cheloniidae	*Chelonia mydas*	Green Turtle	V,P	V	1	Habitat not suitable	Unlikely	Nil	No
Animalia	Aves	Diomedeidae	*Diomedea exulans*	Wandering Albatross	E1,P	E,J	2	Habitat not suitable	Unlikely	Nil	No
Animalia	Aves	Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	1	Habitat not suitable	Unlikely	Nil	No
Animalia	Aves	Accipitridae	*Circus assimilis*	Spotted Harrier	V,P		2	Habitat suitable. No impact on preferred habitat, perch sites or nesting	Possible	Nil	No
Animalia	Aves	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P	C	5	Habitat suitable. No impact on preferred habitat, perch sites or nesting	Possible	Nil	No
Animalia	Aves	Accipitridae	*Hieraaetus morphnoides*	Little Eagle	V,P		1	Habitat suitable. No impact on preferred habitat, perch sites or nesting	Possible	Nil	No
Animalia	Aves	Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E1,P		1	Habitat suitable. No impact on preferred habitat, perch sites or nesting	Possible	Nil	No
Animalia	Aves	Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		6	Habitat not suitable	Unlikely	Nil	No

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status	Records	Habitat description	Likelihood of occurrence	Potential for impact	Assessment of significance required
Animalia	Aves	Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher	E1,P		6	Habitat not suitable	Unlikely	Nil	No
Animalia	Aves	Scolopacidae	*Calidris alba*	Sanderling	V,P	C,J,K	1	Habitat not suitable	Unlikely	Nil	No
Animalia	Aves	Laridae	*Sternula albifrons*	Little Tern	E1,P	C,J,K	1	Habitat not suitable	Unlikely	Nil	No
Animalia	Aves	Strigidae	*^^Ninox strenua*	Powerful Owl	V,P,3		1	Habitat suitable. No impact on preferred habitat, perch sites or nesting	Possible	Nil	No
Animalia	Aves	Petroicidae	*Petroica phoenicea*	Flame Robin	V,P		1	Habitat suitable. Minimal impact on preferred habitat, or nesting	Possible	Negligible	No
Animalia	Mammalia	Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	4	Habitat suitable. Minimal impact on preferred habitat, or harbour	Possible	Negligible	No
Animalia	Mammalia	Phascolarctidae	*Phascolarctos cinereus*	Koala	V,P	V	1	Habitat suitable.	Possible	Nil	No
Animalia	Mammalia	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	16	Habitat suitable. Minimal impact on feed trees	Possible	Negligible	No
Animalia	Mammalia	Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V,P		1	Habitat suitable. No impact on preferred habitat	Possible	Nil	No
Animalia	Mammalia	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V,P		2	Habitat suitable. No impact on preferred habitat	Possible	Nil	No
Animalia	Mammalia	Vespertilionidae	*Myotis macropus*	Southern Myotis	V,P		1	Habitat suitable. No impact on preferred habitat	Possible	Nil	No
Animalia	Mammalia	Otariidae	*Arctocephalus pusillus doriferus*	Australian Fur-seal	V,P		1	Habitat not suitable	Unlikely	Nil	No
Plantae	Flora	Apocynaceae	*Cynanchum elegans*	White-flowered Wax Plant	E1	E	14	Habitat suitable.	Possible	Nil	No
Plantae	Flora	Monimiaceae	*Daphnandra johnsonii*	Illawarra Socketwood	E1	E	42	Habitat suitable.	Known Recorded on site	Nil	See SIS attached, Appendix 4

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status	Records	Habitat description	Likelihood of occurrence	Potential for impact	Assessment of significance required
Plantae	Flora	Myrtaceae	*Gossia acmenoides*	Gossia acmenoides population in the Sydney Basin Bioregion south of the Georges River	E2		2	Habitat suitable.	Possible	Nil	No
Plantae	Flora	Rutaceae	*Zieria granulata*	Illawarra Zieria	E1	E	133	Habitat suitable.	Known Recorded on site	Nil	See SIS attached, Appendix 4
Plantae	Flora	Solanaceae	*Solanum celatum*		E1		2	Habitat suitable.	Possible	Nil	No
Plantae	Flora	Thymelaeaceae	*Pimelea spicata*	Spiked Rice-flower	E1	E	5	Habitat unsuitable.	Unlikely	Nil	No

APPENDIX 2

Table 3.5.2.1 - Native Tree species found on site

Legal status

E1 = Endangered species under Schedule 1 BC Act, 2016
V = Vulnerable species under Schedule 1 BC Act, 2016
P = Protected species under NPW Act 1974
C = Endangered species under EPBC Act, 1999

Scientific name	Common Name	Legal status
Acacia implexa	Hickory wattle	
Acacia maidenii	Maidens wattle	
Acacia mearnsii	Black wattle	
Acmena smithii	Lily pilly	
Alphitonia excelsa	Red Ash	
Baloghia inophylla	Brush bloodwood	
Ceratopetalum gummiferum	NSW christmas bush	
Cinnamomum oliveri	Oliver's sassafras	
Claoxylon australe	Brittlewood	
Cryptocarya glaucescens	Jackwood	
Daphnandra johnsonii	Illawarra socketwood	**E1, C**
Dendrocnide excelsa	Giant stinging tree	
Doryphra sasafras	Sassafras	
Elaeodendron australe syn. Cassine australe	Red olive plum	
Ficus macrophylla	Moreton Bay fig	
Ficus obliqua	Small leaved fig	

Legal status

E1 = Endangered species under Schedule 1 BC Act, 2016
V = Vulnerable species under Schedule 1 BC Act, 2016
P = Protected species under NPW Act 1974
C = Endangered species under EPBC Act, 1999

Scientific name	Common Name	Legal status
Ficus rubiginosa	Port Jackson fig	
Glochidion ferdinandi	Cheese tree	
Guioa semi-glauca	Guioa	
Hibiscus heterophyllous ssp heterophyllous	Native rosella	
Homalanthus populifolius	Bleeding heart	
Livistona australis	Cabbage fan palm	**P**
Melicope micrococca	White euodia	
Myrsine howittiana	Brush muttonwood	
Myrsine variabilis	Muttonwood	
Pisonia umbellifera	Bird lime tree	
Pittosporum undulatum	Sweet pittosporum	
Podocarpus elatus	Plum pine	
Stenocarpus salignus	Scrub beefwood	
Streblus brunonianus	Whalebone tree	
Syzygium australe	Brush Cherry	
Toona ciliata	Red cedar	
Trema tomentosa var. aspera	Native peach	

Table 2.3.4.2 - Native shrub, herb, fern, climbers and forb species found on site

Legal status

E1 = Endangered species under Schedule 1 BC Act, 2016
V = Vulnerable species under Schedule 1 BC Act, 2016
P = Protected species under NPW Act 1974
C = Endangered species under EPBC Act, 1999

Scientific name	Common Name	Legal status
Acacia binervia	Coastal myall	
Acacia longifolia	Sydney golden wattle	
Acacia longifolia ssp sopharae	Coastal wattle	
Adiantum hispidulum	Rough maidenhair	P
Alchornea ilicifolia	Native Holly	
Alpinia caerulea	Native ginger	
Aphanopetalum resinosum	Gum vine	
Arthropteris tenella		
Asplenium australasicum	Bird's nest fern	P
Asplenium flabellifolium	Necklace fern	
Breynia oblongifolia	Coffee Bush	
Bursaria spinosa	Blackthorn	
Calochlaena dubia	Rainbow Fern	
Cassinia aculeata	Dolly bush	
Cayratia clematidea	Native grape	

Legal status

E1 = Endangered species under Schedule 1 BC Act, 2016
V = Vulnerable species under Schedule 1 BC Act, 2016
P = Protected species under NPW Act 1974
C = Endangered species under EPBC Act, 1999

Scientific name	Common Name	Legal status
Cissus antarctica	Water Vine	
Clematis aristata	Old man's whiskers	
Clerodendrum tomentosum	Hairy Clerodendrum	
Commelina cyanea	Native Wandering Jew	
Coprosma quadrifida	Prickly currant bush	
Cyathea cooperi	Straw tree fern	P
Doodia aspera	Prickly Rasp Fern	
Dianella caerulea	Blue flax lily	
Dichondra repens	Kidney weed	
Entolasia stricta	Wiry panic	
Eupomatia laurina – may also present as a small tr*ee*	Bolwarra	
Eustrephus latifolius	Wombat berry	
Gahnia aspera	Rough saw-sedge	
Geitonoplesium cymosum	Scrambling Lily	
Geranium homeanum		
Glycine clandestina	Twining glycine	

Legal status

E1 = Endangered species under Schedule 1 BC Act, 2016
V = Vulnerable species under Schedule 1 BC Act, 2016
P = Protected species under NPW Act 1974
C = Endangered species under EPBC Act, 1999

Scientific name	Common Name	Legal status
Gymnostachys anceps	Settlers flax	
Hibbertia scandens	Climbing guinea flower	
Imperata cylindrica	Bladey grass	
Indigofera australis	Australian indigo	
Leucopogon juniperinus	Prickly beard heath	
Lomandra longifolia	Spiny-headed mat-rush	
Maclura cochinchinensis	Cockspur Thorn	
Marsdenia rostrata	Milk Vine	
Microsorum scandens	Fragrant fern	
Notelaea longifolia, may also present as a small tree	Large Mock-olive	
Notelaea venosa, may also present as a small tree	Veined Mock-olive	
Oplismenus imbecillis	Basket grass	
Pandorea pandorana	Wonga Wonga Vine	
Pellaea falcata	Sickle Fern	
Piper hederaceum var. hederaceum	Giant pepper vine	
Pittosporum multiflorum syn Citriobatus pauciflorus	Orange thorn	

Legal status

E1 = Endangered species under Schedule 1 BC Act, 2016
V = Vulnerable species under Schedule 1 BC Act, 2016
P = Protected species under NPW Act 1974
C = Endangered species under EPBC Act, 1999

Scientific name	Common Name	Legal status
Plectranthus parviflorus	Cockspur flower	
Pseuderanthemum variabile	Pastel flower	
Pteridium esculentum	Bracken	
Rubus rosifolius	Native Raspberry	
Sigesbeckia orientalis		
Smilax australis	Lawyer vine	
Smilax glyciphylla	Sweet sarsparilla	
Stephania japonica	Snake vine	
Viola hederacea	Ivy-leaved violet	
Zieria granulata	Illawarra zieria	E1, C

Table 2.3.4.3 – Notifiable weed and exotic species found on site

Scientific name	**Common Name**	**Legal status**
Ageratina adenophora	Crofton weed	
Asparagus aethiopicus	Asparagus fern	
Avena fatua	Wild oat	
Cirsium vulgare	Spear thistle	
Conyza spp	Fleabane	
Delairia odorata	Cape ivy	
Cotoneaster glaucophyllous	Cotoneaster	
Ehrharta erecta	Panic veldt grass	
Erythrina sykesii	Coral tree	
Gomphocarpus fruticosus	Narrow-leaved cotton bush	
Lantana camara	Lantana	**Prohibition on dealings** *Must not be imported into the State or sold*
Ligustrum lucicidum	Large-leaved privet	
Lycium ferocissimum	African boxthorn	**State priority Weed - Mandatory Measure** ***(Part 2, Division 8, Clause 33, draft Biosecurity Regulation 2017***): *A person must not import into the State or sell.*
Ochna serrulata	Mickey mouse plant	

Scientific name	Common Name	Legal status
Olea africana	African olive	**Regional Recommended Measure** *Land managers prevent spread from their land where feasible. Land managers reduce impacts from the plant on priority assets.*
Passiflora subpeltata	White passionfruit	
Pennisetum clandestinum	Kikuyu	
Phytolacca octandra	Inkweed	
Rubus fruiticosus sp aggregate	Blackberry	**Prohibition on dealings** *Must not be imported into the State or sold*
Senecio madagascarensis	Fireweed	**Prohibition on dealings** *Must not be imported into the State or sold*
Senna septemtrionalis	Arsenic bush	
Sida rhombifolia	Paddys lucerne	
Solanum nigrum	Black-berry nightshade	
Stenotaphrum secundatum	Buffalo grass	
Verbena bonariensis	Purpletop	
Verbena rigida var. rigida	Veined verbena	
Zantedeschia aethiopica	Arum lily	

APPENDIX 3

MU1 Illawarra Escarpment Subtropical Rainforest

DESCRIPTION

Illawarra Escarpment Subtropical Rainforest is the most luxuriant form of rainforest found in the LGA. The forest is tall, often with billowing emergent rainforest trees rising over 35 metres in height, above a dense subcanopy. It supports a high diversity of canopy species including *Dendrocnide excelsa*, *Doryphora sassafras*, *Diploglottis australis*, *Toona ciliata*, *Ficus obliqua* var. *obliqua* and *F. rubiginosa*. In locations free of recent disturbance, majestic examples of these species are present. The subcanopy supports species such as *Pennantia cunninghamii*, *Cryptocarya* spp., *Livistona australis*, *Polyosma cunninghamii*, *Acmena smithii* and *Doryphora sassafras*. An abundance of woody vines and lianes such as *Piper novae-hollandiae* and *Palmeria scandens* contribute to the exclusion of light from the forest floor providing suitable conditions for a cover of shade tolerant ferns. Many species found within this community are shared with Coachwood Warm Temperate Rainforest.

Illawarra Escarpment Subtropical Rainforest is most prominent on the rear of escarpment benches where deep clay soils, high rainfall and sheltered aspects occur in combination. Small isolated patches of this rainforest community are found in deep gullies underlain by richer soils derived from the Cordeaux Crinanite rocks near upper Cordeaux Dam and on the deep alluviums at Picnic Point adjoining the Hacking River in Royal National Park. Clearing of escarpment benches for mining, agricultural and residential land uses is likely to have reduced the original extent of the community in the Wollongong LGA.

Affinities with other rainforest communities in the Sydney Basin Region are uncertain. Analyses of site data indicated that isolated patches of rainforest communities in the Watagan Ranges on the Central Coast share a similar forest structure but a different floristic composition. To the south of the LGA, no similar community has been described in Shellharbour LGA (Mills, 2000). Mills & Jakeman (1995) note that similar rainforest stands occur in the Kangaroo Valley although species composition differs as a result of cooler temperatures. The degree of difference has not been tested by this project. Species composition of an aligned Forest Ecosystem defined by NPWS (2000a) "Coastal Hinterland Subtropical Warm Temperate Rainforest" shares many positive diagnostic species with Illawarra Escarpment Subtropical Rainforest. Floyd (1990) equates field locations that describe both classifications, describing Suballiance 14 *Doryphora-Daphnandra micrantha-Dendrocnide-Ficus-Toona*. Resolution of the relationship between the extent of the community to the south of the Study Area requires further clarification. Data on the regional distribution is presented on this understanding.

FLORISTIC SUMMARY

Number of Sites: ***16***

Trees: 20-35m tall. Mean Projected Canopy Cover 66%

Doryphora sassafras, Livistona australis, Diploglottis australis, Acmena smithii, Cryptocarya glaucescens, Dendrocnide excelsa, Pennantia cunninghamii, Toona ciliata, Ceratopetalum apetalum, Ficus obliqua var. obliqua, Ficus rubiginosa, Cryptocarya microneura, Diospyros australis

Subcanopy Trees: 10-25m tall. Mean Projected Canopy Cover 40%

Polyosma cunninghamii, Clerodendrum tomentosum, Pittosporum undulatum, Claoxylon australe

Tall Shrubs: 1-10m tall. Mean Projected Canopy Cover 30%

Wilkiea huegeliana, Eupomatia laurina

Ground Covers: 0-1m tall. Mean Projected Canopy Cover 15%

Gymnostachys anceps, Arthropteris tenella, Microsorum scandens, Adiantum formosum, Pteris umbrosa, Elatostema reticulatum var. reticulatum, Peperomia blanda var. floribunda, Pseuderanthemum variabile, Pittosporum multiflorum, Doodia aspera, Calochlaena dubia, Lastreopsis decomposita

Vines & Climbers:

Palmeria scandens, Piper novae-hollandiae, Marsdenia rostrata, Pandorea pandorana subsp. pandorana, Morinda jasminoides, Smilax australis, Eustrephus latifolius, Cissus hypoglauca, Marsdenia flavescens, Melodinus australis, Cissus antarctica

Epiphytes:

Asplenium australasicum

KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- A dense, closed forest canopy comprising sometimes large and buttressed rainforest species including Sassafras (*Doryphora sassafras*), Cabbage tree palm (*Livistona australis*), Lilly pilly (*Acmena smithii*), Giant stinging tree (*Dendrocnide excelsa*), Brown beech (*Pennantia cunninghamii*), Red cedar (*Toona ciliata*), large Fig trees (*Ficus obliqua* var. *obliqua*, *Ficus rubiginosa*) and *Cryptocarya* spp. (*C. glaucescens* and *C. microneura*).
- Predominance of rhizomatous fern species climbing on rocks, logs, lianes and tree trunks including Fragrant fern (*Microsorum scandens*) and *Arthropteris tenella*.
- An abundance of large woody vines or lianes and the presence of Pepper vine (*Piper novae-hollandiae*) and Anchor vine (*Palmeria scandens*).
- Presence of epiphytes such as Birds nest fern (*Asplenium australasicum*) in the canopy and on rocks.
- The presence of shade dependant herbs and ferns such as *Elatostema reticulatum* var. *reticulatum*, *Peperomia blanda* var. *floribunda* and Jungle brake (*Pteris umbrosa*).

EXAMPLE LOCATIONS

Mount Keira Scout Camp; Brokers Nose, Corrimal; Scarborough rainforest; Gibson track, Austinmer; Calderwood; Wongawilli.

CONSERVATION STATUS

RESERVATION STATUS

Tenure	Study Area (ha)	Proportion of Total (%)	Sydney Basin Bioregion (ha/%)
National Park Estate	150.96	52.8	2415 (30)
Water Catchment	0	0	7 (0.1)
State Forest	0	0	
Wollongong City Council Reserves	6.95	2.4	
Reserved Subtotal	157.91	55.2	
Other	128.26	44.8	
Total	286.17	100	8114

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	88.87	31.1
B Moderate	123.11	43.0
C Heavy	74.19	25.9
Scattered trees	0	0
Total	286.17	100

THREATENED PLANT SPECIES

Arthropteris palisotii (E1), *Daphnandra* sp. "Illawarra" (E1)

DIAGNOSTIC SPECIES

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Acmena smithii	4	0.76	2	0.44	positive
Adiantum diaphanum	1	0.06	0	0.00	positive
Adiantum formosum	4	0.71	3	0.27	positive
Arthropteris tenella	2	0.88	2	0.17	positive
Asplenium australasicum forma australasicum	2	0.53	1	0.16	positive
Ceratopetalum apetalum	4	0.53	5	0.13	positive
Cryptocarya glaucescens	4	0.65	4	0.24	positive
Cryptocarya microneura	2	0.53	3	0.28	positive
Dendrobium pugioniforme	1	0.06	0	0.00	positive
Dendrocnide excelsa	4	0.65	1	0.06	positive
Diospyros australis	2	0.82	1	0.39	positive
Doodia aspera	2	0.59	3	0.45	positive
Doryphora sassafras	5	1.00	4	0.23	positive
Eupomatia laurina	2	0.94	2	0.27	positive
Ficus coronata	4	0.59	1	0.15	positive
Gymnostachys anceps	3	1.00	2	0.42	positive
Lastreopsis decomposita	4	0.53	3	0.18	positive
Livistona australis	4	1.00	2	0.44	positive
Microsorum scandens	4	0.94	2	0.09	positive
Morinda jasminoides	2	0.76	2	0.31	positive
Neolitsea dealbata	1	0.06	0	0.00	positive
Palmeria scandens	3	0.76	2	0.14	positive
Pennantia cunninghamii	4	0.71	1	0.05	positive

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Peperomia blanda var. floribunda	2	0.06	0	0.00	positive
Piper novae-hollandiae	4	0.71	1	0.07	positive
Pisonia umbellifera	1	0.06	0	0.00	positive
Pittosporum multiflorum	2	0.71	2	0.34	positive
Polyosma cunninghamii	2	0.59	2	0.09	positive
Pteris umbrosa	3	0.65	1	0.05	positive
Toona ciliata	5	0.59	1	0.14	positive
Eustrephus latifolius	1	0.76	2	0.66	negative
Geitonoplesium cymosum	1	0.18	2	0.68	negative
Notelaea venosa	2	0.35	3	0.59	negative
Oplismenus imbecillis	1	0.24	3	0.62	negative
Pittosporum undulatum	1	0.59	3	0.64	negative

APPENDIX 4

Biodiversity Conservation Act 2016 No 63

Current version for 1 July 2019 to date (accessed 24 September 2019 at 13:59)

Part 7 Division 5

Division 5 Preparation of species impact statements

7.20 Form and content of species impact statement

(1) A species impact statement for the purposes of this Part must be in writing signed by the principal author of the statement and by the applicant for development consent or the proponent of the activity proposed to be carried out (as the case requires).

See completed SIS for *Zieria granulata* (Illawarra Zieria), and the EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion,* following.

(2) A species impact statement must include a full description of the proposed development or activity and the information as to matters relating to the impact on threatened species or ecological communities as is required by the regulations.

In summary, the proposed development, involves routine maintenance of kikuyu turfed areas, and the selective removal of weed species, and senescing wattle species to establish a proposed APZ.

Targeted weed removal, will address the negative impacts of weed invasion on specimens of *Zieria granulata* occurring on rainforest margins on the subject property.

The removal of weed species, negatively impacting on 137 specimens of *Zieria granulata* (Illawarra Zieria), identified on the subject property, represents *Specific Objective 2: To identify and manage the threat of weed invasion at sites that contain the species,* in the *Department of Environment and Conservation, (2005) Zieria granulata (Illawarra Zieria) Recovery Plan.*

Only minimal disturbance bush regeneration methods are to be utilized in the vicinity of *Zieria granulata* (Illawarra Zieria) occurring on the subject property. Weed species include: Large-leaved privet (*Ligustrum lucidum*), Lantana (*Lantana camara*), Blackberry (*Rubus fruiticosus sp. Aggregate*); African olive (*Olea Africana*), African boxthorn (*Lycium ferocissimum*), Coral trees (*Erythrina x sykesii*), and Cape Ivy (*Delairea odorata*).

Proposed weed removal in rainforest margin areas is consistent with the Priority action of targeted physical and chemical weed control and bush regeneration activities contained in the NSW Govt, OEH, *Saving our Species Programme Recovery Strategy for: Illawarra Subtropical Rainforest in the Sydney Basin Bioregion.*

(3) A species impact statement must include details of the qualifications and experience in threatened species conservation of the person preparing the statement and of any other person who has conducted research or investigations relied on in preparing the statement.

Please refer to Business Profile – Principal and Author, *Vegetation Community Assessment of Bushfire hazard in central and eastern section of Lot 17/DP 1210621, for proposed Seniors Living development site, 2 Caliope Street, Kiama, NSW, 2533*.

(4) The requirements of this section in relation to information concerning the State-wide conservation status of any species or ecological community are taken to be satisfied by the information in that regard supplied to the principal author of the species impact statement by the Environment Agency Head.

(5) The regulations may make further provision for or with respect to the form and content of species impact statements.

Part 7 Division 1 Section 7.3

7.3 Test for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats

(1) The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

NIL to POSITIVE

All specimens of *Zieria granulata* on the subject property will be retained.

All specimens of *Zieria granulata* identified on the subject property, will be protected and preserved through measures are consistent with recovery actions in the *Department of Environment and Conservation, (2005) Zieria granulata (Illawarra Zieria) Recovery Plan.*

In summary, the measures include:

- Document the location of all specimens of *Zieria granulata* (Illawarra Zieria).
- Establish a 2.5m buffer around all specimens of *Zieria granulata* (Illawarra Zieria).
- Remove weed species, negatively impacting on specimens of *Zieria granulata* (Illawarra Zieria), utilsing minimal disturbance bush regeneration methods. Weed species include: Large-leaved privet (*Ligustrum lucidum*), Lantana (*Lantana camara*), Blackberry (*Rubus fruiticosus sp. Aggregate*); African olive (*Olea Africana*), African boxthorn (*Lycium ferocissimum*), Coral trees (*Erythrina x sykesii*), and Cape Ivy (*Delairea odorata*).

The estimated outcome is a net positive benefit towards the protection and preservation of 137 x stems of *Zieria granulata* identified on the subject property.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(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

NIL to POSITIVE.

The EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion,* occurs in E2 zoned lands, east and outside of any proposed footprint, activities or impacts of the proposed development.

Proposed weed removal in rainforest margin areas is consistent with the Priority action of targeted physical and chemical weed control and bush regeneration activities contained in the NSW Govt, OEH, *Saving our Species Programme Recovery Strategy for: Illawarra Subtropical Rainforest in the Sydney Basin Bioregion.*

Weed species include: Large-leaved privet (*Ligustrum lucidum*), Lantana (*Lantana camara*), Blackberry (*Rubus fruiticosus sp. Aggregate*); African olive (*Olea Africana*), African boxthorn (*Lycium ferocissimum*), Coral trees (*Erythrina x sykesii*), and Cape Ivy (*Delairea odorata*).

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

NIL to POSITIVE.

The EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion,* occurs in E2 zoned lands, east and outside of any proposed footprint, activities or impacts of the proposed development.

Proposed weed removal in rainforest margin areas is consistent with the Priority action of targeted physical and chemical weed control and bush regeneration activities contained in the NSW Govt, OEH,

Saving our Species Programme Recovery Strategy for: Illawarra Subtropical Rainforest in the Sydney Basin Bioregion.

Weed species include: Large-leaved privet (*Ligustrum lucidum*), Lantana (*Lantana camara*), Blackberry (*Rubus fruiticosus sp. Aggregate*); African olive (*Olea Africana*), African boxthorn (*Lycium ferocissimum*), Coral trees (*Erythrina x sykesii*), and Cape Ivy (*Delairea odorata*).

(c) in relation to the habitat of a threatened species or ecological community:

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

NIL to POSITIVE. A nett positive benefit will be achieved by weed removal of weed species that have invaded the rainforest margin of the EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion,* which is also the area where specimens of *Zieria granulata* have been identified on the subject property.

Both the EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion* and specimens of *Zieria granulata*, will be protected and preserved through measures that are consistent with recovery actions in the *Department of Environment and Conservation, (2005) Zieria granulata (Illawarra Zieria) Recovery Plan,* and *Saving our Species Programme Recovery Strategy for: Illawarra Subtropical Rainforest in the Sydney Basin Bioregion..*

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

NA. The EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion,* occurs in E2 zoned lands, east and outside of any proposed footprint, activities or impacts of the proposed development.

Both the EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion* and specimens of *Zieria granulata*, will be protected and preserved through measures that are consistent with recovery actions in the *Department of Environment and Conservation, (2005) Zieria granulata (Illawarra Zieria) Recovery Plan,* and *Saving our Species Programme Recovery Strategy for: Illawarra Subtropical Rainforest in the Sydney Basin Bioregion..*

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

NA. The EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion,* occurs in E2 zoned lands, east and outside of any proposed footprint, activities or impacts of the proposed development. The rainforest represents an isolated remnant.

Both the EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion* and specimens of *Zieria granulata*, will be protected and preserved through measures that are consistent with recovery actions in the *Department of Environment and Conservation, (2005) Zieria granulata (Illawarra Zieria) Recovery Plan,* and *Saving our Species Programme Recovery Strategy for: Illawarra Subtropical Rainforest in the Sydney Basin Bioregion..*

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

NA.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

- *Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process), and listed in Appendix 4 of the Biodiversity Conservation Act, 2016.*

  The proposed development, involves routine maintenance of kikuyu turfed areas, and the selective removal of weed species, and senescing wattle species to establish a proposed APZ.

  Although there will be selective removal of some native plants to establish the APZ, there will also be focused weed removal of weed species that have invaded the rainforest margin of the EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion,* which is also the area where specimens of *Zieria granulata* have been identified on the subject property.

  Both the EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion* and specimens of *Zieria granulata*, will be protected and preserved through measures that are consistent with recovery actions in the *Department of Environment and Conservation, (2005) Zieria granulata (Illawarra Zieria) Recovery Plan,* and *Saving our Species Programme Recovery Strategy for: Illawarra Subtropical Rainforest in the Sydney Basin Bioregion..*

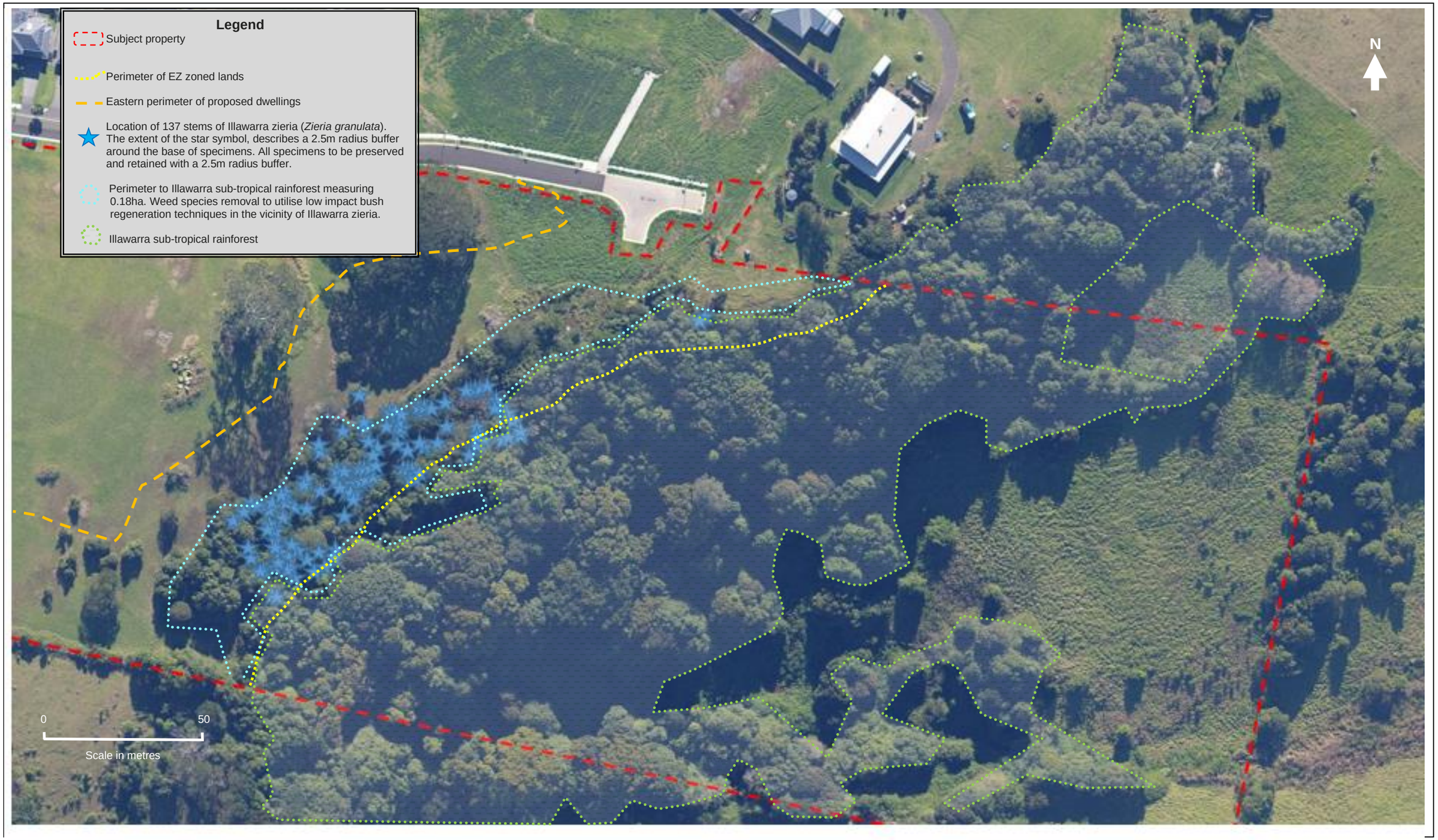
  The proposed activities associated with establishing an APZ on the eastern side of the proposed development, are estimated to deliver a NETT POSITIVE BENEFIT to the EEC, *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion,* and specimens of *Zieria granulata* identified on the subject property, and address the impacts of the following Key Threatening Processes.

- *Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat).*
- *Invasion and establishment of exotic vines and scramblers.*
- *Invasion of native plant communities by African Olive, Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.*
- *Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.*

(2) The Minister may, by order published in the Gazette with the concurrence of the Minister for Planning, issue guidelines relating to the determination of whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Any such guidelines may include consideration of the implementation of strategies under the Biodiversity Conservation Program.

Principal Author: Andrew Horton
Signed: Andrew Slaters date: 17th Sept 2019

Applicant/Proponent:
Signed: date:


Legend
Subject property
Perimeter of EZ zoned lands
Eastern perimeter of proposed dwellings
Location of 137 stems of Illawarra zieria (*Zieria granulata*). The extent of the star symbol, describes a 2.5m radius buffer around the base of specimens. All specimens to be preserved and retained with a 2.5m radius buffer.
Perimeter to Illawarra sub-tropical rainforest measuring 0.18ha. Weed species removal to utilise low impact bush regeneration techniques in the vicinity of Illawarra zieria.
Illawarra sub-tropical rainforest
N
0
50
Scale in metres

GPS location of Illawarra zieria (*Zieria granulata*) within subject property. GPS records are shown in decimal degrees											
Record	Latitude	Longitude	Record	Latitude	Longitude	Record	Latitude	Longitude	Record	Latitude	Longitude
1.	-34.678643	150.840932	44.	-34.678952	150.840099	87.	-34.678952	150.839778	130.	-34.679196	150.839575
2.	-34.678665	150.840926	45.	-34.67897	150.840113	88.	-34.679039	150.839805	131.	-34.679226	150.8396
3.	-34.678806	150.84028	46.	-34.679027	150.840109	89.	-34.679069	150.839797	132.	-34.679252	150.839614
4.	-34.678807	150.840267	47.	-34.679021	150.840106	90.	-34.679121	150.839792	133.	-34.679261	150.839596
5.	-34.678801	150.840262	48.	-34.679034	150.840086	91.	-34.679147	150.839828	134.	-34.679313	150.839656
6.	-34.678796	150.840237	49.	-34.679028	150.840086	92.	-34.679166	150.839824	135.	-34.67931	150.839664
7.	-34.678797	150.840238	50.	-34.679009	150.840081	93.	-34.679196	150.839836	136.	-34.679339	150.839651
8.	-34.678809	150.84022	51.	-34.679	150.840053	94.	-34.679211	150.839785	137.	-34.679345	150.839653
9.	-34.678834	150.840227	52.	-34.678997	150.840059	95.	-34.679246	150.839807			
10.	-34.678824	150.840234	53.	-34.678967	150.840053	96.	-34.679224	150.839745			
11.	-34.678827	150.840248	54.	-34.678946	150.840037	97.	-34.679262	150.83972			
12.	-34.678812	150.84025	55.	-34.678933	150.840037	98.	-34.679277	150.839715			
13.	-34.678879	150.840335	56.	-34.678938	150.840016	99.	-34.679268	150.839704			
14.	-34.678883	150.840354	57.	-34.67891	150.839978	100.	-34.679255	150.839695			
15.	-34.678889	150.840367	58.	-34.678929	150.839934	101.	-34.679249	150.839677			
16.	-34.678883	150.840388	59.	-34.678896	150.839917	102.	-34.679257	150.839668			
17.	-34.678927	150.840393	60.	-34.678944	150.839924	103.	-34.679247	150.839662			
18.	-34.678914	150.840371	61.	-34.678968	150.83994	104.	-34.679235	150.839671			
19.	-34.678935	150.840363	62.	-34.678989	150.839986	105.	-34.679222	150.839716			
20.	-34.678926	150.840335	63.	-34.679011	150.839966	106.	-34.679209	150.839713			
21.	-34.678966	150.840246	64.	-34.679015	150.839929	107.	-34.679189	150.839719			
22.	-34.678947	150.840265	65.	-34.67901	150.839915	108.	-34.679204	150.839682			
23.	-34.678927	150.840283	66.	-34.679265	150.8398	109.	-34.679195	150.83967			
24.	-34.678902	150.84028	67.	-34.679052	150.839938	110.	-34.679187	150.839678			
25.	-34.678874	150.840349	68.	-34.679046	150.839933	111.	-34.679171	150.83966			
26.	-34.678908	150.840305	69.	-34.67906	150.839915	112.	-34.679154	150.839659			
27.	-34.67892	150.840303	70.	-34.679059	150.839916	113.	-34.679149	150.839672			
28.	-34.678829	150.840196	71.	-34.679072	150.839915	114.	-34.679138	150.839677			
29.	-34.678856	150.840162	72.	-34.679082	150.839902	115.	-34.67914	150.839677			
30.	-34.678877	150.840124	73.	-34.679084	150.839905	116.	-34.679108	150.839735			
31.	-34.678868	150.840137	74.	-34.679113	150.839868	117.	-34.6791	150.839786			
32.	-34.678859	150.840092	75.	-34.679121	150.839865	118.	-34.679041	150.839749			
33.	-34.678885	150.840122	76.	-34.679109	150.839875	119.	-34.679053	150.839683			
34.	-34.678886	150.840097	77.	-34.679093	150.839876	120.	-34.679069	150.839663			
35.	-34.679047	150.839958	78.	-34.679063	150.839852	121.	-34.679065	150.839644			
36.	-34.678866	150.840025	79.	-34.679041	150.839833	122.	-34.679109	150.839645			
37.	-34.67886	150.840015	80.	-34.679037	150.839849	123.	-34.67912	150.839666			
38.	-34.6789	150.840032	81.	-34.679027	150.839845	124.	-34.679144	150.839679			
39.	-34.678934	150.840038	82.	-34.679019	150.839864	125.	-34.679091	150.839591			
40.	-34.67893	150.840024	83.	-34.679011	150.839879	126.	-34.679112	150.839557			
41.	-34.678917	150.840047	84.	-34.678988	150.839852	127.	-34.679121	150.839553			
42.	-34.678929	150.840172	85.	-34.678951	150.839789	128.	-34.679131	150.839532			
43.	-34.67896	150.840159	86.	-34.678932	150.839869	129.	-34.679139	150.839525			