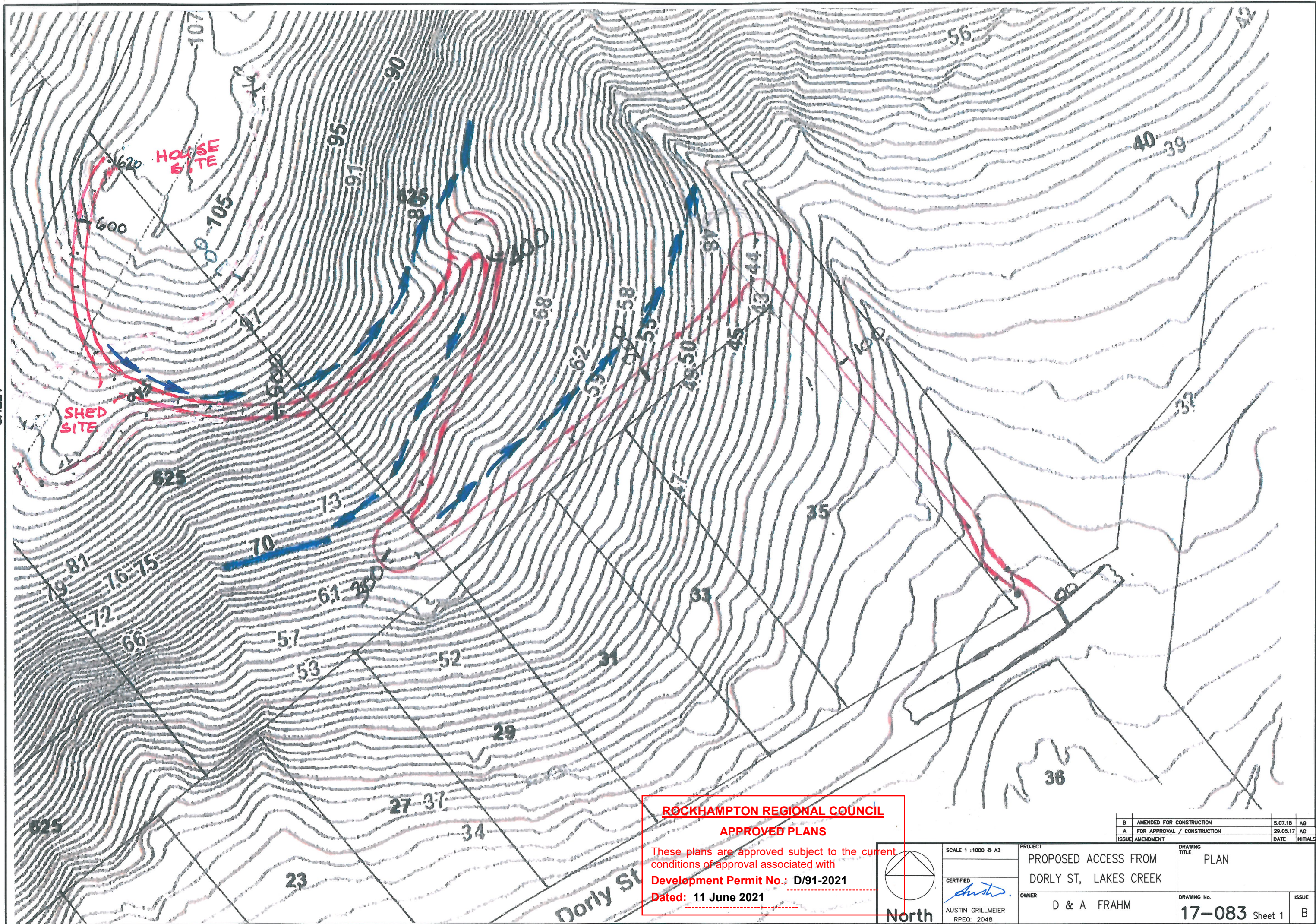




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13 SHEETS



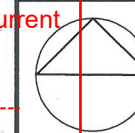
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**Dated: 11 June 2021**



North

SCALE 1 : 1000 © A3

	CERTIFIED
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AUSTIN GRILLMEIER  
RPEQ: 2048

PROJECT

PROPOSED ACCESS FROM  
DORLY ST, LAKES CREEK

OWNER

D &amp; A FRAHM

**DRAWING**

DRAWING  
TITLE

PLAN

DRAWING No.

DRAWING No. 17-083 Sheet 1

ISSUE

B

B	AMENDED FOR CONSTRUCTION	5.07.18	AG
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**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

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**Dated: 11 June 2021**

## Bushfire Hazard Assessment & Management Plan

Proposed Dwelling on  
4, 5, 14 and 15 on 5RP603374  
Lakes Creek 4701

## Publication Details

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## Acronyms and Abbreviations

APZ: Asset Protection Zone. A fuel reduced area surrounding a building (fire break).

AS 3959: Australian Standard 3959: 2018 Building in Bushfire Prone Areas and amendments.

BAL: Bushfire Attack Level indicated in AS3959 for site specific factors.

BHA: Bushfire Hazard Assessment

BMP: Bushfire Management Plan

QFES: Queensland Fire and Emergency Services

QRFS: Queensland Rural Fire Service

RRC: Rockhampton Regional Council

SPP: *State Planning Policy*. July 2017

SPP Guideline: *Natural hazards, risk and resilience - Bushfire. State Planning Policy – state interest guidance material*. December 2019

NCA 1992: *Nature Conservation Act 1992*

VMA 1999: *Vegetation Management Act 1999*



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# Bushfire Hazard Assessment

## 1 Introduction

The purpose of the Bushfire Hazard Assessment is to determine the level of bushfire hazard with reference to:

- a) The Rockhampton Regional Council 8.2.4 Bushfire hazard overlay code;
- b) The Australian Standard AS3959 Construction of buildings in bushfire-prone areas (AS3959); and
- c) Site specific factors that may influence standardised assessment methods.

The subject of this Bushfire Hazard Assessment and Management Plan is the proposed dwelling and any non-livable structure closer than 6 metres to the proposed dwelling located on lots 4, 5, 14 and 15 on 5RP603374 at Lakes Creek 4701.

### 1.1 Site Location

Lots 4, 5, 14 and 15 on 5RP603374 are located at Lakes Creek, 4701 and approximately 1,100 metres Northeast of the Emu Park Rockhampton Road. See **Figure 1** for the site location.

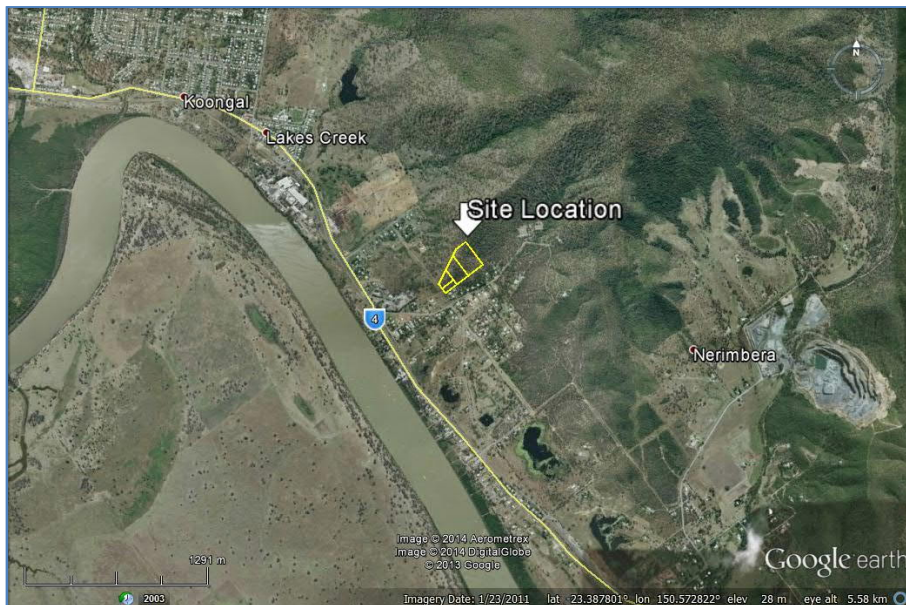


Figure 1. Site location of Lots 4, 5, 14 and 15 on 5RP603374 at Lakes Creek 4701.

### 1.2 Proposed Dwelling Location

Figure 2 shows the approximate location of the proposed dwelling. The dwelling will be located to take advantage of the least hazardous area on the lot. The least hazardous area is determined by an assessment of bushfire hazard constraints provided in this BHA and BMP.





Figure 2. The approximate location of a dwelling on lot 4, 5, 14 and 15 on 5RP603374 is indicated by the blue outline.

### 1.3 Surrounding Landscapes

The subject lot is located at the edge of a large expanse of woodlands to the north through to the Southeast. Residential development is located to the south and Northwest (Figure 3).

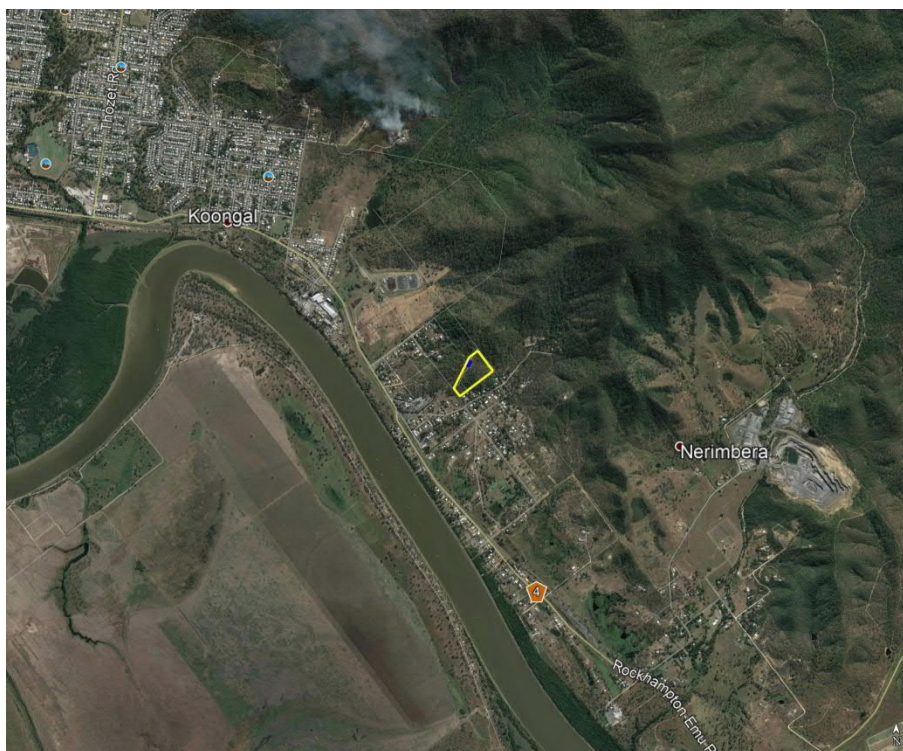


Figure 3. Local vegetation and landscape patterns surrounding the subject lots.



## 1.4 Weather

The following data was obtained from the Bureau of Meteorology ([www.bom.gov.au/climate/averages/tables/cw\\_039083.shtml](http://www.bom.gov.au/climate/averages/tables/cw_039083.shtml)) for the Rockhampton Aero weather station.

Mean annual rainfall is 815 millimetres. Rainfall below 100mm occurs from May to October with September the driest month (24mm)

The hottest months are November to February with the hottest time of year around November to March.

Prevailing winds are south east in the morning and east in the afternoon. Northern winds are most prevalent between September and December.

The risk of fire in the area is related to regular seasonal conditions. Northern winds are generally warm and dry and coincide with higher temperatures and lower rainfall in September to November. These weather conditions, in association with low humidity, represent the greatest risk of bushfire in the area.

## 2 Materials & Methods

Bushfire hazard and associated mitigation is assessed with reference to the AS3959: 2018 Construction of Buildings in Bushfire-Prone Areas and Rockhampton Regional Council Planning Scheme 8.2.4 Bushfire hazard overlay code, the Australian Standard

Construction requirements and minimum dwelling setback distances are with reference to the AS3959 Method 2 and site specific factors that may influence standardised assessment methods.

Vegetation structural descriptions are based on Regional Ecosystems descriptions. Vegetation density scales (very sparse, sparse, medium, dense etc.) are from Melzer (2011). Vegetation heights are calculated using a Suunto clinometer. A Suunto compass is used to determine aspect. Degree of slope is calculated from QLD Data 1 or 5 metre contours where available or otherwise using a Suunto clinometer. Field data is recorded with Android software 'Open Data Kit' using an electronic version of the *fuel assessment field work form 4<sup>th</sup> Edition* (Hines *et. al.*, 2010).

The site specific hazard assessment includes vegetation, slope, aspect and any other natural or manmade features of relevance located within 100 metres of the dwelling site. Consideration is also given to surrounding landscapes and vegetation patterns in the local area. The site specific hazard assessment is considered with respect to vegetation density, species and extent and how natural or manmade features interact with the hazard to modify risk. This provides a measure on the level of risk presented to the dwelling from wildfires at a more detailed local scale.

## 3 Results

### 3.1 Site Selection

Factors determining the location of the dwelling include the degree and nature of nearby potential hazards and risks and the minimisation of impacts to areas of higher biodiversity within the subject lot.

The proposed dwelling site is situated on a relatively flat area cleared of vegetation along the crest of a hill. This site offers a broad flat area on the subject lot. The proposed site minimises impacts to adjacent native vegetation communities by utilising existing cleared areas.



### 3.2 Access

The site is accessible via Thorspur St. which leads off Montgomerie Street. There are two directions of travel to Thorspur St. along Montgomerie St.: off Vesty St in the Northwest or off Dorley St to the Southeast.

The dwelling design and proposed access routes have not been provided at the time of writing. However, access should be compliant with conditions in **Section 8. Driveways & Tracks**.

### 3.3 Site Hazards

Site hazards include degree of slope relative to the dwelling location, vegetation fuel loads and aspect.

#### 1.1.1 Slope

**Figure 4** shows 1 metre contours and 100 metre transects used to establish degree of slope for each aspect relative to the dwelling location. Aspects referred to in the text are shown in **Figure 4**.

Degree of slope was averaged for SE and NW aspects. These are the primary aspects with respect to hazard and will influence lesser slopes to the NE and SW. Results for each slope are provided in **Table 1**.

Table 1. Degree of slope for each aspect:

Aspect	Slope in degrees
Southeast	24
Northwest	15.7
Northeast	9.7 upslope. Effectively 0
Southwest	11
Site	11 (assuming 25m APZ)



Figure 4. One metre contours (OLD Data) around the dwelling location (blue box) with aspects and transects used to determine degree of slope in red.



### 1.1.2 Vegetation hazard

The effective hazards in relation to the dwelling location are grassy woodland communities. **Figure 5** provides aerial views of the dwelling location. There were two distinct vegetation types in proximity to the dwelling location. These were narrow-leaved and silver-leaved ironbark grassy woodland on the Southeast slope (**Figure 6**) and Bluegum grassy woodland on the Northwest slope (**Figure 7**).

There are shrubby woodlands with a component of dry rainforest understorey within 100 metres of the dwelling but at a distance that is not likely to affect fire behaviour in relation to the dwelling location.



Figure 5. Aerial imagery showing the approximate location of the dwelling and surrounding vegetation.





Figure 6. Narrow leaved and silver leaved iron bark woodlands were located on the Southeast slope. Native grasses were the dominant understorey vegetation with very sparse low shrubs present (*Macrozamia* and *Acacia* spp.). Taller weedy grasses were present in disturbed areas near the top of the slope.



Figure 7. Bluegum grassy woodland was located on the northwest slope. Grasses were largely low native grasses with weedy tall grasses at the top of the slope. Shrubs were very rare.



### 3.4 Surface Fuel Hazard Rating

Surface fuel load estimates are assessed with respect to Hines *et. al.* (2010). Hines *et. al.* provides an assessment of fuel hazard on a 5 step scale from low, moderate, high, very high to extreme. These hazard ratings with respect to a vegetation layer provides an estimate of tons/ha of fuel load for that layer.

Figure 8 provides a classification of surface vegetation layers as levels of potential fuel. The assessment does include tree bark hazard types. It does not include estimated density of canopy trees.

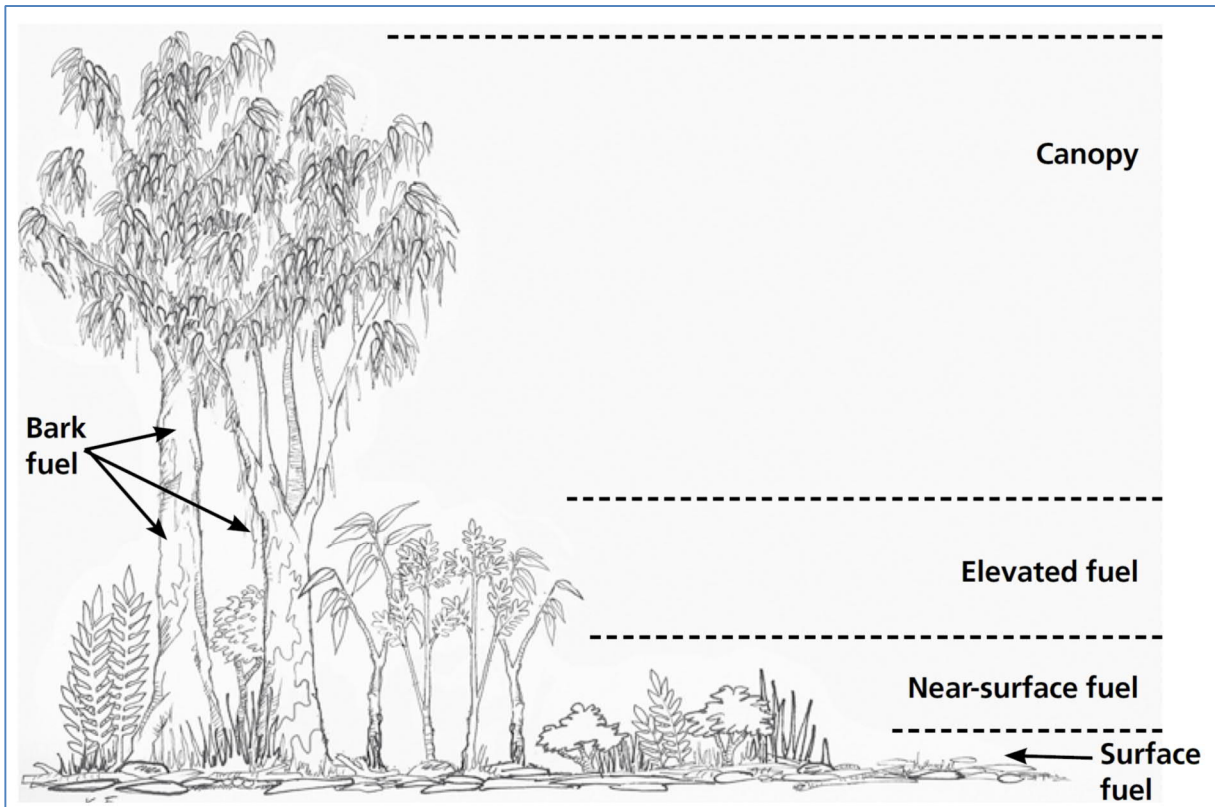


Figure 8. A diagram of various layers of vegetation hazard used in the BAL calculation for surface fuels (taken from Hines *et. al.*, 2010).

### 3.5 Surface fuel load estimate

The average value of indicative fuel loads (t/ha) for each layer of elevated fuel (Hines *et. al.* 2010) is provided in Table 2.

Table 2. Results of estimated tons per hectare of the surface fuel loads at the site by layer and total.

Surface layer	Hazard Rating		Tons/hectare	
	Ironbark	Bluegum	Ironbark	Bluegum
Bark	Moderate	Low	1	0
Elevated	Low	Low	1	0.5
Near-surface	Very high	Very High	4-6	4-6
Surface	Moderate	Moderate	2-4	2-4
Total Surface Fuels average (t/ha)			10	8.5

### 1.1.3 Notes on Grassland and Canopy Fuel Loads

NSW Rural Fire Service (NSWRFS, 2020) provides an estimate of 6.5 t/ha for unmanaged continuous native grasslands and 4.5 t/ha for discontinuous grasslands. The AS3959: 2018 estimate for grasslands is 4.5 t/ha. The SPP-Bushfire-APZ-Width-Calculator (QFES, 2020) provides an estimate of 4.1 t/ha for *Grasslands associated with mixed species woodlands*. An approximate average of 5 t/ha was used in the estimate of surface fuel loads.

The estimated fuel contributed by canopy varies significantly between the AS3959: 2018 woodland category of 10 t/ha and the QFES (2020) estimates for Queensland vegetation types (2.3t/ha for *Moist to dry eucalypt woodland on coastal lowlands and ranges* and 3.2t/ha for open forest of the same landscape type. The AS3959: 2018 woodland category is based on southern Australian woodlands where canopy tree biomass is generally far greater than Central Queensland types. Five t/ha of canopy tree biomass was used to calculate overall fuel loads for this report.

### 3.6 Evidence of Fire

There was evidence of a recent fire at the time of the site survey. The fire was confined to grasses and chard bark to approximately 1.5 metres on ironbark trees. There was no remaining evidence of fire on bluegum trees.

### 3.7 Environmental Considerations

Some canopy trees should be retained within the APZ to no greater than 10% canopy cover. Native grasses should be retained but maintained at the heights specified in the Bushfire Management Plan for management of APZ areas. Retention of some canopy trees will retain some biodiversity values and help reduce weedy grass invasion by shading.

### 3.8 Assessed Hazard

Minimum distance ranges for Southeast and Northwest aspects are provided in **Table 3** and **Table 4**. Northeast and Southwest APZ distances should be the same as the Southeast aspect. The minimum recommend BAL construction standard is BAL-19.

Table 3. Asset Protection Zone ranges and corresponding BAL construction standards for SE, NE & SW aspects of the dwelling (see Figure 4. One metre contours (QLD Data) around the dwelling location (blue box) with aspects and transects used to determine degree of slope in red.).

BAL	APZ range (Metres)
29	18.5 to < 27.1
19	27.1 to < 38.0

Table 4. Asset Protection Zone ranges and corresponding BAL construction standards for NW aspects of the dwelling (See Figure 4. One metre contours (QLD Data) around the dwelling location (blue box) with aspects and transects used to determine degree of slope in red..

BAL	APZ range (metres)
29	10.0 to < 15.2
19	15.2 to < 22.5



# Bushfire Management Plan

## 4 Introduction

This Bushfire Management Plan has been developed with regard to The Rockhampton Regional Council 8.2.4 Bushfire hazard overlay code; The Australian Standard AS3959 *Construction of buildings in bushfire-prone areas* (AS3959); and information from a site bushfire hazard survey.

### 4.1 Purpose

The purpose of this Bushfire Management Plan is to reduce risks from bushfire hazard to a tolerable level of risk.

The aim of the Bushfire Management Plan is to provide appropriate construction standards, Asset Protection Zones and hazard maintenance and recommendations based on the identified hazard components present at the time of survey. Conditions may change over time so that owners and occupiers should be prepared to increase risk reduction when required.

Owners and occupiers must bear in mind that implementation of the Bushfire Management Plan will assist in addressing and mitigating identified fire hazards on the subject site, however, the plan does not in itself prevent the loss of life or property. Owners should consider additional mitigation measures such as those provided as recommendations in this Plan or as advised by your local Rural Fire Service Warden.

### 4.2 Bushfire Survival Plan

To assist in mitigating risk, current and future occupants should develop a **Bushfire Survival Plan**. Leaving too late, when a fire is approaching is a common cause of fatalities during a bushfire event. The decision to stay when a fire is approaching involves activating the **Bushfire Survival Plan** and undertaking planned actions before, during, and after the fire. A Bushfire Survival Plan template and/or guidance material can be obtained from the Queensland Fire and Emergency Service.

### 4.3 Ongoing Risk Management

Occupiers should implement all practical measures to prevent the loss of life and property.

It is imperative that owners and occupiers maintain hazard reduction measures and equipment so that they are at hand and functional in a bushfire emergency.

At the start of the bushfire season, revisit your bushfire survival strategy and ensure all intended measures are in place and working. Fine fuels around the house and within the APZ are the greatest threat to a dwelling. Ensure these areas are fuel reduced. Check all hoses; water sources; pumps etc. are adequate and functional. Ensure driveways and fire trails are adequate and suitable for firefighting vehicles.

In case of fire, immediate contact should be made with the relevant fire authority and all directions and advice should be followed.

### 4.4 Responsible Agencies

The responsible Fire Authority is the Queensland Fire and Emergency Services (QFES). The Rural Division of the QFES is responsible for bushfires. The Urban Division of the QFES is responsible for structural fires.

The Local Authority is Livingstone Shire Council. It is the responsibility of the Council and the building certifier to ensure that the measures outlined in this Management Plan are in place prior to the occupation of any buildings that are subject to this plan.

## 5 Site Description

The subject of the Bushfire Management Plan is a proposed dwelling on lot 4, 5, 14 and 15 on 5RP603374 located at Lakes Creek 4701 in the Rockhampton Regional Council area.

## 6 Expected Fire Behavior

Warm, dry Northern winds are common in September to November and coincide with low rainfall. These weather conditions in association with low humidity represent the greatest risk of bushfire in the area.

The absence of ladder fuels and clear separation between canopy and surface fuels indicate a very low likelihood of canopy fires. However, the Southeast aspect may be prone to canopy fires in extreme to catastrophic fire conditions.

The Southeastern slope is relatively steep. Fires from this direction will be very fast moving. Flame heights are not likely to be significant where fire remains within the surface layers. Some ember attack is likely from all directions.

## 7 Construction Standards and Building Protection Zones

1. Asset Protection Zones (fire breaks) will conform to the distances indicated in **Table 5** in accordance with the AS3959 BAL Construction Standard. Relevant aspects are shown in **Figure 9**.
2. The nearest surface of the dwelling must not be located closer to the hazard than the distance ranges indicated in for the BAL Construction Standard employed.
3. Adjacent structures on the subject site are to comply with Section 3.2.3 of the AS3959. That is, any non-liveable structure closer than 6 metres to the dwelling will be constructed to the appropriated BAL standard.
4. Tree canopy cover in the APZ will be less than 10%; and
5. The nearest canopy should be located greater than 2 metres from any part of the roofline of the dwelling.

The installation of a rooftop or perimeter sprinkler system is strongly recommended. The associated pump should be able to be operated independently of the electricity grid. This may be petrol or diesel operated pump or an electric pump powered by a generator.

**Table 5. Asset Protection Zone ranges and associated BAL Construction Standards for each aspect of a dwelling located on the subject lot. Relevant aspects are shown in Figure 9.**

Aspect(s)	BAL	APZ range (Metres)
SE, NE & SW	29	18.5 to < 27.1
	19	27.1 to < 38.0
Aspects(s)	BAL	APZ range (metres)
NW	29	10.0 to < 15.2
	19	15.2 to < 22.5





Figure 9. Aspects indicated in Table 5. The ridgeline divides SE and NW aspects.

## 8 Driveways & Tracks

Driveways to the house site should:

6. Have a minimum formed width of 4 metres including any gates, a minimum vertical clearance of 4.8 metres and be no less than 6 metres clear from hazardous vegetation<sup>1</sup>;
7. Have adequate drainage to prevent soil erosion;
8. Be constructed to a standard so that they are accessible by QFES fire fighting vehicles in all weather conditions and capable of accommodating a vehicle of 8 tonnes;
9. Access roads on slopes greater than 12.5% must be constructed of materials (i.e. concrete or bitumen) that will support and convey two wheel drive heavy firefighting vehicles in all weather conditions;
10. Have passing bays for firefighting appliances at no more than 200 metres distant from either the dwelling or the access entry point.; and
  - 1.1. Passing bays are 20 metres long with a formed width of 6 metres.
11. Have a turning area no further than 50m from the dwelling, and a turning area located at the junction of Montgomerie St. and Thorspur St.
12. Turning areas are to consist of a circle with a minimum radius of 8m (including roll-over kerbs if they are provided) or T or Y heads of specified dimensions as indicated in **Figure 10**;
13. Fire trails are to be constructed in the same manner as driveways or otherwise to the satisfaction of QRFS.

<sup>1</sup> Trees can be retained in the roadside clearing area if dry shrubs and fine fuels are removed and grasses are maintained at no greater than 30 centimetres in height.

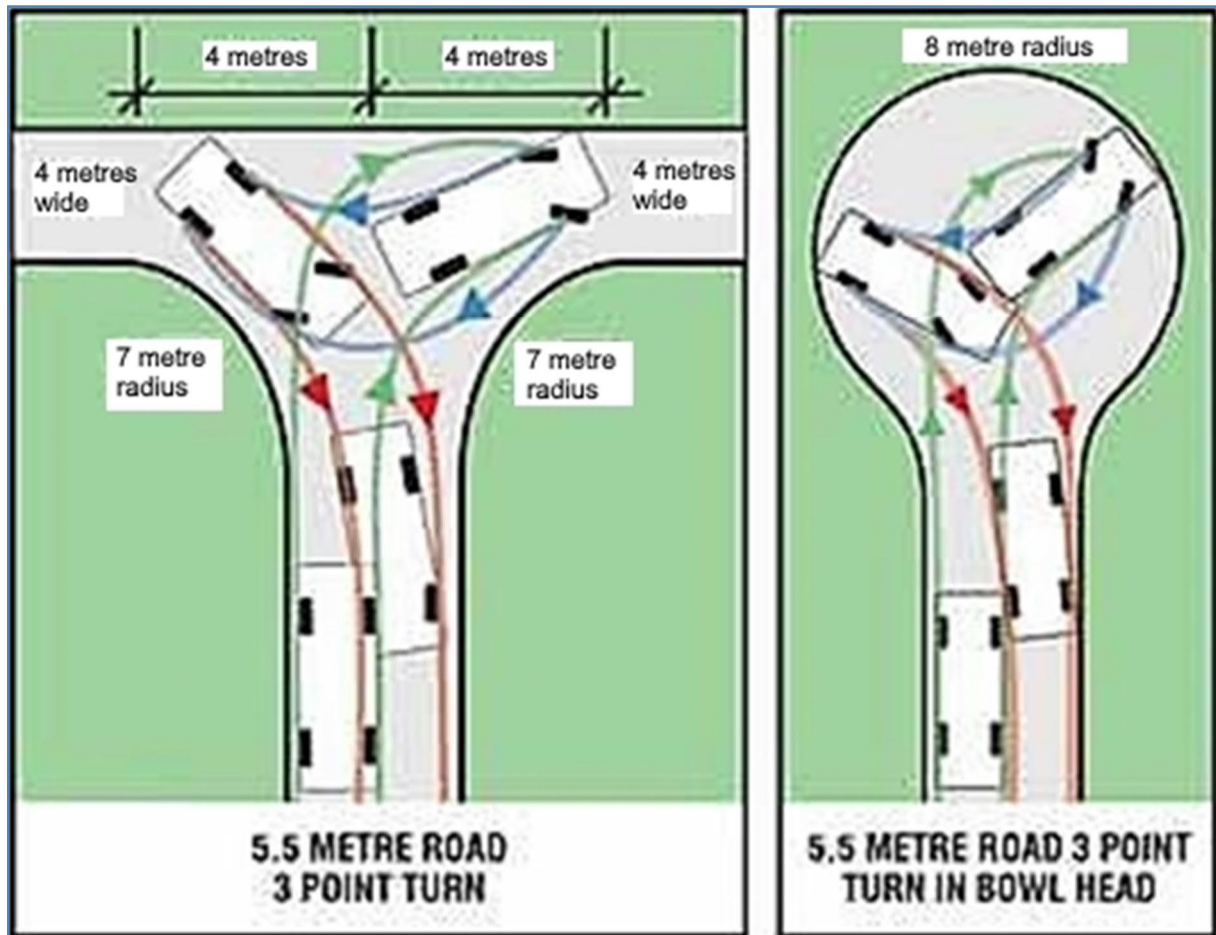


Figure 10. Example turnaround areas (Taken from Building Fire Safety Management Tool & Advisory Notes, State of Queensland (Queensland Fire and Emergency Services) 2015).

## 9 Water supply for firefighting purposes

The lot will have:

1. A dedicated on-site water storage for firefighting to be located within 10 metres of the dwelling that:
  - 1.1. Is constructed of non-combustible materials or is an underground tank;
  - 1.2. has a take-off connection from the building to the tank which is at a level that provides on-site water storage of not less than 20,000 litres;
  - 1.3. has a hardstand area allowing heavy rigid fire appliance access within six (6) metres of a tank; and
  - 1.4. has fire brigade tank fittings consisting of:
    - 1.4.1. fifty (50) millimetre ball valve and male camlock coupling for above ground tanks; and
    - 1.4.2. above ground water pipe fittings that are metal; or
    - 1.4.3. for underground tanks, an access hole of 200 millimetre diameter (minimum) to allow access for suction lines.
  - 1.5. Are accessible at all times to any appliance from the Queensland Fire and Emergency Services;



2. Other accessible water sources (e.g. accessible dam, bore or swimming pool) are to be provided with all-weather access and a hardstand area within 6 metres of the water source.

## 10 Landscaping

1. The dwelling should be located so that it is:
  - a) 10 meters from any retained vegetation strips or small areas of vegetation;
  - b) Retained trees in the APZ should provide a non-continuous canopy with a total canopy cover of less than 10%; and
  - c) All dead and damaged timber is to be removed within the APZ.
2. Lawns and Gardens within 10m width surrounding the dwelling are to be kept at no greater than 50mm in height;
3. Grassed areas and lawns for a further 10m are to be kept at no greater than 150mm;
4. The balance of the setback zone will be kept in a hazard reduced state: free of weeds (particularly lantana and guinea grass) and grasses at no greater than 200mm high: and
5. Landscaping trees within 10m of residences should be fire resistant species. No tree or shrub should be in contact with or overhang buildings.
6. All fencing and other garden structures within 10 metres of the dwelling will be constructed from non-combustible materials.

## 11 Purchaser/Resident Education and Awareness Programs

Each owner should be provided with a copy of this Fire Management Plan with an alert placed either on the title or Council rate searches that the Fire Management Plan is in existence and is to be made available to subsequent owners. The hazard ratings are to be placed on council plans and / or rate notices.

Owners should read and be familiar with the information contained in this report. Owners are responsible for maintenance of fire reduction measures on the site to reduce the risk of fire.

Owners should establish a Fire Safety Plan and Emergency Evacuation Plan for the event of fire including all suitable evacuation routes from their land and dwelling for fire from all potential directions. In the event of a fire, dialling 000 obtains emergency assistance.

Bushfire Safety Plans should include a series of time actions:

1. out of season observations for general fire safety around your house and property;
2. at the start of the fire season;
3. when very high to catastrophic conditions are announced for your area
4. when a fire is near your area;
5. when QRFS provide a watch and act or elevated warnings; and
6. when you are told to leave

Examples of Fire Safety Plans include the *Rural Property Fire Management Guide* and '*Plan Act Survive*' - *Bushfire Survival Plan*.

Residents should maintain regular contact with the Fire Brigade for local information updates and check the Queensland Rural Fire Service website for any updated fire safety guides and further information.

Additional recommendations to reduce fire risk around the dwelling are provided in **Table 6**



**Table 6. Hazard Reduction Measures: The following recommendations provide additional measures to reduce hazards around the dwelling**

Category	Issue	Action
<b>Buildings</b>	Maintenance: Buildings and Grounds	<ul style="list-style-type: none"> <li>• Clear overhanging trees and shrubs from dwellings and associated structures;</li> <li>• Point LPG gas tank relief valves away from dwellings;</li> <li>• Store flammable items well away from dwellings (e.g. woodpiles, boxes, paper);</li> <li>• Secure roof and clean gutters of dry leaf debris to eliminate an ignition source for embers;</li> <li>• Clear fuels around the house for at least 20 metres;</li> <li>• Trim under fences and remove overgrown bushes and plants;</li> <li>• Ensure surrounding grassed areas are trimmed and well-watered; and</li> <li>• Install non-flammable gutter guards.</li> <li>• Ensure door mats and other flammable material is moved away from the building when a bushfire is imminent.</li> </ul>
<b>Water</b>	Water Supply and firefighting equipment	<ul style="list-style-type: none"> <li>• Water sources for firefighting may include an accessible dam or tank with fire brigade tank fittings, a swimming pool, bore water etc. These sources should be provided with all-weather access;</li> <li>• All structures should be provided with a garden hose with metal fittings attached to the water supply at all times. The hose should be of sufficient length to reach all sides of a building; and</li> <li>• Regularly check that firefighting equipment is operational.</li> <li>• Rooftop and perimeter sprinkler systems are considered to be very effective in reducing the risk of spot fires around a dwelling.</li> </ul>
<b>Hazard Reduction</b>	Close proximity of buildings to hazardous vegetation  Hazard reduction:	<ul style="list-style-type: none"> <li>• Trees should be located at a sufficient distance away from dwellings so that when fully mature, branches do not overhang the eaves of the house.</li> <li>• Create a 1 to 2 metre non-flammable area immediately around the dwelling.</li> <li>• Within the hazard reduction zones, hazardous understory vegetation (dry sclerophyll species) should be removed within the setback zone of all structures. These can be replaced with fire resistant species.</li> </ul>
<b>Landscaping</b>	Growth of grasses and other fire prone vegetation in disturbed and cleared areas	<ul style="list-style-type: none"> <li>• Remove tall weedy grasses and undesirable regrowth from the APZ; and</li> <li>• Maintain all safety buffer areas free of weeds and tall grasses to maximum heights set out in this Bushfire Management Plan.</li> </ul>
	Landscaping species	<ul style="list-style-type: none"> <li>• Many species of locally occurring dry rainforest species are very effective at suppressing the spread of fire.</li> <li>• Avoid using palm trees and ferny leaved trees near the dwelling. These species are susceptible to burning.</li> </ul>

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## 13 Appendix

AS3959: 2018 Method 2 results



Calculated December 16, 2020, 5:23 pm (MDc v.4.9)

NW

Minimum Distance Calculator - AS3959-2018 (Method 2)

Inputs		Outputs	
Fire Danger Index	40	Rate of spread	1.2 km/h
Vegetation classification	Woodland	Flame length	9.449999999999999 m
Understorey fuel load	8.5 t/ha	Flame angle	61 °, 73 °, 83 °, 88 °, 90 ° & 95 °
Total fuel load	13.5 t/ha	Elevation of receiver	2.71 m, 2.55 m, 1.71 m, 0.35 m, 0 m & 0 m
Vegetation height	n/a	Fire intensity	8,407 kW/m
Effective slope	15.7 °	Transmissivity	0.883, 0.868, 0.847, 0.824, 0.8110000000000001 & 0.743
Site slope	11 °	Viewfactor	0.5928, 0.4373, 0.2939, 0.1992, 0.1618 & 0.0442
Flame width	100 m	Minimum distance to < 40 kW/m <sup>2</sup>	7.2 m
Windspeed	n/a	Minimum distance to < 29 kW/m <sup>2</sup>	10 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m <sup>2</sup>	15.2 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m <sup>2</sup>	22.5 m
		Minimum distance to < 10 kW/m <sup>2</sup>	27.3 m

Rate of Spread - Mcarthur, 1973 &amp; Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 &amp; Noble et al., 1980

Elevation of receiver - Douglas &amp; Tan, 2005

Flame angle - Douglas &amp; Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas &amp; Tan, 2005





Calculated December 16, 2020, 5:28 pm (MDc v.4.9)

SE

Minimum Distance Calculator - AS3959-2018 (Method 2)

Inputs		Outputs	
Fire Danger Index	40	Rate of spread	2.51 km/h
Vegetation classification	Woodland	Flame length	18.14 m
Understorey fuel load	10 t/ha	Flame angle	60 ° , 71 ° , 79 ° , 84 ° , 86 ° & 92 °
Total fuel load	15 t/ha	Elevation of receiver	5.19 m, 4.96 m, 3.63 m, 1.63 m, 0.34 m & 0 m
Vegetation height	n/a	Fire intensity	19,486 kW/m
Effective slope	24 °	Transmissivity	0.867, 0.844, 0.8159999999999999, 0.789, 0.776 & 0.719
Site slope	11 °	Viewfactor	0.6037, 0.4495, 0.3059, 0.208, 0.169 & 0.0456
Flame width	100 m	Minimum distance to < 40 kW/m <sup>2</sup>	13.6 m
Windspeed	n/a	Minimum distance to < 29 kW/m <sup>2</sup>	18.5 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m <sup>2</sup>	27.1 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m <sup>2</sup>	38 m
		Minimum distance to < 10 kW/m <sup>2</sup>	44.8 m

Rate of Spread - Mcarthur, 1973 &amp; Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 &amp; Noble et al., 1980

Elevation of receiver - Douglas &amp; Tan, 2005

Flame angle - Douglas &amp; Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas &amp; Tan, 2005

Asset Protection Zones (APZ) for BAL-19 and BAL-29  
The APZ represents the minimum cleared distance range for the associated with a BAL construction standard.

APZ Ranges are:

SE, NE & SW aspects:  
BAL- 29: 18.5 to < 27.1m  
BAL-19: 27.1 to < 38.0m

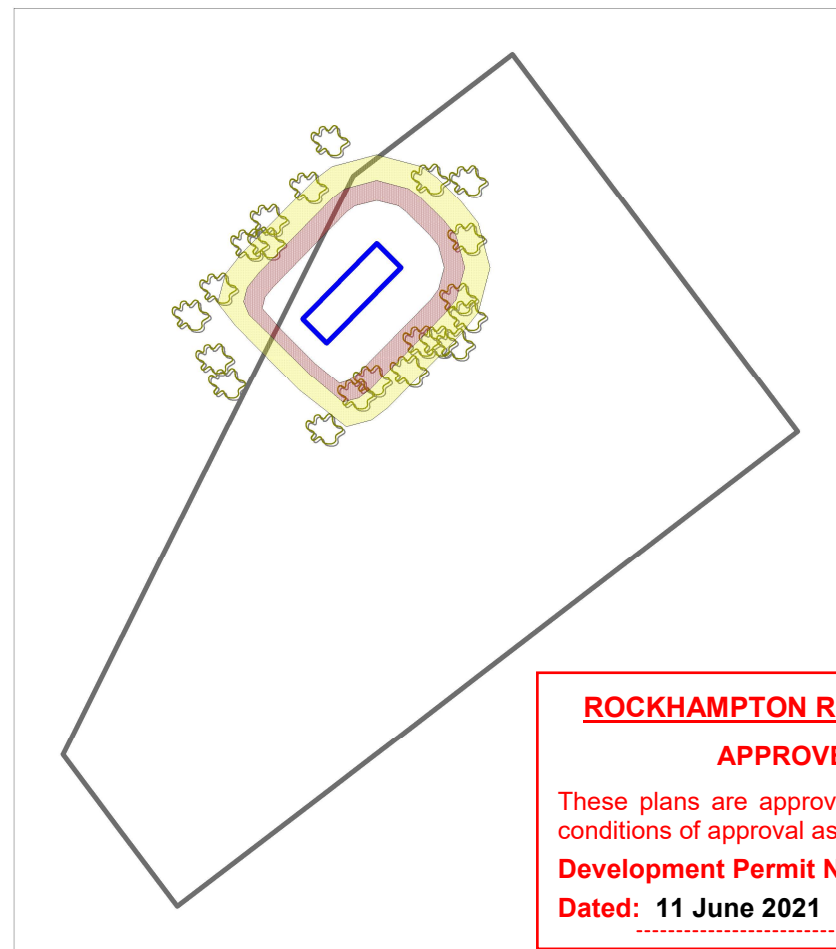
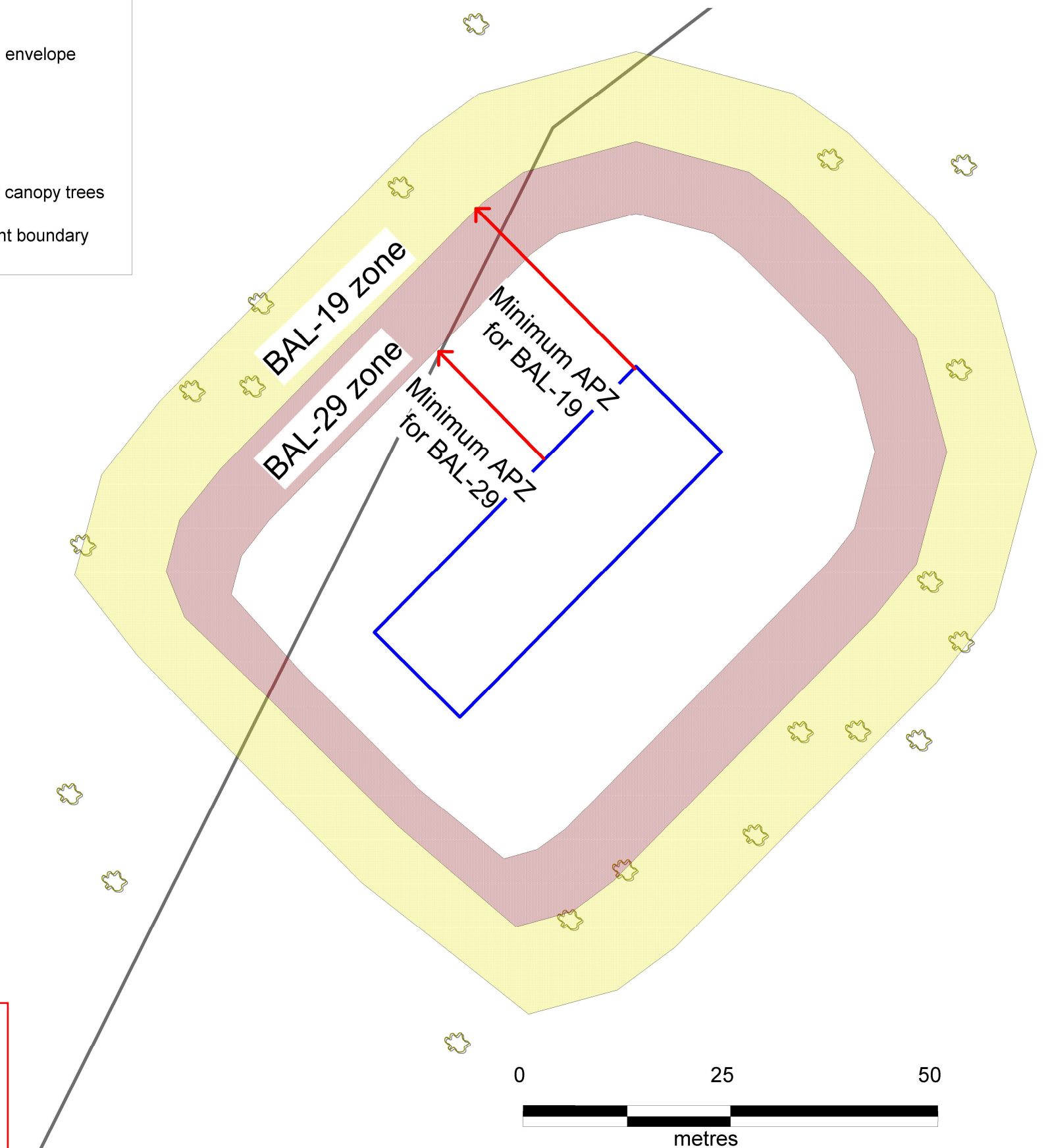
NW aspect:  
BAL-29: 10.0 to < 15.2m  
BAL-19: 15.2 to < 22.5m

Fire buffer distances have been calculated using  
site surface fuel loads with AS3959 Method 2

The building envelope is 14.5 metres by 45 metres

#### LEGEND

- Building envelope
- BAL-29
- BAL-19
- ✿ Nearest canopy trees
- Allotment boundary



#### ROCKHAMPTON REGIONAL COUNCIL

#### **APPROVED PLANS**

These plans are approved subject to the current  
conditions of approval associated with  
**Development Permit No.: D/91-2021**  
**Dated: 11 June 2021**

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## Bushfire Hazard Assessment and Management Plan

Proposed dwelling on lots 4, 5, 14 and 15 on 5RP603374, Lakes Creek

Addendum to Bushfire Hazard Assessment & Management Plan.  
Proposed Dwelling on lots 4, 5, 14 and 15 on 5RP603374, Lakes Creek 4701  
Denley Environmental 15/12/2020. File ref 40931 BMP Lakes Creek Clarke.docx

Printed  
15 Feb 2021







**Vegetation Survey and Assessment of Impacts**  
**Proposed dwelling on lots 4, 5, 14 and 15 on 5RP603374, Lakes Creek,**  
**Rockhampton Regional Council**

For Ms Alison Clarke  
Prepared by Denley Environmental

**ROCKHAMPTON REGIONAL COUNCIL**

**APPROVED PLANS**

These plans are approved subject to the current  
conditions of approval associated with

**Development Permit No.: D/91-2021**

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# 1 Executive Summary

Denley Environmental undertook an environmental site survey and evaluation of significant environmental values on lots 4, 5, 14 and 15 on 5RP603374 (the subject site) on behalf of the owner of the land, Ms Alison Clarke. The subject site is located at Lakes Creek in the Parish of Archer, Rockhampton Regional Council. The proposed development is a single dwelling with associated infrastructure and services.

Information gathered in the site survey included extent and type of remnant vegetation, threatened species and associated habitat, potential for fauna habitat and existing disturbance.

We found that:

1. the site is located at the periphery of a large area of remnant vegetation to the north. The site does not connect or form a corridor to other large areas of remnant vegetation. Existing residential areas are located within 100 to 200 metres to the east, south and west of the subject site.
2. the site is immediately adjacent to an area of Essential Habitat for *Cycas ophiolitica*. However there were no *C. ophiolitica* located within or near the site. Clearing of remnant vegetation will not be required so that potential habitat for *C. ophiolitica* will not be impacted.
3. the site contains sufficient existing cleared area for the proposed dwelling, associated infrastructure and mandatory clearing distances to address bushfire hazard on the site.
4. local dry rainforest species can be planted within the fire buffer zone to address loss of habitat or effects to visual amenity from clearing.

The proposed development will have only a nominal impact on the existing environment. The subject site contains sufficient cleared area to place a dwelling without the need to clear areas of native vegetation. Development approval would not impact on significant environmental areas, threatened species or wildlife corridors.

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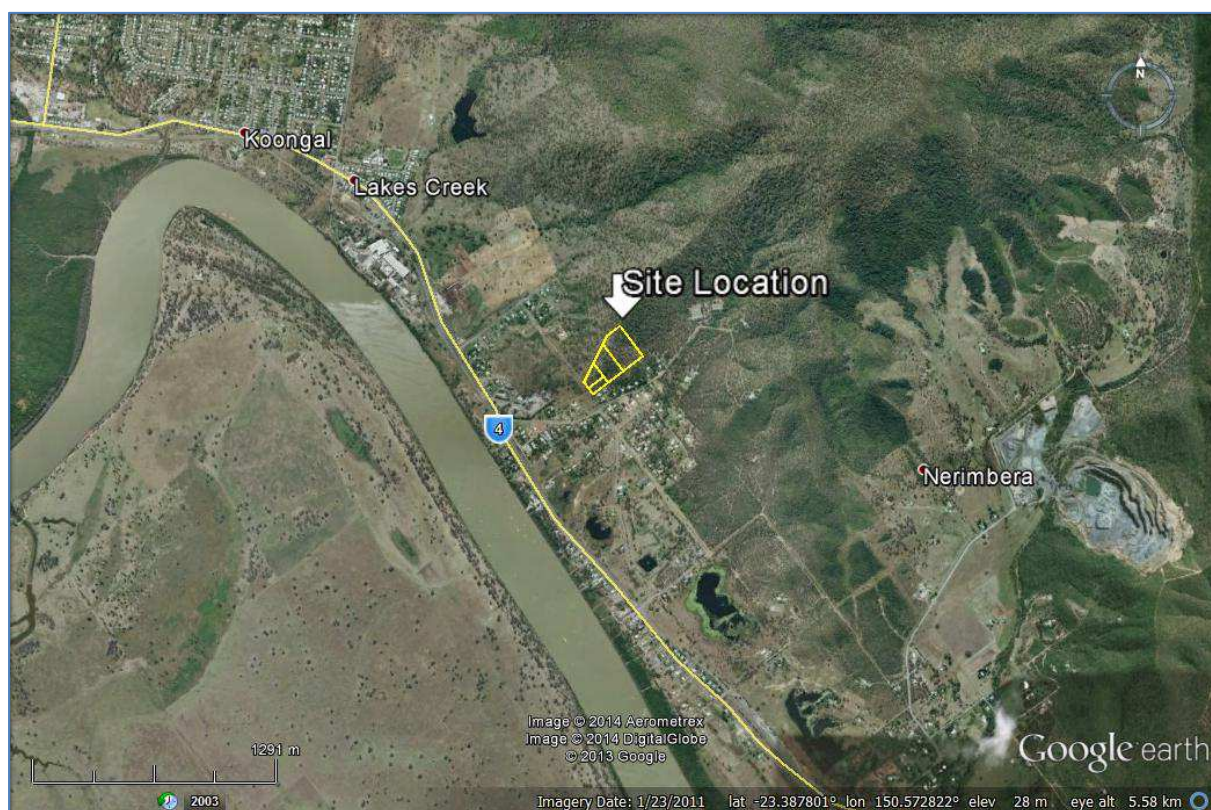
## 2 Introduction

This report provides information on identified natural values for the area on and adjacent to the subject site (lots 4, 5, 14 and 15 on 5RP603374) and potential impacts as a result of proposed development for a dwelling and associated infrastructure. The report is with reference to the Rockhampton Regional Council (RRC) Biodiversity / Nature Conservation Code.

Opportunities to enhance and or incorporate natural values into the development planning are incorporated in the report recommendations.

## 3 Site Description and Location

The subject site is located at Lakes Creek in the parish of Archer in the Rockhampton Regional Council area. See Figure 1 for the site location.



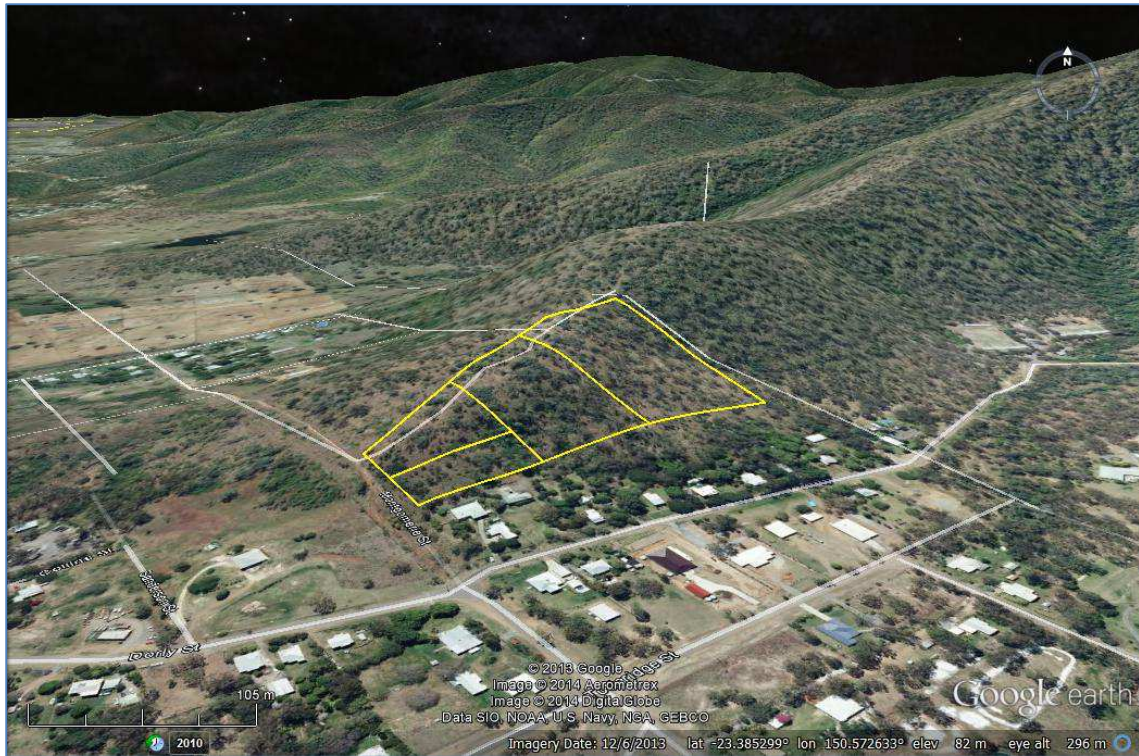
**Figure 1. Location of lots 4, 5, 14 and 15 on 5RP603374 (the subject site).**

### 3.1 *Local landscape*

The subject site is located on the lower hills of the Berserker Range. Topography on and adjacent to the location of a proposed dwelling consists of a broad, sloping (15%) ridgeline running downslope northeast to southwest with a steep southeast facing slope (34%) and steep northwest facing slope (28%). The ridgeline and part of the northwest slope has been cleared. Remnant vegetation consists of three dry woodland communities.

An approximate 3D representation of the subject allotments and associated landscape is provided in Figure 2.





**Figure 2. A 3D representation of the allotments and local landscape (produced in Google Earth).**

#### 4 Regional Ecosystems



**Figure 3. An extract of the Regional Ecosystems Vegetation map over the subject site. . The area of blue hatching is essential habitat for *Cycas ophiolitica*.**

Regional Ecosystem Vegetation Communities described over the allotment is a single mixed polygon of Regional Ecosystems 11.2.6/11.12.4/11.12.3 in a ratio of 55:25:20.

These communities are described in Figure 3 and Table 1.

**Table 1. Regional Ecosystem vegetation communities indicated as present over the subject site.**

Regional Ecosystem	Abridged *REDD Description	*VMA Status
11.12.6	Corymbia citriodora open forest on igneous rocks (granite).  Corymbia citriodora, Eucalyptus crebra, E. microcarpa/E. molucanna, Angophora leiocarpa and E. melanophloia open forest to woodland. Other tree species that may be present include E. tereticornis +/- C. tessellaris +/- C. clarksoniana and E. fibrosa.	Least Concern
11.12.4	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks.  Canopy species include Falcata toona, Ficus virens, Canarium australianum, Alstonia scholaris, Planchonella pohlmanniana, Cleistanthus dallachyanus and Backhousia citriodora. Common shrub or understorey species are Mackinlaya macrosciadea, Baloghia inophylla, Polyalthia nitidissima, Bosistoa brassii and Aglaia sapindina. The sparse ground layer includes species such as Scleria sphacelata and Adiantum hispidulum. Vines and epiphytes are common and include Microsorium punctatum, Cissus oblonga, Tetrastigma thorsborneorum, Smilax australis and Pisonia aculeata.	Least Concern
11.12.3	Eucalyptus crebra, E. tereticornis, Angophora leiocarpa woodland on igneous rocks especially granite.  Eucalyptus crebra, E. tereticornis +/- Angophora leiocarpa and E. melanophloia woodland. Other tree species that may be present include Corymbia clarksoniana, C. tessellaris, C. erythrophloia, C. citriodora and E. exserta.	Least Concern

\*REDD = Regional Ecosystems Description Database. Version 8

\*VMA = Vegetation Management Act 1999

Regional Ecosystems uphill and north of the site are RE 11.12.6 with *E. crebra* dominant. Vegetation on the eastern and western slopes are generally components of either RE 11.12.6 and RE 11.12.3. There was no RE 11.12.4 present on the site. However, occasional evergreen vine thicket shrub species occur in the area.

## 5 Site Vegetation

In addition to conducting targeted site surveys, incidental observations on vegetation type and location were made over the subject site. Three targeted site surveys were conducted in areas of representative vegetation types. The location of the three site surveys are indicated in Figure 4.

Data collection for the survey of vegetation types consisted of dominant/characteristic species, structural information, soil types, landscape, and threatened species.

A vegetation map to a scale of 1:2000 is provided in the appendix. A cropped version of the map is provided in Figure 5.





**Figure 4. Location of the vegetation survey sites in relation to the subject allotments.**



**Figure 5. Site vegetation map showing the distribution of vegetation types.**



Four vegetation units were identified:

### **5.1 Vegetation Unit 1**

Vegetation unit 1 consisted of cleared areas with weedy tussock grasses and *Acacia* spp. regrowth. Unit 1 is located along the ridgeline within the site and on the western slope outside the site (Figure 6).

### **5.2 Vegetation Unit 2**

*Eucalyptus melanophloia* dominant woodland with *E. crebra* associated on steep slopes. Median height of 12 metres. *E. tereticornis* and *Corymbia clarksoniana* occur as scattered patches and isolated individuals, particularly on the lower slopes (Figure 7).

The mid story was a sparse layer of *Acacia saligna* and *Macrozamia* sp.

Ground layers were tussock grasses (no fertile material) of 40% cover (60% in open areas).

Unit two is located near the crest on the steep southeast facing slope.

### **5.3 Vegetation Unit 3**

*Eucalyptus crebra* dominant woodland on steep slopes. Median height of 16 metres (Figure 8).

The mid story was a sparse layer of *Acacia saligna*, *Acacia* sp. and isolated *Macrozamia* sp.

Ground layers were tussock grasses (no fertile material) including *Themeda triandra* of 40% cover.

### **5.4 Vegetation Unit 4.**

*Eucalyptus tereticornis* dominant woodland with *E. melanophloia*, *Corymbia erythropholia*, *E. crebra* and *C. tessellaris* on slopes. Median height of 17 metres (Figure 9).

The mid story was a sparse to medium layer of *Acacia saligna*, *Acacia* sp., *Alphitonia excelsa* and *Ficus opposita*.

Ground layers were tussock grasses (no fertile material) including *Themeda triandra* of 40% cover.

### **5.5 Weeds and Other Disturbance**

Weedy vines and grasses were present in open areas. These were primarily *Megathyrsus maximus*, *Melinis repens* and *Passiflora foetida*. There were no declared class 1 or 2 weeds present. *Lantana camara* (class 3) occurred as scattered clumps within vegetation unit 4.

Evidence of fire was located within all areas as burnt lying timber and within the *Eucalyptus melanophloia* woodland on the eastern slope. Burns on the eastern slope were up to the middle bole of trees. This was approximately 4 metres, indicating a relatively low intensity burn.

Ground and ladder fuels for bushfire consisted of low growing tussock grasses of 40% cover, a very sparse shrub layer and rough bark on iron bark and bloodwood trees (*E. crebra*, *E. melanophloia*, *C. erythrophloia*). There was no evidence of recent fires.





**Figure 6. Vegetation unit 1, cleared with grass and woody regrowth.**



**Figure 7. Vegetation unit 2, *Eucalyptus melanophloia* woodland.**





**Figure 8. Vegetation unit 3. *Eucalyptus crebra* woodland on northern ridgeline slope.**



**Figure 9. Vegetation unit 4. *Eucalyptus tereticornis* woodland on the western slope.**

## 6 Essential Habitat

The essential habitat map shows a buffered area immediately to the north and outside the subject site (see Figure 3). The essential habitat area is for *Cycas ophiolitica* which commonly occurs on the Berserker ranges. There were no *Cycas ophiolitica* located in search of the site.

There were no large hollow bearing trees within the subject site or indications of potential nesting places (other than arboreal potential for birds). The *Eucalyptus crebra* woodland appears to provide more potential for hollow bearing trees and essential habitat for *C. ophiolitica*.

## 7 Site Habitat and Potential Impacts

This site is located at the boundary of an extensive area of remnant vegetation and associated habitat. Vegetation to the south is largely regrowth and residential development.

Vegetation along the eastern slope extends for 100 to 200 metres downslope to existing residential development.

Vegetation on the western slope extends for approximately 200 metres to cleared areas and residential development.

The area to the north east of the site contains an extensive area of remnant vegetation and associated habitat.

The site is on the periphery of a large area of important remnant. However, habitat values on the subject site have been limited by adjacent clearing and residential development. It is unlikely development approval for a single dwelling on the subject site would adversely affect existing remnant vegetation and associated habitat.

### 7.1 **Clearing for bushfire**

Existing clearing is sufficient in area to place a dwelling and maintain a fire buffer zone in accordance with Rockhampton Regional Council bushfire policy guidelines. The State Planning Policy Guideline (SPP 1/03) suggests a minimum fire buffer distance of 1.5 times the tallest adjacent trees. An applicable SPP 1/03 buffer would amount to a distance of 21 to 25 metres to the adjacent woodlands. Current clearing is sufficient for a dwelling of 14 metres in width in addition to 29 metres of cleared area either side of the dwelling (toward critical northeast and southwest slopes).

## 8 Biodiversity Code Applicability

There appears to be no significant impact on environmental matters with regard to the purpose of the RRC Biodiversity /Nature Conservation Code:

1. habitat of rare and threatened, and endemic species will not be affected. The development area is cleared and there are no *Cycas ophiolitica* within the adjoining vegetation.
2. there are no National or International areas of ecological significance present on the subject site or likely to be affected;
3. There are no vegetation corridors linking major habitats. The site is at the boundary of an area of significant vegetation and within and adjacent to existing cleared areas and residential development.
4. The proposed development is relatively low impact consisting of a single dwelling within an existing cleared area. It is unlikely any significant or essential ecological processes will be affected.
5. Scenic amenity will be addressed in the associated planning report and in the architectural design of the dwelling. Please refer to these reports and drawings for more information.
6. Environmentally sensitive areas will not be adversely affected. The proposed development is relatively small scale, located within an existing cleared and disturbed area and in close proximity to existing residential development.

## 9 Conclusions

The following actions are required to address biodiversity and bushfire requirements and to enhance and incorporate local natural values into the development:

1. A dwelling and associated buildings and services is to be located in existing cleared and disturbed areas;
2. The dwelling is to be located to maximize cleared distances on all sides of the dwelling for bushfire protection and in particular between the northwest and southeast slopes; and
3. Any landscape planting within remnant vegetation located adjacent to the dwelling and other infrastructure to consist of dry rainforest species commonly occurring in the area. Planting of dry rainforest species will reduce the potential bushfire hazard by suppression fire and shading out dry grasses and herbs. Species common to Regional Ecosystem 11.12.4 would be suitable.

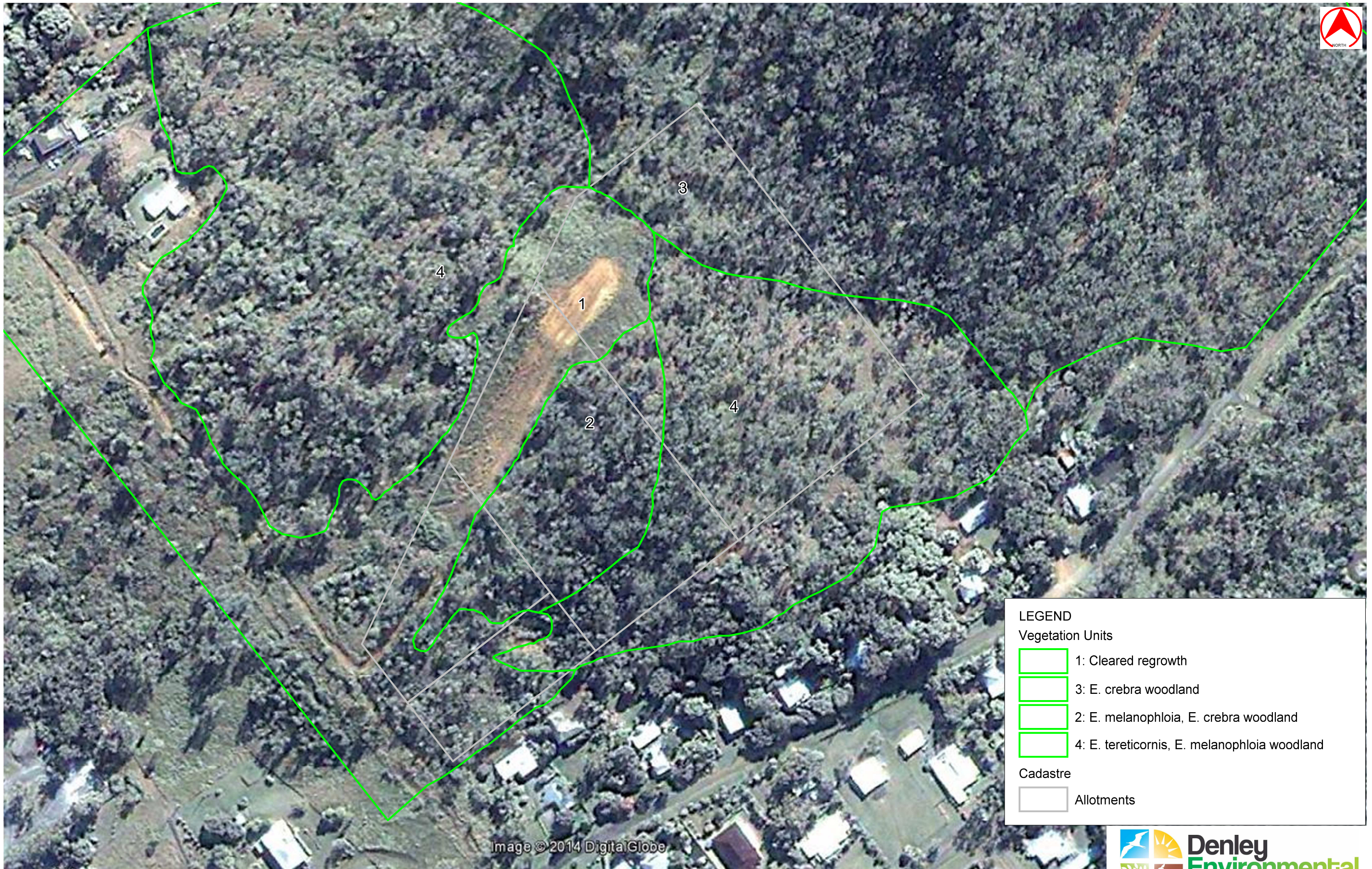


## 10 Appendix

1:2000 Site Vegetation Map

Regional Ecosystems Vegetation Map





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metres  
Scale 1 : 2,000 (A3 Original Size)

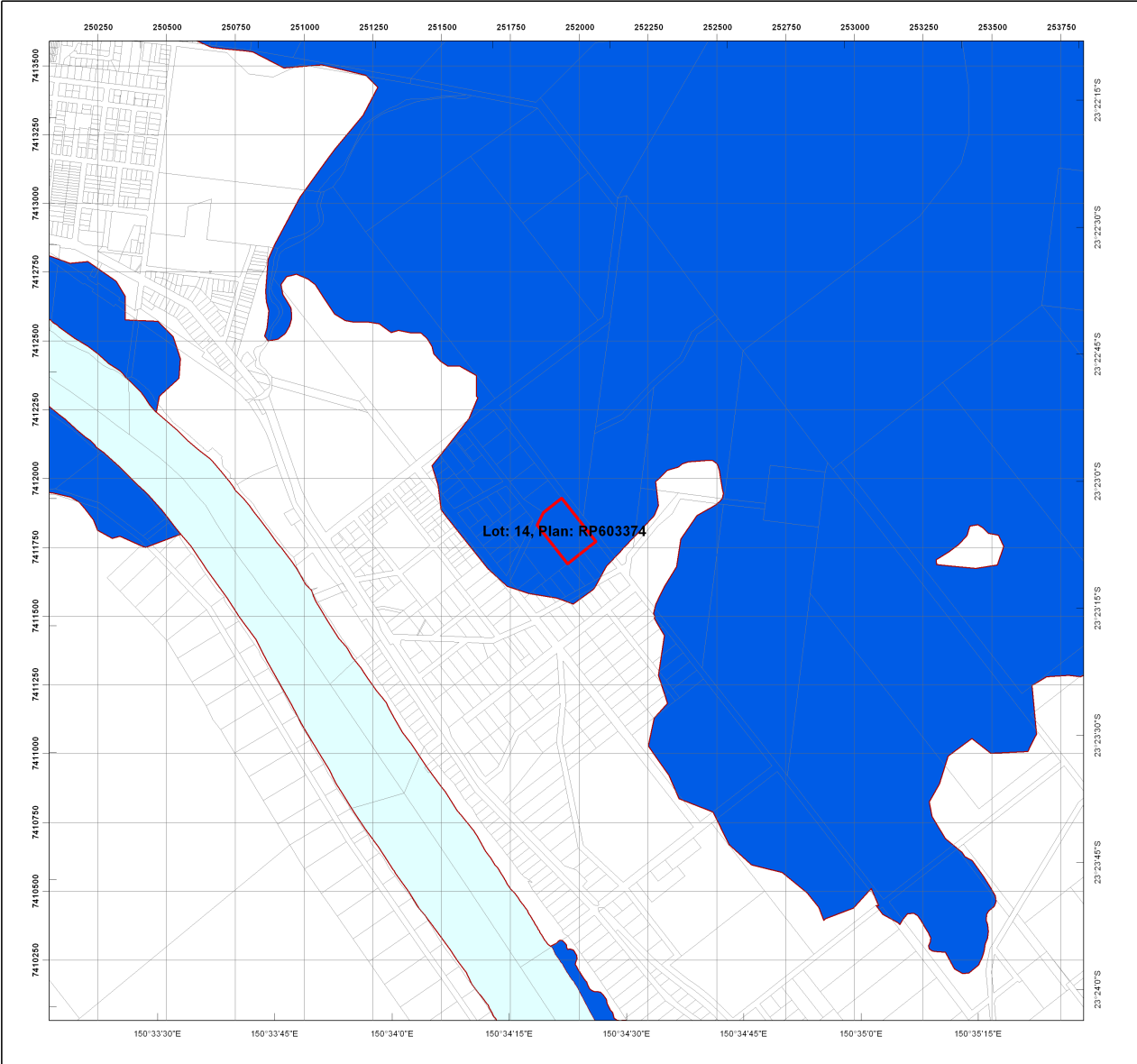
## Vegetation Map

lots 4, 5, 14 and 15 on 5RP603374



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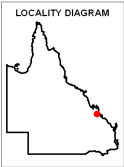




**Regulated Vegetation Management Map**

**Legend**

- Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Vegetation not regulated under the VMA)
- Water
- Area not categorised
- Cadastral line
- Property boundaries shown are provided as a locational aid only



0 200 400 600 800 1,000 m

This product is projected into:  
GDA 1994 MGA Zone 56

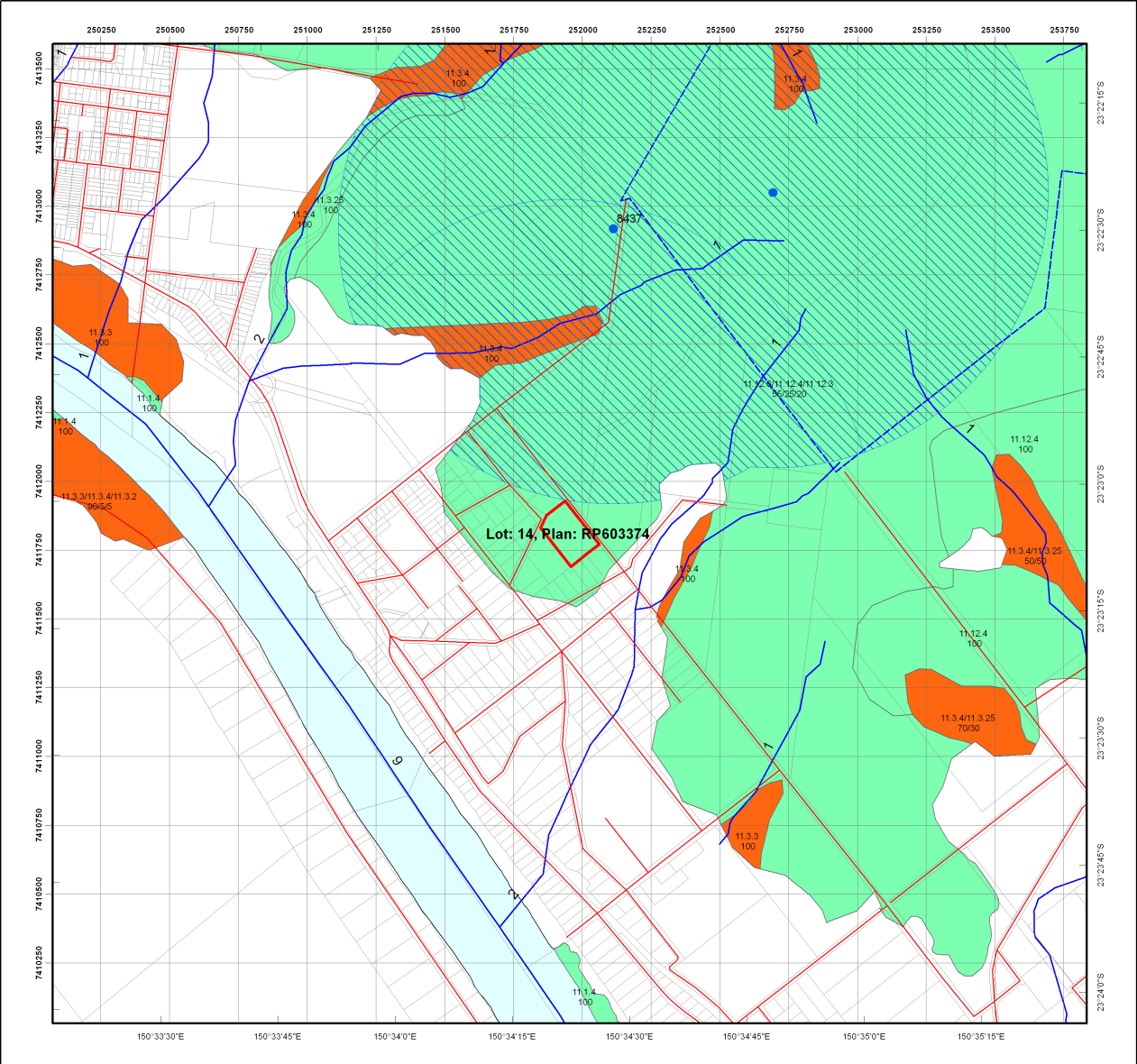


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Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: [www.dnrm.qld.gov.au](http://www.dnrm.qld.gov.au) or contact the Department of Natural Resources and Mines.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at <http://www.information.qld.gov.au/>

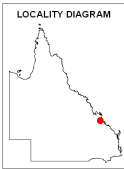
This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.



## Vegetation Management Supporting Map

### Legend

- Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category A or B area containing remnant vegetation
- Category A or B area under Section 20AH  
These areas are edged in yellow and filled with the remnant RE Status
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem
- Category C area containing high value regrowth vegetation
- Category C area under Section 20AI  
These areas are edged in purple and filled with the remnant RE Status
- Non Remnant
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourse on the vegetation management watercourse map  
(Stream order shown as black number against stream where available)
- Roads
- © Pitney Bowes Software Pty Ltd
- National Parks, State Forest and other reserves
- Cadastral line
- Property boundaries shown as provided as a locational aid only



0 150 300 450 600 750 m

This product is projected into:  
GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: [www.dnrm.qld.gov.au](http://www.dnrm.qld.gov.au) or contact the Department of Natural Resources and Mines.

Digital data for the vegetation management watercourse map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at <http://www.information.qld.gov.au/>





Vegetation Management Act 1999 - Extract from the essential habitat database - version 4.0

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - Module 8: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Sustainable Planning Act 2009*; and
- Self-assessable vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s or on and within 2.2 km of an identified coordinate on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Natural Resources and Mines website (<http://www.dnrm.qld.gov.au>) has more information on how the layer is applied under the State Development Assessment Provisions - Module 8: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

- (a) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or
- (b) in which the protected wildlife, at any stage of its life cycle, is located.

Essential habitat identifies endangered or vulnerable native wildlife prescribed under the *Nature Conservation Act 1994*.

Essential habitat in Category A and B (Remnant vegetation species record) areas:1100m Species Information

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
8437	Cycas ophiolitica	Marlborough blue	E	eucalypt woodland	80 to 400 m	skeletal, clay loam, alluvium	creek bank, levee, lower slope, ridge

Essential habitat in Category A and B (Remnant vegetation species record) areas:1100m Regional Ecosystems Information

Label	Regional Ecosystem (this is a mandatory essential habitat factor, unless otherwise stated)
8437	8.12.12, 11.3.4, 11.3.9, 11.3.25, 11.3.38, 11.11.4, 11.11.5, 11.11.7, 11.11.15, 11.11.20, 11.12.1, 11.12.3, 11.12.4, 11.12.6

Essential habitat in Category A and B (Remnant vegetation) areas:1100m Species Information - (no results)

Essential habitat in Category A and B (Remnant vegetation) areas:1100m Regional Ecosystems Information - (no results)

Essential habitat in Category C (High value regrowth vegetation) areas:1100m Species Information - (no results)

Essential habitat in Category C (High value regrowth vegetation) areas:1100m Regional Ecosystems Information - (no results)