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BCA Check Pty Ltd trading as Bushfire Certifiers

BUSH FIRE ASSESSMENT REPORT

Lot 7 DP 1239938

Hutley Drive Lennox Head

Proposed 63-lot residential use and concept

Prepared for: Clarence Property Corporation Limited

Prepared by:
Peter Thornton
BPAD-L3 ACCREDITED PRACTITIONER

Date: 29 August 2018 amended

Ref: 18/288

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DOCUMENT CONTROL

Revision No.	Date	Description	Prepared	Checked	Authorised
A	29.08.2018	Final	Peter Thornton	SJT	Peter Thornton
B	24.01.2019	Final amended	Peter Thornton	SJT	Peter Thornton

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1.0 EXECUTIVE SUMMARY

This report has been prepared for the proposed 63-lot residential subdivision known as Epiq Super Lot 7 at Lot 7 DP 1239938, Hutley Drive Lennox Head against the requirements of Planning for Bushfire Protection, 2006 (PBP2006). The report has been amended to address NSW Rural Fire Service query in an email dated 23rd November relating to the future subdivision to the west being required to revegetate a 50-60m strip of littoral rainforest vegetation adjacent to proposed Lots 1 and 18.

The subject allotment is mapped as being bushfire prone. In addition, there is revegetation (current and proposed) to the west and northwest of the proposed subdivision which has been taken into consideration in the bushfire threat assessment as potentially being a bushfire hazard.

The report specifies some variation to the perimeter road width requirements based on the low bushfire risk as outlined in the performance solution. An additional performance solution is provided to demonstrate potential setbacks from the future rainforest vegetation on the west side of Lots 1 and 18, whilst including the performance solution for the current grassland in this location.

The following table is provided as a summary of the recommendations and method of assessment for each consideration relating to Planning for Bushfire Protection 2006.

MEASURE	RECOMMENDATION	METHOD OF ASSESSMENT
APZ Required	Each residential allotment is to be maintained as an inner protection area (IPA).	Performance Solution
Water Supply	Street hydrants are to comply with s4.1.3 PBP2006.	Acceptable Solution
Electricity Supply	New electricity supply to be in accordance with s4.1.3 PBP2006	Acceptable Solution
Gas Supply	Gas supply to comply with PBP2006.	Acceptable Solution
Construction Standards	Future dwellings are capable of being sited to receive <29kW/m^2 & are to be assessed in accordance with s4.15.	Performance Solution
Landscape	Landscaping is to comply with Appendix 5 of PBP2006.	Acceptable Solution
Access	Public roads to comply with s4.1.3(1) PBP2006 however no perimeter road is required.	Performance Solution

The report makes the following summary of recommendations for the development.

1. Any future dwellings on the proposed lots are to be assessed in accordance with s4.15 of the Environmental Planning and Assessment Act 1979.

2. At the commencement of works and in perpetuity each allotment is to be managed and maintained as an Asset Protection Zone (APZ) to prevent the spread of a fire towards the buildings in accordance with the requirements of Standards for Asset Protection Zones (RFS 2005).

3. A 1.8m non-combustible fence with no perforations i.e. solid, is to be constructed along the western boundary of Lot 1 and Lot 18 and be in close contact to the ground.

4. The public roads are to comply with s4.1.3(1) Planning for Bushfire Protection 2006 with exception to a perimeter road having a width of 8m wide adjacent to the regenerated rainforest vegetation. The perimeter road is permitted to comply with Table 4.1 of PBP2006. Further, a perimeter road will not be required to the west of proposed Lots 1 and 18 which adjoin current grassland/future rainforest located on an upslope.

5. Water, electricity and gas services shall comply with s4.1.3 of Planning for Bushfire Protection 2006.

6. Landscaping is to be undertaken in accordance Appendix 5 of Planning for Bushfire Protection 2006 and managed and maintained in perpetuity.

2.0 INTRODUCTION

2.1 GENERAL

The purpose of this report is to establish suitable measures to provide bushfire mitigation measures in order for Council to make determination of the proposed 63-lot residential subdivision known as Epiq Super Lot 7 on Lot 7 DP 1239938, Hutley Drive Lennox Head against the requirements of Planning for Bushfire Protection, 2006.

2.2 SIGNIFICANT ENVIRONMENTAL FEATURES

An assessment is to be undertaken, if applicable, with regard to:

- State Environmental Planning Policy No. 44 (Koala Habitat Protection)
- Biodiversity Conservation Act 2016 (NSW)
- Local Land Services Act 2013 (NSW)
- Land Management (Native Vegetation) Code 2017 (NSW)
- National Parks and Wildlife Act 1974 (NSW)
- Environmental Protection and Biodiversity Conservation Act 1999 (Cwlth).

This report does not consider the above legislation and in this regard this report should be read in conjunction with the Statement of Environmental Effects submitted with the application to the consent authority.

2.3 REPORT DETAILS

Report Reference No.: 18/288

Property Address: Epiq Super Lot 7 at Lot 7 DP 1239938, Hutley Drive Lennox Head

Client:	Clarence Property Corporation Limited
Local Government Area:	Ballina Shire Council
Proposal:	63-lot residential subdivision
Drawings:	See Appendix.
Report Prepared By:	Peter Thornton MFireSafeEng Building Surveyor (MAIBS) BPAD – L3 Accredited Practitioner

3.0 PROPOSED DEVELOPMENT

The applicant is proposing a 63-lot residential subdivision known as Epiq Super Lot 7 at Lot 7 DP 1239938, Hutley Drive Lennox Head with no Special Fire Protection Purpose (SFPP) development proposed.

The subdivision will include public roads that will be constructed to Ballina Shire Council construction design requirements.

The following is a brief description of the proposal.[1]

Newton Denny Chapelle ("NDC") in association with Planners North is engaged by Clarence Property Corporation Limited ("Proponent") to submit a request to the Minister for Planning & Environment to modify the Concept Approval and Project Approval (MP 07_0026) for Epiq Lennox (formerly known as 'Pacific Pines'), pursuant to the provisions of Section 75W of the Environmental Planning and Assessment Act 1979 ("the Act").

The key elements of the Concept Plan & Project Approval (MP 07_0026) which are sought to be amended via the current application relate to approved 'Super Lot 7' (Lot 5 DP 1239938) and involve:

- *Amend the conventional residential layout which currently incorporates 47 torrens title residential lots into 34 residential lots, 26 live –work lots and 3 neighbourhood commercial lots to be utilised for the approved Tavern, storage premises and live work apartments.*
- *Introduce 'live-work' lots which provide opportunities for integrated housing and employment for small business*
- *The introduction of neighbourhood commercial lots to provide for the reinstatement of the originally approved tavern lot, in addition to a storage premises and live work apartment land uses;*
- *Amend the lot layout and road network to better respond to the topography of Super Lot 7*

[1] Newton Denny Chapelle, 'Request for SEAR's for Epiq Lennox Concept Plan & Project Approval MP007_0026', Ref.14/351 23.11.2017

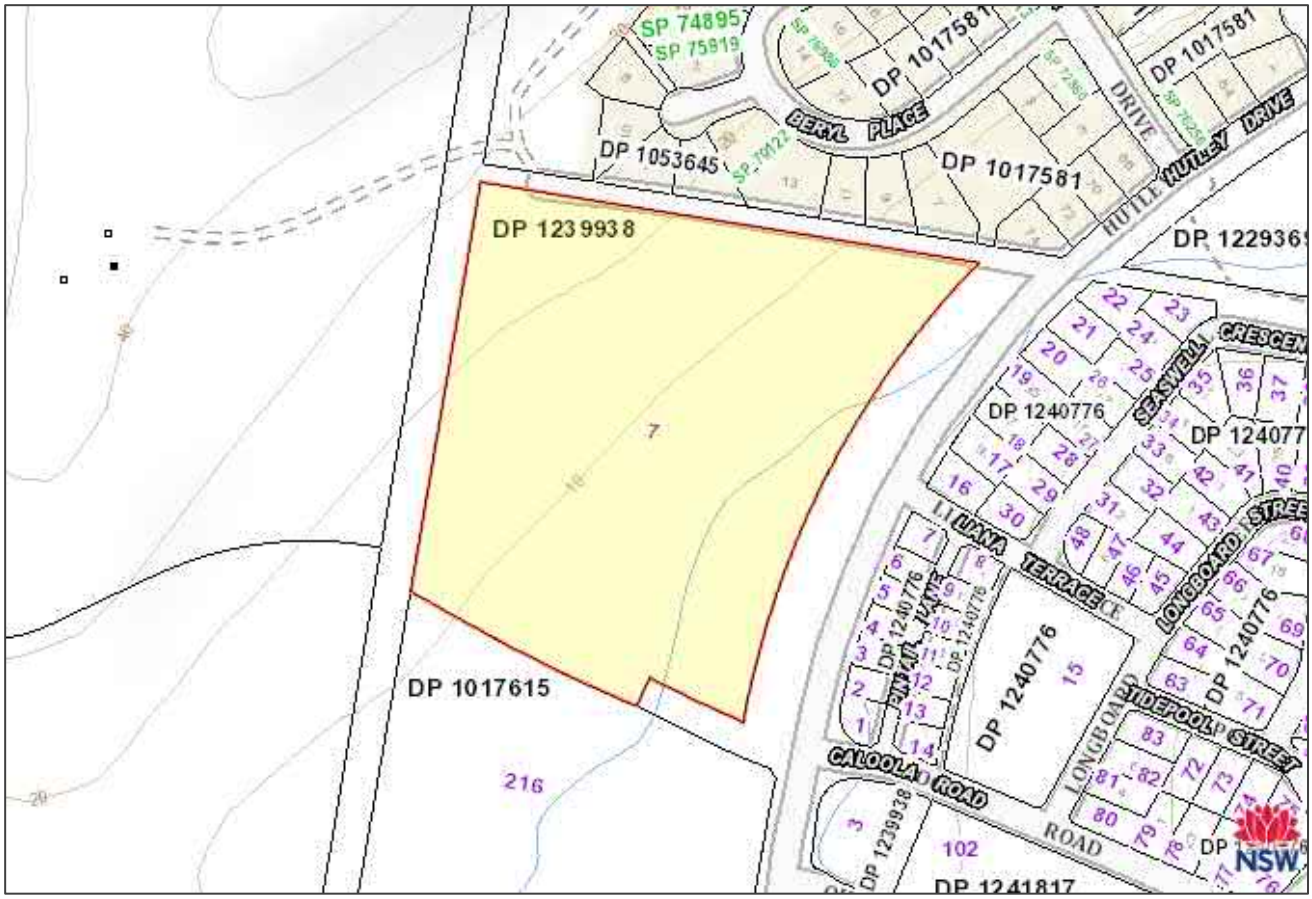

Figure 1: Location of proposed subdivision *Source: NSW Govt Six Maps*

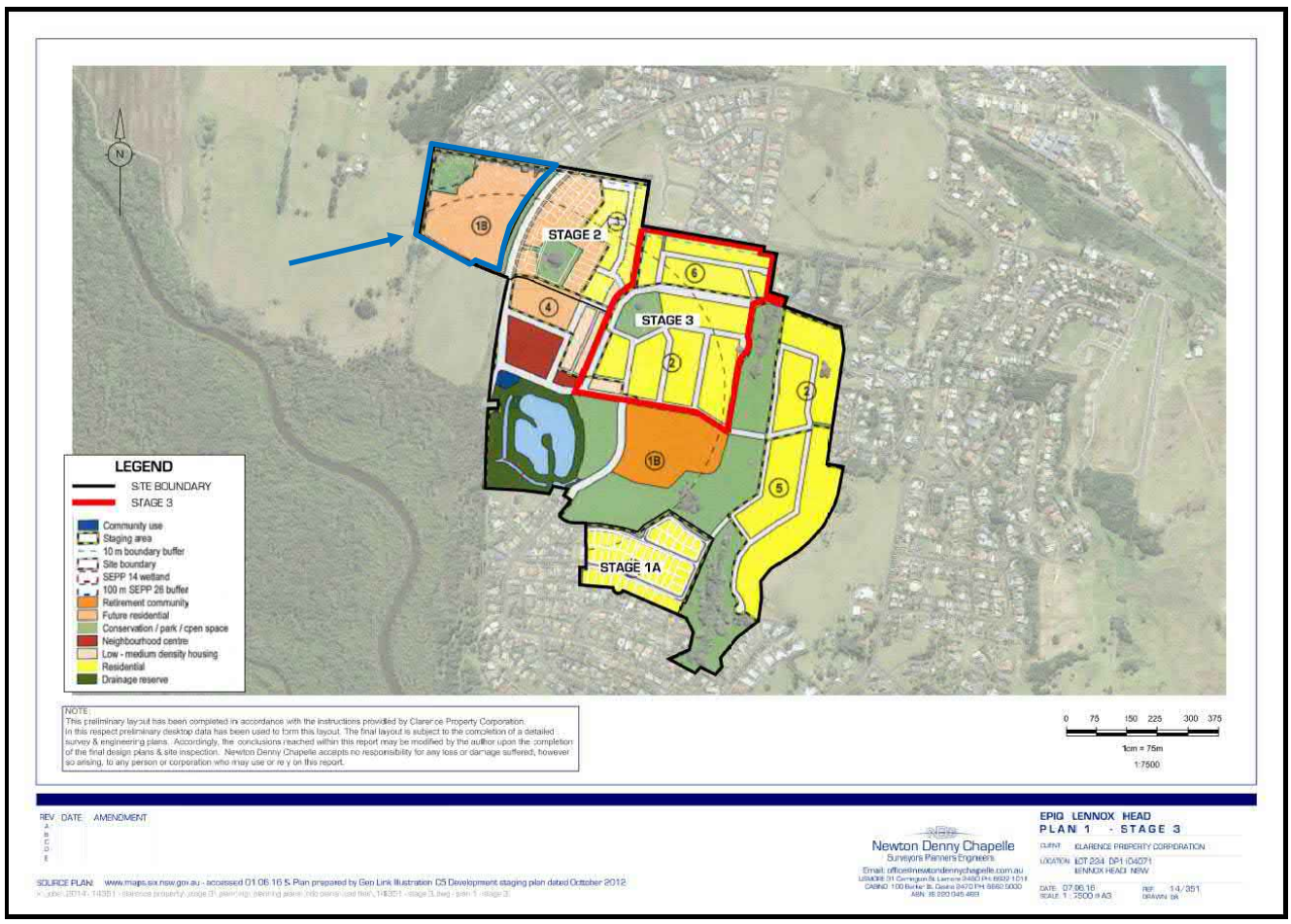

Figure 2: Super Lot 7 – Blue outline

Figure 3: Plan of subdivision of Super Lot 7 (larger image in Appendix A).

4.0 BUSHFIRE THREAT ASSESSMENT

The bushfire mapping shows the proposed development is mapped bushfire prone land as identified in Figure 4.

Aerial mapping and inspection of the site shows the mapping is accurate however does not take account of revegetation which is considered in this assessment.

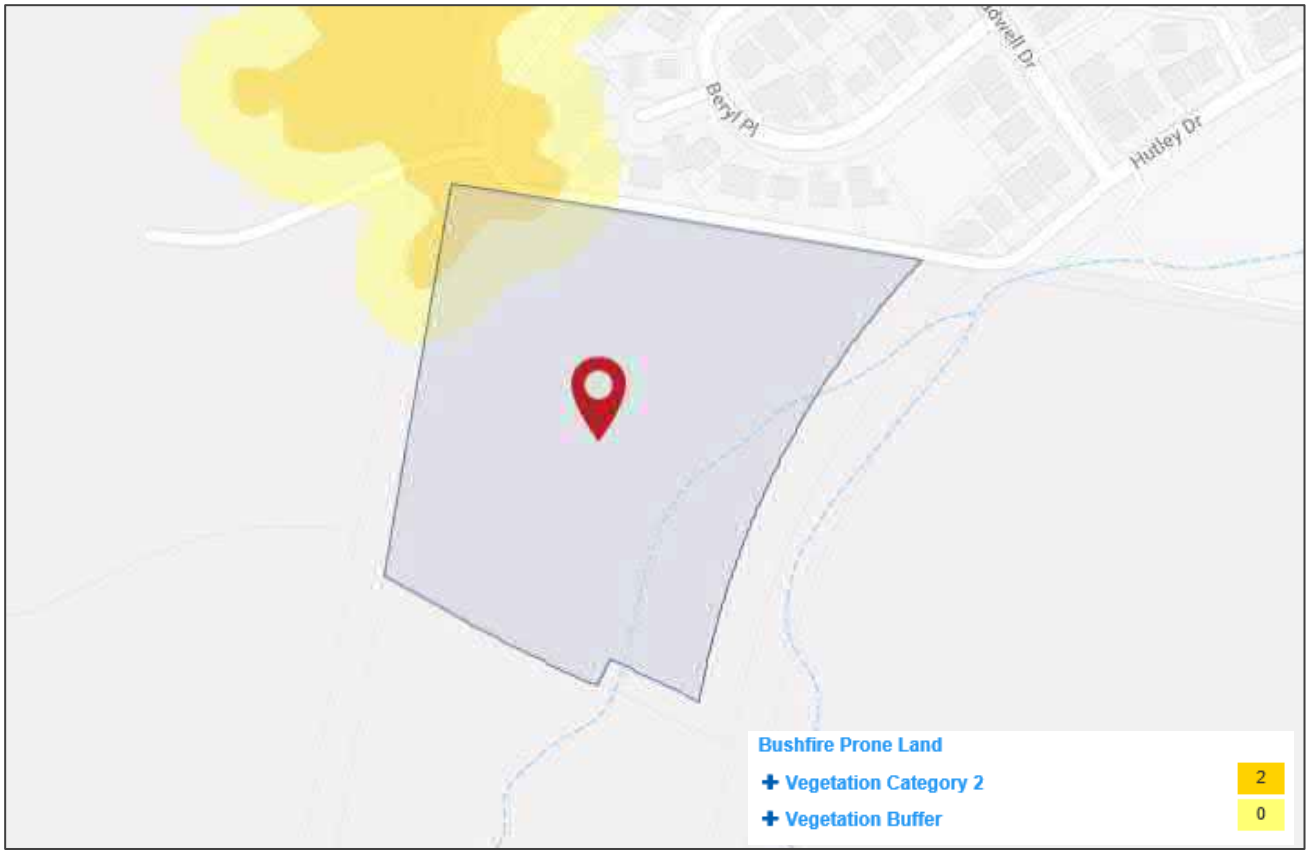

Figure 4: Bushfire prone land map *Planningportal.nsw.gov.au*

Figure 5: Current aerial image (boundary approximate) *TerraServer, 03.07.2018*

An inspection of the subject site was undertaken to establish the hazard classification that will most likely influence the bushfire behaviour. The inspection identified the proposed revegetation area had been planted with rainforest vegetation and was consistent with the GeoLINK Illustration 3.1 Report dated 20.04.2018 as shown in Figure 6.

Grassland vegetation is identified to the west by the Environmental Management Plan prepared by GeoLINK dated 16/07/2013, it also being noted apart from a small group of trees the hazard most influencing the bushfire behaviour from the west will be grassland located on an upslope. It is noted however the approved subdivision to the west ''Outlook'' has consent requiring the revegetation of a strip of littoral rainforest adjacent to proposed Lots 1 and 18 as shown in

Rainforest re-vegetation to the northwest precinct of the subdivision of Super Lot 7 Epiq Estate.

Table 1: Bushfire Threat Assessment

Aspect	Veg. Slope	Dominant Vegetation Formation Class (Table A2.1 PBP2006)
Northwest	Upslope	Rainforest revegetation.
East	n/a	Managed land.
South	n/a	Managed land (sporting fields)
West	Upslope	Grassland

It is understood proposed Lot 61 may have a child centre use with a future development application. In this regard the allotment is capable of complying with the acceptable solution asset protection zones of Planning for Bushfire Protection 2006 Table A2.6.

Figure 6: Revegetation plan *GeoLINK Illustration 3.1 Report dated 20.04.2018*

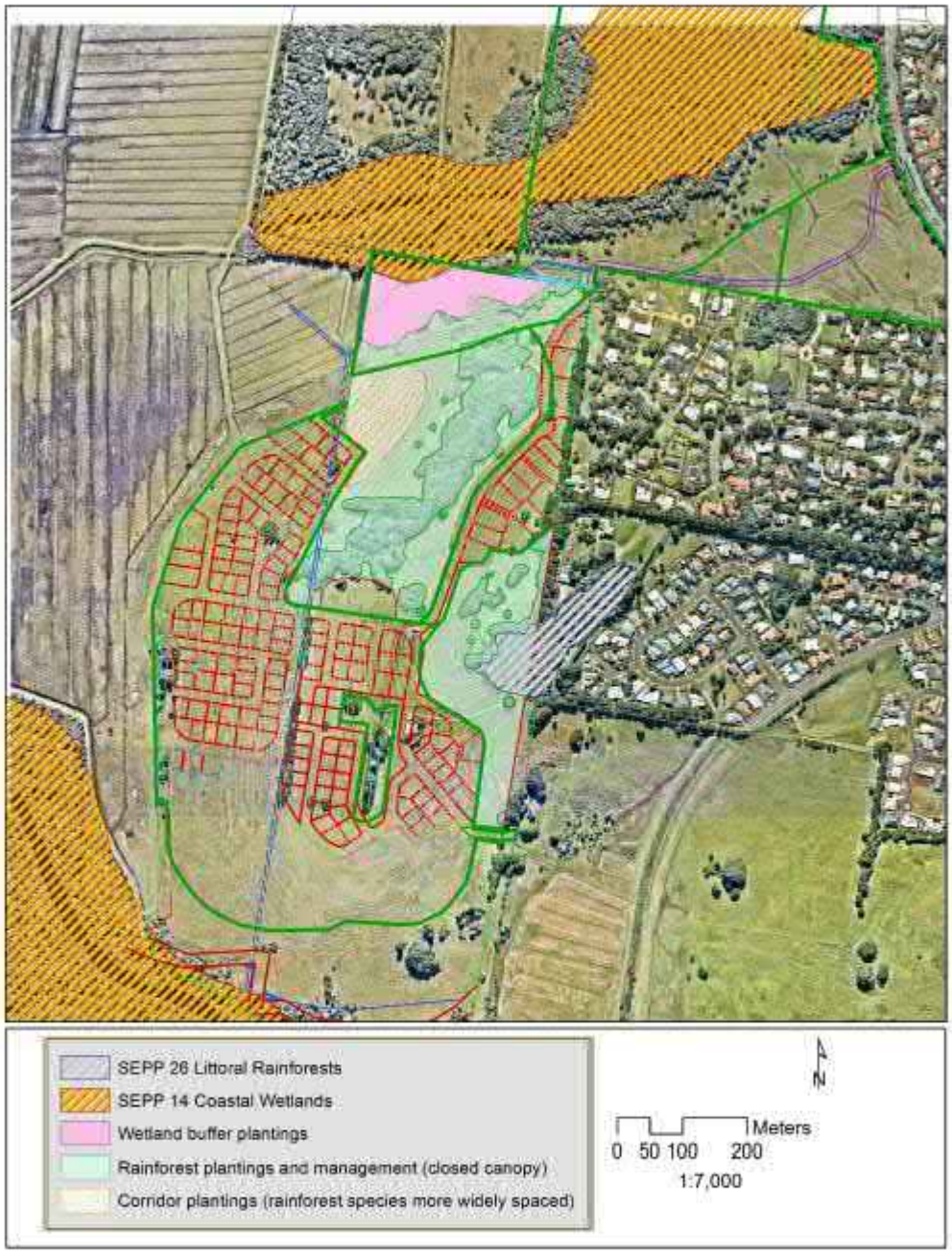

Fig. 2: Proposed littoral rainforest and wetland assisted regeneration and plantings

Figure 7: Regeneration plan for Outlook Subdivision.
Peter Parker Environmental Consultants Report February 2016.

5.0 ASSET PROTECTION ZONES AND CONSTRUCTION STANDARDS

Asset Protection Zones are areas established and maintained to ensure that bushfire fuels are progressively reduced between the development and the bushfire hazard. The asset protection zone incorporates an Inner Protection Area (IPA) having reduced fuel loadings of approximately 3t/ha.

At the commencement of works and in perpetuity each allotment is to be managed and maintained as an Asset Protection Zone (APZ) to prevent the spread of a fire towards the buildings in accordance with the requirements of Standards for Asset Protection Zones (RFS 2005) (see ***attached*** in Appendix). The building line to the boundary adjacent to the conservation area is to be a minimum 10m.

Table 2: Summary Bushfire Threat Assessment

Aspect	Veg. Slope	Vegetation Class	Setback from Hazard	Complies A2.5 PBP2006 and <29kW/m^2 received.
Northwest	Upslope	Rainforest regeneration	10m	Yes
East	n/a	Managed land	n/a	Yes
South	n/a	Managed land	n/a	Yes
West	Upslope	Grassland/future rainforest regeneration	4.5m Performance solution	Yes (AS 3959-2009)

5.1 PERFORMANCE SOLUTION

The performance solution documents the findings of specific Method 2 AS 3959-2009 modelling including the modelling of reduced radiant heat flux by way of a 1.8m high metal fence along the west boundaries of Lots 1 and 18 in order to comply with the 29kW/m^2 threshold as required by the performance criteria. The modelling will include the current grassland hazard and the future approved rainforest regeneration identified in Figure 7 of this report.

All other aspects of the development shall comply with the acceptable solution requirements of Planning for Bushfire Protection 2006 with exception to the performance solution in this report.

5.1.1 SCOPE AND ASSUMPTIONS

Scope

The scope of the performance solution is limited to the departure from the acceptable solution requirements identified in this report.

The report provides recommendations that will reduce the risk of ignition to the future buildings while the fire front passes however as documented in AS 3959-2009:

"The goal of absolute safety during a bush fire event is not attainable and despite best effort there is the ever-present risk of personal injury or damage to property. Ultimately, it is the responsibility of the owner/occupier to comply with conditions of consent and to maintain systems designed to mitigate the impacts of bush fire."

Should a change in proposed boundary or building envelope occur then the development will be needed to verify consistency with the analysis contained within the report.

Assumptions
The Asset Protection Zones will be managed and maintained in perpetuity in accordance with Planning for Bushfire Protection 2006 and reiterated with specific development consent conditions.

5.1.2 RELEVANT STAKEHOLDERS

- Ballina Shire Council (Consent Authority)
- NSW Rural Fire Service (referral)
- Clarence Property Corporation Ltd (Owner)
- Bushfire Certifiers (Bushfire Consultants)
- Newton Denny Chapelle (Consultant Town Planners).

5.1.3 SITE DESCRIPTION

Identification of Vegetation Type, Slope and distance pursuant to Planning for Bushfire Protection 2006

The bushfire threat assessment in Section 4 of this report is provides for the performance solution.

5.1.4 METHODOLOGY

The assessment method for the alternate solution is consistent with Part 1.0.3 – Assessment Methods in the Housing Provisions of the Building Code of Australia 2016. The report will be assessed in accordance with Part 1.0.5(b)(ii) by using a quantitative analysis consistent with Planning for Bushfire Protection 2006.

5.1.5 PERFORMANCE SOLUTION – METHOD 2 AS 3959-2009

The Design Fire No.1 acknowledges the vegetation classification being grassland on an upslope of 6 degrees with the site slope of the proposed asset protection zone is also flat. The modelling includes calculation of the reduction in radiant heat by the inclusion of a 1.8m high non-combustible fence along the west boundary of proposed Lots 1 and 18.

Design Fire No. 2 is provided in recognition of the rainforest revegetation as shown in Figure 7 with the 1.8m high non-combustible fence included with a short fire run.

The assumptions and methodology have been set for each aspect. The methodology is to use the following formulas to establish the rate of spread, intensity and flame length using the same method used to determine the outcomes for the acceptable solutions pursuant to A2.2 of Planning for Bushfire Protection 2006 and AS 3959-2009.

The accepted method of establishing the reduced radiant heat flux due to proposed shielding by a 1.8m high non-combustible fence will be adopted. In this regard the view factor of the shielding calculation has been subtracted from the view factor when calculated without the radiant heat shield. The flame length is reduced by the height of the proposed radiant heat shield and this will also determine whether there will be any flame contact on the building.

All other aspects of the development shall comply with the acceptable solution requirements of Planning for Bushfire Protection 2006.

5.1.6 ACCEPTANCE CRITERIA

The report will demonstrate using quantification methods to determine compliance with the performance criteria which states:

"Radiant heat levels at any point on a proposed building will not exceed 29kW/m^2."

5.1.7 DESIGN FIRE No. 1

Design Fire No.1 acknowledges the vegetation classification being grassland on an upslope of 6 degrees with the site slope of the proposed asset protection zone is also flat. The modelling includes calculation of the reduction in radiant heat by the inclusion of a 1.8m high non-combustible fence along the west boundary of proposed Lots 1 and 18.

Site Street Address:	Lot 7 Hutley Drive, Lennox Head		
Assessor:	Peter Thornton; BCA Check Pty Ltd		
Local Government Area:	Ballina	**Alpine Area:**	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description:	Base Model		
Vegetation Information			
Vegetation Type:	Grassland	**Vegetation Group:**	Grassland
Vegetation Slope:	6 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	4.5	**Overall Fuel Load(t/ha):**	4.5
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	default	**APZ/Separation(m):**	4.5
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	110
Program Outputs			
Category of Attack:	FLAME ZONE	**Peak Elevation of Receiver(m):**	2.2
Level of Construction:	BAL FZ	**Fire Intensity(kW/m):**	21977
Radiant Heat(kW/m2):	42.14	**Flame Angle (degrees):**	52
Flame Length(m):	5.59	**Maximum View Factor:**	0.621
Rate Of Spread (km/h):	9.45	**Inner Protection Area(m):**	4
Transmissivity:	0.893	**Outer Protection Area(m):**	0

Figure 8: Base design fire No.1

The base design fire No.1 has established that without a radiant heat shield and based on the methodology outlined in this report and Appendix 2 of Planning for Bushfire Protection 2006 (PBP2006) the forecast radiant heat level with a 4.5m asset protection zone to the west of proposed Lots 1 and 18 is 42.14kW/m^2 and a flame length of 5.59m.

Run Description:	1.8m Fence		
Vegetation Information			
Vegetation Type:	Grassland	**Vegetation Group:**	Grassland
Vegetation Slope:	6 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	0.465	**Overall Fuel Load(t/ha):**	0.465
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	4.5
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	110
Program Outputs			
Category of Attack:	MODERATE	**Peak Elevation of Receiver(m):**	0.88
Level of Construction:	BAL 19	**Fire Intensity(kW/m):**	2271
Radiant Heat(kW/m2):	13.44	**Flame Angle (degrees):**	78
Flame Length(m):	1.8	**Maximum View Factor:**	0.2
Rate Of Spread (km/h):	9.45	**Inner Protection Area(m):**	4
Transmissivity:	0.886	**Outer Protection Area(m):**	0

Figure 9: Shielding Impact Design Fire – 1.8m high metal fence.

The design fire establishes the maximum view factor that will be forecast should a 1.8m high non-combustible radiant heat shield be provided along the western boundary of Lots 1 and 18 has determined a view factor of .200.

Run Description:	Final Design Fire with Fence		
Vegetation Information			
Vegetation Type:	Grassland	**Vegetation Group:**	Grassland
Vegetation Slope:	6 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	4.5	**Overall Fuel Load(t/ha):**	4.5
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	4.5
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	110
Program Outputs			
		Peak Elevation of Receiver(m):	2.2
		Fire Intensity(kW/m):	21977
Radiant Heat(kW/m2):	28.57	**Flame Angle (degrees):**	52
Flame Length(m):	5.59	**Maximum View Factor:**	0.421
Rate Of Spread (km/h):	9.45	**Inner Protection Area(m):**	4
Transmissivity:	0.893	**Outer Protection Area(m):**	0

Figure 10: Final Design Fire Calculation.

The final design fire calculation has determined that when a 1.8m high non-combustible radiant heat shield is provided to the west boundary the radiant heat received by a future building is forecast to be 28.57kW/m^2.

The flame length of 5.59m of the base design fire will be reduced to 3.79m when the height of the fence (1.8m) is factored in to the design. In turn, the study demonstrates that a future dwelling having a 4.5m Inner Protection Area from the western boundary of lots 1 and 18 will not receive radiant heat levels that exceed 29kW/m^2 and will comply with the acceptance criteria outlined in this report.

5.1.8 DESIGN FIRE No. 2

Design Fire No.2 acknowledges the potential future vegetation classification of the ‘’Outlook’’ subdivision being littoral rainforest on an upslope of 6 degrees with the site slope of the proposed asset protection zone is also flat. The modelling includes calculation of the reduction in radiant heat by the inclusion of a 1.8m high non-combustible fence along the west boundary of proposed Lots 1 and 18 in conjunction with short fire run methodology.

Undertake short fire run modelling from the west. The following modelling uses zero degrees effective slope over a 50m direct fire run with littoral rainforest vegetation. The vegetation type, slope and fire run distance is considered meritorious to use a short fire run methodology in relation to the forecast fire behaviour from the western direction.

The methodology will be as outlined in Method 2 of AS 3959-2009. The variations to the AS 3959-2009 Method 2 inputs will be outlined in the sections following however they relate to-

- Fire front width reduction due to short fire run modelling.

- NSW RFS Community Resilience Sheet – Methodology for assessing bush fire risk for low risk vegetation and Appendix A Community Resilience Sheet 1/14.

Redundancies include-

- The performance solution assumes 100% rate of spread at fire initiation stage within the primary hazard however it is acknowledged that ember ignition will require a growth period that is not likely to reach 100% intensity over a short fire run.

- Flame emissivity is conservative, with 95% emitting power (as detailed in AS3959 (2009).

- Rate of spread assumes that the fire is moving at equilibrium rate of spread from the instant it starts. This is not possible with Cheney and Barry's (1969) forest growth model of R=Rss e-a/t being more appropriate, where R = rate of spread at time t, Rss = equilibrium rate of spread, t = time since ignition.

Fire initiation from the west in the study area will have a direct fire run of approximately 50m. The fire behaviour with this fire run from a point ignition is not likely to evolve into a fire with 100% intensity as prescribed by AS 3959-2009.

The fire will be in the initiation and growth stages of development. As shown in the Bushfire CRC illustration below the rate of spread will not be sufficient to fully involve the canopy and therefore the intensity and flame length is potentially overestimated by AS 3959-2009.

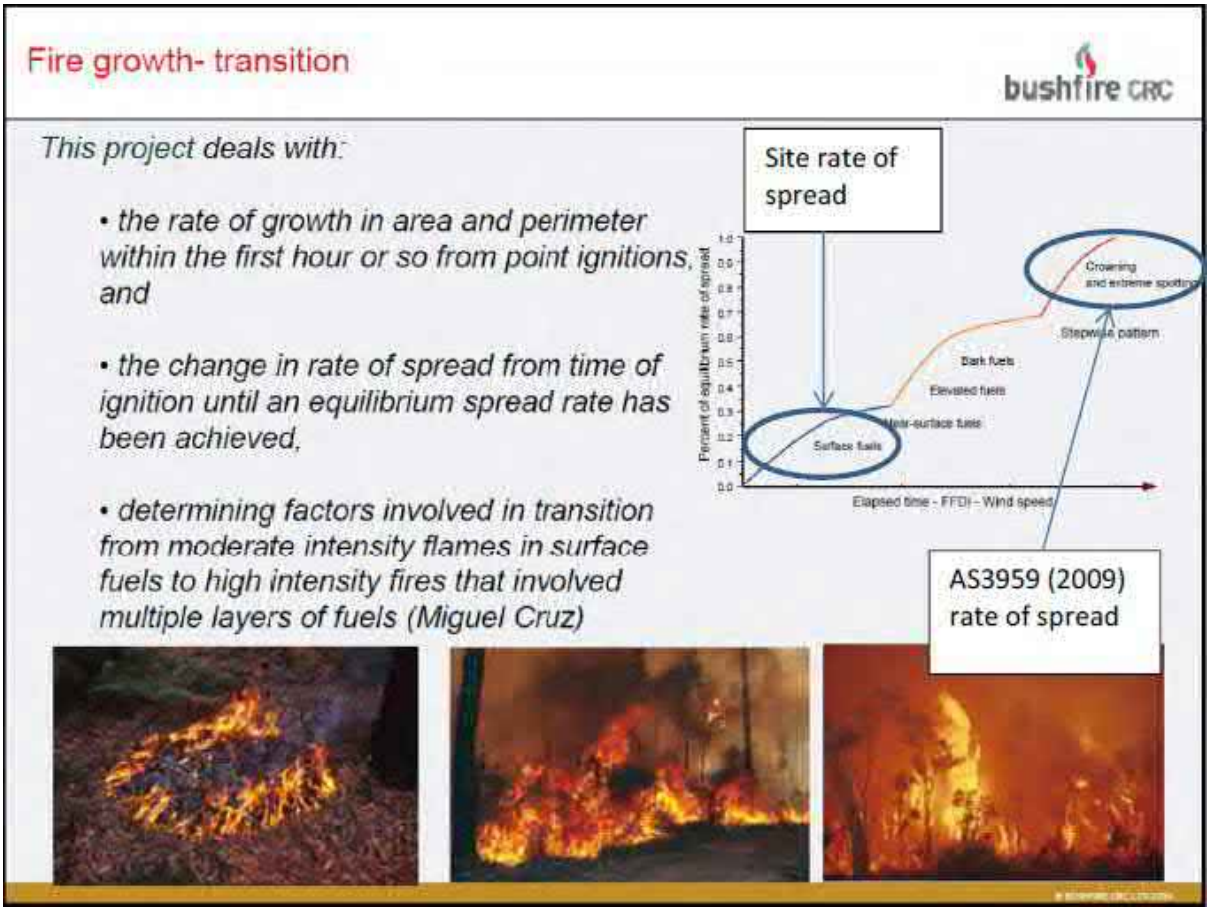

Figure 11: Bushfire CRC graph shows how short fire runs will not reach 100% intensity

The following quantification of short fire runs is provided to identify the minimum asset protection zone width from the building in order to establish that the forecast radiant heat received by the building will not exceed 29kW/m^2 given the trail design for construction of a future dwelling is set to a maximum BAL 29 AS 3959-2009.

The fire scenario used to quantify the forecast fire front is from a single or multi-spot ignition source. The following model provides some variation to the intensity, rate of spread and flame length calculation adopted by AS 3959-2009.

The variations are used due to the fact that AS 3959-2009 has inputs for a fire in full equilibrium state of spread whereas the size and short fire run of the rainforest will promote fire behaviour in the initiation and growth stage in an accelerating phase rather than at 100% intensity at the vegetation/APZ interface. Given the canopy is not expected to be involved in the fire event the surface and elevated fuels of 10t/ha will be used in the modelling. This is consistent with Appendix A of the NSW RFS Community Resilience Sheet – Methodology for assessing bush fire risk for low risk vegetation.

The elevated fuels are forecast to be in the range of 0.9m (vesta) to 1.4m which is consistent with Appendix B of NSW RFS Community Resilience Sheet – Methodology for assessing bush fire risk for low risk vegetation. The performance solution uses 1.4m as a conservative measure given the vegetation had not been planted at the time of reporting.

Table 3: PBP2006 Inputs

PARAMETER	PLANNING FOR BUSHFIRE PROTECTION 2006 INPUT
Littoral Rainforest Surface Fuel Load	10 tonnes per hectare
Slope	6 degrees upslope
Average Elevated Vegetation Height	1.4m
FDI	80
Flame Temperature	1090 kelvin

The methodology of Method 2 AS 3959-2009 is used as part of the performance solution with the following variations relating to fire front width and flame height being consistent with NSW RFS Community Resilience Sheet – Methodology for assessing bush fire risk.

1. Given the shape and short fire run there will be insufficient convective mass to make the flame tilt as modelled in the view factor model. However for conservatism the view factor model of flame tilt will be used in the design fire.

2. Radiant heat shall be measured as a cylinder or elliptical shape rather than a flat panel. Alexander (1985) proposes the length to breadth ratio of 1.0 + 0.0012 W2.154 where W equals a theoretical wind speed of 30 km/h. In turn the calculation establishes that the length to breadth (Lb) ratio = 2.82.

3. AS3959 (2009) Rate of spread (metres per minute) = (0.0012 * FDI * Surface fuel load* (0.069*SLOPE)*1000)/60.

4. Alexander (1985) proposes a head fire spread ratio of = $((Lb+\sqrt{(Lb^2)}-1) / Lb-(Lb^2) -1))$.
   Head fire spread (Hfs) = 29.85 metres per hour.

5. Alexander (1985) proposes ellipse length by dividing the forward rate of spread (AS3959 (2009) calculation) with the Head Fire Spread.
   Ellipse length (El) = ROS/Hfs+ROS

6. Total ellipse length (Tel) is calculated by multiplying Ellipse length by the time taken to travel the short fire run distance.
   Tel = El * (distance/ROS)

7. The ellipse breadth (Eb) is calculated by multiplying the actual fire run as it is shorter than the ellipse length by the length breadth ratio.

8. The flame width at the APZ interface for a fire burning directly to the dwelling will be 9.15m as provided in the following –

Inputs

Fire Run Distance	50	metres
FDI	80	
Veg Slope	-6	deg
Surface Fuel Load	10	tph
Overall Fuel Load	10	tph
Wind Speed	30	kph
Elevated Fuel Height	1.4	metres
Outputs		
ROS	634.56	metres per hour
Length/Breadth Ratio	2.82	
Headfire/Backfire spread	29.85	metres per hour
Full Elipse Length	21.26	
Full Spread	655.82	
Head Width	232.27	
ROS	10.58	metres per minute
Duration to travel Fire Run	4.73	
ROS	0.63	kph
Length/Breadth using ROS	2.82	kph
Headfire/Backfire spread ratio	29.85	
-	10.93	metres per minute
Total Ellipse Length	51.67	metres
Head Width	18.30	metres

The fire front has been forecast at 18.30m and will be included in the following design fire in order to establish distance from the west boundary to a potential dwelling location in order to be within the threshold of BAL 29 AS 3959-2009.

Run Description:	Design Fire 2 base		
Vegetation Information			
Vegetation Type:	Rainforest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	6 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	10	**Overall Fuel Load(t/ha):**	10
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	4.5
Fire Inputs			
Veg./Flame Width(m):	18.3	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	80
Program Outputs			
Category of Attack:	FLAME ZONE	**Peak Elevation of Receiver(m):**	2.03
Level of Construction:	BAL FZ	**Fire Intensity(kW/m):**	3279
Radiant Heat(kW/m2):	37.2	**Flame Angle (degrees):**	54
Flame Length(m):	5.02	**Maximum View Factor:**	0.549
Rate Of Spread (km/h):	0.63	**Inner Protection Area(m):**	4
Transmissivity:	0.892	**Outer Protection Area(m):**	0

Figure 12: Based modelling of short fire run

The modelling establishes that with a 4.5m APZ the radiant heat levels will be forecast at 37.2kW/m^2 without a 1.8m high radiant heat shield.

Run Description:	Design Fire 2 - 1.8m fence		
Vegetation Information			
Vegetation Type:	Rainforest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	6 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	2.42	**Overall Fuel Load(t/ha):**	2.42
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	4.5
Fire Inputs			
Veg./Flame Width(m):	18.3	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	80
Program Outputs			
		Peak Elevation of Receiver(m):	0.88
		Fire Intensity(kW/m):	192
Radiant Heat(kW/m2):	13	**Flame Angle (degrees):**	77
Flame Length(m):	1.8	**Maximum View Factor:**	0.193
Rate Of Spread (km/h):	0.15	**Inner Protection Area(m):**	4
Transmissivity:	0.886	**Outer Protection Area(m):**	0

Figure 13: Shielding Impact Design Fire – 1.8m high metal fence.

The design fire establishes the maximum view factor that will be forecast should a 1.8m high non-combustible radiant heat shield be provided along the western boundary of Lots 1 and 18 has determined a view factor of .193.

Run Description:	Design Fire 2 final		
Vegetation Information			
Vegetation Type:	Rainforest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	6 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	10	**Overall Fuel Load(t/ha):**	10
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	4.5
Fire Inputs			
Veg./Flame Width(m):	18.3	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	80
Program Outputs			
		Peak Elevation of Receiver(m):	2.03
		Fire Intensity(kW/m):	3279
Radiant Heat(kW/m2):	24.13	**Flame Angle (degrees):**	54
Flame Length(m):	5.02	**Maximum View Factor:**	0.356
Rate Of Spread (km/h):	0.63	**Inner Protection Area(m):**	4
Transmissivity:	0.892	**Outer Protection Area(m):**	0

Figure 14: Final modelling of short fire run and 1.8m high metal fence.

The final design fire calculation has determined that when a 1.8m high non-combustible radiant heat shield is provided to the west boundary of Lot 1 and Lot 18 the radiant heat received by the building is forecast to be 24.13kW/m^2.

The flame length of 5.02m of the base design fire will be reduced to 3.22m when the height of the fence (1.8m) is factored in to the design. In turn, the study demonstrates that a future dwelling having a 4.5m Inner Protection Area from the western boundary of lots 1 and 18 will not receive radiant heat levels that exceed 29kW/m^2 and will comply with the acceptance criteria outlined in this report.

5.1.7 DEFENDABLE SPACE

The 4.5m setback from the hazard provides adequate defendable space for fire fighters and emergency services once the fire front has passed.

The recommended 1.8m high radiant heat shield will provide shielding from any residual heat and allow for safe operation in the defendable space.

5.1.8 REDUNDACIES

The following redundancies have been provided for the performance solution.

- Excellent access i.e. public roads together with hydrant water supply will allow for rapid fire brigade intervention.
- The flame temperature when the seat of the fire is shielded will likely be less than 1090K.

6.0 WATER AND UTILITY SERVICES

6.1 WATER SERVICES

Street hydrants are to be provided to comply with s4.1.3 Planning for Bushfire Protection 2006.

6.2 ELECTRICITY SERVICES

Electricity services shall comply with s4.1.3 of Planning for Bushfire Protection 2006.

6.3 GAS SERVICES

Should a gas service be installed compliance with s4.1.3 of Planning for Bushfire Protection 2006 is required.

7.0 ACCESS

The applicant is proposing an internal road network that will allow egress away from the bushfire hazard that has mapped the subject property as being designated bushfire prone land. There is required to be a fire hydrant system to s4.1.3 Planning for Bushfire Protection 2006 it being noted that the site is serviced by the NSW Fire Brigade.

The public roads are to comply with s4.1.3(1) Planning for Bushfire Protection 2006 (see ***attached***) with exception to a perimeter road having a width of 8m wide adjacent to the regenerated rainforest vegetation. The perimeter road is permitted to comply with Table 4.1 of PBP2006. Further, a perimeter road will not be required to the west of proposed Lots 1 and 18 which adjoin grassland located on an upslope.

Perimeter Roads

As stated in section 4.1.3(1) PBP2006 a perimeter road is the preferred option in subdivision design. The primary purpose of the perimeter road is to;

- Provide fire-fighters with easier access to structures, allowing more efficient use of firefighting resources;

  Comment:
  There will be adequate access in recognition of the low bushfire risk for fire fighters to easily access future structures. Street hydrants will be provided with compliant coverage and will allow fire fighters to stage any fire-fighting from the street. It is also noted the land to the west will be subject to future subdivision with the grassland hazard being removed.

- Provide a safe retreat for firefighters;

  Comment:
  Given the potential street hydrant locations and the short intervals between access points allowing fire hydrant hoses to cover all areas of a structure when staged from the public road. The perimeter road having a reduced width adjacent to the rainforest revegetation is considered reasonable due to the low risk hazard based on classification, short fire runs and upslope topography.

- Provide a clear control line from which to conduct hazard reduction or back burning operations.

  Comment:
  Consideration in relation to perimeter roads needs to take the bushfire hazard and risk into account. When the hazard is high in relation to vegetation type i.e. forest, slopes and fire runs then a bushfire will have the potential to have a high level of intensity and rate of spread. In these circumstances it is critical to have perimeter roads to enable firefighters to be able to work adjacent to the hazard in order to create clear control lines to undertaken hazard reduction or back burning operations to minimize the fire intensity at the development interface.

  The bushfire hazard potentially impacting the proposed subdivision is not considered to be high risk given it is a small area of rainforest on an upslope together with grassland vegetation which will be removed with a future subdivision. These vegetation types and the limited size of the hazard will not have significantly sustained fire fronts and will unlikely require back burning.

  Further, the direct fire run in the northwest precinct of the development is approximately 70-170m in length at the widest points and location on upslopes. The growth stage through the rainforest from a point ignition will be slow and this will limit the intensity of the bushfire at the development interface. Therefore, the likely need to back burn or undertaken hazard reduction with this size and type of hazard is negligible.

8.0 LANDSCAPING

The majority of buildings adversely impacted upon in a bushfire event happen through ember attack and in this regard combustible material surrounding the buildings e.g. landscaping, can play a significant part during the event. Adequate management of landscaping is critical to the survivability of an asset and for occupant safety during a bushfire.

It is recommended that landscaping is undertaken in accordance Appendix 5 of Planning for Bushfire Protection 2006 and managed and maintained for the life of the development.

9.0 CONCLUSION

This assessment demonstrates that whilst requirements of Planning for Bushfire Protection 2006 do not apply directly given that the proposed buildings which are not located on bushfire prone land consideration has been given to PBP2006.

DISCLAIMER

This report was prepared for the purposes and exclusive use of the stated client to accompany an application to Ballina Shire Council for a proposed residential subdivision and is not to be used for any other purpose or by any other person or Corporation. BCA Check Pty Ltd accepts no responsibility for any loss or damage suffered howsoever arising to any person or Corporation who may use or rely on this report in contravention of the terms of this clause.

Reporting has been based on the relevant Council and Rural Fire Service Guidelines, however, recommendations given in this report are based on our site investigation at the time of reporting. In some cases site conditions may change dramatically within a few years due to rapid vegetation re-growth and invading weed species.

The report has been established to reduce the risk of ignition to the building and to promote occupant safety and this is dependent on the property and structure being maintained in perpetuity to the recommendations in this report and the standards of Planning for Bushfire Protection 2006. It is noted however that the report and the recommendations within cannot and do not propose that the building or occupants will not be adversely impacted upon given that bushfire is a natural phenomenon and cannot fully be predicted as can occupant behavior.

REFERENCES

ABCB, (2016), The Building Code of Australia, *Australian Building Codes Board Canberra,* Volume 2.

NSW Rural Fire Service and Planning NSW (2006), *Planning for bushfire protection, A guide for councils planners fire authorities developers and homeowners.* Rural Fire Service NSW Australia.

Standards Australia, (2009), AS3959 *Construction of buildings in bushfire prone areas,* Australian Standards, Sydney.

LEGISLATION

Environmental Planning and Assessment Act 1979 and Regulations 2000. *New South Wales.* Parliamentary Counsel's Office, NSW Government Information Service.

APPENDICES

- **Plans of Subdivision**
- **Biodiversity Assessment Super Lot 7 – Epiq Lennox, GeoLINK 20.04.2018**
- **Access Public Roads s4.1.3(1) Planning for Bush Fire Protection 2006**
- **Standards for Asset Protection Zones – NSW Rural Fire Service**

SITE PLAN

SCALE 1:500

FOR APPROVAL

REV	DESCRIPTION	BY	APP.	DATE
A	FOR APPROVAL	DY	CP	

REVISIONS

SCALES SHOWN ARE FOR AN A1 SIZE ORIGINAL DRAWING

0 5 10 20 30
Full Size 1:500 ; Half Reduction 1:1000
SCALE (m)

SCALES

CHECK PRINT
INCOMPLETE REVISION

DISTRIBUTION	SIGN	DATE
DRAFTING CHECK		
DESIGN CHECK		
DESIGN VERIFIED		

THIS DRAWING HAS NOT BEEN CHECKED OR VERIFIED AND MUST NOT BE RELIED UPON

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CLARENCE PROPERTY

EPIQ ESTATE - LENNOX HEAD, NSW, 2478
SUPER LOT 7
OVERALL SITE PLAN

Reference No.	DRAWING No.	REVISION
2014/351	14351-S7-DA-AD-01	A

Plot Date: 21 Aug, 2018 CAD File Name: K:\Jobs\2014\14351 - Clarence Property\Super Lot 7\Engineering\Drawings\14351-S7-DA-AD-01.dwg

HENDERSON LANE

RESERVE

REGENERATION AREA
7795m²

ROAD

HUTLEY DRIVE

SPORTSFIELD

CALOOLA ROAD

YIELD BREAKDOWN

RESIDENTIAL A	33 LOTS
RESIDENTIAL B	1 LOTS
WORK LIVE	26 LOTS
MIXED USE	3 LOTS
TOTAL LOTS	**63 LOTS**
10m BUFFER ZONE	

REV	DATE	AMENDMENT
A		
B		
C		

SOURCE PLAN N/A

Newton Denny Chapelle
Surveyors Planners Engineers

SKODA LOT LAYOUT

REV C

Biodiversity Assessment

Super Lot 7 – Epiq Lennox

GeoLINK
environmental management and design

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Prepared for: Clarence Property

UPR	Description	Date Issued	Issued By
1675-1513	First issue	06/04/2018	ILC
1675-1519	Second issue	20/04/2018	ILC

Table of Contents

Illustrations

Tables

Appendices

1. Introduction

1.1 Background

GeoLINK has prepared this Biodiversity Assessment on behalf of Clarence Property to support an amendment for the modification to the Major Project approval (s.75W application) of the Epiq Lennox development site (previously known as Pacific Pines). The proposed modification seeks to undertake amendments to Super Lot 7 ('SL7') under the Concept Approval (MP 07_0026) prepared under Part 3A of the *Environmental Planning and Assessment Act 1979* (EPA Act) and approved October 2008.

While Secretary's Environmental Assessment Requirements (SEARs) were provided for the proposed modification, the SEARs did not specify any requirements with regard to biodiversity matters.

The aim of this assessment is to identify any significant biodiversity matters relevant to the proposed modification, which may include:

- Habitat for threatened species or communities listed in the *Biodiversity Conservation Act 2016* (BC Act).
- Koala habitat (as per State Environmental Planning Policy [SEPP] 44 – Koala Habitat Protection).
- Matters protected under the *Coastal Management Act 2016* and State Environmental Planning Policy (Coastal Management) 2018.
- Threatened species or communities listed in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 The Site and Study Area

The Epiq Lennox site consists of multiple allotments at Lennox Head within the Ballina Local Government Area (LGA) and comprises former grazing land which has been historically cleared and disturbed, with some small areas of remnant vegetation retained (refer to **Illustration 1.1**). The Epiq Lennox site has been subject to ongoing earthworks and construction as part of site development for the past two years. A significant drainage corridor runs through the central portion of the site and drains to North Creek to the west. This area lies within the approved Conservation Zone (as per (MP 07_0026), established for the retention, protection and management of threatened communities and threatened species habitat.

The study area (SL7) comprises Lot 7 DP1239938 Hutley Drive in the north-west corner of Epiq Lennox and includes Management Zone 1, the majority of which has been planted out with rainforest trees (refer to **Illustration 1.2**). The balance of SL7 comprises pasture grass, with infrequent trees (Camphor Laurel, rainforest trees, regrowth). Substantial earthworks have been completed and are ongoing in the eastern portion of the lot (refer to **Illustration 1.2**).

1.3 The Proposal

The proposed modification will seek to undertake amendments to the Concept Approval (MP 07_0026); refer to **Appendix A**. The key changes proposed for the approved development are:

- Increasing the number of residential lots from 47 to 60 residential lots comprising of 34 conventional residential lots and 26 live-work lots;
- Introduce two neighbourhood commercial lots to re-introduce a tavern lot and the commencement of a community child care and storage facility; and
- Modify the subdivision design and road network within Super Lot 7.

Information shown is for illustrative purposes only

Drawn by: GJM Checked by: PJS Reviewed by: ILC Date: 26/03/2018
Source of base data: Google Earth

0 150

North

Site Plan

Drawn by: GJM Checked by: PJS Reviewed by: ILC Date: 6/04/2018

Information shown is for illustrative purposes only

Source of base data: Google Earth

North

0 50

Study Area

GeoLINK environmental management and design

Biodiversity Assessment - Epiq Super Lot 7 - Epiq Lennox

1675-1515

Illustration 1.2

2. Methodology

2.1 Personnel

The site was assessed by GeoLINK Senior Ecologist Ian Colvin on 5 April 2018.

2.2 Desktop Review

Prior to assessment of the study area, the following desktop analysis was completed:

- Review of previous ecological assessments and reporting (James Warren and Associates 2003, GeoLINK 2007, 2013, 2015a, 2015b, 2017).
- A search of the BioNet Wildlife Atlas (10 km x 10 km grid centred on the site).
- A search of the Protected Matters Search Tool for Matters of National Environmental Significance (MNES) within a 5 km radius of the site.
- Review of littoral rainforest mapping in State Environmental Planning Policy (Coastal Management) 2018.

2.3 Assessment

The assessment of the study area utilised the following methodology:

- Random meander of SL7 and completing a general flora inventory using a modified Braun-Blanquet index.
- Searches for threatened flora species (with the exception of targeted survey for Hairy Jointgrass)
- Opportunistic survey of all fauna based on visual or aural observations.

Given that a number of detailed ecological assessments have undertaken at the Epiq site and that the study area is small in area, highly disturbed and lacking significant habitat, the scope of assessment is considered adequate.

3. Flora

3.1 Desktop Analysis

3.1.1 Database Searches

BioNet search results identified (refer to **Appendix B**):

- Records of 16 threatened flora species within 5 km of the site, including 12 species listed in the EPBC Act
- Records of ten EECs from within the Ballina LGA; four of these communities are listed under the EPBC Act.

Protected Matters Search Tool results identified (refer to **Appendix B**):

- Habitat for 23 threatened flora species within 5 km of the site
- Habitat for three threatened communities within 5 km of the site.

3.1.2 Previous Studies

Seven threatened flora species and four threatened communities have been identified and mapped (refer to **Table 3.1** and **Appendix C**) at Epiq Lennox. Of the species/ communities recorded to date, one has been recorded within SL7 (Rough-shelled Bush Nut).

Table 3.1 Threatened Flora and Communities Recorded at the Site from Previous Studies

Scientific Name	*Common Name*	*BC Act*	*EPBC Act*
THREATENED FLORA			
Archidendron hendersonii	White Laceflower	V	-
Arthraxon hispidus	Hairy Jointgrass	V	V
Eleocharis tetraquetra	Square-stemmed Spike-rush	E	-
Macadamia tetraphylla	Rough-shelled Bush Nut	V	V
Syzygium hodgkinsoniae	Red Lilly Pilly	V	V
Tinospora tinosporoides	Arrow-head Vine	V	-
Xylosma terrae-reginae	Queensland Xylosma	E	-
THREATENED COMMUNITIES			
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E	-
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E	CE
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E	E
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E	-

CE = Critically Endangered, E = Endangered, V = Vulnerable

3.2 Assessment

3.2.1 Vegetation

Vegetation within SL7 comprises disturbed land with a mosaic of small, isolated communities (refer to **Illustration 3.1**):

1. Closed grassland (rank pasture) dominated by Broad-leaved Paspalum (*Paspalum mandiocanum*) with other pasture grasses (Vasey Grass *Paspalum urvillei,* Kikuyu *Cenchrus clandestinum*) and common agricultural weeds. Native vegetation is sparse to absent.

2. A rainforest planting within the Management Zone (which includes a small stand of naturally occurring Tuckeroo *Cupaniopsis anacardioides*).

3. A small patch of degraded littoral rainforest dominated by mature Tuckeroo, a mature Hard Quandong (*Elaeocarpus obovatus*), and several mature Camphor Laurel (*Cinnamomum camphora*). This community is characteristic of plant community type (PCT) 1275 *Tuckeroo - Riberry - Yellow Tulipwood littoral rainforest of the NSW North Coast Bioregion* in the BioNet Vegetation Classification.

4. A small patch of isolated regrowth Swamp Oak (*Casuarina glauca*). This community is characteristic of PCT 1145 *Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion*, although is a very poor example of the community.

5. Patches of Camphor Laurel (*Cinnamomum camphora*), typically with Lantana (*Lantana camara*). Native vegetation is sparse to absent.

As noted, substantial earthworks have been completed and are ongoing in the eastern portion of SL7 and this portion of the site comprises bare earth.

Photographs of SL7 are provided at **Appendix D**; a flora inventory is provided at **Appendix E**.

3.2.2 Threatened Flora

One threatened flora species occurs within SL7 – Rough-shelled Bush Nut. A mature tree occurs along the western boundary, with a single immature tree and several seedlings retained along the northern buffer area of the Management Zone (refer to **Illustration 3.1**). All trees will be retained in-situ.

3.2.3 Threatened Ecological Communities

The small patch of tuckeroo (Community 3) is characteristic of the Threatened Ecological Community (TEC) *Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*. This community also occurs in the adjacent road reserve and within the adjacent former SEPP 26 rainforest patch (known as the 'Gradwell remnant') to the north within Lot 1 DP1070446 and Lot 2 DP1177902. Rainforest plantings within Management Zone 1 could be considered representative of this same TEC upon maturity.

The small patch of regrowth Swamp Oak is elevated from the floodplain and has colonised a small seepage area expressing at the toe of the hillslope. This area would not be subject to 1 in 100 year flood inundation and so is not characteristic of the TEC *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*. This vegetation does not meet condition thresholds for the recently listed TEC in the EPBC Act *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community.*

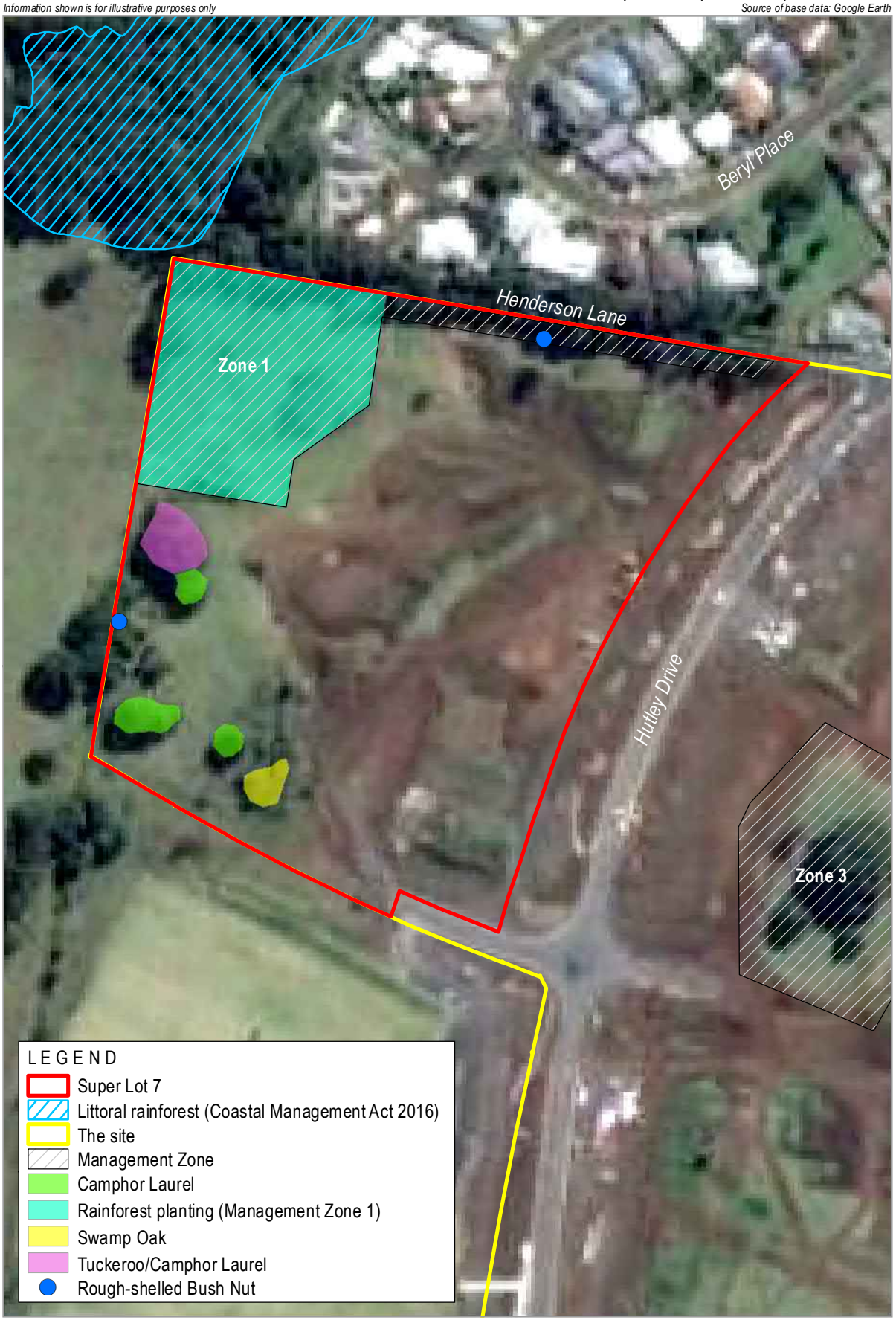
3.2.4 Condition

SL7 is highly degraded from overgrown rank pasture and earthworks and contains little naturally occurring native vegetation except for the small stand of littoral rainforest (approximately 8 trees) and minor regrowth.

Drawn by: AB Checked by: RE Reviewed by: ILC Date: 6/04/2018

Information shown is for illustrative purposes only

Source of base data: Google Earth



North

0 50

Vegetation Plan

4. Fauna

4.1 Desktop Analysis

4.1.1 Database Searches

BioNet search results identified records of 60 threatened fauna species within 5 km of the site, including 17 species listed in the EPBC Act (refer to **Appendix B**). Protected Matters Search Tool results identified habitat for 56 threatened fauna species and 76 migratory species within 5 km of the site (refer to **Appendix B**).

4.1.2 Previous Studies

Five threatened fauna species have been recorded at the Epiq site (refer to **Table 4.1**). It is likely that a number of additional threatened fauna may utilise Epiq for foraging on an opportunistic or seasonal basis including the Black-necked Stork, Brolga, Eastern Grass Owl and several microchiropteran bat species.

Table 4.1 Threatened Fauna Recorded at the Site

Scientific Name	*Common Name*	*BC Act*	*EPBC Act*
*Amaurornis moluccana**	Pale-vented Bush-hen	V	-
Botaurus poiciloptilus	Australasian Bittern	E	E
Daphoenositta chrysoptera	Varied Sittella	V	-
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-

E = Endangered, V = Vulnerable

* recorded by GeoLINK during vegetation monitoring in the west of the site in 2017

4.2 Habitat Assessment

4.2.1 Threatened Fauna

No threatened fauna species listed under the BC Act or EPBC Act have been recorded within SL7 and none were observed during the site inspection. Given the small size and disturbed condition of SL7 (an active earthworks zone) it is unlikely that any threatened fauna species would depend on resources within the study area for key life cycle requirements (foraging, roosting, breeding).

4.2.2 Habitat Values

The Epiq Lennox site comprises disturbed farmland which is under construction and subject to ongoing noise, disturbance and earthworks. Nevertheless, the site as a whole is likely to support a range of common frog, bird and mammal species, with wetland areas providing habitat for frogs and waterfowl. Flowering rainforest trees and paperbarks provide resources for fruit and nectar feeding birds (honeyeaters, friarbirds, lorikeets, figbirds etc) and also support insect feeding species such as thornbills, fantails etc. The Epiq site may provide habitat for a limited range of mammals, with dense

grass cover providing refuge for introduced ground dwelling species such as the House Mouse and Black Rat, while arboreal mammals such as the Ringtail and Brushtail Possum may occur.

SL7 has very low fauna habitat values due to lack of any significant habitat attributes and ongoing noise and disturbance from earthworks. Rank grassland provides habitat for ground-dwelling mammals and cryptic bird species (eg. Brown Quail, Tawny Grassbird, Australasian Pipit, Golden-headed Cisticola). No hollow-bearing trees (or significant habitat features) or primary Koala feed trees occur. Fifteen common bird species were recorded in and adjacent to SL7 during the site assessment.

4.2.3 Wildlife Corridors

The site occurs within the Lennox regional corridor as per Scotts (2003) and is described as a 'coastal corridor/ very patchy section of coastal corridor/ patchy key habitats'.

4.2.4 Potential for Threatened Species Occurrence

Based on the desktop analysis, habitat present and previous records, the potential for threatened fauna to occur has been assessed[1] (refer to **Appendix F**). Due to the absence of significant habitat within SL7 and that ongoing noise and disturbance occur nearby from ongoing construction activities on a daily basis, no habitat of importance (ie. core foraging or breeding habitat) for any threatened fauna species occurs.

[1] Marine species for which no habitat occurs at the site are not considered.

5. Impacts and Mitigation

5.1 Potential Impacts of the Proposal

Impacts of the proposal are very low on the basis that SL7 comprises vacant grassland with minimal native vegetation or significant habitat. The main biodiversity impact of the proposal is the loss of the small stand of mature littoral rainforest (8 trees). The loss of these trees has already been considered in the designation of the conservation and management zones for the project where native vegetation has been retained and enhanced (including habitat for Hairy Jointgrass).

Rough-shelled Bush Nut along the northern boundary will be retained within Management Zone 1, while the single mature Rough-shelled Bush Nut along the western boundary will be retained within a residential lot (Lot 1). A sewer line is proposed within approximately 4.2 metres of the western Rough-shelled Bush Nut (refer **to Figure 5.1**). Mitigation measures are prescribed to ensure the potential for damage to this tree are minimised.

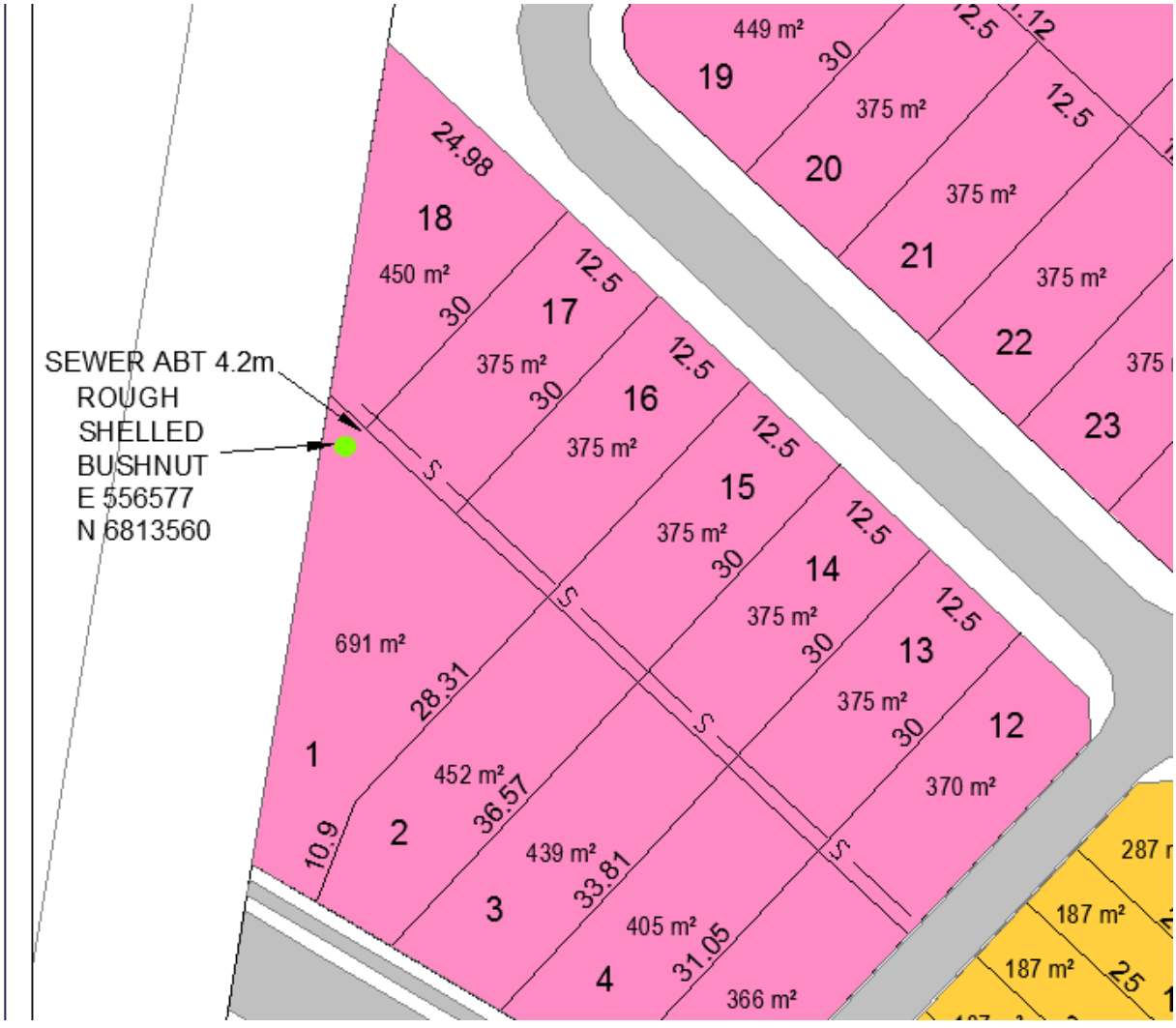


Figure 5.1 Rough-shelled Bush Nut and proposed sewer line

On this basis, biodiversity impacts of the proposal may include:

Construction phase

- Loss of a small stand of isolated mature littoral rainforest (8 trees).
- Loss of a small stand of isolated regrowth Swamp Oak.
- Minor localised disturbance to fauna (this is already occurring).
- Potential for spread and/ or introduction of weeds and pathogens.
- Potential for disturbance to rainforest plantings within Management Zone1.
- Potential for disturbance to Rough-shelled bush Nut retained in-situ on the western boundary from installation of the sewer line.

Occupation phase

- Resident activity within Management Zone1.

5.2 Mitigation

To minimise biodiversity impacts which may result from the proposal, the following mitigation measures are prescribed:

Construction phase

- Measures to minimise the potential for the spread of weeds must be implemented during construction.
- Sediment fencing and erosion controls must be implemented and maintained for the duration of the works.
- The western Rough-shelled Bush Nut must be clearly marked on site and a temporary exclusion zone (eg. parawebbing) established within 3 metres of the tree.
- Trenching works for the sewer line completed as sensitively as possible within Lot 1 to avoid damaging the Rough-shelled Bush Nut.
- Construction work limits must be clearly marked prior to commencement of works and para-webbing or similar must be placed along the boundary of Management Zone 1 with signage stating *'Protected vegetation – keep out'* or words of similar intention.
- Requirements to avoid vegetation disturbance or damage and protect the western Rough-shelled Bush Nut must be clearly explained to all personnel and subcontractors during the induction process prior to construction works.

Occupation phase

To protect rainforest plantings within Management Zone 1, the following prescriptions apply:

- Permanent boundary markings (eg. bollards) shall be installed along the boundary of Management Zone 1 to restrict access. Signage stating *"Conservation Zone - entry prohibited"* (or words of similar intention) shall be placed along the fencing.
- If fencing of Management Zone 1 is completed it must be permeable to permit fauna movement (eg. post and rail fencing) and barbed wire must not be utilised.

6. Statutory Assessment

The following sections assess the findings of the site assessment with regard to relevant statutory requirements.

6.1 Coastal Management Act 2016

The *Coastal Management Act 2016* (CM Act) aims to achieve ecologically sustainable development that:

- protects and enhances sensitive coastal environments, habitats and natural processes
- strategically manages risks from coastal hazards
- maintains and enhances public access to scenic areas, beaches and foreshores
- supports the objectives for our marine environments under the *Marine Estate Management Act 2014*
- protects and enhances the unique character, cultural and built heritage of our coastal areas, including Aboriginal cultural heritage.

The Act defines the coastal zone as comprising four coastal management areas. Each area has different characteristics and may at times overlap. The four coastal management areas are:

1. Coastal wetlands and littoral rainforests area; areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26.

2. Coastal vulnerability area; areas subject to coastal hazards such as coastal erosion and tidal inundation

3. Coastal environment area; areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands.

4. Coastal use area; land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

The north-western corner of the site occurs within the designated 100 m proximity area to a patch of adjacent littoral rainforest mapped under the CM Act (refer to **Figure 6.1**). However, no development is proposed in this part of the site as it lies within a Management Zone and no littoral rainforest will be affected.

Figure 6.1 Littoral rainforest mapped in the CM Act adjacent to the site

6.2 State Environmental Planning Policy (Coastal Management) 2018

SEPP Coastal Management 2018 aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the *Coastal Management Act 2016*, including the management objectives for each coastal management area, by:

(a) managing development in the coastal zone and protecting the environmental assets of the coast, and

(b) establishing a framework for land use planning to guide decision-making in the coastal zone, and

(c) mapping the 4 coastal management areas that comprise the NSW coastal zone for the purpose of the definitions in the *Coastal Management Act 2016*.

As noted, the north-western portion of Super Lot 7 lies within the 100 m proximity area to a patch of adjacent littoral rainforest depicted on the *Coastal Wetlands and Littoral Rainforests Area Map*. The Policy states that: *development consent must not be granted to development on land identified as "proximity area for coastal wetlands" or "proximity area for littoral rainforest" on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on:*

(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

The proposed modification will not affect adjacent littoral rainforests and the need to buffer this community has been taken into account from the early planning stages, by designation Management Zone 1 as a planted rainforest buffer. Surface water flows will not be altered as SL7 occurs downslope of littoral rainforest communities.

6.3 State Environmental Planning Policy (SEPP) 44 – Koala Habitat Protection

SEPP 44 applies to all LGAs listed under Schedule 1, which includes Ballina LGA. The Policy applies to areas of land at least one hectare in size and may include adjoining land under the same ownership. Ballina Shire Council have completed the *Ballina Shire Koala Management Strategy* (2017) under the provisions of SEPP 44 which applies to areas of land designated as Koala Planning Areas (KPAs). Where land is not within a KPA, the 'standard' Policy applies. Epiq Lennox is not within a KPA, so a standard SEPP 44 assessment has been completed as follows.

SEPP 44 listed Schedule 2 listed Koala feed tree species are as follows:

- Bimble Box (*Eucalyptus populnea*)
- Broad-leaved Scribbly Gum (*Eucalyptus haemastoma*)
- Forest Red Gum (*Eucalyptus tereticornis*)
- Large-fruited Grey Gum (*Eucalyptus punctata*)
- Ribbon Gum (*Eucalyptus viminalis*)
- River Red Gum (*Eucalyptus camaldulensis*)

- Scribbly Gum (*Eucalyptus signata*)
- Swamp Mahogany (*Eucalyptus robusta*)
- Tallowwood (*Eucalyptus microcorys*)
- White Box (*Eucalyptus albens*)

The Policy defines potential Koala habitat as areas of native vegetation where Schedule 2 trees constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. No Schedule 2 trees occur at SL7, therefore potential Koala habitat does not occur and no further assessment under SEPP 44 is required.

6.4 Biodiversity Conservation Act 2016 (BC Act)

The BC Act requires a test of significance ('five-part test') when assessing whether an action, development or activity is likely to significantly affect threatened species, ecological communities, or their habitats.

As threatened flora and communities occur within and in close proximity to SL7, tests of significance have been completed (refer to **Appendix G**). The test concluded that the proposal would be unlikely to significantly increase the risk of extinction for any flora species or communities, and hence a Species Impact Statement (SIS) is not required.

6.5 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act protects/ regulates MNES, including:

- World heritage properties.
- National heritage places.
- Wetlands of international importance.
- Nationally threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).
- A water resource, in relation to coal seam gas development and large coal mining development.

Based on the search results and site assessment (refer to summary at **Table 6.1**), no significant impacts to any MNES are likely to result from the proposal, therefore referral to the Minister for the Environment and Energy is not required.

Table 6.1 Assessment of MNES

Factor	*Impact*
Any impact on a World Heritage property?	
No World Heritage properties occur within 5 km of the site.	Nil
Any impact on a National Heritage place?	
No National Heritage places occur within 5 km of the site.	Nil
Any impact on a wetland of international importance?	
No Wetlands of International Significance (Ramsar Sites) occur within 5 km of the site.	Nil
Any impact on nationally listed threatened biodiversity?	
Habitat for three threatened ecological communities, 79 threatened species and 76 migratory species are identified within 5 km of the site. The modified proposed would not impact on any habitat for nationally listed species or communities. All Rough-shelled Bush Nut in SL7 will be retained in-situ.	Nil
Any impact on a Commonwealth marine area?	
No Commonwealth marine areas occur within 5 km of the site.	Nil
Any impact on the Great Barrier Reef Marine Park?	
The Great Barrier Reef Marine park is distant from the site.	Nil
Does the proposal involve a nuclear action (including uranium mining)?	
The proposal does not involve a nuclear action.	Nil
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	
The Proposal does not involve any impact on a water resource, in relation to coal seam gas development and large mining development.	Nil

7. Conclusion

In response to the (modified) proposal and its potential impacts on biodiversity, the following applies:

- Native vegetation is very sparse and SL7 is highly degraded and disturbed.
- One threatened flora species occurs (Rough-shelled Bush Nut) – all trees and seedlings will be retained in-situ.
- A small patch of disturbed littoral rainforest TEC will be removed. This is adequately compensated for by the substantial plantings already completed within Management Zone 1.
- No significant habitat for threatened fauna occurs.
- Assessments of significance for Rough-shelled Bush Nut and littoral rainforest concluded that a significant impact is unlikely as a result of the proposal.
- Assessment under SEPP 44 (Koala Habitat Protection) determined that potential Koala habitat does not occur at the site.
- Assessment under SEPP Coastal Management 2018 determined that the modification would not impact on adjacent littoral rainforest depicted on the *Coastal Wetlands and Littoral Rainforests Area Map*.

Impacts of the proposal are very low on the basis that SL7 comprises an active construction site with little native vegetation or significant habitat. Mitigation measures have been proposed to minimise the limited biodiversity impacts that may result from the proposal.

An SIS is not required and referral to the federal Minister of the Department of Environment and Energy is not required.

References

Ballina Shire Council (2017). *Ballina Shire Koala Management Strategy*.

GeoLINK (2007). *Pacific Pines Estate Lennox Head. Part 3A Application No. MP07_0026: Environmental Assessment Report.* Prepared for Petrac Pty Ltd.

GeoLINK (2013a). *Environmental Management Plan Pacific Pines, Lennox Head Part 3A Approval MP_0026*. Report prepared for The Royal Bank of Scotland.

GeoLINK (2013b). *Environmental Management Plan Pacific Pines, Lennox Head EPBC 2007/3585*. Report prepared for The Royal Bank of Scotland.

GeoLINK (2015a). *Vegetation Monitoring Report: August 2015 Epiq Lennox.* Report prepared for Clarence Property Group Corp.

GeoLINK (2015b). *Conservation Zone Management Plan: Pacific Pines, Lennox Head, Part 3A Approval MP_0026*. Prepared for Clarence Prop Corp Ltd.

James Warren and Associates (2003). *Flora and Fauna Assessment Pacific Pines Estate.* A report to Bob and Judith Pidcock.

Scotts, D. (2003). *Key habitats and corridors for forest fauna: A landscape framework for conservation in north-east New South Wales.* NSW NPWS Occasional Paper 32, NSW National Parks and Wildlife Service.

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Appendix A

Super Lot 7 Concept Plan

Legend

- Site Boundary
- Major Contour (1m)
- Regeneration Area
- 10m Buffer
- 14 CP Carparking Nos

Yield Breakdown

Residential A	33 Lots
Residential B	1 Lot
Work Live	26 Lots
Commercial	2 Lots
TOTAL LOTS	**62 Lots**

Land Use Breakdown

Residential Lots	1.44 ha
Work/Live Lots	0.55 ha
Commercial	0.86 ha
Open Space	0.78 ha
Buffer	0.17 ha
Road	1.85 ha
TOTAL AREA	**5.65 ha**

Note:
All Lot Numbers, Dimensions and Areas are approximate only, and are subject to survey and Council approval.

Dimensions have been rounded to the nearest 0.1 metres.

Areas have been rounded down to the nearest 5m².

The boundaries shown on this plan should not be used for final detailed engineers design.

Source Information:
Site boundaries: NDC.
Adjoining information: DCDB.
Contours: NDC.

Scale 1 : 1500 @ A3

0 10 20 40 60 80

PROJECT	**EPIQ**	CLIENT	**CLARENCE PROPERTY CORPORATION**
Job Ref. 131433	Date. 17 OCTOBER 2017	PLAN OF SUBDIVISION LOT 1-60, 100, 101 & 200 ALLOTMENT LAYOUT SUPER LOT 7	
Comp By. JLS	DWG Name. 131433-14 PROP PLAN		
Chk'd By. PHE	Locality. LENNOX HEAD		
Local Authority. BALLINA SHIRE COUNCIL			

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ABN 44 140 292 762

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Scale	Sheet	Plan Ref	Rev
1:1500	A3	**131433-14**	

Appendix B

Search Results

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 TSC Act 1995) Entities in selected area [North: -28.76 West: 153.53 East: 153.63 South: -28.86] returned a total of 8,562 records of 76 species.
Report generated on 8/03/2018 1:49 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Myobatrachidae	3137	*Crinia tinnula*		Wallum Froglet	V,P		55	
Animalia	Amphibia	Hylidae	3166	*Litoria aurea*		Green and Golden Bell Frog	E1,P	V	1	
Animalia	Amphibia	Hylidae	3202	*Litoria olongburensis*		Olongburra Frog	V,P	V	16	
Animalia	Reptilia	Cheloniidae	2004	*Caretta caretta*		Loggerhead Turtle	E1,P	E	4	
Animalia	Reptilia	Cheloniidae	2007	*Chelonia mydas*		Green Turtle	V,P	V	2	
Animalia	Reptilia	Dermochelyidae	2013	*Dermochelys coriacea*		Leatherback Turtle	E1,P	E	2	
Animalia	Aves	Anseranatidae	0199	*Anseranas semipalmata*		Magpie Goose	V,P		2	
Animalia	Aves	Anatidae	0200	*Nettapus coromandelianus*		Cotton Pygmy-Goose	E1,P		2	
Animalia	Aves	Anatidae	0214	*Stictonetta naevosa*		Freckled Duck	V,P		2	
Animalia	Aves	Columbidae	0021	*Ptilinopus regina*		Rose-crowned Fruit-Dove	V,P		5	
Animalia	Aves	Podargidae	0314	*Podargus ocellatus*		Marbled Frogmouth	V,P		1	
Animalia	Aves	Diomedeidae	0092	*Phoebetria fusca*		Sooty Albatross	V,P	V	1	
Animalia	Aves	Procellariidae	0072	*Ardenna carneipes*		Flesh-footed Shearwater	V,P	J,K	4	
Animalia	Aves	Procellariidae	0971	*Pterodroma solandri*		Providence Petrel	V,P	J	1	
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*		Black-necked Stork	E1,P		64	
Animalia	Aves	Ardeidae	0197	*Botaurus poiciloptilus*		Australasian Bittern	E1,P	E	3	
Animalia	Aves	Ardeidae	0196	*Ixobrychus flavicollis*		Black Bittern	V,P		1	
Animalia	Aves	Accipitridae	0218	*Circus assimilis*		Spotted Harrier	V,P		4	
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*		White-bellied Sea-Eagle	V,P	C	61	
Animalia	Aves	Accipitridae	0225	*Hieraaetus morphnoides*		Little Eagle	V,P		15	

Animalia	Aves	Accipitridae	8739	^^*Pandion cristatus*	Eastern Osprey	V,P,3		104
Animalia	Aves	Gruidae	0177	*Grus rubicunda*	Brolga	V,P		4
Animalia	Aves	Burhinidae	0174	*Burhinus grallarius*	Bush Stone-curlew	E1,P		6
Animalia	Aves	Burhinidae	0175	*Esacus magnirostris*	Beach Stone-curlew	E4A,P		4
Animalia	Aves	Haematopodidae	0131	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		20
Animalia	Aves	Haematopodidae	0130	*Haematopus longirostris*	Pied Oystercatcher	E1,P		59
Animalia	Aves	Charadriidae	0141	*Charadrius leschenaultii*	Greater Sand-plover	V,P	V,C,J,K	27
Animalia	Aves	Charadriidae	0139	*Charadrius mongolus*	Lesser Sand-plover	V,P	E,C,J,K	45
Animalia	Aves	Jacanidae	0171	*Irediparra gallinacea*	Comb-crested Jacana	V,P		3
Animalia	Aves	Rostratulidae	0170	*Rostratula australis*	Australian Painted Snipe	E1,P	E	1
Animalia	Aves	Scolopacidae	0166	*Calidris alba*	Sanderling	V,P	C,J,K	14
Animalia	Aves	Scolopacidae	0161	*Calidris ferruginea*	Curlew Sandpiper	E1,P	CE,C,J,K	95
Animalia	Aves	Scolopacidae	0165	*Calidris tenuirostris*	Great Knot	V,P	CE,C,J,K	54
Animalia	Aves	Scolopacidae	0167	*Limicola falcinellus*	Broad-billed Sandpiper	V,P	C,J,K	4
Animalia	Aves	Scolopacidae	0152	*Limosa limosa*	Black-tailed Godwit	V,P	C,J,K	17
Animalia	Aves	Scolopacidae	0160	*Xenus cinereus*	Terek Sandpiper	V,P	C,J,K	75
Animalia	Aves	Laridae	0972	*Gygis alba*	White Tern	V,P		1
Animalia	Aves	Laridae	0120	*Onychoprion fuscata*	Sooty Tern	V,P		1
Animalia	Aves	Laridae	0117	*Sternula albifrons*	Little Tern	E1,P	C,J,K	81
Animalia	Aves	Cacatuidae	0265	*^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		1
Animalia	Aves	Psittacidae	8913	^^*Pezoporus wallicus wallicus*	Eastern Ground Parrot	V,P,3		3
Animalia	Aves	Tytonidae	0252	^^*Tyto longimembris*	Eastern Grass Owl	V,P,3		19
Animalia	Aves	Tytonidae	0250	^^*Tyto novaehollandiae*	Masked Owl	V,P,3		4
Animalia	Aves	Meliphagidae	0610	*Gavicalis fasciogularis*	Mangrove Honeyeater	V,P		14

Animalia	Aves	Pomatostomidae	8388	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V,P		4
Animalia	Aves	Neosittidae	0549	*Daphoenositta chrysoptera*	Varied Sittella	V,P		15
Animalia	Aves	Artamidae	8519	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		1
Animalia	Mammalia	Dasyuridae	1008	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	2
Animalia	Mammalia	Dasyuridae	1045	*Planigale maculata*	Common Planigale	V,P		5
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*	Koala	V,P	V	13
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	27
Animalia	Mammalia	Pteropodidae	1294	*Syconycteris australis*	Common Blossom-bat	V,P		1
Animalia	Mammalia	Molossidae	1329	*Mormopterus norfolkensis*	Eastern Freetail-bat	V,P		1
Animalia	Mammalia	Vespertilionidae	1346	*Miniopterus australis*	Little Bentwing-bat	V,P		16
Animalia	Mammalia	Vespertilionidae	1834	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V,P		4
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*	Southern Myotis	V,P		2
Animalia	Mammalia	Vespertilionidae	1336	*Nyctophilus bifax*	Eastern Long-eared Bat	V,P		2
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		3
Animalia	Mammalia	Balaenopteridae	1575	*Megaptera novaeangliae*	Humpback Whale	V,P	V	1
Animalia	Gastropoda	Camaenidae	I002	*Thersites mitchellae*	Mitchell's Rainforest Snail	E1	CE	3
Plantae	Flora	Cunoniaceae	10943	*^Davidsonia jerseyana*	Davidson's Plum	E1,P,2	E	2
Plantae	Flora	Cunoniaceae	10944	*Davidsonia johnsonii*	Smooth Davidson's Plum	E1,P	E	3
Plantae	Flora	Euphorbiaceae	8334	*^Fontainea oraria*	Coastal Fontainea	E4A,P,2	E	41
Plantae	Flora	Fabaceae (Mimosoideae)	7757	*Archidendron hendersonii*	White Lace Flower	V,P		17
Plantae	Flora	Lauraceae	3477	*Cryptocarya foetida*	Stinking Cryptocarya	V,P	V	32
Plantae	Flora	Lauraceae	8480	*Endiandra muelleri subsp. bracteata*	Green-leaved Rose Walnut	E1,P		2
Plantae	Flora	Meliaceae	3682	*Owenia cepiodora*	Onion Cedar	V,P	V	1
Plantae	Flora	Menispermaceae	3691	*Tinospora tinosporoides*	Arrow-head Vine	V,P		17

Plantae	Flora	Myrtaceae	11894	*Gossia fragrantissima*	Sweet Myrtle	E1,P	E	2	
Plantae	Flora	Myrtaceae	4290	*Syzygium hodgkinsoniae*	Red Lilly Pilly	V,P	V	5	
Plantae	Flora	Myrtaceae	4292	*Syzygium moorei*	Durobby	V,P	V	1	
Plantae	Flora	Orchidaceae	4480	*^Phaius australis*	Southern Swamp Orchid	E1,P,2	E	5	
Plantae	Flora	Orchidaceae	7324	*^Pterostylis nigricans*	Dark Greenhood	V,P,2		1	
Plantae	Flora	Poaceae	4776	*Arthraxon hispidus*	Hairy Jointgrass	V,P	V	7352	
Plantae	Flora	Proteaceae	5446	*Macadamia tetraphylla*	Rough-shelled Bush Nut	V,P	V	56	
Plantae	Flora	Rutaceae	6457	*Acronychia littoralis*	Scented Acronychia	E1,P	E	23	

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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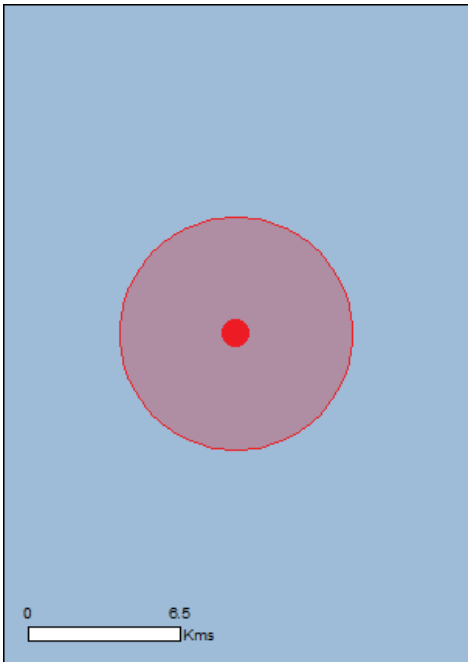

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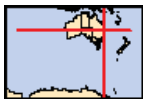

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	79
Listed Migratory Species:	76

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	110
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	1
Invasive Species:	38
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat known to occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat may occur within area
Other		
Thersites mitchellae Mitchell's Rainforest Snail [66774]	Critically Endangered	Species or species habitat known to occur within area
Plants		
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat likely to occur within area
Allocasuarina defungens Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat likely to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area
Baloghia marmorata Marbled Balogia, Jointed Baloghia [8463]	Vulnerable	Species or species habitat may occur within area
Bulbophyllum globuliforme Miniature Moss-orchid, Hoop Pine Orchid [6649]	Vulnerable	Species or species habitat may occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat known to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Davidsonia jerseyana Davidson's Plum [67219]	Endangered	Species or species habitat may occur within area
Davidsonia johnsonii Smooth Davidsonia, Smooth Davidson's Plum, Small-leaved Davidson's Plum [67178]	Endangered	Species or species habitat likely to occur within area
Diploglottis campbellii Small-leaved Tamarind [21484]	Endangered	Species or species habitat likely to occur within area
Endiandra floydii Floyd's Walnut [52955]	Endangered	Species or species habitat likely to occur within area
Floydia praealta Ball Nut, Possum Nut, Big Nut, Beefwood [15762]	Vulnerable	Species or species habitat likely to occur within area
Fontainea oraria Coastal Fontainea [24038]	Endangered	Species or species habitat known to occur within area
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat known to occur within area
Owenia cepiodora Onionwood, Bog Onion, Onion Cedar [11344]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat known to occur within area
Randia moorei Spiny Gardenia [10577]	Endangered	Species or species habitat likely to occur within area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat likely to occur within area
Syzygium moorei Rose Apple, Coolamon, Robby, Durobby, Watermelon Tree, Coolamon Rose Apple [12284]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa incana Wandering Tattler [831]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Roosting known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus kelloggi Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Microphis manadensis Manado Pipefish, Manado River Pipefish [66258]		Species or species habitat may occur within area
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Ballina	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		

Name	Status	Type of Presence
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss,		Species or species

Name	Status	Type of Presence
Kariba Weed [13665]		habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-28.80545 153.58616

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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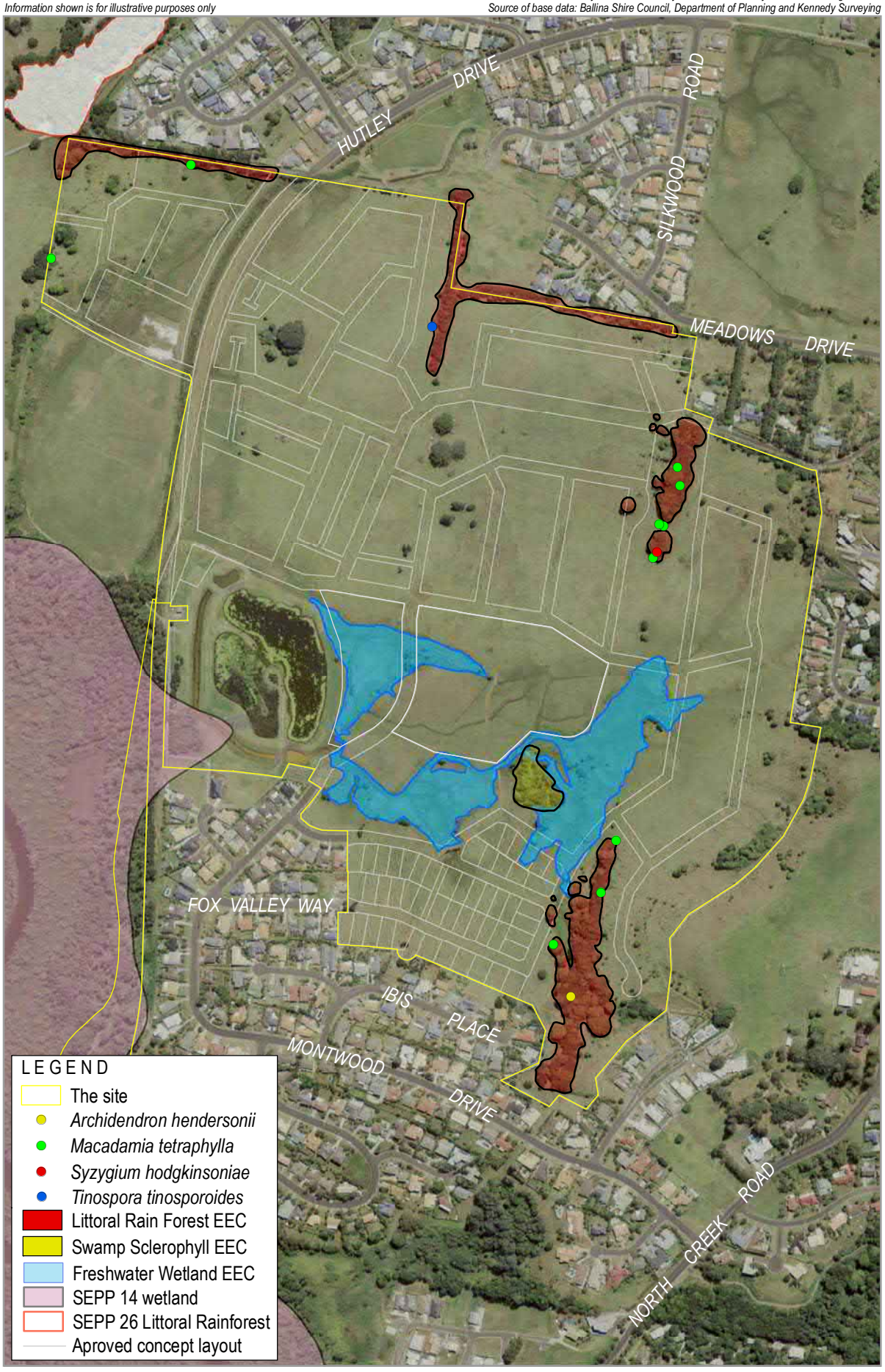
Appendix C

Threatened Flora & TEC Records

Information shown is for illustrative purposes only

Drawn by: TJP Checked by: MVE Reviewed by: DGH Date: August 2012
Source of base data: Ballina Shire Council, Department of Planning and Kennedy Surveying



0 150

North

Distribution of all EECs and Threatened Species (excluding HJG and SSSR) at the Site

Drawn by: PJS Checked by: GJM Reviewed by: ILC Date: 13/04/2017

Information shown is for illustrative purposes only

Source of base data: SIX Maps and Kennedy Surveying

Freshwater Wetland EEC Distribution within Conservation Zone

0 150

North

Information shown is for illustrative purposes only

Drawn by: GJM Checked by: PJS Reviewed by: ILC Date: 31/05/2017
Source of base data: Google Earth and Kennedy Surveying

North

0 150

Square-stemmed Spike-rush Distribution within Conservation Zone

Drawn by: GJM Checked by: PJS Reviewed by: ILC Date: 10/05/2017

Information shown is for illustrative purposes only

Source of base data: Google Earth and Kennedy Surveying

North

0 150

Hairy Joint Grass Distribution within Conservation Zone

Appendix D

Site Photographs

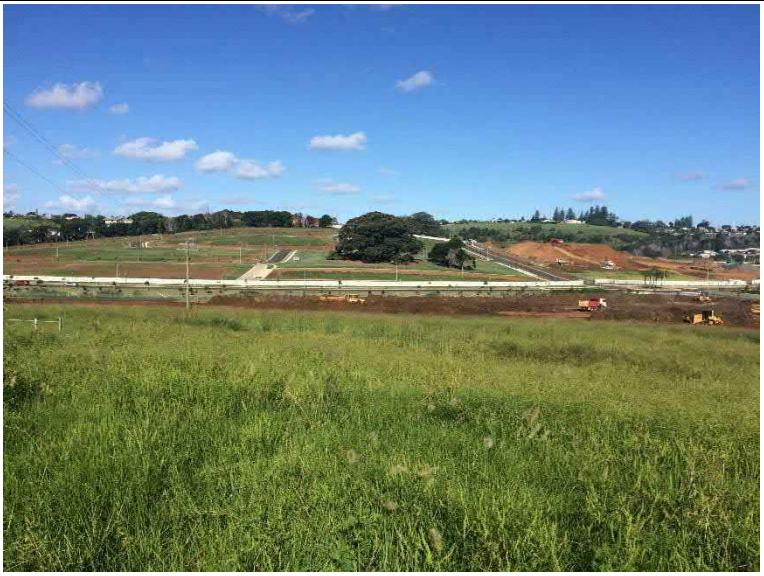
	***Plate D1 Typical grassland in west of SL7, looking east to Montwood Drive (note earthworks)***
	Plate D2 Camphor Laurel and Swamp Oak regrowth in south of SL7
	Plate D3 Mature Rough-shelled Bush Nut on western boundary (to be retained in-situ)

	Plate D4 Small stand of littoral rainforest in west of site (to be removed)
	Plate D5 Rainforest plantings in north-west of site (Management Zone 1)

Appendix E

Flora Inventory

Table E.1 Flora Inventory (does not include trees planted within Management Zone 1)

Family	*Scientific name*	*Common name*
Apiaceae	*Centella asiatica*	Pennywort
Apocynaceae	*Melodinus australis*	Southern Melodinus
Araliaceae	*Schefflera actinophylla**	Umbrella Tree
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Asteraceae	*Ageratina adenophora**	Crofton Weed
Asteraceae	*Ageratum houstonianum**	Blue Billygoat Weed
Asteraceae	*Ambrosia artemisiifolia**	Annual Ragweed
Asteraceae	*Baccharis halimifolia**	Groundsel Bush
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Casuarinaceae	*Casuarina glauca*	Swamp Oak
Convolvulaceae	*Ipomoea cairica**	Coast Morning Glory
Cyperaceae	*Cyperus polystachyos*	Bunchy Sedge
Davalliaceae	*Nephrolepis cordifolia**	Fishbone Fern
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower
Ebenaceae	*Diospyros pentamera*	Myrtle Ebony
Elaeocarpaceae	*Elaeocarpus obovatus*	Hard Quandong
Euphorbiaceae	*Glochidion sumatranum*	Umbrella Cheese Tree
Euphorbiaceae	*Macaranga tanarius*	Macaranga
Euphorbiaceae	*Mallotus discolor*	Yellow Kamala
Euphorbiaceae	*Mallotus philippensis*	Red Kamala
Fabaceae (Caesalpinioideae)	*Senna pendula var. glabrata**	Winter Senna
Fabaceae (Faboideae)	*Desmodium uncinatum**	Silver-leaf Desmodium
Fabaceae (Faboideae)	*Vigna parkeri**	Creeping Vigna
Iridaceae	*Freesia laxa**	False Freesia
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Lauraceae	*Cryptocarya triplinervis var. triplinervis*	Three-veined Laurel
Lauraceae	*Neolitsea australiensis*	Green Bolly Gum
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Lythraceae	*Cuphea carthagenensis**	Cuphea
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Meliaceae	*Dysoxylum fraseriannum*	Rosewood
Meliaceae	*Dysoxylum mollissimum*	Red Bean
Menispermaceae	*Stephania japonica var. discolor*	Snake Vine
Moraceae	*Ficus coronata*	Creek Sandpaper Fig
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn
Myrtaceae	*Austromyrtus dulcis*	Midgen Berry
Myrtaceae	*Psidium cattleyanum**	Cherry Guava

Family	*Scientific name*	*Common name*
Myrtaceae	*Rhodomyrtus psidioides*	Native Guava
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet
Onagraceae	*Ludwigia octovalvis*	Willow Primrose
Oxalidaceae	*Oxalis corniculata**	Creeping Oxalis
Passifloraceae	*Passiflora foetida**	Stinking Passionfruit
Passifloraceae	*Passiflora suberosa**	Corky Passionfruit
Passifloraceae	*Passiflora subpeltata**	White Passionflower
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Poaceae	*Andropogon virginicus**	Whiskey Grass
Poaceae	*Cenchrus clandestinus**	Kikuyu
Poaceae	*Leersia hexandra*	Swamp Ricegrass
Poaceae	*Oplismenus aemulus*	Basket Grass
Poaceae	*Paspalum mandiocanum**	Broad-leaved Paspalum
Poaceae	*Paspalum urvillei**	Vasey Grass
Poaceae	*Pennisetum alopecuroides*	Swamp Foxtail
Poaceae	*Sacciolepis indica*	Indian Cupscale Grass
Poaceae	*Setaria sphacelata**	Setaria
Poaceae	*Sorghum halepense **	Johnson Grass
Polygonaceae	*Persicaria attenuata*	Smartweed
Polygonaceae	*Persicaria strigosa*	Spotted Knotweed
Proteaceae	*Macadamia tetraphylla#*	Rough-shelled Bush Nut
Rosaceae	*Rubus rosifolius*	Native Raspberry
Rutaceae	*Citrus x taitensis**	Bush Lemon
Rutaceae	*Murraya paniculata**	Murraya
Salicaceae	*Dovyalis caffra**	Kei Apple
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
Sapindaceae	*Guioa semiglauca*	Guioa
Simaroubaceae	*Quassia sp. Mt Nardi*	Quassia
Smilacaceae	*Smilax australis*	Lawyer Vine
Solanaceae	*Solanum capsicoides**	Devil's Apple
Solanaceae	*Solanum mauritianum**	Tobacco Bush
Solanaceae	*Solanum pseudocapsicum**	Madeira Winter Cherry
Solanaceae	*Solanum seaforthianum**	Climbing Nightshade
Thymelaeaceae	*Wikstroemia indica*	Tie Bush
Verbenaceae	*Lantana camara**	Lantana
Zingiberaceae	*Hedychium gardnerianum**	Ginger Lily

* Introduced species

threatened species (BC Act, EPBC Act)

Appendix F

Potential for Threatened Fauna Occurrence

Table F.1 Threatened Fauna Potential Occurrence Assessment

Scientific Name	*Common Name*	*Status*		*Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)*	*Suitability of Site Habitat*	*Potential Occurrence and need for Test of Significance*
		BC Act	*EPBC Act*			
AMPHIBIANS						
Crinia tinnula	Wallum Froglet	V	-	Acid paperbark and sedge swamps known as 'wallum', this is a banksia-dominated lowland heath ecosystem characterised by acidic waterbodies.	Low	Low; no further assessment required.
Litoria aurea	Green and Golden Bell Frog	E	V	Amongst vegetation in and around permanent swamps, lagoons, farm dams and on flood-prone river flats, particularly where there are bullrushes or spikerushes.	Low	Low; no further assessment required.
Litoria olongburensis	Olongburra Frog	V	V	Paperbark swamps and sedge swamps of the coastal 'wallum' country amongst sedges and rushes.	Low	Low; no further assessment required.
AVIFAUNA						
Amaurornis moluccana	Pale-vented Bush-hen	V	-	Variety of coastal wetlands from wetlands, mangroves, lagoons and swamps to river margins and creeks running through rainforest.	Low	Low; no further assessment required.
Anseranas semipalmata	Magpie Goose	V	-	Shallow wetlands (<1 m deep), large swamps and dams with dense growth of rushes or sedges.	Low	Low; no further assessment required.
Anthochaera phrygia	Regent Honeyeater	CE	CE	Dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly box-ironbark woodland, swamp mahogany forests, and riverine sheoak woodlands.	Low	Low. No OEH records within locality; no further assessment required.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	Woodlands and dry open sclerophyll forests, usually dominated by eucalypts; also recorded in shrublands, heathlands and various modified habitats.	Low	Low; no further assessment required.
Botaurus poiciloptilus	Australasian Bittern	E	E	Permanent freshwater wetlands with tall dense vegetation, particularly bullrushes and spikerushes.	Low	Low; no further assessment required.
Burhinus grallarius	Bush Stone-curlew	E	-	Lightly timbered open forest and woodland, and partly cleared farmland with woodland remnants, preferring areas with dry leaf-litter, fallen timber and sparse ground cover.	Low	Low; no further assessment required.

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and need for Test of Significance
		BC Act	EPBC Act			
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Sheoaks in coastal forests and woodlands, timbered watercourses, and moist and dry eucalypt forests of the coast and the Great Divide up to 1,000 m.	Low	Low; no further assessment required.
Circus assimilis	Spotted Harrier	V	-	Grassy open woodland, inland riparian woodland, grassland and shrub steppe.	Low	Low; no further assessment required.
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	CE	E	Drier rainforests and adjacent wet eucalypt forest, wetter lowland also wetter lowland rainforests.	Low	Low; no further assessment required.
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Low	Low; no further assessment required.
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Swamps, mangroves, mudflats, dry floodplains.	Low	Low; no further assessment required.
Erythrotriorchis radiatus	Red Goshawk	CE	E	In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	Low	Low; no further assessment required.
Gavicalis fasciogularis	Mangrove Honeyeater	V	-	Mangrove forest, also near coastal forests and woodlands including casuarina and paperbark swamps.	Low	Low; no further assessment required.
Grus rubicunda	Brolga	V	-	Shallow swamps, floodplains, grasslands and pastoral lands, usually in pairs or parties.	Low	Low; no further assessment required.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	Around the Australian coastline and inland along rivers and wetlands of the Murray Darling Basin.	Low	Low; no further assessment required.
Hieraaetus morphnoides	Little Eagle	V	-	Open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used.	Low	Low; no further assessment required.
Irediparra gallinacea	Comb-crested Jacana	V	-	Vegetation floating on slow-moving rivers and permanent lagoons, swamps, lakes and dams.	Low	Low; no further assessment required.
Ixobrychus flavicollis	Black Bittern	V	-	Dense vegetation fringing and in streams, swamps, tidal creeks and mudflats, particularly amongst swamp sheoaks and mangroves.	Low	Low; no further assessment required.

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and need for Test of Significance
		BC Act	EPBC Act			
Lathamus discolor	Swift Parrot	E	E	Forests, woodlands, plantations, and banksias.	Low	Low. No OEH records within locality; no further assessment required.
Nettapus coromandelianus	Cotton Pygmy-Goose	E	-	Freshwater lakes, lagoons, swamps and dams, particularly those vegetated with waterlilies and other floating and submerged aquatic vegetation.	Low	Low; no further assessment required.
Pandion cristatus	Eastern Osprey	V	-	Forages for fish in fresh, brackish or saline waters of rivers, lakes, estuaries with suitable nesting sites nearby.	Low	Low; no further assessment required.
Pezoporus wallicus wallicus	Eastern Ground Parrot	V	-	Heathland and sedgeland within or adjacent to swamps.	Low	Low; no further assessment required.
Podargus ocellatus	Marbled Frogmouth	V	-	Subtropical rainforest spending most time is deep, wet sheltered gullies.	Low	Low; no further assessment required.
Pomatostomus temporalis temporalis	Grey-crowned Babbler	V	-	Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains.	Low	Low; no further assessment required.
Ptilinopus regina	Rose-crowned Fruit-Dove	V	-	Subtropical and dry rainforest, moist eucalypt forest and swamp forest.	Low	Low; no further assessment required.
Rostratula benghalensis	Australian Painted Snipe	E	V	Well-vegetated shallows and margins of wetlands, dams, sewage ponds, wet pastures, marshy areas, irrigation systems, lignum, tea-tree scrub, and open timber.	Low	Low; no further assessment required.
Stictonetta naevosa	Freckled Duck	V	-	Permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree.	Low	Low; no further assessment required.
Turnix melanogaster	Black-breasted Button-quail	V	V	Drier rainforests and vine scrubs, often in association with Hoop Pine and a deep moist leaf litter layer.	Low	Low. No OEH records within locality; no further assessment required.

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and need for Test of Significance
		BC Act	EPBC Act			
Tyto longimembris	Eastern Grass Owl	V	-	Areas of tall grass, including tussocks in swampy areas, grassy plains, swampy heath, cane grass, sedges on flood plains.	Low	Low; no further assessment required.
Tyto novaehollandiae	Masked Owl	V	-	Dry eucalypt forest and woodlands.	Low	Low; no further assessment required.
MAMMALS						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Sandstone cliffs and fertile woodland valley habitat.	Low	Low. No OEH records within locality; no further assessment required.
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	Low	Low; no further assessment required.
Miniopterus australis	Little Bentwing-bat	V	-	Moist eucalypt forest, rainforest and dense coastal scrub.	Low	Low; no further assessment required.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Forest or woodland; roosts in caves, old mines and stormwater channels.	Low	Low; no further assessment required.
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	Occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Low	Low; no further assessment required.
Myotis macropus	Southern Myotis	V	-	Bodies of water, rainforest streams, large lakes, reservoirs.	Low	Low; no further assessment required.
Nyctophilus bifax	Eastern Long-eared Bat	V	-	Lowland subtropical rainforest and wet and swamp eucalypt forest, extending to adjacent moist eucalypt forest.	Low	Low; no further assessment required.
Petauroides volans	Greater Glider	-	V			
Phascolarctos cinereus	Koala	V	V	Appropriate food trees in forests and woodlands, and treed urban areas.	Low; no primary feed trees occur.	Low; no further assessment required.

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and need for Test of Significance
		BC Act	EPBC Act			
Planigale maculata	Common Planigale	V	-	Rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas with surface cover close to water.	Low	Low; no further assessment required.
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	Cool temperate rainforest, moist and dry forests, and wet heathland, inhabiting dense layers of grass, ferns, vines and shrubs.	Low	Low. No OEH records within locality; no further assessment required.
Pseudomys novaehollandiae	New Holland Mouse	V	V	Occurs in open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Low	Low. No OEH records within locality; no further assessment required.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Low	Low; no further assessment required.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	Low	Low; no further assessment required.
Syconycteris australis	Common Blossom-bat	V	-	Roosts in littoral rainforest and feeds on flowers in adjacent heathland and paperbark swamps.	Low	Low; no further assessment required.
Xeromys myoides	Water Mouse	-	V	Mangroves and associated saltmarsh, sedgelands, clay pans, heathlands and freshwater wetlands.	Low	Nil - not recorded in NSW.
INVERTEBRATES						
Argynnis hyperbius inconstans	Australian Fritillary	E	CE	Open swampy coastal habitat where the caterpillar's food plant, Arrowhead Violet (*Viola betonicifolia*) occurs.	Low	Low. No OEH records within locality; no further assessment required.
Phyllodes imperialis smithersi	Pink Underwing Moth	E	E	Found in undisturbed subtropical rainforest below 600 m. Breeding habitat is restricted to areas where the caterpillar's food plant, *Carronia multisepala*, grows in a collapsed shrub-like form.	Low	Low. No OEH records within locality; no further assessment required.
Thersites mitchellae	Mitchell's Rainforest Snail	E	CE	Remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils.	Low	Low; no further assessment required.

V = Vulnerable; E = Endangered; EP = Endangered Population; CE = Critically Endangered

Appendix G

BC Act Tests of Significance

Tests of significance are required for the following threatened communities and species for which habitat occurs within the Conservation Zone:

Flora:

- Rough-shelled Bush Nut

TECs:

- Littoral rainforest

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,

Rough-shelled Bush Nut

The Rough-shelled Bush Nut is a small to medium-sized, usually densely bushy, tree growing up to 18m tall. The leaves are 7 – 25 cm long and oblong or slightly lance-shaped. The leaf-margins are toothed and prickly. Creamy pink to purplish flowers hang in long strings among the leaves. The fruit is woody brown and globular, 2 – 3 cm in diameter. Flowering occurs August–October; fruit ripe in January. The species is confined chiefly to the north of the Richmond River in north-east NSW, extending just across the border into Queensland and typically occurs in subtropical rainforest.

Threatening processes for this species include:

- Clearing and fragmentation of habitat for coastal development, agriculture and roadworks.
- Risk of local extinction due to low numbers.
- Grazing and trampling by domestic stock.
- Fire.
- Invasion of habitat by weeds.
- Loss of local genetic strains through hybridisation with commercial varieties.
- Reduction of genetic diversity as a result of fragmentation

Potential Impacts from the Proposal

The proposal would have no direct impact on Rough-shelled Bush Nut, as all stems will be retained, either within management Zone 1, or within a private allotment (the single mature tree on the western boundary). As such, the modified proposal would be unlikely to have an adverse effect on the life cycle of Rough-shelled Bush Nut in the locality such that a viable local population of the species is placed at risk of extinction.

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

(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,

The small stand of littoral rainforest within Super Lot 7 will be removed, however other areas of littoral rainforest are retained and protected at the site. The loss of this small stand (8 trees) will not place the local occurrence of littoral rainforest at risk of extinction

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

Rough-shelled Bush Nut: no habitat will be removed or modified as a result of the modified proposal.

Littoral rainforest: a small area of habitat will be removed as a result of the modified proposal. This is not significant in the context of retained vegetation at the Epiq site.

(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

Rough-shelled Bush Nut: no habitat will be fragmented or isolated as a result of the modified proposal.

Littoral rainforest: the small stand within SL7 (8 trees) will be removed; no other littoral rainforest habitat at the site will be fragmented or isolated as a result of the modified proposal.

(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,

Rough-shelled Bush Nut: no habitat will be removed or modified as a result of the modified proposal.

Littoral rainforest: the habitat to be removed (8 trees) is not important in the context of the broader Epiq site and areas of adjacent reserved littoral rainforest.

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),

No areas of outstanding biodiversity value have been declared in Ballina LGA.

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.

A key threatening process (KTP) is defined under the BC Act as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species or ecological communities. The current list of KTP under the BC Act, and whether the Proposal is recognised as a KTP is shown in **Table G.1**.

Table G.1 Key Threatening Processes

Key Threatening Process (as per Schedule 4 of the BC Act)	***Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?***		
	Likely	***Possible***	***Unlikely***
Aggressive exclusion of birds by noisy miners (*Manorina melanocephala*)			✓
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic climate change			✓
Bushrock removal			✓

Key Threatening Process (as per Schedule 4 of the BC Act)	***Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?***		
	Likely	***Possible***	***Unlikely***
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)			✓
Competition and habitat degradation by feral goats (*Capra hircus*)			✓
Competition from feral honeybees (*Apis mellifera*)			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓
Forest eucalypt dieback associated with over-abundant psyllids and bell miners			✓
Herbivory and environmental degradation caused by feral deer			✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition			✓
Importation of red imported fire ants (*Solenopsis invicta*)			✓
Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Infection of native plants by *Phytophthora cinnamomi*			✓
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae			✓
Introduction of the large earth bumblebee (*Bombus terrestris*)			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)			✓
Invasion and establishment of the Cane Toad (*Bufo marinus*)			✓
Invasion, establishment and spread of Lantana (*Lantana camara*)			✓
Invasion of native plant communities by African Olive (*Olea europaea L. subsp. cuspidata*)			✓
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)			✓
Invasion of native plant communities by exotic perennial grasses			✓
Invasion of the Yellow Crazy Ant (*Anoplolepis gracilipes*) into NSW			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss of hollow-bearing trees			✓
Loss or degradation (or both) of sites used for hill-topping by butterflies			✓
Predation and hybridisation by feral dogs (*Canis lupus familiaris*)			✓
Predation by the European Red Fox (*Vulpes vulpes*)			✓
Predation by the feral cat (*Felis catus*)			✓
Predation by *Gambusia holbrooki* (Plague Minnow or Mosquito Fish)			✓

Key Threatening Process (as per Schedule 4 of the BC Act)	***Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?***		
	Likely	***Possible***	***Unlikely***
Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)			✓
Removal of dead wood and dead trees	✓		

The proposal is not characteristic of two KTPs - clearing of native vegetation (minor regrowth, small stand of littoral rainforest), and removal of dead wood and dead trees (dead Camphor Laurel, dead tree limbs and debris). These impacts are very low in the context of the overall development of the Epiq site. The degree that the proposed modification would contribute to any threatening process is not considered likely to place the local population of any of the subject species or communities at significant risk of extinction.

Conclusion

It is considered unlikely that the local population of any of the subject species/ communities would be placed at significant risk of extinction as a result of the proposed modification.

Access (1) – Public Roads

Intent of measures: to provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from an area.

Background

Public roads include the perimeter road and the internal road system of any urban subdivision as well as public roads in rural-residential subdivisions.

A perimeter road is the preferred option to separate bushland from urban areas. Fire trails will only be considered acceptable in exceptional circumstances. This is based on the difficulties and costs associated with maintaining fire trails on private land. A perimeter fire trail cannot be imposed on the adjoining land and should not cross a number of residential allotments.

The perimeter road forms part of the APZ and is required to provide a separation between the building and the boundary of the bush fire hazard.

The purpose of the public road system is to:

- provide firefighters with easier access to structures, allowing more efficient use of firefighting resources;
- provide a safe retreat for firefighters; and
- provide a clear control line from which to conduct hazard reduction or back burning operations.

Roads should provide sufficient width to allow firefighting vehicle crews to work with firefighting equipment about the vehicle.

Where staged development occurs or development operates under an approved Masterplan, the RFS will consider temporary perimeter roading subject to availbility of reticulated water supply.

Table 4.1 provides the minimum widths for public roads that are not perimeter roads for the safe access of fire fighting vehicles in urban areas.

Curve radius (inside edge) (metres)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

Source: AS 2890.2 – 2002.

Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle)

Figure 4.4 provides the dimensions for the curvature of roads (inner and outer turning circles) to be used for access roads (both public and private) and fire trails.

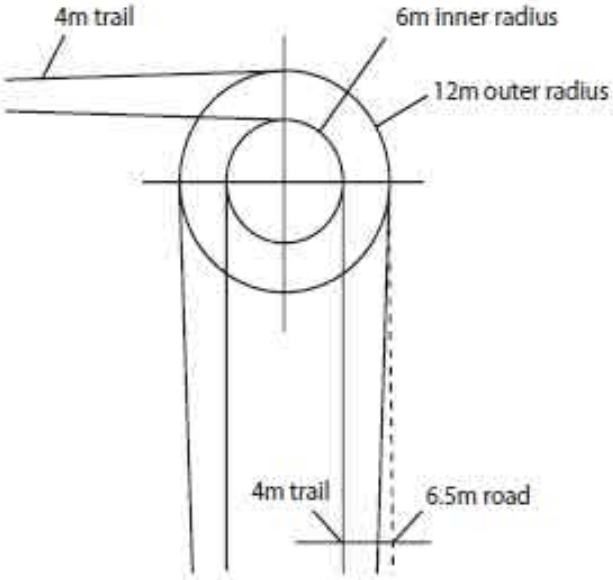


Figure 4.4 Dimensions for inner and outer turning circle radius for (public and private access) roads and fire trails.

Examples of public road access arrangements that do not facilitate bush fire fighting.

Performance Criteria	Acceptable solutions
The intent may be achieved where:	
• firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources)	• public roads are two-wheel drive, all weather roads.
• public road widths and design that allow safe access for firefighters while residents are evacuating an area.	• urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle). • the perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas. • traffic management devices are constructed to facilitate access by emergency services vehicles. • public roads have a cross fall not exceeding 3 degrees. • all roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard. • curves of roads (other than perimeter roads) are a minimum inner radius of six metres and minimal in number, to allow for rapid access and egress. • the minimum distance between inner and outer curves is six metres. • maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient. • there is a minimum vertical clearance to a height of four metres above the road at all times.
• the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles.	• the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicate load rating.
• roads that are clearly sign-posted (with easily distinguishable names) and buildings/properties that are clearly numbered.	• public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression. • public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.
• there is clear access to reticulated water supply	• public roads up to 6.5 metres wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression. • one way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.
• parking does not obstruct the minimum paved width	• parking bays are a minimum of 2.6 metres wide from kerb edge to road pavement. No services or hydrants are located within the parking bays. • public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.

standards

for asset protection zones

protection

NSW RURAL FIRE SERVICE

STANDARDS FOR ASSET PROTECTION ZONES

INTRODUCTION

For thousands of years bush fires have been a natural part of the Australian landscape. They are inevitable and essential, as many Australian plants and animals have adapted to fire as part of their life cycle.

In recent years developments in bushland areas have increased the risk of bush fires harming people and their homes and property. But landowners can significantly reduce the impact of bush fires on their property by identifying and minimising bush fire hazards. There are a number of ways to reduce the level of hazard to your property, but one of the most important is the creation and maintenance of an Asset Protection Zone (APZ).

A well located and maintained APZ should be used in conjunction with other preparations such as good property maintenance, appropriate building materials and developing a family action plan.

WHAT IS AN ASSET PROTECTION ZONE?

An Asset Protection Zone (APZ) is a fuel reduced area surrounding a built asset or structure. This can include any residential building or major building such as farm and machinery sheds, or industrial, commercial or heritage buildings.

An APZ provides:

- a buffer zone between a bush fire hazard and an asset;
- an area of reduced bush fire fuel that allows suppression of fire;
- an area from which backburning may be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Potential bush fire fuels should be minimised within an APZ. This is so that the vegetation within the planned zone does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy.

WHAT WILL THE APZ DO?

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the asset;
- damage to the built asset from intense radiant heat; and
- ember attack on the asset.

WHERE SHOULD I PUT AN APZ?

An APZ is located between an asset and a bush fire hazard.

The APZ should be located wholly within your land. You cannot undertake any clearing of vegetation on a neighbour's property, including National Park estate, Crown land or land under the management of your local council, unless you have written approval.

If you believe that the land adjacent to your property is a bush fire hazard and should be part of an APZ, you can have the matter investigated by contacting the NSW Rural Fire Service (RFS).

There are six steps to creating and maintaining an APZ. These are:

1. Determine if an APZ is required;
2. Determine what approvals are required for constructing your APZ;
3. Determine the APZ width required;
4. Determine what hazard reduction method is required to reduce bush fire fuel in your APZ;
5. Take measures to prevent soil erosion in your APZ; and
6. Landscape and regularly monitor in your APZ for fuel regrowth.

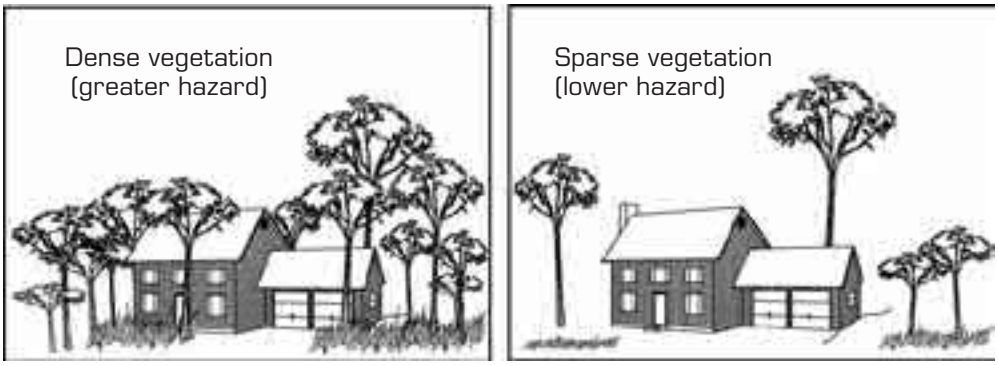
STEP 1. DETERMINE IF AN APZ IS REQUIRED

Recognising that a bush fire hazard exists is the first step in developing an APZ for your property.

If you have vegetation close to your asset and you live in a bush fire prone or high risk area, you should consider creating and maintaining an APZ.

Generally, the more flammable and dense the vegetation, the greater the hazard will be. However, the hazard potential is also influenced by factors such as slope.

- A large area of continuous vegetation on sloping land may increase the potential bush fire hazard.
- The amount of vegetation around a house will influence the intensity and severity of a bush fire.
- The higher the available fuel the more intense a fire will be.



Isolated areas of vegetation are generally not a bush fire hazard, as they are not large enough to produce fire of an intensity that will threaten dwellings.

This includes:

- bushland areas of less than one hectare that are isolated from large bushland areas; and
- narrow strips of vegetation along road and river corridors.

If you are not sure if there is a bush fire hazard in or around your property, contact your local NSW Rural Fire Service Fire Control Centre or your local council for advice.

STEP 2. DETERMINE WHAT APPROVALS ARE REQUIRED FOR CONSTRUCTING YOUR APZ

If you intend to undertake bush fire hazard reduction works to create or maintain an APZ you must gain the written consent of the landowner.

Subdivided land or construction of a new dwelling
If you are constructing an APZ for a new dwelling you will need to comply with the requirements in *Planning for Bushfire Protection*. Any approvals required will have to be obtained as part of the Development Application process.

Existing asset
If you wish to create or maintain an APZ for an existing structure you may need to obtain an environmental approval. The RFS offers a free environmental assessment and certificate issuing service for essential hazard reduction works. For more information see the RFS document *Application Instructions for a Bush Fire Hazard Reduction Certificate* or contact your local RFS Fire Control Centre to determine if you can use this approval process.

Bear in mind that all work undertaken must be consistent with any existing land management agreements (e.g. a conservation agreement, or property vegetation plan) entered into by the property owner.

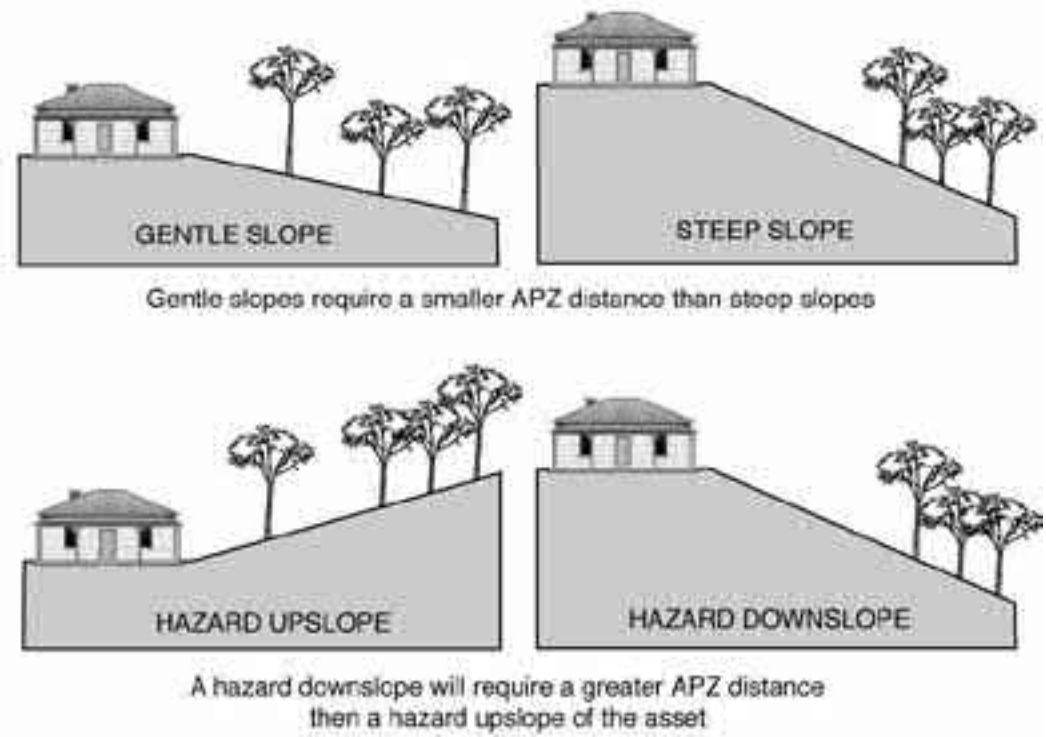
If your current development consent provides for an APZ, you do not need further approvals for works that are consistent with this consent.

If you intend to burn off to reduce fuel levels on your property you may also need to obtain a Fire Permit through the RFS or NSW Fire Brigades. See the RFS document *Before You Light That Fire* for an explanation of when a permit is required.

STEP 3. DETERMINE THE APZ WIDTH

The size of the APZ required around your asset depends on the nature of the asset, the slope of the area, the type and structure of nearby vegetation and whether the vegetation is managed.

Fires burn faster uphill than downhill, so the APZ will need to be larger if the hazard is downslope of the asset.



Gentle slopes require a smaller APZ distance than steep slopes

A hazard downslope will require a greater APZ distance then a hazard upslope of the asset

Different types of vegetation (for example, forests, rainforests, woodlands, grasslands) behave differently during a bush fire. For example, a forest with shrubby understorey is likely to result in a higher intensity fire than a woodland with a grassy understorey and would therefore require a greater APZ width.

A key benefit of an APZ is that it reduces radiant heat and the potential for direct flame contact on homes and other buildings. Residential dwellings require a wider APZ than sheds or stockyards because the dwelling is more likely to be used as a refuge during bush fire.

Subdivided land or construction of a new dwelling
If you are constructing a new asset, the principles of *Planning for Bushfire Protection* should be applied. Your Development Application approval will detail the exact APZ distance required.

Existing asset
If you wish to create an APZ around an existing asset and you require environmental approval, the Bush Fire Environmental Assessment Code provides a streamlined assessment process. Your Bush Fire Hazard Reduction Certificate (or alternate environmental approval) will specify the maximum APZ width allowed.

For further information on APZ widths see *Planning for Bushfire Protection* or the *Bush Fire Environmental Assessment Code* (available on the RFS website), or contact your local RFS Fire Control Centre.

STEP 4. DETERMINE WHAT HAZARD REDUCTION METHOD IS REQUIRED TO REDUCE BUSH FIRE FUEL IN YOUR APZ

The intensity of bush fires can be greatly reduced where there is little to no available fuel for burning. In order to control bush fire fuels you can reduce, remove or change the state of the fuel through several means.

Reduction of fuel does not require removal of all vegetation, which would cause environmental damage. Also, trees and plants can provide you with some bush fire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns. Some ground cover is also needed to prevent soil erosion.

Fuels can be controlled by:

1. raking or manual removal of fine fuels
Ground fuels such as fallen leaves, twigs (less than 6 mm in diameter) and bark should be removed on a regular basis. This is fuel that burns quickly and increases the intensity of a fire.

Fine fuels can be removed by hand or with tools such as rakes, hoes and shovels.

2. mowing or grazing of grass
Grass needs to be kept short and, where possible, green.

3. removal or pruning of trees, shrubs and understorey
The control of existing vegetation involves both selective fuel reduction (removal, thinning and pruning) and the retention of vegetation.

Prune or remove trees so that you do not have a continuous tree canopy leading from the hazard to the asset. Separate tree crowns by two to five metres. A canopy should not overhang within two to five metres of a dwelling.

Native trees and shrubs should be retained as clumps or islands and should maintain a covering of no more than 20% of the area.

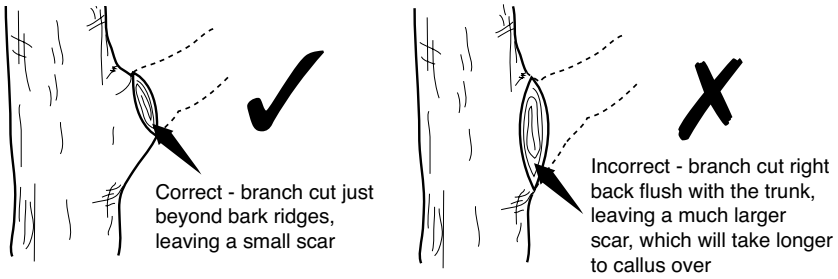
When choosing plants for removal, the following basic rules should be followed:

1. Remove noxious and environmental weeds first. Your local council can provide you with a list of environmental weeds or 'undesirable species'. Alternatively, a list of noxious weeds can be obtained at **www.agric.nsw.gov.au/noxweed/;**
2. Remove more flammable species such as those with rough, flaky or stringy bark; and
3 Remove or thin understorey plants, trees and shrubs less than three metres in height

The removal of significant native species should be avoided.

Prune in acordance with the following standards:

- Use sharp tools. These will enable clean cuts and will minimise damage to the tree.
- Decide which branches are to be removed before commencing work. Ensure that you maintain a balanced, natural distribution of foliage and branches.
- Remove only what is necessary.
- Cut branches just beyond bark ridges, leaving a small scar.
- Remove smaller branches and deadwood first.



There are three primary methods of pruning trees in APZs:

1. Crown lifting (skirting)
Remove the lowest branches (up to two metres from the ground). Crown lifting may inhibit the transfer of fire between the ground fuel and the tree canopy.

2. Thinning
Remove smaller secondary branches whilst retaining the main structural branches of the tree. Thinning may minimise the intensity of a fire.

3. Selective pruning
Remove branches that are specifically identified as creating a bush fire hazard (such as those overhanging assets or those which create a continuous tree canopy). Selective pruning can be used to prevent direct flame contact between trees and assets.

Your Bush Fire Hazard Reduction Certificate or local council may restrict the amount or method of pruning allowed in your APZ.

See the *Australian Standard 4373 (Pruning of Amenity Trees*) for more information on tree pruning.

4. Slashing and trittering
Slashing and trittering are economical methods of fuel reduction for large APZs that have good access. However, these methods may leave large amounts of slashed fuels (grass clippings etc) which, when dry, may become a fire hazard. For slashing or trittering to be effective, the cut material must be removed or allowed to decompose well before summer starts.

If clippings are removed, dispose of them in a green waste bin if available or compost on site (dumping clippings in the bush is illegal and it increases the bush fire hazard on your or your neighbour's property).

Although slashing and trittering are effective in inhibiting the growth of weeds, it is preferable that weeds are completely removed.

Care must be taken not to leave sharp stakes and stumps that may be a safety hazard.

5. Ploughing and grading
Ploughing and grading can produce effective firebreaks. However, in areas where this method is applied, frequent maintenance may be required to minimise the potential for erosion. Loose soil from ploughed or graded ground may erode in steep areas, particularly where there is high rainfall and strong winds.

6. Burning (hazard reduction burning)
Hazard reduction burning is a method of removing ground litter and fine fuels by fire. Hazard reduction burning of vegetation is often used by land management agencies for broad area bush fire control, or to provide a fuel reduced buffer around urban areas.

Any hazard reduction burning, including pile burns, must be planned carefully and carried out with extreme caution under correct weather conditions. Otherwise there is a real danger that the fire will become out of control. More bush fires result from escaped burning off work than from any other single cause.

It is YOUR responsibility to contain any fire lit on your property. If the fire escapes your property boundaries you may be liable for the damage it causes.

Hazard reduction burns must therefore be carefully planned to ensure that they are safe, controlled, effective and environmentally sound. There are many factors that need to be considered in a burn plan. These include smoke control, scorch height, frequency of burning and cut off points (or control lines) for the fire. For further information see the RFS document *Standards for Low Intensity Bush Fire Hazard Reduction Burning,* or contact your local RFS for advice.

7. Burning (pile burning)
In some cases, where fuel removal is impractical due to the terrain, or where material cannot be disposed of by the normal garbage collection or composted on site, you may use pile burning to dispose of material that has been removed in creating or maintaining an APZ.

For further information on pile burning, see the RFS document *Standards for Pile Burning.*

In areas where smoke regulations control burning in the open, you will need to obtain a Bush Fire Hazard Reduction Certificate or written approval from Council for burning. During the bush fire danger period a Fire Permit will also be required. See the RFS document *Before You Light that Fire* for further details.

STEP 5. TAKE MEASURES TO PREVENT SOIL EROSION

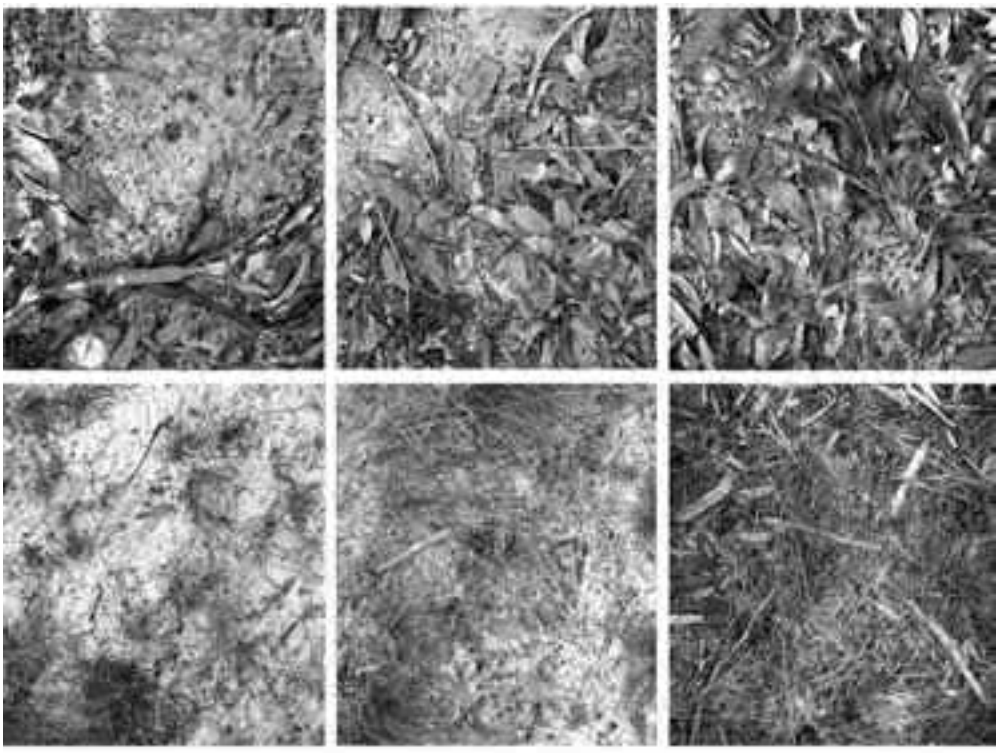
While the removal of fuel is necessary to reduce a bush fire hazard, you also need to consider soil stability, particularly on sloping areas.

Soil erosion can greatly reduce the quality of your land through:

- loss of top soil, nutrients, vegetation and seeds
- reduced soil structure, stability and quality
- blocking and polluting water courses and drainage lines

A small amount of ground cover can greatly improve soil stability and does not constitute a significant bush fire hazard. Ground cover includes any material which directly covers the soil surface such as vegetation, twigs, leaf litter, clippings or rocks. A permanent ground cover should be established (for example, short grass). This will provide an area that is easy to maintain and prevent soil erosion.

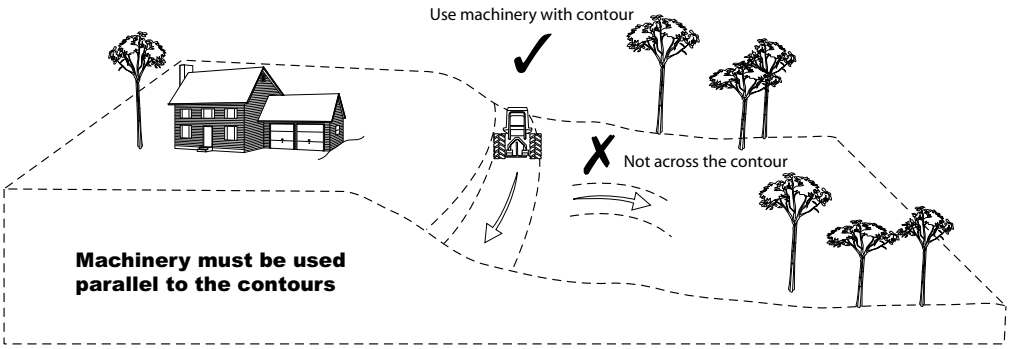
When using mechanical hazard reduction methods, you should retain a ground cover of at least 75% to prevent soil erosion. However, if your area is particularly susceptible to soil erosion, your Hazard Reduction Certificate may require that 90% ground cover be retained.



50% **75%** **100%**

Ground Cover

To reduce the incidence of soil erosion caused by the use of heavy machinery such as ploughs, dozers and graders, machinery must be used parallel to the contours. Vegetation should be allowed to regenerate, but be managed to maintain a low fuel load.

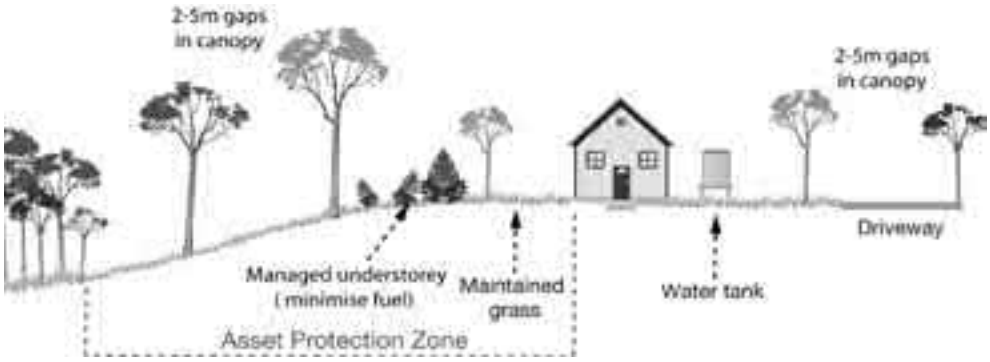


STEP 6. ONGOING MANAGEMENT AND LANDSCAPING

Your home and garden can blend with the natural environment and be landscaped to minimise the impact of fire at the same time. To provide an effective APZ, you need to plan the layout of your garden to include features such as fire resistant plants, radiant heat barriers and windbreaks.

Layout of gardens in an APZ
When creating and maintaining a garden that is part of an APZ you should:

- ensure that vegetation does not provide a continuous path to the house;
- remove all noxious and environmental weeds;
- plant or clear vegetation into clumps rather than continuous rows;
- prune low branches two metres from the ground to prevent a ground fire from spreading into trees;
- locate vegetation far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission;
- plant and maintain short green grass around the house as this will slow the fire and reduce fire intensity. Alternatively, provide non-flammable pathways directly around the dwelling;
- ensure that shrubs and other plants do not directly abut the dwelling. Where this does occur, gardens should contain low-flammability plants and non flammable ground cover such as pebbles and crush tile; and
- avoid erecting brush type fencing and planting "pencil pine" type trees next to buildings, as these are highly flammable.



Removal of other materials
Woodpiles, wooden sheds, combustible material, storage areas, large quantities of garden mulch, stacked flammable building materials etc. should be located away from the house. These items should preferably be located in a designated cleared location with no direct contact with bush fire hazard vegetation.

Other protective features
You can also take advantage of existing or proposed protective features such as fire trails, gravel paths, rows of trees, dams, creeks, swimming pools, tennis courts and vegetable gardens as part of the property's APZ.

PLANTS FOR BUSH FIRE PRONE GARDENS

When designing your garden it is important to consider the type of plant species and their flammability as well as their placement and arrangement.

Given the right conditions, all plants will burn. However, some plants are less flammable than others.

Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage the ground fire to spread up to, and then through, the crown of the trees.

Plants that are less flammable, have the following features:

- high moisture content
- high levels of salt
- low volatile oil content of leaves
- smooth barks without "ribbons" hanging from branches or trunks; and
- dense crown and elevated branches.

When choosing less flammable plants, be sure not to introduce noxious or environmental weed species into your garden that can cause greater long-term environmental damage.

For further information on appropriate plant species for your locality, contact your local council, plant nurseries or plant society.

If you require information on how to care for fire damaged trees, refer to the Firewise brochure *Trees and Fire Resistance; Regeneration and care of fire damaged trees.*

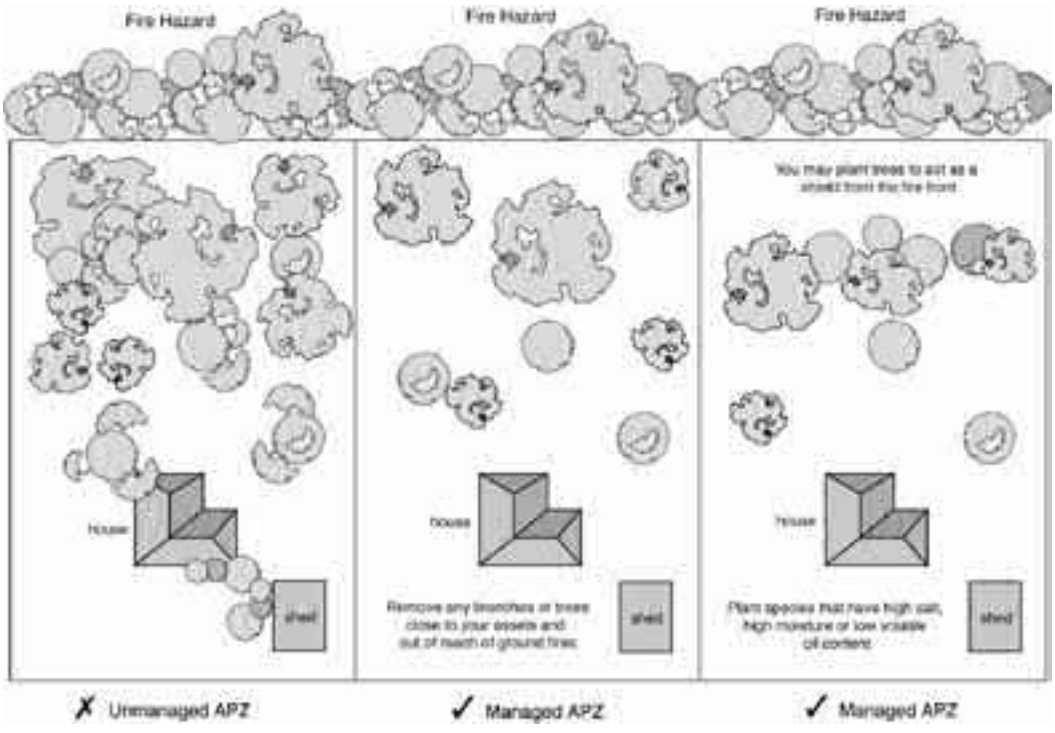
WIND BREAKS

Rows of trees can provide a wind break to trap embers and flying debris that could otherwise reach the house or asset.

You need to be aware of local wind conditions associated with bush fires and position the wind break accordingly. Your local RFS Fire Control Centre can provide you with further advice.

When choosing trees and shrubs, make sure you seek advice as to their maximum height. Their height may vary depending on location of planting and local conditions. As a general rule, plant trees at the same distance away from the asset as their maximum height.

When creating a wind break, remember that the object is to slow the wind and to catch embers rather than trying to block the wind. In trying to block the wind, turbulence is created on both sides of the wind break making fire behaviour erratic.



HOW CAN I FIND OUT MORE?

The following documents are available from your local Fire Control Centre and from the NSW RFS website at **www.rfs.nsw.gov.au.**

- Before You Light That Fire
- Standards for Low Intensity Bush Fire Hazard Reduction Burning
- Standards for Pile Burning
- Application Instructions for a Bush Fire Hazard Reduction Certificate

If you require any further information please contact:

- your local NSW Rural Fire Service Fire Control Centre. Location details are available on the RFS website or
- call the NSW RFS Enquiry Line 1800 679 737 (Monday to Friday, 9am to 5pm), or
- the NSW RFS website at **www.rfs.nsw.gov.au.**

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