KOALA PLAN OF MANAGEMENT

RESIDENTIAL SUBDIVISION OF PART LOT 499 DP1258597, SOUTH LINDFIELD, BLACKWOOD STREET, PORT MACQUARIE.

FEBRUARY 2022

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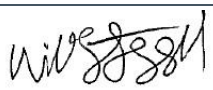
KPoM Prepared by Jason Berrigan of JB Enviro in January 2021 and Updated by WolfPeak

Revision History

Revision	Date	Prepared By	Reviewed By	Description
0	28/02/2022	Will Steggall	David Stubbs	KPOM Update

Authorisation

Author name	Will Steggall	**Reviewer / approver name**	David Stubbs
Author position	Senior Ecologist	**Review position**	Regional Manager
Author signature		**Reviewer / approver signature**	
Date	28/02/2022	**Date**	28/02/2022

CONTENTS

1. INTRODUCTION

This Koala Plan of Management (KPoM) has been prepared under the Koala Habitat Protection State Environmental Planning Policy (KSEPP) 2020.

It accompanies a Planning Proposal to rezone approximately 2ha of land in the northwest corner of part Lot 499 DP1258597, Blackwood Street, South Lindfield.

The proposal is to rezone the portion of the parent lot to R1 General Residential under the PMHC Local Environmental Plan (LEP) 2011, with the remainder being zoned Environmental. The current minimum Lot size is 40ha under the RU1 zoning and will change to 450m^2 under the R1 zoning. A preliminary rezoning concept is shown in **Figure 2.**

2. BACKGROUND INFORMATION

2.1 Key Definitions

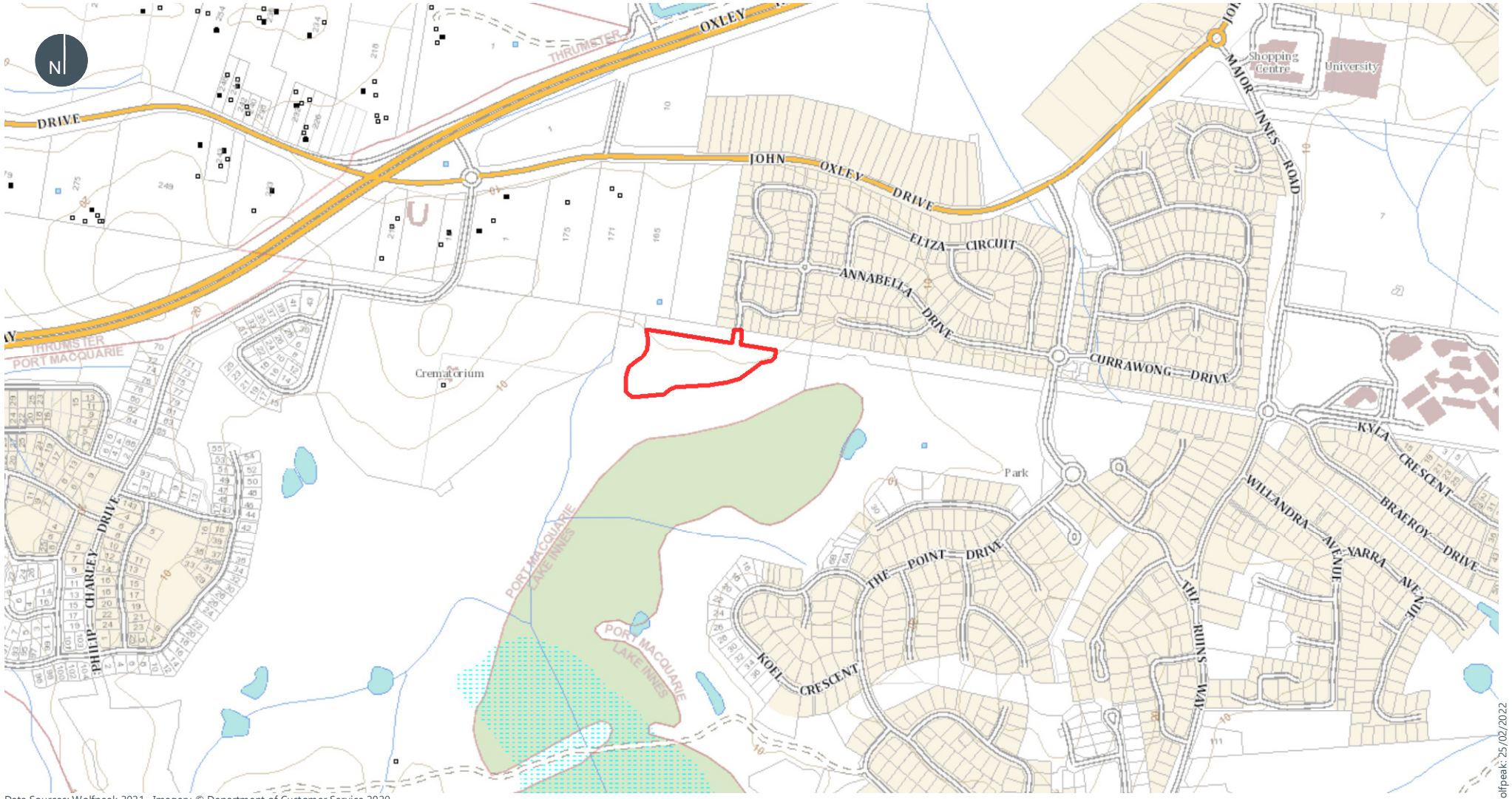
The “study site/site” is the area of land on the larger property owned by the proponent proposed to be rezoned, indicated by the polygon in Figure 2, and falls under the jurisdiction of this KPoM.

For the purposes of considering indirect impacts, the “study area” consists of the site and the adjacent land within 100m (the likely detectable limit of potential impacts associated with the proposal). The “locality” is defined as land within a 10km radius of the study site.

2.2 Site Location and Access

Refer to Figure 1 for the general location of the site and the locality.

The site is to be formally accessed via a formed road connection to Blackwood Street. A firetrail or at most one-way road may connect to future residential subdivision to the northwest.



Data Sources: Wolfpeak 2021, Imagery © Department of Customer Service 2020

Wolfpeak: 25/02/2022

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GDA2020 MGA Zone 56 1:10,000 @ A4

Legend

Development Site

Figure 1 | Locality

South Lindfield Rezoning

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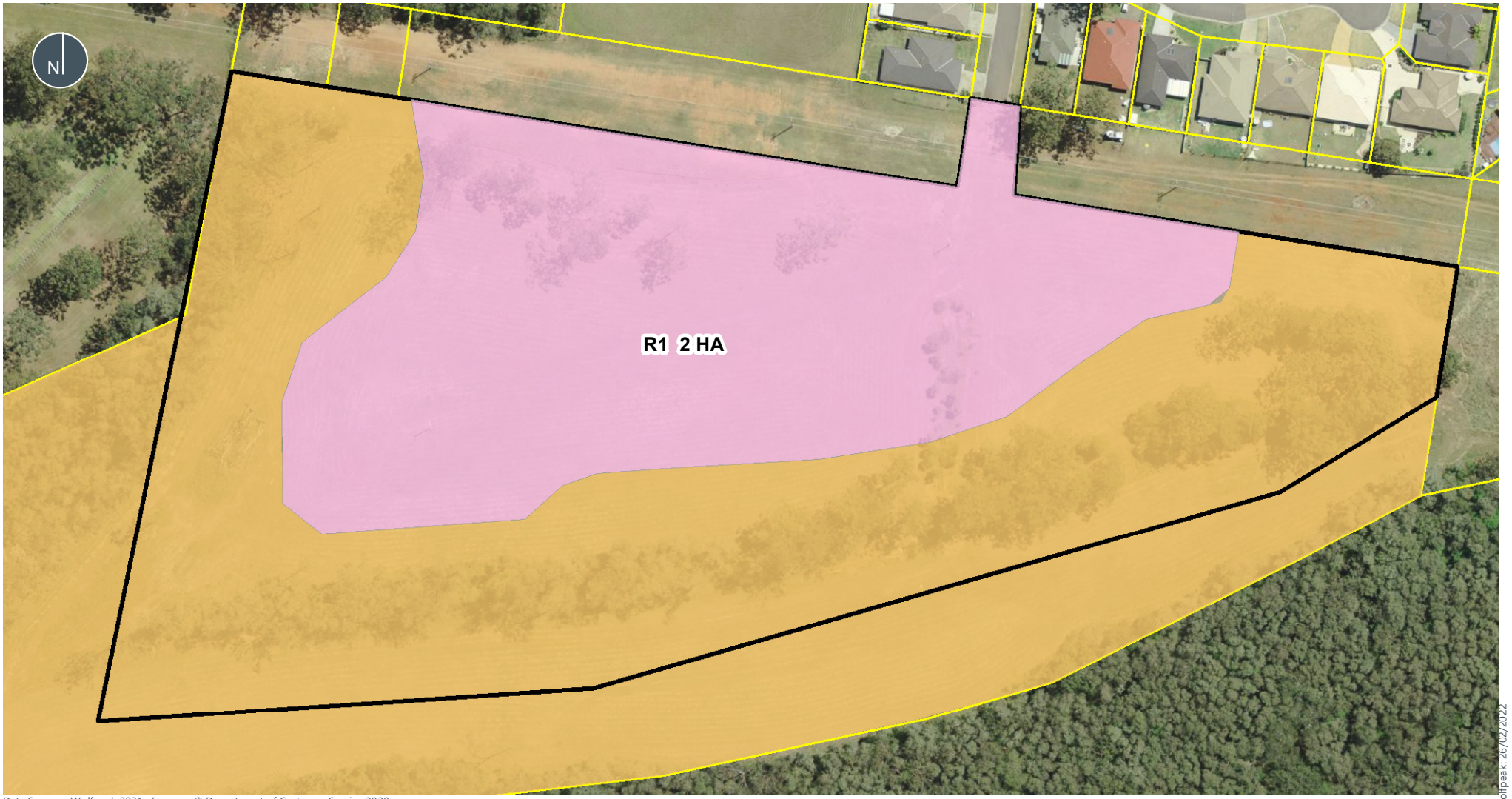

Data Sources: Wolfpeak 2021, Imagery © Department of Customer Service 2020

Wolfpeak: 26/02/2022

0 10 20 40 60 80 100 Meters

GDA2020 MGA Zone 56 1:1,567 @ A4

Legend

- Updated Development Envelope
- Subject Land
- Proposed C2 Zone
- Lot Boundaries

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Figure 2 | Nominal Area Under KPOM Jurisdiction

South Lindfield Rezoning KPoM

3. LEGISLATIVE AND POLICY FRAMEWORK

3.1 Commonwealth

3.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the Federal Government's primary environmental legislative instrument. This act necessitates approval for any action that will have a Significant Impact on Matters of National Environmental Significance (MNES). MNES recognised under the EPBC Act, that act as a trigger for the Commonwealth assessment and approval process include;

- World Heritage properties;
- National Heritage Places;
- RAMSAR wetlands of international significance;
- Threatened species and ecological communities;
- Migratory species;
- Nuclear actions, including uranium mining;
- The Commonwealth marine environment;
- A water resource, in relation to coal seam gas development and large coal mining development

The Koala was listed as Vulnerable under the EPBC Act in April 2012. On 12th February 2022, the Koala was listed as Endangered. This listing covered the most at-risk Koala populations in Queensland, NSW and the ACT. As a result, any actions that are likely to have a significant impact on the Koala in these states must be referred to the Minister who will decide whether an assessment is required under the EPBC Act (DoE 2013).

3.2 NSW

3.2.1 Koala Habitat Protection SEPP 2020

State Environmental Planning Policy no. 44 – Koala Habitat Protection (SEPP 44) 1995 was replaced in early 2020 by the Koala Habitat Protection SEPP 2019. The 2019 SEPP was repealed from November 30 2020, and replaced with the Koala Habitat Protection SEPP 2020 (KSEPP).

In March 2021, The Koala Habitat Protection SEPP 2021 came into force and applies to non-rural land in certain Local Government Areas, with the KSEPP 2020 still applying to rural land.

The KSEPP is essentially SEPP 44 with some minor amendments, and retains the planning policy that "aims to encourage the proper conservation and management of areas of natural vegetation

that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline".

The KSEPP requires the identification of Potential and Core Koala Habitat on development sites and planning areas, and the preparation of a Koala Plan of Management (KPOM) if Core Koala Habitat is found.

The KSEPP also allows local governments to prepare Local Government Area (LGA) wide Koala management plans referred to as Comprehensive Koala Plans of Management (CKPoM). Coastal LGA's that have implemented CKPoMs include Kempsey, Coffs Harbour, Port Stephens and Lismore.

No approved CKPoM has been prepared for the Port Macquarie-Hastings Council (PMHC) LGA to date, however a large Koala population study has recently been undertaken by Biolink (2013), with a draft updated Koala Plan of Management (PMHC 2018b) and Koala Strategy (PMHC 2018a) prepared by PMHC.

3.2.2 Koala Recovery Plan

A NSW Recovery Plan for the Koala was prepared by the then Department of Environment and Climate Change (DECC) in 2008. The overall objective of the plan is "to reverse the decline of the Koala in New South Wales, to ensure adequate protection, management and restoration of Koala habitat, and to maintain healthy breeding populations of Koalas throughout their current range."

The plan adopted the specific objectives of the National Koala Conservation Strategy (ANZECC 1998) to achieve broader conservation outcomes. A number of specific recovery actions and performance criteria were formulated to implement the objectives.

3.2.3 Biodiversity Conservation Act 2016

As of August 25th 2017, the Biodiversity Conservation (BC) Act 2016 replaced the Threatened Species Conservation Act 1995. The Koala remains listed as Vulnerable under the Act.

A future Development Application under Part 4 of the Environmental Planning and Assessment Act 1979 will have lodge a Biodiversity Development Assessment Report (BDAR) and obtain biodiversity credits to offset impacts. A provisional BDAR (JBE 2021) has been prepared, with an addendum report prepared by Wolfpeak (2022) and identified a quantum of 3 Koala species credits as being required for the future development.

3.2.4 Saving our Species Iconic Koala Project and NSW Koala Strategy

The NSW Koala Strategy was adopted in 2018. With $44.7 million funding, it aims to secure the wild Koala population for the next 100 years via a series of actions (implemented by State and local government, to community groups), initially to stabilise and increase the Koala population across its NSW range, to maintain genetically viable populations.

The Strategy identifies 24 key actions to be implemented over 3 years, with annual reporting and an evaluation at the end to identify revisals and updates of the actions to achieve the objections.

The Saving our Species Iconic Koala Project forms a key part of the Strategy.

The 2019-2020 bushfire season was acknowledged as a catastrophic ecological event on the NSW Koala population, with 30.6% of high suitability habitat in the North Coast region burnt. A series of emergency actions were implemented under the Strategy in response to the event eg. post fire survivor search and recovery and installation of water stations.

The 2019-2020 annual report (DPIE 2020b) reports 7918ha of Koala habitat has been protected eg. via biodiversity credits and other agreements under the BC Act 2016 (eg. Conservation Agreements), and conversion of State Forest to Reserve. Other actions include support for rehabilitators, new research and sighting programs, and funding indirect conservation actions via community groups. eg. bush regeneration and habitat creation.

The Project has now identified a series of actions to address threats from 2017-2021. These actions include measures to address threats through to training programs for carers rehabilitating Koalas, and targeted research, as well as funding priorities. The Project's success is to be measured against specified performance criteria to refine the approach and achieve its objectives.

3.3 PMHC

3.3.1 Koala Recovery Strategy 2018

PMHC adopted the Koala Recovery Strategy in 2018. The Strategy has the following aims:

- safeguard the welfare of koalas and reverse the current population decline;
- encourage management of areas of Koala habitat and increase habitat linkage opportunities;
- maintain the genetic diversity of koalas in the LGA;
- reduce Koala road strike;
- reduce domestic dog attacks;
- assist in the development of Fire Management Plans for the LGA;
- increase community and public awareness concerning Koala conservation and management; and
- increase understanding of local threats to population by undertaking selective and localised research.

The Strategy has a series of recommended actions for the identified threats to the PMHC LGA Koala population, most of which involve developing or are to be detailed in a Comprehensive Koala Plan of Management (CKPoM). PMHC prepared an updated draft CKPoM (PMHC 2018b), but it has not been approved by DPIE or finalised.

4. KPOM OBJECTIVES AND PERFORMANCE CRITERIA

4.1 Guidelines for Individual Koala Plans of Management

The SEPP 44 B35 Circular (Department of Urban Affairs and Planning 1995) provides guidelines for the preparation of individual Koala plans of management. These are shown in Table 1 below along with the section in which they are addressed in the KPoM.

Table 1: KSEPP KPoM guidelines

Number	Criteria	Section Addressed
i)	An estimate of population size	Section 5.3.1
ii)	Identification of preferred tree species for the locality and extent of resource available	Section 5.2.1, 5.3.2
iii)	An assessment of the regional distribution of Koalas and the extent of alternative habitat available to compensate for that to be affected by the actions	Section 5.3.3
iv)	Identification of linkages of Core Koala Habitat to other adjacent areas of habitat and movement of Kolas between areas of habitat. Provision of strategies to enhance and manage these corridors	Section 5.3.3 Section 6.1
v)	Identification of major threatening processes such as disease, clearance of habitat, road kill and dog attack which impact on the population. Provision of methods for reducing these impacts	Section 6
vi)	Provision of detailed proposals for amelioration of impacts on Koala populations from any anticipated development within zones of Core Koala Habitat	Section 7
vii)	Identification of any opportunities to increase size or improve condition of existing core habitat, this should include lands adjacent to areas of identified Core Koala Habitat	Section 7
viii)	The plan should state clearly what it aims to achieve (for example, maintaining or expanding the current population size or habitat area)	Section 4.2
ix)	The plan should state criteria against which achievement of these objectives is to be measured (for example, a specified population size or specific time frame or the abatement of threats to the population)	Section 4.3
x)	The plan should also have provisions for continuing monitoring, review and reporting. This should include an identification or who will undertake further work and how it will be funded.	Section 8 and appendices

4.2 Objectives

The principle objective of this Koala Plan of Management is to ensure the study area retains its ability to support a Koala population, and also to enhance this by increasing potential carrying capacity and linkages within the broader Core Koala Habitat.

The objective of this Koala Plan of Management (KPoM) is to maintain the viability of the current Koala population which occurs in the local area via:

- Retaining the majority of existing mature Koala food trees trees.
- Increasing the net extent of primary browse species to increase its carrying capacity and potentially allow population expansion;
- Maintaining and enhancing linkages with other habitat known to be required by the local Koala population; and,
- Effectively mitigate threats to the viability of Koalas induced by the proposal.

4.3 Performance Criteria

The criteria against which achievement of the objectives are to be measured are:

1. A net increase of food trees within the study area.
2. Maintenance of effective linkages within the study area.
3. Nil Koala losses or injury due to road strike, drowning in pools, or attack by dogs via adequate mitigation measures.
4. No increase in disease incidence.
5. No unmitigated increase in threats to Koalas within the study area.

5. KOALA HABITAT AND POPULATION CHARACTERISTICS

5.1 Site Vegetation Communities

As shown in Figure 3, the site vegetation consists of:

- Pasture over most of the site, comprising most of the R1 zone with a small patch of parkland vegetation dominated by Tallowwood.
- Wet sclerophyll forest in the eastern half of the southern remnant strip, where Tallowwood is common.
- Narrow band of wet sclerophyll in the northwest corner boundary, with Tallowwood present.
- Swamp forest dominated by paperbarks along the southwest corner, and forming a single line of trees along most of the southwest boundary. Forest Red Gum and more so Swamp Mahogany occur commonly.

The adjacent LINR vegetation consists of:

- Swamp forest dominated by paperbarks over most of this area. A localised cluster of Swamp Mahogany occurs on the southwest corner, but otherwise preferred Koala food trees occur in low abundance on the margins.
- Pasture along the cadastral boundaries, mostly in the north.

5.2 KSEPP Koala Habitat Assessment

5.2.1 Koala Habitat Assessment

5.2.1.1 Potential Koala Habitat Assessment

Three Schedule 2 browse species are present on the site: Tallowwood, Forest Red Gum and Swamp Mahogany.

A formal Potential Koala Habitat Assessment was undertaken (JBE 2021), determining that at least 1ha of habitat surpassing the 15% threshold required is present. Potential Koala Habitat mapping is shown in Figure 4.

5.2.1.2 Core Koala Habitat Assessment

As detailed in JBE (2021), the site as part of a broader study area across Lot 499 and adjacent land owned or adjacent to that owned by the proponent has been subject to a series of surveys from 2011 to 2017, using diurnal and nocturnal Koala surveys, with the majority via a modified Dique et al (2004) methodology.

These surveys have consistently recorded 0-4 Koalas across, with seasonal usage varying as shown in the following table.

Table 2: Koala Numbers in Innes Lake – South Linfield residential area per season 2011-2017

	Summer	Autumn	Winter	Spring
Min. number of Koalas	0	0	0	0
Max. number of Koalas	2	2	4	3

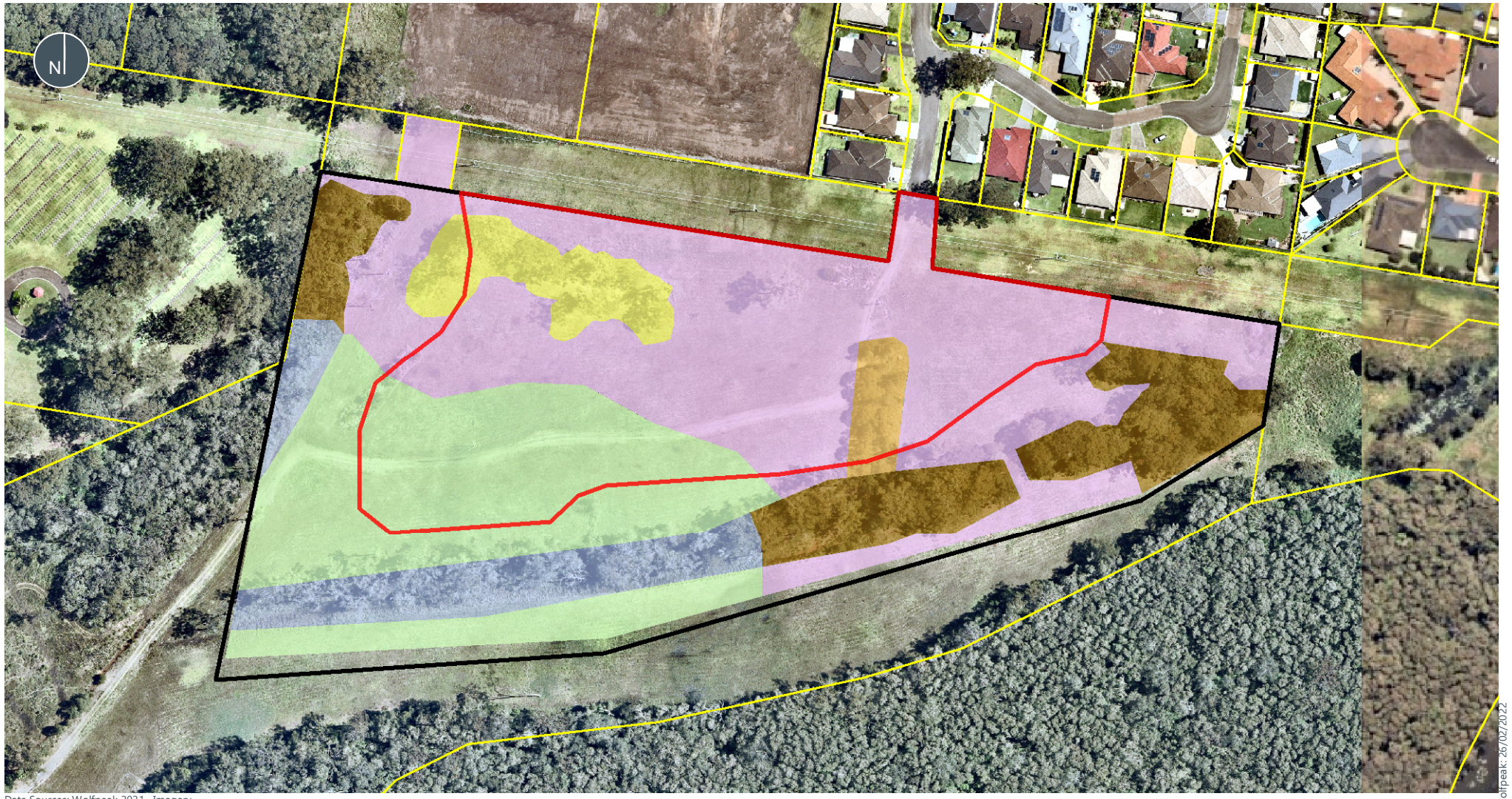
Naturecall (2015a) also recorded irregular visitation of few Koalas in remnant habitat to the northwest, and Darkheart (2006a) and other surveys (Biodiversity Australia 2019, 2018) recovered similar numbers and irregular presence in the area now occupied by Ascot Park to the west.

No Koala scats were observed within the proposed development envelope over the recent survey period, or directly adjacent, but Koala scratches were confidently identified on the smooth bark of Forest Red Gums.

The data to date very clearly illustrates that the proposed re-zoning area forms part of Core Koala Habitat that extends to include habitat in the current study area.

5.2.1.3 Conclusion

Due to the presence of female Koalas with joeys and a breeding male in adjoining lands previously; and ongoing records of Koalas on site and within associated habitats: the site was considered to form part of a larger area of Core Koala Habitat.



Data Sources: Wolfpeak 2021, Imagery

Wolfpeak: 26/02/2022

0 12.5 25 50 75 100 125 Meters

GDA2020 MGA Zone 56 1:2,000 @ A4

Legend

- Updated Development Envelope
- Subject Land
- Lot Boundaries
- VZ1_PCT690
- VZ2_PCT690
- VZ3_PCT690
- VZ4_PCT1724
- PCT690
- PCT1730

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Figure 3 | Vegetation Communities

South Lindfield Rezoning KPoM

Data Sources: Wolfpeak 2021, Imagery

Wolfpeak: 26/02/2022

Legend

- Updated Development Envelope
- Subject Land
- Potential Koala Habitat

0 12.5 25 50 75 100 125 Meters

GDA2020 MGA Zone 56 1:2,048 @ A4

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Figure 4 | Potential Koala Habitat

South Lindfield Rezoning KPoM

5.3 Characteristic of the Core Koala Habitat

5.3.1 Estimate of Population Size

JBEnviro (2021) and previous studies (JBE 2017, Naturecall 2015a, Biolink 2005a, 2005b, 2005e, Darkheart 2006e, 2011) confirm that the site is part of a wider area of Core Koala Habitat used by a population of Koalas. This population appears to range well beyond the site, possibly over the wider Ruins Way/Mill Hill area, south to Lake Innes Nature Reserve, and west to Ascot Park. This wider population appears to be small, as suggested by the extensive and on-going survey for and by Vilro; other nearby studies (e.g. Naturecall 2015a, Darkheart 2006e, 2011) and sightings by this and previous surveys on and adjacent to the site.

Due to this wider landscape of Core Koala Habitat (eg. Mahers Headland, Lake Innes Nature Reserve, etc), there is also likely to be a periodic influx of recruits to maintain genetic diversity in the study area. Hence at certain times of the year, it is possible that temporary resident Koalas may be present in the study area eg. sub-dominant males.

In line with Koala ecology, the local aggregate using the site and adjacent habitat for at least a small part of their range is thus considered likely to be at most about 4 Koalas, constituting a dominant male, at least 1-2 breeding females, and their young.

5.3.2 Preferred Tree Species

From a collation of previous landscape-based Koala food tree research and data collected by the coastal LGA study, Biolink (2013a) determined that the following are the primary preferred Koala browse species in the PMHC LGA, depending on soil landscape:

Table 3: PMHC LGA Primary preferred Koala food trees per soil landscape

Transferral, Alluvial, Swamp and Thrumster Residual (TASTr) Soil Landscapes: **Medium to High Fertility**	**Erosional, other Residuals, Colluvial, Beach and Aeolian (ERCBA) Soil Landscapes:** **Low to Medium Fertility**
Tallowwood (*E. microcorys*)	*Tallowwood (*E. microcorys*)
Swamp Mahogany (*E. robusta*)	Swamp Mahogany (*E. robusta*)
Grey Gum (*E. propinqua*)	
Forest Red Gum (*Eucalyptus tereticornis*)	

* *Tallowwood use appears to be size dependent on low to medium soil landscapes (Biolink 2013).*

Tallowwood, Swamp Mahogany and Forest Red Gum (in decreasing order of abundance) are the only preferred Koala browse species on site.

Naturecall (2015) recorded use of these species on adjoining land to the northwest. Biolink (2005a) and Darkheart (2005g, 2006e) recorded use of Tallowwood in Ascot Park to the southwest.

5.3.3 Distribution of Koala Populations, Site Context and Linkages

5.3.3.1 Regional Distribution of Koalas

Koala numbers have declined throughout most of their previous range in NSW, with the main occurrences being in the northeast of the state (DECC 2008). Most coastal populations now persist in fragmented and isolated areas of habitat (predominantly secondary class A with some localised primary areas supporting high density populations), with extensive areas of potential habitat appearing to be devoid of Koalas (DECC 2008). In contrast, some well-known western populations appear to be increasing. The difference is considered to primarily be due to increasing development pressure eg from agriculture and urban expansion in the coastal region (DECC 2008, AKF 2014, 2007).

In the north coast and mid-north coast regions, areas with large numbers of records are restricted to localities such as Ballina, Port Stephens, Port Macquarie, Coffs Harbour, Tweed and Lismore (Connell Wagner 2000b, Lunney et al 1999, Port Stephens Council 2001, DECC 2008, AKF 2008, 2007). The Koala Recovery Plan (DECC 2008) notes that in addition to these major population centres are numerous small populations many of which are disjunct to urban and rural development, as well as natural barriers (DECC 2008).

5.3.3.2 Distribution and Abundance of Koalas in the PMHC LGA:

The coastal sector of the Hastings Local Government Area (LGA) is well known to contain a viable Koala population in varying densities, generally within the following major areas (Biolink 2013, Connell Wagner 2000a, 2000b, Starr 1990, Biolink 2003, 2005a, 2005a, 2005c, 2008, 2013, AMBS 2003, Biosis 2004, Darkheart 2013, 2008a, 2008b, 2006e, 2005a-i, 2005a-h, Berrigan 2003a-d, 2002a-c, 2001a-e, 2000a-f, 1999a-c, 1998, 1997, Kendall 1993, 1991, Mt King Ecological Surveys 1993, OEH 2014a):

- Port Macquarie urban area
- Lake Cathie Plains to Lakes Innes/Thrumster area (approaching Sancrox)
- Lake Innes Nature Reserve/Kooloonbung Creek Nature Reserve and adjoining private lands
- Lake Cathie area
- Dunbogan Peninsula
- Point Plomer area

A number of other well-known smaller and/or low density population centres also occur in scattered occurrences eg. Broken Bago State Forest, Telegraph Point, North Brother, Bonny Hills, North Shore and Huntington area (OEH 2014a, Biolink 2005c, 2013, Darkheart 2005a, 2005b, 2004a, Kel Mackay pers. comm., Mrs Penny Marshall BHCC pers. comm.).

Biolink (2013a) in their major study estimated a population of approximately 2000 Koalas in the coastal LGA, occupying an Area of Occupancy of only 24% of available habitat.

Studies of the nearby Lake Innes Nature Reserve (Starr 1990, Mt King Ecological Surveys 1991, Connell Wagner 2000b), Thrumster (Biolink 2008, 2005a, 2005b, 2005d, 2003, Darkheart 2005g,

2006e) and Port Macquarie (Starr 1990, Mt King Ecological Surveys 1991, Connell Wagner 2000b, Wilkes and Snowden 1998, Martin 1996) have estimated that a sizeable Koala population exists in the locality. Estimates range from 400-500 in Port Macquarie (Martin 1996) with a similar number in the northern reaches of Lake Innes Nature Reserve (NPWS 1999, Phillips unpub. data cited in Biolink 2008, 2005a, 2005b), to >200 in the Thrumster area (Biolink 2008, 2005a, 2005c). These are however only estimates or based on modelling and hence a number of limitations of this data must be considered eg. reliance on extrapolation from SAT data with limited validation.

An estimated 300 Koalas in the Lake Cathie area has been proposed though given limitations on survey methodology (ie public records which may be many sightings of the same Koala), this figure is recommended by Biolink to be treated with caution (Biolink 2005a, 2005c).

The Lake Innes-Thrumster population is considered by Biolink (2013) to be of national and state significance (Biolink 2008, 2005a, 2005b, 2013).

5.3.3.3 Local Populations

Studies of the adjacent Lake Innes Nature Reserve (Biolink 2013, Starr 1990, Mt King Ecological Surveys 1991, Connell Wagner 2000b), the majority of Vilro Pty Ltd land holding (Biolink 2005a, 2005b, Darkheart 2006e), Thrumster (Biolink 2008, 2003) and Port Macquarie (Starr 1990, Mt King Ecological Surveys 1991, Connell Wagner 2000b, Wilkes and Snowden 1998, Martin 1996) have determined that a sizeable Koala population exists in the locality.

As noted above, estimates have been proposed in the range of 400-500 in Port Macquarie (Martin 1996) with a smaller number in the northern reaches of Lake Innes Nature Reserve (NPWS 1999, Phillips unpub. data cited in Biolink 2005a, 2005c), and the Thrumster area (Biolink 2008). These numbers are only provisional estimates however, with no comprehensive survey or verified statistical census undertaken to date (DECC 2008). Biolink (2005a, 2008) has offered estimates from their work in the northern Lake Innes Peninsular and Thrumster area, but these have not been independently verified or validated by using comparative methodologies e.g. Dique et al 2004.

Any lack of firm knowledge about the extent and health status of the local Koala population is a significant concern for planning (PMHC 2018). Over-estimation of the Koala population size and poor understanding of health status (eg low fertility due to Chlamydia) can mask declines, hence in the absence of adequate data, the Uncertainty Principle must be applied to management of Koalas in Port Macquarie and its environs.

Nothwithstanding this limitation on the larger population size, the long term monitoring of the Mill Hill/Ruins Way and Ascot Park by Vilro coupled with studies by Darkheart and Naturecall provide a high level of confidence of the size and seasonal variation in use of habitat within the study area.

5.3.3.4 Linkages

Regional:

The former Office of Environment and Heritage (OEH) has mapped corridors at a regional scale throughout northern NSW. This map is shown in Figure 5.

The subject site does not fall within a regional or sub-regional corridor. As evident in Figure 6, a regional corridor is mapped to the south of the site within Lake Innes Nature Reserve, and a sub-regional corridor is mapped well to the west.

The focal species of these corridors are the Koala, Brushtailed Phascogale and the Eastern Chestnut Mouse (Scotts 2002). Due to the lack of fragmentation of this portion of the corridor, it is considered likely to support Koala movement as this species may use as little as 1 tree/ha - Wilkes and Snowden 1998).

Local:

As shown in Figures 1 and 5 the study area and immediate locality has a high level of fragmentation by urban development and historical rural land uses. Koalas occurring in this local matrix are also increasingly threatened by further fragmentation and gradual attrition of habitat via residential development, increased exposure to predators (wild and domestic dogs), and the introduction of barriers/mortality threats posed by local roads which may all contribute to the decline of the local population (DECC 2008, AKF 2006, 2006, 2011, Curtin et al 2002, Port Stephens Council 2001, Hindell and Lee 1990, Connell Wagner 2000b, Dique et al 2004, Hume 1995, Jurskis and Potter 1997, Phillips 2000, Phillips et al 2000, Biolink 2005a, 2005b, 2008, PMHC 2018).

The most important local linkage is Lake Innes – Kooloonbung Creek NR linkage which acts as link between the urban Port Macquarie Koala population and LINR Koala population (Connell Wagner 2000b, Wilkes and Snowden 1998). Post 2019-2020 fire season, the value of this linkage and unburnt habitat on private land (also currently owned by the proponent) off the southern end of The Ruins Way is likely to have become vital for the recovery of the LINR Koala population due to the extent of fire (as shown in Figure 6).

The peninsular of intact swamp forest within Lake Innes Nature Reserve between the West Lindfield and West Ruins Way precincts is the only fully intact forest in close proximity to the site. This forest has preferred Koala food trees (predominantly Swamp Mahogany) most commonly on the outer margins (particularly the west and northwest) and provides an intact arboreal and terrestrial link directly to the remainder of the Reserve, as well to significant Koala habitat along the northwest and northeast fringes of the Reserve where food trees are more common than they are immediately adjacent to the south (Biolink 2005a, 2005b, 2008, Phillips 2000b).

Linkage to the north is limited by fences and lack of habitat apart from a few scattered remnant trees along most of the northeast boundary and in Annabella Downs to West Ruins Way. The subdivision to the northeast was identified CKH (Berrigan 2003g), but only a few food trees have been retained in the road reserve of the estate (Oxley Grove) as an urban woodland. Koalas are known to continue to use these trees (evidenced by scats and sightings). Koala movement further north is minimal due to lack of sufficient habitat, as well as fences and barriers posed by more extensive cleared and low-lying land (Darkheart 2010a, 2010b, Biosis 2005, AMBS 2003), and now the Oxley Highway Deviation which has fauna fencing/sound barriers intended to direct fauna to designated underpasses.

Linkage northwest into identified CKH is facilitated by the western strip with canopy cover broken by the overhead powerline easement, with current fencing being permeable except around the Crematorium where Koalas must rely on overlapping trees on either side of the tall mesh fence for access/egress.

Linkage west is via remnant forest around on Lot 449 and the Crematorium boundary which links to CKH reserved within and adjacent to Ascot Park. Strips of swamp forest to wet sclerophyll forest provide linkages to the southwest to LINR.

Linkage east to southeast is provided by provided by narrow remnant strips of forest between fairways which link to a very well vegetated urban woodland which is adequate for the Koala to both inhabit and move through (Connell Wagner 2000b, Wilkes and Snowden 1998, AKF 2007). A distinct urban woodland corridor runs from The Ruins Way to Mill Hill via the wooded road reserve along The Ruins Way and Mill Hill Road. A cleared services easement, scattered trees and small remnants to the east also offer linkage (though barriers posed by fencing and yards with dogs would be a limitation) to the narrow link along Major Innes Drive which links to the Oxley Highway and Kingfisher Rd area, and other small remnants in the southeast Ruins Way area and ultimately Lake Innes Nature Reserve. These all link to a dedicated corridor off Mill Hill that links west to Lake Innes Nature Reserve. Koalas are periodically sighted in this main corridor, indicating its significance.

These links would be used by residential Koalas as part of their lifecycle movements, and at times by dispersing sub-adults from local Core Koala Habitat.

Site Context:

In the local context, appraisal of Figure 5 shows that the site's and adjacent land's limited remnant habitat combined with the wooded road reserves form part of a larger matrix of remnants amongst mostly developed land in the John Oxley Drive/Ruins Way/Major Innes Drive area. Historical photos also show that this area has been subject to a cumulative loss of Koala habitat, particularly in the last 20 years.

As detailed previously, there are a plethora of Koala records in the locality. This includes several records on and close to the site, and numerous records within approximately 1km of the site (eg. DPIE 2020a, Biolink 2013a, 2008, 2005a, 2005b, Berrigan 2003c, 2003g, 2003h, 2001b, 2001c, 2001d, 2000b, 2000c, 1999a, 1999b, JBE 2017, Naturecall 2015a, Darkheart 2014, 2007e,2006e, 2005d, 2005f, 205l, 2004g, 2004l, 2004g, 2004l, 2004n, 2004p, 2004q, etc, Connell Wagner 2000b, Wilkes and Snowden 1998, Biosis 2005, 2004, AMBS 2003).

This and other studies have determined that the site and the Ruins Way/Lake Innes residential area to Ascot Park areas contains Core Koala Habitat spread over both the northern reaches of Lake Innes Nature Reserve and adjacent forested rural land (Biolink 2005a, 2005b, 2008, 2003), supported by a matrix of remnants, roadside trees and an urban woodland (Berrigan 1999c, 2001i, 2003m, 2003n, Darkheart 2007c, 2013, EcoPro 1999b, Connell Wagner 2000b, Hastings Council 2003, Wilkes and Snowden 1998, Biolink 2005a, 2005b, 2008).

Koalas occurring on site thus form part of the local sub-population within the larger population which use the site as part of their range. This range is likely to extend over the adjacent private lands, the crematorium, northern extent of Lake Innes Nature Reserve, and possibly west to Ascot Park and east to the Ruins Way area.

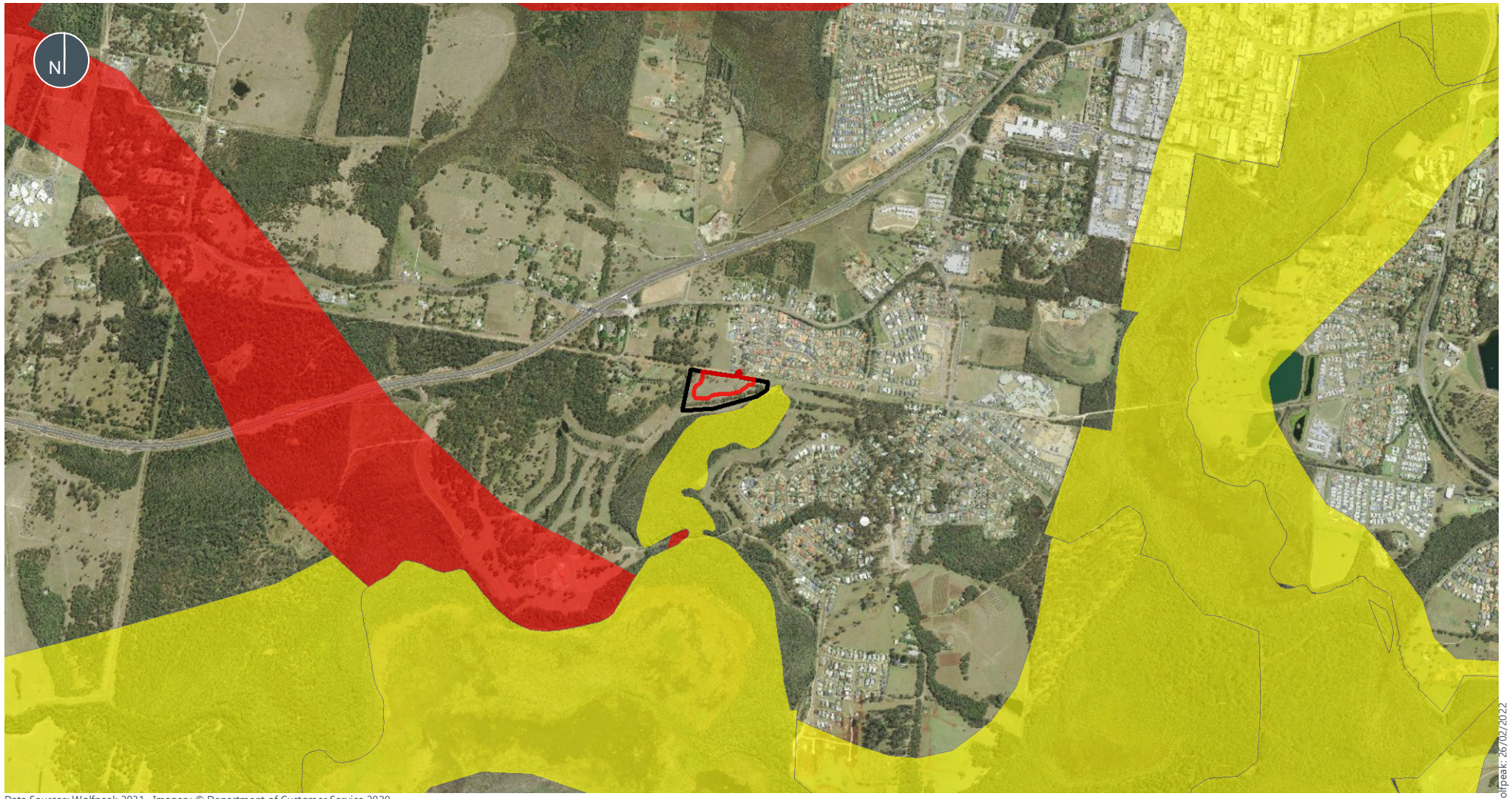
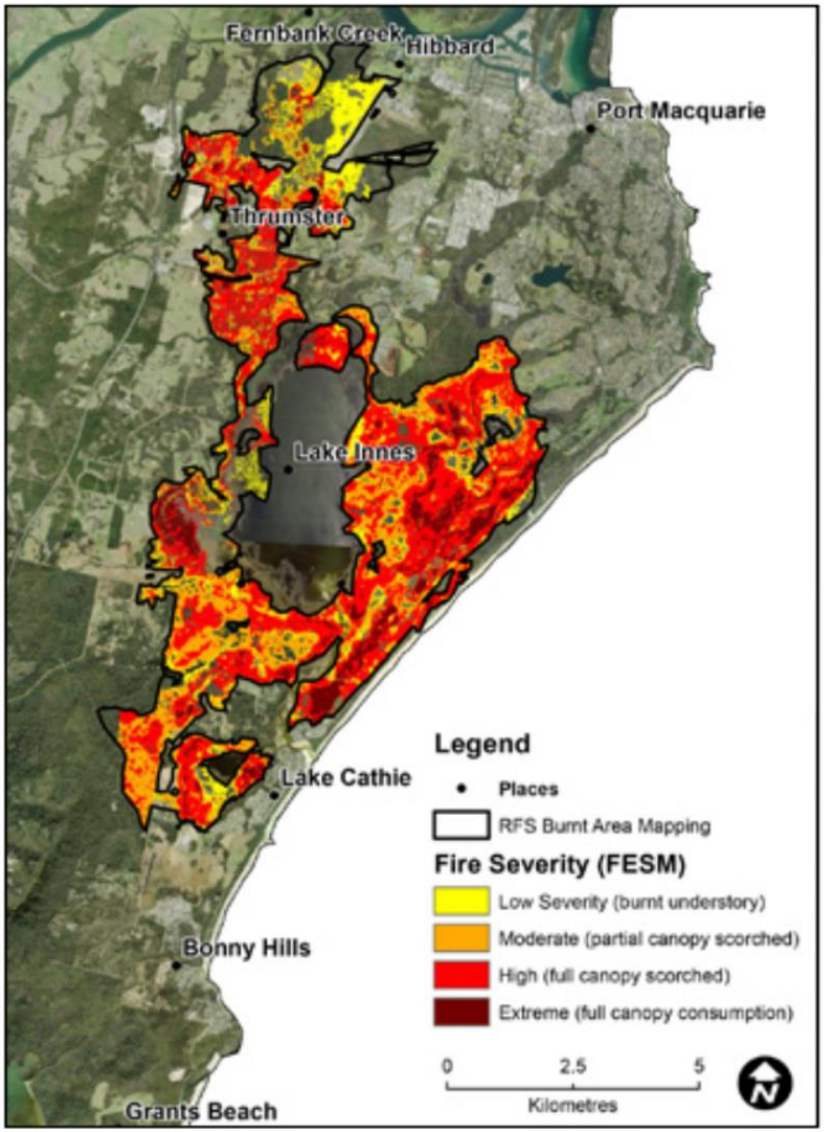
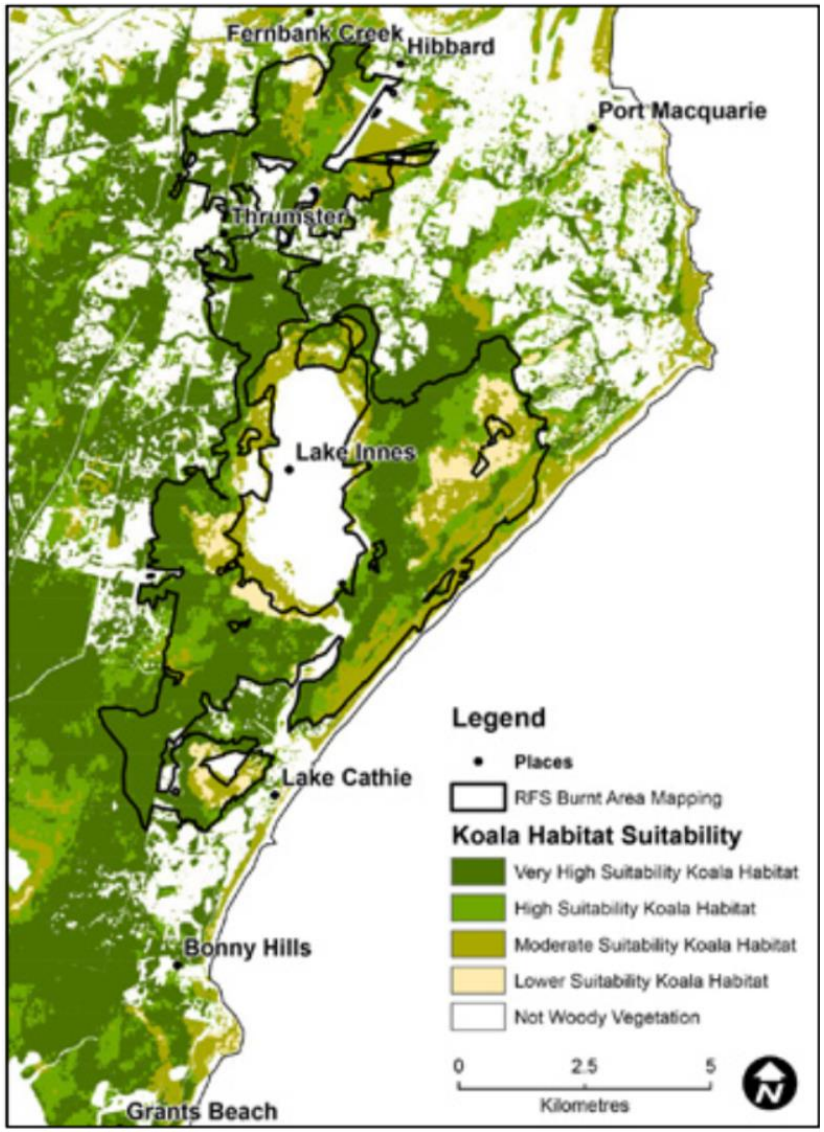


Figure 5 | Regional Corridors

South Lindfield Rezoning KPoM

Figure 6: 2019-2020 fire intensity mapping and suitable Koala Habitat (DPIE 2020b)





6. THREAT ASSESSMENT AND MITIGATION

The following impacts/threats are generally associated with development of Koala habitat (Connell Wagner 2000a, 2000b, Wilkes and Snowden 1998, Biolink 2003, 2005a, 2005b, 2005c, 2008, Dr Stephen Phillips pers. comm., Lunney et al 1999, Port Stephens Council 2001, AKF 2007, 2000, State Forests 2000, DECC 2008, PMHC 2018a).

In context of the anticipated rezoning, these are first identified, and then the ameliorative measures/recommendations to address this threat/impact are detailed.

6.1 Loss of Forage Trees/Habitat

6.1.1 Assessment

Habitat loss and/or fragmentation is the most serious threat to Koalas both historically and at present (DECC 2008, AKF 2014, 2007, 2000, Connell Wagner 2000b, Port Stephens Council 2001, Lunney et al 1999, Wilkes and Snowden 1998, PMHC 2018, etc.).

The proposed development footprint has attempted within consideration of all constraints to minimise loss of habitat via retaining all of the southern and western strips of forest which contain KFTs. Only 12 KFTs in the north of the proposed development envelope plus 4 young saplings growing in a windrow in the southwest corner of the development envelope is to be removed.

No trees are proposed to be retained within yards due to long term issues with future tree removal and lack of recruitment, and the impracticality of prohibiting dog ownership.

Connectivity will be retained via retention and augmentation of the southern and western strips as detailed in section 7.1. These will be reserves managed under a Vegetation Management Plan (VMP), with no public access needed as no linkage (eg. footpath or road) will pass through these areas.

6.1.2 Mitigation

6.1.2.1 Habitat Retention and Protection

Figure 2 shows that the development envelope comprising the R1 zone, with the residual comprising the majority of Potential Koala Habitat to be zoned Environmental under the PMHC LEP 2011.

As shown in Figure 7, the southern and less so the western remnant strips augmented with plantings of KFTs with understorey and edge plantings to deter public access. These strips are excluded from the Asset Protection Zones, and will not be able to be cleared/modified under the 10/50 Vegetation Clearing Code of Practice via specific planning provisions in the precinct's DCP. Plantings may also occur outside these nominated areas in the proposed C2 zone adjacent to the Nature Reserve where required.

Legend

- Updated Development Envelope
- Proposed Offset Planting Area
- Proposed C2 Zone
- Lot Boundaries

Note: Offset planting to be undertaken in the crosshatched areas shown or may include land proposed to be zoned C2, adjacent to Lake Innes Nature Reserve, where required.

wolfpeak

Figure 7 | Proposed Offset Planting Areas

South Lindfield Rezoning KPoM

6.1.2.2

Habitat replacement:

Consistent with the KPoM for the adjoining South Lindfield development precinct (Naturecall 2015a) and the PMHC DCP, Koala food trees removed for the development will be subject to an offset ratio of 1:2.

These will mostly be located along the southern strip, widening this area to both increase its linkage value but also to create more habitat for the local population of the Critically Endangered Native Guava, which is locally common in the study area (JBE 2021). This area is outside any APZ and will be excluded from the 10/50 Vegetation Clearing Code of Practice; and will not conflict with any infrastructure.

Council policy requires that replacement plantings are to be spaced at a minimum of 10m apart on cleared land or 5m apart where existing canopy gaps exist to allow maximum crown development via allowing low branching (woodland form) and reduced competition. Trees to be used are preferred to be advanced size trees that meet NATSPEC Specifying Trees, unless plantings are undertaken pre-emptively (preferably at least 5 years before actual tree loss) in which case small size classes may be used.

The offset plantings are to comprise Tallowwoods, Forest Red Gum and Swamp Mahogany, with species selection being in accordance with the soils and environmental conditions at the planting location.

Offset plantings will be subject to a Vegetation Management Plan (VMP) to ensure success of all plantings.

In addition, the outside edge adjacent to the R1 area is to be planted with pungent leaved plants (eg. *Lomandra longifolia, Gahnia clarkei, Melaleuca styphelioides*, etc) to discourage public entry.

Transformer weeds (eg. Lantana) will be eliminated from the western and southern strips under the VMP.

6.2 Potential Injury During Clearing

6.2.1 Assessment

Tree-felling and clearing will pose an associated risk of injury or mortality to any Koalas present on site at the time (AKF 2007).

At least 1-4 Koalas are known to have an association with the site/study area, hence pre-clearing surveys and supervision by an ecologist will be required during any clearing undertaken on the site to reduce the risk of injury or mortality.

6.2.1.1 Mitigation

In order to minimize the risk of Koala's being killed or injured during any clearing works on the site; the following measures must be implemented:

- The area of work is to be inspected for Koalas by an ecologist immediately prior to commencement of any vegetation removal.

- The ecologist is to remain on-site during vegetation removal to maintain surveillance for Koalas and rescue other fauna as required.
- No such vegetation removal is to be carried out while any Koala is present in the area of operation unless a 50m buffer is established. If the Koala shows signs of sickness or injury, the Port Macquarie Koala Hospital is to be advised.
- A report by the ecologist is to be provided within 7 days of the clearing event detailing methods and results of the supervision.

6.3 Vehicle Strike/Road Kills

6.3.1 Assessment

Traffic collision (usually resulting in death) is a major threatening process to the Port Macquarie Koala population, particularly to males, who account for most of the injured animals (most likely due to more frequent and longer movements during their life cycle e.g. during breeding seasons) PMHC 2018a, Wilkes and Snowden 1998, Connell Wagner 2000b, DPIE 2020b-d).

This will be a very minor risk on site as no road will bisect habitat, and no habitat is to be created within the residential area. There will be the risk of a Koala crossing the roads regardless of the absence of habitat, hence in addition to zoning to 50 kph, any perimeter ring road will have physical speed reduction included in its design e.g. as in Annabella Downs.

6.3.2 Mitigation

As discussed previously, no new internal roads will pass through vegetation that forms part of a linkage between retained habitat.

To reduce the risk of Koala road strike, the following measures will need to be implemented:

- Speed limit on all roads will be zoned 50kph, but design will aim to reduce effective speed to 40kph using measures as on Annabelle Drive.
- Koala warning signage to be erected at entry to the precinct, with the Koala Hospital number displayed on the sign.
- Street lighting to be strategically positioned to focus lighting on the road, not on adjacent bushland.

6.4 Pets and Feral Predators

6.4.1 Assessment

Domestic Dogs

Dog attack is a major cause of Koala mortality in the PMHC LGA (Wilkes and Snowden 1998, PMHC 2018a, Connell Wagner 2000). Domestic dogs are probably the main source of dog attack mortality near residential areas (Wilkes and Snowden 1998, Lunney *et al* 1999, Port Stephens Council 2001, Connell Wagner 2000, State Forests 2000, DPIE 2020g).

Dog ownership prohibition is however extremely difficult to enforce in the long term. Dogs may also enter from adjacent unregulated areas.

Feral Cats and Foxes

Cats are not considered a serious predator to the Koala (NWSC 2000a, Dickman 1996, Wilkes and Snowden 1998, DECC 2008, Lunney *et al* 1999, Connell Wagner 2000b, etc). Hence no specific prescription is provided in this KPoM.

Foxes are not considered a significant threat to Koalas, though there is the potential for attack on sick, injured or juvenile Koalas (DECC 2008). These vermin are also a serious threat to native species ie recognised as Key Threatening Processes (NSWSC 2000a, 2000b, Dickman 1996). These are subject to current controls under the PMHC Feral Species Management Strategy.

6.4.2 Mitigation

Dogs are permitted within the future development envelope, but only via use of Koala and dog impermeable fencing to separate dogs from Koala habitat on each residential lot i.e. dogs must be confined to yards with no Koala access.

Dogs must only be on leash when outside a yard.

These restrictions will be incorporated into Development Application approval for future dwellings.

No Koala food trees are to be retained or planted within the residential area to minimise the risk of dog and Koala contact.

Signage on the edge of the retained habitat to the south and west will advise dogs are prohibited at all times; must be leashed when outside yards; the contact number for reporting unleashed dogs to PMHC; and contact number of reporting sick or injured Koalas to the Koala Hospital.

6.5 Drowning in Pools

6.5.1 Assessment

Koalas can swim, but have been recorded drowning in pools where they could not climb out. Koalas may enter the pool via falling from overhanging branches, or walking in by mistake (DECC 2008). Wilkes and Snowden (1998) state that since the implementation of child-proof fencing around pools, accidental drowning has ceased to be a significant threatening process in Port Macquarie.

As pools may be installed by new landowners, there may be a risk of Koalas drowning if there are trees overhanging the pools if trees were located in rear yards.

This should be avoided as no Koala trees are to be retained in rear yards of residential lots, and all fencing will be Koala exclusive.

6.5.2 Mitigation

No specific provisions required as all house yard fencing will be required to be Koala exclusive and no KFTs to be retained in yards. Any pool established will also require a pool fence as per the Swimming Pools Act 1992. This should largely prevent Koalas from entering pools.

6.6 Barriers

6.6.1 Assessment

Developments may result in physical and behavioural barriers that impair Koala usage of the site or access to adjacent areas.

Fences offer the main physical barrier. Koalas can climb sturdy chain mesh, wooden paling or solid-type fences with wooden fences on both sides (Port Stephens Council 2001, Wilkes and Snowden 1998). Busy roads, barking or aggressive dogs, and adverse human contact may pose behavioural barriers (DECC 2008).

The site is currently partially fenced along boundaries to the west and northeast.

No habitat is proposed to be retained in yards, hence Koala friendly fencing is not required. Koala exclusion fencing around house yards is however required to minimise risk of dog-Koala contact. These will pose no barrier to Koala movement to access habitat or life cycle movements as the western and southern strips will be unfenced and retain connectivity.

6.6.2 Mitigation

No mitigation required. Some form of bollard fencing may be provided along the northern side of the southern strip to prevent parking and storage of vehicles, caravans, etc.

6.7 Bushfires

6.7.1 Assessment

Bushfires, particularly intense, crown-burning fires, are a major threat to wildlife and threatened fauna such as Koalas, as demonstrated in the 2019-2020 fire season (DPIE 2020b, DECC 2008). Extensive fires that burn out a large extent of habitat – particularly habitat that is isolated or fragmented, and thus limited in escape, refuge or re-colonisation potential, are particularly damaging if not catastrophic via direct mortality or indirectly (e.g. insufficient resources left to support the population, injured animals unable to climb exposed to predation, etc).

Less intense fires may also cause secondary problems such as smoke-inhalation/breathing disorders, loss of food supply, stress and displacement (e.g. via complete burning of an individual's home range).

Altered fire frequency can also ultimately simplify or alter the character of vegetation communities by removing fire sensitive species (e.g. convert wet sclerophyll to dry), and even develop fire-prone communities e.g. promote development of a grassy groundcover (NSWSC 2000).

The cleared and maintained fairways to the south and also to the east and southwest provide key firebreaks which significantly reduce the risk of catastrophic fire in the study area, with LINR to the south the most vulnerable to a crown fire. Consequently, there is only a low risk of bushfire impacting the site.

The study area remained unburnt after the 2019-2020 fire season, hence in the short to medium term, is likely to be important to the local Koala population.

6.7.2 Mitigation

Fire will remain excluded from any fuel reduction activities due to the presence of a Critically Endangered rainforest species. While the potential survival of the population of Native Guava on-site is unknown due to severe Myrtle Rust infection, fire would kill any potential immune plants and all seedlings. Hence fuel reduction is not to be permitted until there is research that shows any benefit to this species.

APZs outside these strips will fall over areas to be maintained ie. roads, road verges and front yards. These will be managed outside the KPoM.

6.8 Disease

6.8.1 Assessment

Most Koalas are naturally infected with Chlamydia pathogens (Sharp and Phillips 1999, Phillips 1997). Chlamydia and other diseases may develop when Koalas are under stress, of which one cause is habitat loss/disturbance (DECC 2008, Catling 1991, McFarland 1999, AKF 2007, Port Stephens Council 2001). Chlamydia infections may lead to urinary tract and reproductive tract infections which can cause female infertility.

This disease occurs throughout the Port Macquarie Koala population (Connell Wagner 2000b). A female was observed by Naturecall (2015a) to the northwest showing advanced infection signs. This is a concern given the risk of transmission of this disease through the population via breeding activity, and potential sterilisation of dominant adults limiting recruitment and fecundity.

The proposal will see loss of 16 Koala food trees, many of which show some evidence of at least periodic use. While this loss will be offset via replacement plantings, it will be at least 10 years before the value of the smaller trees is offset, and >50 years before the bigger trees are offset.

The loss of KFTs poses the risk of increasing stress on the local aggregate and this has the potential to increase vulnerability to Chlamydia (AKF 2007).

6.8.2 Mitigation

Monitoring and public awareness will be required to determine if any new infections are occurring and undertake remedial action, as follows:

- Contact details for Koala Hospital at site office during construction.
- Koala warning signage is to detail contact details for the Koala Hospital to facilitate prompt reporting of sick or injured Koalas.

7. IMPLEMENTATION, MONITORING AND COMPLIANCE

7.1 Monitoring and Review

Given that full development of the area will be realised in the long term, the monitoring regime has been devised to consider short and long term achievement of the KPoM objectives and measures.

The check list appended to this document summarises the specific actions required to be undertaken by responsible authorities to implement the recommendations of the KPoM. This can assist to ensure the provisions of the KPoM are implemented.

The provision of a KPoM Compliance Check with each DA will also assist in ensuring both the relevant provisions of the KPoM and conditions of consent of future are implemented and provide a means of feedback for compliance assessment.

The KPoM will be deemed successful if monitoring determines that the objectives stated in section 3.0 are achieved as per the listed specified performance criteria.

7.1.1 Per DA KPoM Compliance Checks

To ensure key measures of this KPoM are implemented, any future DA must demonstrate compliance with the provisions of the KPoM at various stages from the DA to post-construction eg. prior to issuing the Subdivision Certificate, it must be demonstrated that clearing was monitored and offset plantings have been established under a VMP.

Table 4 shows a provisional timeline for implementation of the KPoM measures and key reporting requirements. This is to ensure KPoM measures such as clearing monitoring and establishment of offset plantings are undertaken as required until the full development of the area is realised.

7.1.2 Koala Monitoring

The following is to be undertaken by an approved ecologist, and reported to PMHC:

1. Koala Presence and Usage Survey: A Koala survey is to be undertaken to census Koala usage of retained habitat and check for the incidence of disease. Methods are to:
    - Include a combination of survey techniques to be used eg. 100% coverage spotlighting surveys, call playback, day searches, and scat searches (with application of the SAT if statistical assumptions can be met). Objective is to detect Koalas present, indicate current population size, and assess health (eg. signs of Chlamydia) and fecundity (eg. presence of young, breeding activity of male).
    - Be undertaken during the Koala breeding season to increase detection; and include several non-consecutive day and night surveys.
    - In line with previous monitoring and to allow analysis of trends, the whole site must be surveyed on one night (or day).

2. VMP Review: The VMP is to be reviewed for success in reaching key performance indicators eg number of established offset plantings, improved condition as indicated by very low weed diversity and density, etc.

Annual reviews of the VMP are to be taken to ensure works are on track and recommendations/remediation measures implemented and allow compliance enforcement.

Monitoring is recommended to be undertaken annually until the development is completed to ensure the KPoM is addressing its objectives and the VMP are effectively implemented. Recommendations are to be implemented before the next review period.

7.2 Implementation Schedule

The following table provides a summary of the timeline for implementation of the ameliorative measures for assisting with compliance assessment.

Table 4: Implementation schedule for ameliorative measures

Issue	Pre-DA/Rezoning Stage	DA Approval	Construction Phase	Operation Phase
Retention and Protection of Key Habitat	Koala food trees to be removed or retained identified. Planning mechanisms to protect retained habitat implemented. DA to demonstrate compliance with KPoM	Approval of plan detailing trees/habitat to be removed. VMP required to be prepared and commenced before clearing commences.	Clear identification and fencing off of trees/vegetation to be removed/retained. Construction undertaken in accordance with KPoM and consent conditions. Compliance enforcement by Council.	All planted trees managed and protected permanently. Implementation of any recommendations for improvements of current measures. Compliance enforcement by Council.
Habitat replacement	Identify Koala food trees to be removed. Identify and map proposed location of planting areas in relation to development, and estimate number of replacements.	Plans for offset plantings regeneration approved and become binding on proponent to execute as detailed. Commence and complete VMP and planting works.	Maintain plantings as applicable per development stage.	Maintenance of weeds and plantings until established. Ongoing maintenance until all plantings self-sufficient. Compliance enforcement by Council. Implementation of any recommendations for improvements until plantings are self-sufficient.
Predator Control	Planning provisions to require Koala exclusion fencing around all year yards.	Title covenant specifying Koala-proof fences where relevant. Signage detailing dog provisions on west and southern strips.	Compliance enforcement by Council.	Compliance enforcement by Council. Implementation of any recommendations for improvements of current measures.
Pools	Planning provisions to manage pools.	Council to ensure Koala-proof fencing around yards; and child proof fencing	Compliance enforcement by Council.	Compliance enforcement by Council.

Mortality/injury during clearing of habitat	Survey and mapping of all habitat to be retained/removed.	Consent condition specifying ecologist to supervise clearing and manage Koala welfare.	Clearing as per protocol. Report to PMHC confirming compliance.	N/A
Vehicle Collision	Identify where engineering designs required to control speed, signage required; and strategic lighting.	DA approval of appropriate engineering mechanisms, lighting and signage installation.	Measures implemented. Road design as per KPoM.	Measures effective. Records kept of Koala incidents involving fences and vehicles included in monitoring reports.
Physical and Behavioural Barriers (fences and roads)	DA plans to show permanent fencing is required. Yard fencing to be Koala exclusive. Any fencing along western and southern strips to be Koala friendly.	Consent approval subject to Koala friendly or exclusion fencing where applicable. Compliance enforcement by Council.	Fencing constructed as per development consent conditions Compliance enforcement by Council.	Reporting of any injured Koalas to Koala Hospital. Remedial action taken following reporting of injuries. Compliance enforcement by Council.
Disease	Provisions for signage to include Koala Hospital number.	Signage required as condition of consent.	Construction undertaken in accordance with plans. Contact details for Koala Hospital provided on site during construction	Records kept and included in monitoring reports. Permanent public Koala signage with Koala Hospital phone number. Compliance enforcement by Council.

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APPENDIX 1: COMPLIANCE CHECKLIST

The following checklist details the specific actions to be taken to achieve the objectives the KPoM and the responsible authorities for implementation. This Plan will help compliance assessment of the KPoM in regards to its performance criteria.

Number	Action	Responsible Organisation	Timeframe	Action completed	Comments
In-situ Habitat Retention					
1a	Koala food trees identified to be retained and protection via reserves and exclusion from 10/50 rule achieved.	PMHC Proponents	During rezoning and future development	☐	
Offset Plantings					
2a	Suitable offsets provided; and trees planted as per required specifications.	Proponents	Pre-DA DA Post DA	☐	
2b	Offsets located in secure area where cannot be removed under other planning processes and mechanisms.	Proponents PMHC	Pre-DA DA	☐	
2c	Prepare and implement VMP to manage plantings/offset areas	Proponents PMHC	Pre-DA DA Post-DA	☐	
Clearing and Construction Management					
3a	All trees to be removed surveyed by a registered surveyor and mapped on plan for DA approval to demonstrate KPoM Compliance	Surveyor PMHC	Pre-DA DA	☐	
3b	Pre-clearing survey by ecologist prior to clearing	Ecologist	Clearing Phase	☐	

3c	Clearing monitoring by ecologist	Ecologist		☐	
3d	Any Koalas found to be monitored during clearing and inspected for signs of disease. Any welfare concerns to be referred to the Koala Hospital	Ecologist		☐	
3e	Report to PMHC on clearing monitoring	Ecologist	Post-clearing.	☐	
Traffic Collision					
4a	Speed limitations by engineering measures to 40km/hr	Planner/Engineer PMHC	Design at pre-DA and DA.	☐	
4b	Koala warning signage	Planner PMHC	Pre-DA DA	☐	
4c	Strategic street lighting	PMHC, Proponent	Pre-DA DA	☐	
Dog Attack					
5a	Prohibition of dogs from reserves via planning provisions.	PMHC	Rezoning	☐	
5b	Dog ban to be noted on signage with Koala Hospital details for emergencies and Council Ordinance Officer number to report stray dogs.	PMHC Proponent	DA	☐	
5c	Koala exclusion fencing around all residential lots where dogs may be kept.	PMHC Proponent	DA	☐	

5d	Council Ordinance Officer to ensure compliance	PMHC	On-going	☐	
Pools					
6a	Pool fence to be Koala proof where required.	PMHC Proponent	DA	☐	
Barriers					
7a	No fence design (either temporary or permanent) is to include a material or design feature that may potentially injure Koalas (or other fauna) eg barbs and loose wire.	PMHC Proponents Construction Contractors	DA Construction	☐	
7b	No fence to form a barrier to access of retained or offset habitat.	PMHC Proponent	DA	☐	
Bushfire					
8a	Designation and management of APZs.	PMHC Planners/proponents	Pre-DA DA	☐	
Disease					
9a	Public signage detailing contact details for the Koala Hospital to facilitate prompt reporting of sick or injured Koalas.	PMHC Proponent	DA	☐	

9b	Monitoring to census Koala health and records of disease in Koalas in vicinity of site from Koala Hospital.	PMHC Ecologist	Operational phase	☐	
9c	Contact details for Koala hospital at construction site during construction to report any sick or injured Koalas	PMHC Construction Contractor	DA Construction Phase	☐	

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