Ballina Shire Comprehensive Koala Plan of Management

DRAFT

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General publishing information

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Executive Summary

Koalas are an iconic part of the Australian landscape. Whilst many local people have lived with and known about koalas living around Ballina Shire, a 2013 study (Biolink, 2013) identified the presence of a "nationally significant" population living in the southern parts of the shire. This study (the Koala Habitat and Population Assessment: Ballina Shire Council LGA) provided many interesting insights into the characteristics of koalas in the local area and their importance regionally, as well as providing the basis for recognising the national significance of our local koala populations.

Koalas in Ballina Shire are predominantly found around Meerschaum Vale, Wardell, Bagotville, Uralba, the Blackwall Range and on the Alstonville Plateau. Koala habitat in Ballina Shire is generally not in areas subject to planned urban development and so the focus on the Ballina Shire Comprehensive Koala Plan of Management is around infrastructure and rural land management. More specifically, the Pacific Highway upgrade, other road infrastructure, dogs, rural land use and private native forestry are key considerations of the Plan. The plan is designed to be part of the long term recovery of a healthy self-sustaining koala population in the shire.

Council sees the management of lands across the Shire as a collaborative partnership between community, landholders and government. This plan sets out the regulatory aspects of land management where Council has a role, but it also contains a number of management actions it would like to pursue in a partnership role with landholders, industry (farming) and the wider community which are integral to achieving the vision of a self-sustaining koala population.

The Plan recognises the significant role of the NSW Government in infrastructure and forestry activities, and the negative impacts these activities may have where koalas are not adequately considered. Council is supportive of efforts to avoid, minimise and mitigate potential impacts on the koala population from these activities particularly in the Bagotville, Meerschaum Vale, and Wardell areas.

The Ballina Shire CKPoM recognises the unique qualities of place that have supported koalas within the shire and recognises significant intrinsic value in the ongoing presence of koalas in the shire into the future. It provides a template for a transparent development assessment pathway as well as detailing Council and community action that will contribute to the ongoing viability of koala populations in Ballina Shire.

How to use this Plan

This Plan is set out in four main sections. It is not a document that needs to be read from cover to cover. Depending on your purpose, you can enter it at different points to get the information you need.

Parts 1 and 2 - Introduction and General Provisions sets out the purpose and objectives of the Plan, describes the parts of Ballina to which the Plan applies and does not apply, answers key questions about the legislative context of the Plan, and identifies the objectives of the plan and the management approach, and outlines the operation and review of the Plan.

Part 3 - Koala Management Framework reviews the koala habitat mapping and the methodology used to determine the identified Koala Management Precincts.

Part 4 - Management Activities is an important section of the Plan. The management activities listed in this section are arranged by subject into a range of predominantly non-regulatory initiatives which collectively aim to of enhancing koala habitat and providing opportunities for collaborative efforts to do so. The management activities can also be found listed in suggested chronological order in Appendix 6.

Part 5 - Development Assessment Framework is of particular interest to people requiring a *development application* for an activity or development. The Plan's Development Assessment Framework is triggered when a *development application* is required and is also designed to apply to proposals that require approval under Part 5 of the *Environmental Planning and Assessment Act.*

Acknowledgements

This Comprehensive Koala Plan of Management (the Plan) was overseen in its development by the Ballina Shire Koala Project Reference Group (PRG). The PRG was convened by Ballina Shire Council as a way to ensure that all relevant issues could be included for consideration within the Plan. The membership of the PRG was as follows:- Councillor Sharon Cadwallader (Chair, Ballina Shire Council), Lorraine Vass (Friends of the Koala, Inc), Kath Robb (NSW Farmers), Jolyon Burnett (Australian Macadamia Society), Steve Jensen (Department of Planning and Environment), John Turbill (Office of the Environment), Greg Collins (Roads and Maritime Services), Ross Goldingay (Southern Cross University), Effie Ablett (Ballina Environment Society) and Zofie Lahodny-Gesco (NSW Rural Fire Service). John Nagle (Local Land Services) provided specialist input on habitat and rural landholder issues, and Ian Gaskell (Environmental Scientist, Ballina Shire Council) on habitat.

Dr Steve Phillips, of Biolink Pty Ltd Ecological Consultants provided extensive koala expertise in development of the Koala Habitat Study to the PRG as well as the Plan. Biolink prepared the *Koala Habitat and Population Assessment: Ballina Shire Council LGA – November 2013*. This work underpinned further study on vegetation types suitable for the use of koalas in Ballina Shire. Modelling of the impacts on koala population of various events including dog attack and vehicle strike were also prepared by Dr Phillips and his team reflects a level of input well above that which was originally contracted for, but which has provided a very solid basis for the preparation of the Plan.

During preparation of the Plan, rural landholders were separately engaged as a group that had a very practical interest in the provisions of the Plan. The result of this discussion has shaped many of the strategic and ancillary actions of this Plan.

The Koala Habitat Study and CKPOM have been prepared by Council and Biolink Ecological Consultants with funding support provided by the Office of Environment and Heritage.

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Part 1 Introduction

1.1 Background to the Plan of Management

The Koala Habitat and Population Assessment: Ballina Shire Council LGA (KHS) was prepared by Biolink Ecological Consultants and adopted by Council in December 2013. The study showed that the southern half of the shire supports an Important Population of koalas, as defined by the Federal Government's Environmental Protection and Biodiversity Conservation Act 1999 (Figure 1). This population is currently being affected by a number of threats including habitat loss and fragmentation, dog attack, road strike and disease. There is also potential for significant adverse impacts arising from fire. A key consideration in relation to the long term viability of the koala population in Ballina Shire is the construction and subsequent operation of the recently approved Pacific Highway Section 10 as part of the Woolgoolga to Ballina Pacific Highway Upgrade program.

Figure 1 Location of the important koala population (EPBC Act) in Ballina Shire

The development of this Comprehensive Koala Plan of Management (this Plan) addresses the need identified within the KHS for an informed planning response to the issues raised as being for the long term viability of the Ballina Shire koala populations. Not all of these issues can be addressed in a regulatory sense in this Plan. However, there are actions identified within the Plan which aim to assist both Council and the community to meet these recommendations.

In summary, the recommendations of the KHS are:-

1. Specific areas identified within the KHS to be regarded as Core Koala Habitat until adoption of a CKPOM.

2. Consider 'that area bounded by the current alignment of the Pacific Highway south from the bridge over Duck Creek to the west of Ballina and southwards to the Richmond River at Wardell, thereafter along the Richmond River to the junction of Marom and Yellow Creeks extending upstream along Yellow Creek to Wardell Road and along Wardell Road to Alstonville, and thereafter east along the Bruxner Highway to its intersection with the Pacific Highway, again in the vicinity of Duck Creek' be considered as supporting an Important Population for the purposes of the EPBC Act Significant Impact Guidelines.

3. Prepare a map detailing areas of Preferred Koala Habitat for the Ballina LGA.

4. In collaboration with the NSW Roads and Maritime Services, Council should pursue the need for a rigorous evaluation of ameliorative options for koalas along future upgrades to the West Ballina – Broadwater section of the Pacific Highway, specifically at the proposed Wardell bypass section.

5. Consider development and installation of measures that will work effectively to minimise road-strike at known koala black spots.

6. Council to develop and adopt a set of stringent Development Control measures that will work to ensure that all future developments within key koala population or habitat areas will consistently result in implementation of 'best-practice' koala friendly planning measures.

7. Consider the need to facilitate meetings between landholders and other stakeholders with a view to establish a long term management strategy for windbreak and barrier plantings which are now supporting a koala population.

8. Development of 'minimum data set' assessment standards to ensure that a high standard of assessment by ecological consultants is maintained in the future.

This plan is underpinned by the premise expressed in recommendation 2. It specifically addresses recommendations 3, 5, 6, 7 and 8 and works toward the intent of recommendation 4. Council has also engaged separately with the RMS in relation to the Pacific Highway Upgrade and the local koala population.

1.2 Statutory Context

Ballina Local Environmental Plan 2012 and Ballina Shire Development Control Plan 2012

The Ballina Local Environmental Plan 2012 and Ballina Local Environmental Plan 1987 made under the *Environmental Planning and Assessment Act* 1979 (EP&A Act) provide a statutory planning framework for Council to regulate development and protect important aspects of the built and natural environment. The LEPs identify land use zones for all land in the LGA. For each zone, the LEPs set out objectives and identify what kinds of development are permitted either with or without development consent.

The EP&A Act provides for preparation of environmental planning instruments, including State Environmental Planning Policies such as the *State Environmental Planning Policy No. 44 – Koala Habitat Protection.*

For development that is permitted with consent, the Ballina Development Control Plan supplements the Ballina LEP 2012 and Ballina LEP 1987 by providing more detailed information and controls. Ballina Shire's DCP provides for the protection and enhancement of ecologically significant areas. This CKPoM provides a detailed consideration of how this can occur with respect to preferred koala habitat.

This CKPOM includes an action to include provisions in the DCP to give effect to the development related requirements set out in Section 5.

State Environmental Planning Policy No. 44 – Koala Habitat Protection

SEPP 44 is made under the *Environmental Planning and Assessment Act* 1979 with the aim of encouraging 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:

a) by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and

b) by encouraging the identification of areas of core koala habitat, and

c) by encouraging the inclusion of areas of core koala habitat in environment protection zones.

The policy applies to any development application (DA) on contiguous areas of land under the same ownership that are greater than 1 hectare in area, and where 'potential' and/or 'core' koala habitat (as defined in SEPP 44) is found. In cases where such a DA proposes to disturb 'potential' or 'core' koala habitat, the DA assessment pathway identified in SEPP 44 must be followed.

Under SEPP 44, there is provision for preparation of plans of management which aim to protect areas of koala habitat and mitigate negative effects of a proposed development on resident koalas and their habitat. A Comprehensive Koala Plan of Management, such as this Plan, can be prepared for part of or the whole of a local government area. Individual Koala Plans of Management are prepared for specific land and developments. A DA on land that supports core or potential koala habitat cannot be approved by Council unless an approved Comprehensive or Individual Plan of Management is in place.

A Comprehensive Koala Plan of Management offers a number of significant advantages to both Council and applicants. For Council, a Comprehensive Plan:

- facilitates a strategic and coordinated approach to management of koalas and their habitat.
- reduces the resources required to process individual DAs.
- facilitates further government, non-government and community involvement in koala conservation in the Ballina LGA.
- Identifies the philosophy and management approach taken by Council with respect to koalas.
- Identifies priorities for the application of resources and associated rationale.

For development proponents, a Comprehensive Plan:

- removes the need to prepare an Individual Koala Plan of Management (where one would have been required).
- can reduce the time taken to process a DA.
- provides transparent procedures and guidelines for assessing a DA.

- ensures that requirements to compensate the loss of *preferred koala food trees*, and *preferred* and *core koala habitat,* are documented and transparent.

Threatened Species Conservation Act 1995 and Environment Protection and Biodiversity Conservation Act 1999

The koala is listed as a vulnerable species throughout NSW for purposes of both the NSW *Threatened Species Conservation Act* 1995 (TSC Act) and the *Commonwealth Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).

Both pieces of legislation require individuals and/or Council to determine whether or not their actions are likely to have a significant impact on koalas or their habitat based on specific criteria.

The koala population in the southern part of Ballina Shire meets the definition of an Important Population definition for the purposes of the EPBC Act. This places particular requirements on individuals and all levels of government when considering development in this area.

Native Vegetation Act 2003

In NSW, the *Native Vegetation Act* 2003 regulates the clearing of native vegetation on land zoned for rural purposes. Urban areas and land in conservation and forestry estates are not subject to the provisions of the Native Vegetation Act. Clearing approvals under the Native Vegetation Act are determined by the Northern Rivers Local Land Services. Depending on the zoning of the land, development consent may also be required under the applicable LEP for certain types of development or clearing.

Approval for harvesting timber from native forests on private land (private native forestry) is determined and regulated by the Environment Protection Authority. There is a Private Native Forestry Code of Practice for Northern NSW that should be followed and this is supported by the Native Vegetation Regulation 2013. Forest operations are not permitted within any area identified as 'core koala habitat' within the meaning of State Environmental Planning Policy No. 44 – Koala Habitat Protection. Note that this refers to areas mapped as Primary, Secondary A, Secondary B Habitat and Secondary C habitat within the Southern Koala Management Precinct as sown in Figures XX and XX.

Companion Animals Act 1998

The *Companion Animals Act* 1998 and the *Companion Animals Regulation* 2008 provide for the identification and registration of cats and dogs, how they are managed and the duties and responsibilities of their owners in NSW. In particular, pet owners must ensure that their dog (or cat) does not threaten or harm a person or animal (such as a koala) and is prevented from straying or causing other nuisance.

The *Companion Animals Act* 1998 also provides for Council to prohibit dogs and cats on public land for the purpose of protecting wildlife.

Local Government Act 1993

The NSW *Local Government Act* 1993 establishes and directs the functions of local government. Koala management is a relevant consideration for councils as the Act includes the following requirement by way of the Council Charter:

'to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically sustainable development'.

The Act also requires Council to have in place an Integrated Planning and Reporting Framework to ensure Council operations and strategic planning are meeting the needs of the community. Within this framework, Council's Delivery Program and Operational Plan for 2014/2015 commits to preparation of a Comprehensive Koala Plan of Management for the shire.

1.3 Community Involvement

The development of this Plan was undertaken in consultation with a Project Reference Group who collectively developed the approach taken. Council has recognised that any endeavours to ensure a future for Ballina's koalas and their habitat required the involvement of the whole of the Ballina community, and particularly that of rural landholders.

The Project Reference Group (PRG) was convened to provide input to the plan which covered the diverse range of interests present within the shire, and also more regionally. The PRG included representation from NSW Department of Planning and Environment, the NSW Office of the Environment, Roads and Maritime Services, Southern Cross University, Friends of the Koala, NSW Farmers, NSW Rural Fire Service, Ballina

Environment Society and the Australian Macadamia Society. Specialist input was provided by Local Land Services and Council's Development and Environmental Health Group.

The terms of reference for the PRG gave the group a role primarily as a sounding board for the discussion of key elements of the plan during its preparation. At times, the PRG and its members were asked to indicate a view on key aspects of the Plan. The PRG membership followed the process over 2 years from the initiation and development of the Koala Habitat Study. In relation to the CKPOM, the group considered the vision, aims and objectives of the plan, the planning framework for the plan and a number of key issues associated with ecological, rural land management and development matters in relation to Ballina Shire.

A rural landholder engagement process invited members from the peak bodies of rural industry groups with a presence within Ballina Shire to participate in a discussion about koala management and agriculture. This allowed farmers and rural industry as much input as possible to the Plan.

The Plan recognises the national importance of Ballina's koala population (Biolink, 2013) and therefore the PRG included consideration of the regional contribution Ballina Shire makes towards supporting the broader regional population.

The Plan was also publicly exhibited between DATE and DATE.

1.4 Scope of this Plan

This Plan, together with the supporting Koala Habitat Study (Phillips et al, 2013) has been prepared in accordance with SEPP 44 and the Recovery Plan for the Koala. Accordingly, this Plan covers a range of issues including development control, strategic planning, koala habitat restoration, managing threats from roads, dogs, fire and disease, community engagement, implementation, and ongoing monitoring, reporting and review. The Plan also has relevance to a wide range of stakeholders.

If you are preparing a development application to develop land, this Plan provides guidance on how you will need to address potential impacts on koalas or their habitat in your *development application*. If you don't need development consent for any of the activities you conduct or plan to conduct on your land, this Plan does not apply from a regulatory perspective[1] (note: core koala habitat definitions and mapping informs other instruments and regulatory frameworks which may relate to development proposals).

[1] The Plan is designed to apply to development that does not require development consent but requires approval under Part 5 of the *Environmental Planning and Assessment Act* although such application is not the subject of SEPP 44.

The exception to this is for **private native forestry**. Private native forestry is not permitted within any area identified as 'core koala habitat' under the provisions of the Private Native Forestry Code of Practice for Northern NSW. 'Core koala habitat' is defined in SEPP No. 44 as an area of land with a resident population of koalas. Core koala habitat is addressed in further detail elsewhere in this Plan.

If you are a landholder, the Plan identifies a range of voluntary opportunities and benefits for landholders wanting to preserve and/or enhance koala habitat on their land. The Plan provides for a long term strategy to implement a number of non-regulatory management activities aimed at enhancing Ballina's koala population. These include such activities as the development of koala-based tourism opportunities and creation of koala corridors on public and private lands.

If you are a member of the community interested in koala management or Council activity more generally, the plan outlines how Council plans to approach koala management in Ballina Shire both in terms of regulatory requirements and Council/stakeholder actions. To this end, this Plan includes non-regulatory management activities to help protect and enhance Ballina's koala population. It provides opportunities to engage both with landholders and Ballina's broader community.

Part 2 General Provisions

2.1 Name of the Plan

This document is called the Ballina Shire Comprehensive Koala Plan of Management 2015.

2.2 Land to which the Plan Applies

This Plan is based on the study area examined in the Ballina Shire Koala Habitat Study (Phillips et al, 2013), but its focus is the three Koala Management Precincts which identified the main areas of koala activity. The land to which the Comprehensive Koala Plan of Management for Ballina Shire applies is identified as the koala planning area as shown in Figure 2. Further and more detailed information about the koala planning area and the associated koala management precincts is found in Section 3.6.

The Plan does not apply to:

1. Crown lands within the *koala planning area* that are dedicated as either a conservation reserve or a State Forest under the *National Parks & Wildlife Act 1974* (NPW Act) and *Forestry Act 1916* respectively;
2. Lands that are outside the *koala planning area*.
3. Existing allotments of land less than one hectare in area except:
    a. Where the land together with any adjoining land in the same ownership has an area of more than one hectare; or
    b. Where the land is located in the 'Southern Koala Management Area'.

There are areas of vegetation which were identified as meeting the criteria for identification as Primary Habitat that are not contained within the koala planning area. These areas were not identified in the koala habitat study as a focal point for koala activity at the time of the study. These areas are typically small and isolated. Notwithstanding this, these areas are still subject to the provisions of SEPP 44 despite not being subject to this CKPOM.

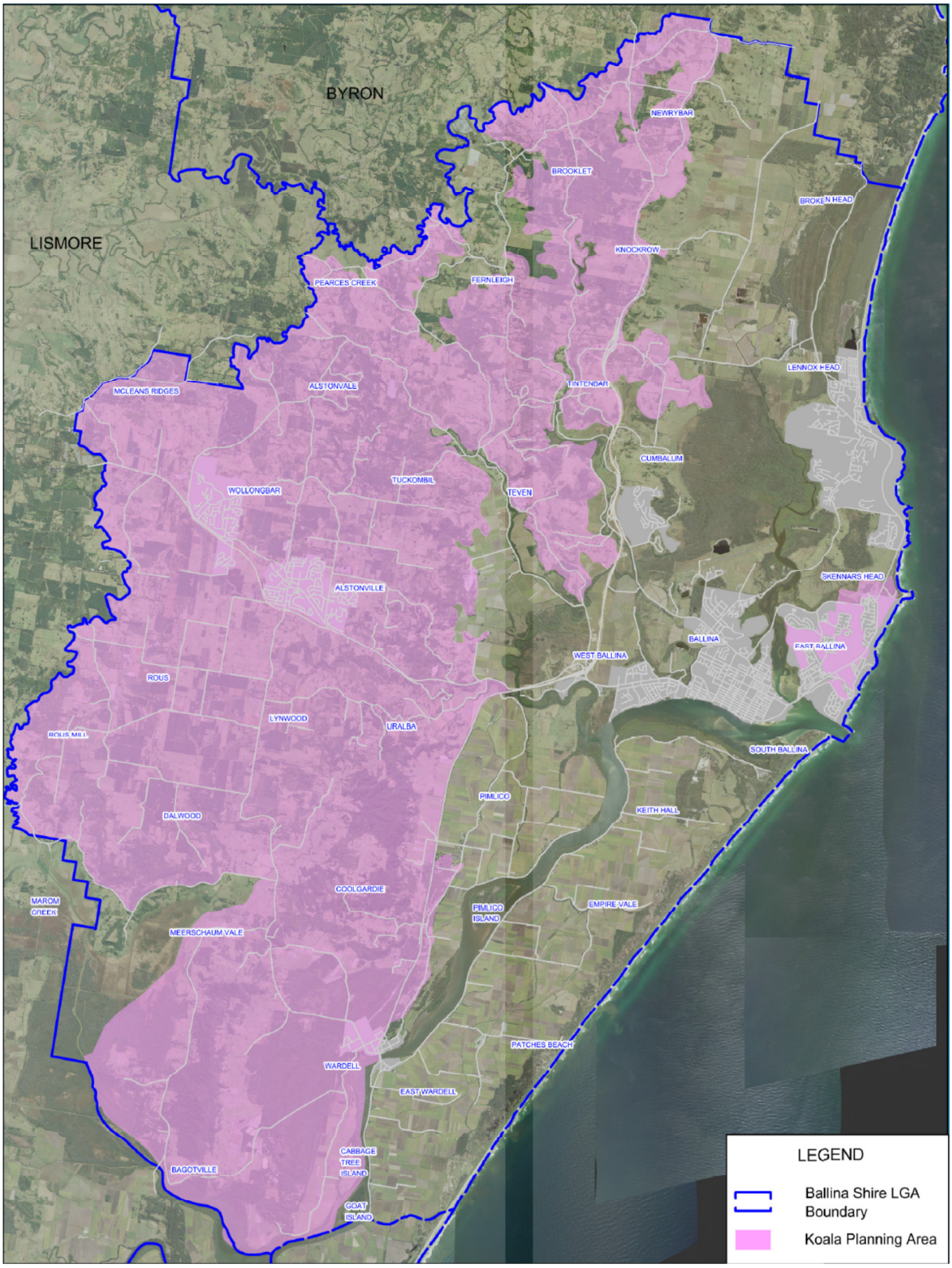


Figure 2: Koala Planning Area

2.3 Making and Commencement of the Plan

This Plan has been prepared consistent with both Part 3 and Part 4 of SEPP 44. Part 3 of SEPP 44 provides for the preparation of Comprehensive Koala Plans of Management which must be consistent with the guidelines and approved by the Director of the Department of Planning and Environment. Part 4 of SEPP 44, encourages Councils to give effect to the aims of SEPP 44 by preparing a Development Control Plan for land that is or adjoins Core Koala Habitat.

i. This Plan was adopted by resolution of Council on DATE, 2015.
ii. For the purposes of a Koala Plan of Management made under Part 3 of SEPP 44, this Plan was endorsed by the Department of Planning and Environment and commenced operation on DATE.

2.4 Relationship to other Koala Plans of Management

The Plan does not supersede any approved Koala Plans of Management that are currently in force in the koala planning area. Current approved and conditional Individual Koala Plans of Management (IKPOM's) are detailed in Appendix 1. Should any of these IKPOM's have a requirement to be reviewed or updated, that review or update should be in accordance with this Plan.

2.5 Duration of the Plan

The Plan is to remain in effect for a period of 20 years unless amended or superseded, but may be extended at the discretion of Council.

The Plan is to be reviewed at five yearly intervals, including a comprehensive review at 10 years. The 10 year review must consider any periodic koala surveys, impacts of intervening infrastructure projects, new legislation and effectiveness of the provisions of this CKPoM in meeting the aims and expected outcomes of the Plan. Notwithstanding, the Plan may be reviewed at any time at the discretion of Council.

2.6 Rationale of the Plan

This Plan focuses on those threats to the koala population in Ballina Shire which can be managed or influenced by Council, through a combination of regulatory measures (consistent with Council's core land-use responsibilities) and complementary non-

regulatory management activities to help address the majority of threats facing koalas in Ballina.

The plan recognises the significance of the 'important (koala) population' as defined by the EPBC Act 1999 in the southern part of the shire and seeks to respond to identified threats to the shire's koala population. The plan draws on a combination of Council, State agency, community and landholder initiatives as a collaborative approach to support koalas in Ballina Shire.

The voluntary measures have been developed to support community and Council working separately and together to enhance koala habitat within the shire and to avoid and mitigate against existing and expected future impacts.

2.7 Vision, aims and outcomes

2.7.1 Vision and Aims

i. This plan is working toward the vision of **a self-sustaining long-term koala population in Ballina Shire**.

ii. This vision is intended to be articulated by way of the following aims:

   a. To retain and consolidate areas of core koala habitat and create or enhance koala habitat linkages.

   b. To support the community in protecting and enhancing Ballina Shire's koala population.

   c. To enhance community awareness of the extent and importance of the koala population in Ballina Shire.

   d. To support the koala population more broadly within the Northern Rivers.

2.7.2 Objections and Outcomes

The following can be read as objectives or outcomes that Council is seeking to achieve or substantially advance towards over the life of the Plan. Management and regulatory actions identified within the plan are expected to:-

(a) Minimise the potential for adverse impact within current and future areas of core koala habitat.

(b) Create, manage and/or restore koala habitat linkages and corridors to re-establish a complex and biodiverse landscape.

(c) Facilitate the mutually productive co-existence of people and koalas by working with landholder communities.

(d) Provide a transparent and consistent assessment pathway and criteria for the processing of development applications, as well as present guidelines for: koala habitat assessment; food tree and koala habitat retention; compensation for the loss of food trees and koala habitat.
(e) Promote koalas as an asset for Ballina Shire's economic development and tourism.
(f) Demonstrate resources for the effective implementation and monitoring of the CKPoM.
(g) Improve community knowledge, understanding and awareness of the local koala population and koala habitat.
(h) Ensure that koalas, koala habitat and koala movement patterns are integrated considerations in infrastructure planning.

The above objectives will be realised through both the management activities and Development Assessment Framework detailed in this Plan and should be considered in the context of the findings and recommendations identified in the koala habitat study that is associated with this Plan (Biolink Ecological Consultants, 2013).

In terms of the long term survival and flourishing of Ballina's koala population, the regulatory aspects of this Plan form only one part of the picture. One of the most significant threats to koala habitat in Ballina Shire is the potential loss of habitat through private native forestry.

Additionally, the siting and construction of Section 10 of the Woolgoolga to Ballina Pacific Highway upgrade has the potential to negatively impact the koala population in the Southern Koala Management Precinct.

This plan recognises the significant and ongoing potential for impact on the koala population as a result of the planned Pacific Highway Upgrade. This plan aims to support the activities of the RMS in ensuring a healthy koala population into the future.

2.8 Koala Habitat Mapping

Koala habitat mapping has been undertaken to support decision making with regard to the boundaries of the koala planning area and koala management precincts. Existing mapping undertaken by Council staff, along with koala surveys undertaken as part of the 2013 Koala Habitat Study, have been utilised to determine the following:

- Presence or absence of koalas.
- Presence or absence of koala food trees and their correlating vegetation communities.

- The relationship between the presence of koalas and particular vegetation communities that can be inferred.

This field work has then been reviewed in the context of the geomorphological attributes of the koala planning area at a landscape scale to further determine correlations between vegetation, soils, and geomorphology.

Preferred koala habitat mapping is contained in Figure 3.

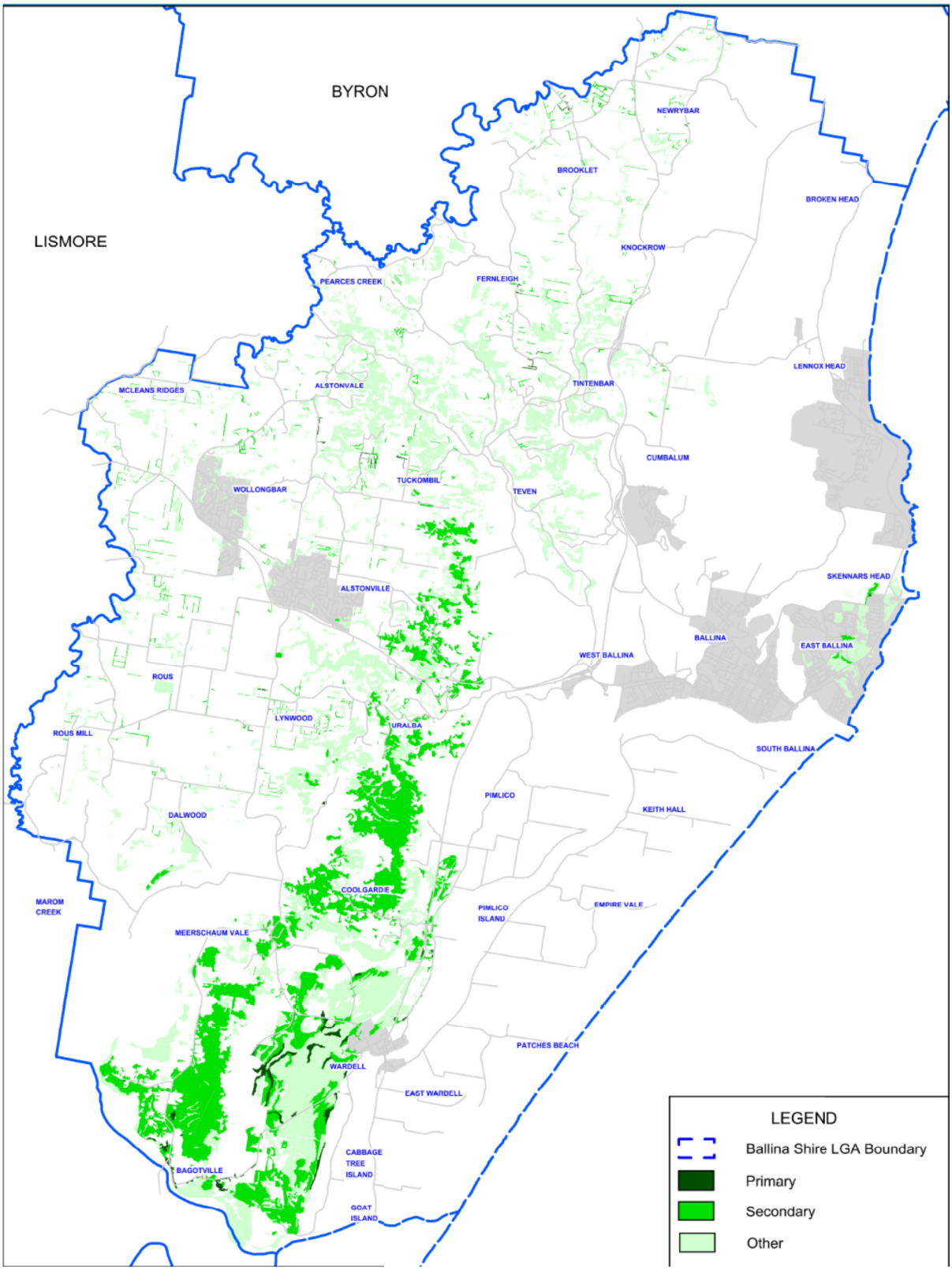


Figure 3 Preferred Koala Habitat (secondary classes to be refined prior to public exhibition)

Part 3 Koala Management Framework

3.1 Overview

This part of the Plan examines the status of koalas in Ballina Shire as it stands and the challenges and opportunities potentially or actually affecting the population. It also provides the rationale for the management and regulatory actions nominated within the Plan.

3.2 Status of Koalas in Ballina Shire

An analysis of historical koala records undertaken as part of this Plan (Biolink Ecological Consultants, 2013) is one of nine similar studies across NSW (eight) and south-east Queensland (one). On the whole, the results of these studies suggest there has been an average range contraction of about 30% over the last three koala generations (equivalent to approximately 18 years) regionally. Moreover, there has been an alarming decrease of about 45% in the amount of otherwise suitable habitat that is actually being used by koalas (about 20 years; pers. comm. S. Phillips).

The analysis for Ballina provides a complex picture. There was significant contraction in the extent of occurrence and the area of occupancy during the early to mid 20th century likely related to clearing for forestry and other purposes. Since that time, records of koala incidence had implied significant recovery for both the Ballina and adjoining south-east Lismore LGA populations. It is thought that this is partly due to extensive eucalypt windbreak plantings on the Alstonville Plateau during the 1980's, providing a high nutrient food source as well as a potential transport corridor.

The apparent recovery shire-wide indicated in the records analysis has not been borne out by the field surveys undertaken. Possible reasons for this include the ongoing population isolation effects of habitat fragmentation, as well as an underestimate of numbers of koalas being subject to vehicle strike, dog attack and disease.

Notwithstanding these impacts, Ballina's koala population within the Bagotville, Meerschaum Vale and Wardell areas (the Southern Koala Management Precinct) meets the criteria for an 'Important Population' for the purposes of the Environmental Planning and Biodiversity Conservation Act (1999). This means that the population here in Ballina is recognised as a nationally significant one.

This Plan seeks to provide a pathway to support this nationally important koala population, whilst recognising that there are significant barriers to its ongoing sustainability. It also seeks to support other koala populations within the shire and greater Northern Rivers region through retaining, increasing and connecting available preferred habitat over time, and increasing koala awareness.

Threats to koala populations

The background scientific research study accompanying this Plan outlines the processes threatening koala populations and their habitat (Biolink Ecological Consultants, 2013). These processes include:

(a) Clearing of koala habitat for urban development, roadwork, forestry, agricultural and mining activities.
(b) Fragmentation of koala habitat which isolates individuals and populations, impedes gene flow and the ability to maintain effective recruitment levels. This includes degradation of habitat by logging of preferred food trees.
(c) Mortalities caused by dog attack and vehicle strike.
(d) Mortalities caused by random events such as fire and/or extreme weather conditions.
(e) Disease, mainly associated with Chlamydia.

As a guide to human impacts on koalas, the following information shows the numbers of koalas found dead or brought into care by Friends of the Koala in Ballina Shire and surrounding shires over the past 3 years.

LGA	Sightings/ Advice	Admittances	Information	Mortalities
Richmond Valley 2013-14	12	6	5 – mortalities 1 - released	Disease – 1 Car hit – 1 Injury – 1 Unknown 5
Richmond Valley 2012-13	10	8	9 - mortalities	Disease – 2 Car hit – 3 Injury – 1 Geriatric – 1 Unknown - 1
Lismore 2013-14	210	175	12 – in care 10 – released 3 – relocated 150 - mortalities	Disease – 66 Car hits – 30 Dogs – 10 Injury – 6 Geriatric – 4 Orphans – 4 Unknown – 30

LGA	Sightings/ Advice	Admittances	Information	Mortalities
Lismore 2012-13	187	161	0 – in care 26 - released 135 - mortalities	Disease – 74 Car hits – 18 Dogs – 11 Injury – 11 Orphans – 8 Unknown - 13
Ballina 2013-14	28	11	1 – in care 10 - mortalities	Disease – 6 Injury – 2 Unknown - 2
Ballina 2012-13	21	17	2 - released 15 - mortalities	Disease – 4 Car hits – 4 Dogs – 1 Injury – 2 Unknown - 4
Byron 2013-14	93	43	3 – in care 3 - released 35 - mortalities	Disease – 20 Car hits – 4 Dogs – 3 Injury – 3 Unknown - 3
Byron 2012-13	101	70	3 – in care 10 – released 3 - relocations 55 - mortalities	Disease – 27 Car hits – 13 Unknown - 15

Table 1 Regional Information on Koala Assistance (Friends of the Koala 2014).

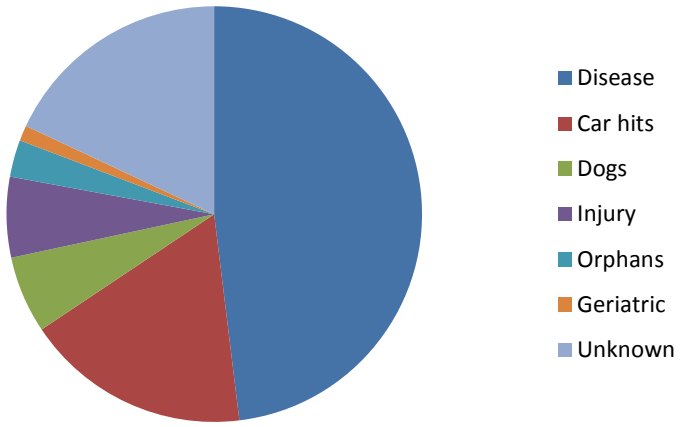


Table 2 Koala Mortality by Cause - 2012 to 2014

Disease is recognised as having a major impact on koalas, with euthanasia of diseased animals accounting for the majority of known mortalities since 2003. The background study to this Plan (*Koala Habitat and Population Assessment: Ballina Shire Council*, Biolink Ecological Consultants, 2013) identifies that increases in disease can naturally

occur due to reduced metabolic/genetic fitness and/or immunity caused by natural stressors such as reduced food tree availability and/or increased interaction of threats to koalas.

However, with human development in and around *koala habitat*, koalas face additional stress factors such as habitat loss, impediments to movement (fences, roads), vehicle strike, and dog attack, which consequently leads to increased levels of disease. Where these stress factors are not managed, the impacts of disease on individuals and koala populations are much greater.

The impacts of fire on koala populations have also been well documented for areas such as the Tweed coast and south-east Queensland. The two populations in Ballina Shire of particular concern are the small population located in East Ballina, and the nationally significant population in the Bagotville, Meerschaum Vale and Wardell area. Both these populations live in vegetation adjacent to and contiguous with large areas of coastal heath, which is quite prone to (and well adapted for) fire. The presence of the health within the important koala population area means that fire is of particular concern to the Ballina Shire koala population.

The preceding table and graph illustrate the trends for past threats to koalas. Clearing for the Pacific Highway upgrade or private native forestry, and possible impacts during construction or operation of the Pacific Highway are new events which will place stress on koalas in affected areas.

3.3 Preferred Koala Habitat

Following the Koala Habitat Study, comprehensive koala habitat categorisation project has been undertaken to identify the areas of preferred koala habitat across the shire and cross-reference this habitat with existing koala populations. This work has informed the development of the koala management precincts, as well as informing the actions outlined in this plan to support the Ballina Shire koala population.

Habitat categorisations were based on the presence/absence of preferred koala food trees rather than “the 15% rule” proposed by SEPP 44. To this end the terms “Primary”, and “Secondary” koala food tree species as used in the following definitions are based on the mathematical models and associated definitions of Phillips (2000b) and are thus consistent with terminology used in the approved Recovery Plan for the Koala (DECC 2008). Ongoing analyses of koala activity data from low nutrient substrates (Phillips and Allen 2014) has recently established the basis for further partitioning of Secondary (Class

B) habitat based on differences in the relative abundance of identified Secondary food tree species. Specifically, vegetation communities wherein secondary food tree species are a dominant or co-dominant component of the tallest stratum support significantly higher koala activity levels (and hence have a higher koala carrying capacity) than do vegetation communities wherein secondary food tree species occur at lower densities (Phillips and Allen 2014). This knowledge has resulted in the need to recognise a further habitat category - Secondary (Class C) Koala Habitat - as described in further detail below:

- Primary Koala Habitat – forest and/or woodland communities occurring on soils of medium to high nutrient value whereupon primary koala food tree species are dominant or co-dominant (i.e. ≥ 50%) components of the tallest stratum species.
- Secondary (Class A) Koala Habitat – forest and/or woodland communities occurring on soils of medium to high nutrient value whereupon primary food tree species are sub-dominant components of the tallest stratum species.
- Secondary (Class B) Koala Habitat – forest and/or woodland communities occurring on soils of low to medium nutrient value whereupon primary food tree species are absent, the tallest stratum instead dominated or co-dominated by secondary food tree species only.
- Secondary (Class C) Koala Habitat – forest and/or woodland communities occurring on soils of low to medium nutrient value whereupon primary food tree species are again absent and secondary food tree species are sub-dominant components of the tallest stratum species.

Each of the preceding classifications reflect the different koala carrying capacities of the associated vegetation communities, with areas of Primary Koala Habitat capable of sustaining high density populations (i.e. > 0.5 koalas ha^{-1}), whereas Secondary (Class C) Koala Habitat can only sustain low density populations (i.e. < 0.1 koalas ha^{-1}). Collectively, the four major habitat classifications function to identify areas of Preferred Koala Habitat. As a component of this classification system a habitat code of “Other” was generally applied to those communities wherein koala food tree species were absent.

However, there are many variables contributing to the distribution of koalas within a landscape. The limited extent of mapped Primary Habitat within the Southern KMP does not reflect the complex nature of the landscape in supporting the Important Population that has been identified as resident there. The population is adapted to a mix of Primary and

Secondary (Class A) Habitat within a larger Secondary (Class B) and Secondary (Class C) Habitat landscape. It appears that in this area, all types of koala habitat and the surrounding vegetation network is important for the continued occupation of the landscape by koalas. The importance of existing vegetation regardless of type and class is also illustrated by the extent of fragmentation in Ballina Shire. For this reason, for the purposes of this Plan, all preferred koala habitat within the Southern KMP is defined as Core Koala Habitat (see Section 3.4).

This plan is designed to work at a landscape level whilst acknowledging the significance of smaller areas of habitat and the role played by individual trees and species. Management actions within this Plan are written with the intention to retain the existing complexity of vegetation landscapes and increase the connectivity between those areas which area already vegetated and supporting koalas.

This approach is consistent with the application of the precautionary principle and the categorisation methods recommended in the Recovery Plan for the Koala (DECC, 2008).

Koalas living in Ballina Shire on the Alstonville Plateau are dependent on windbreak plantings of Tallowwood (*Eucalyptus microcorys*) or Forest Red Gum (*Eucalyptus tereticornis)*. These plantings do not meet the formal definition of Preferred Koala Habitat, although they clearly support a significant number of animals both in residence and in transit. Due to their location, function and presence on agricultural lands there is typically no regulatory role for Council in managing these windbreak areas. There are a number of unknowns with regard to these areas also, which include:

- Whether or not the koala population is extending northward from the Alstonville Plateau as new plantings of koala feed trees occur.
- How important the windbreak plantings are in and of themselves for the continued recovery of a regional population.
- What the long term future of these windbreaks are, and how best this can be managed to support a koala population.

Disruption (such as clearing or a mass dying out) to the windbreaks over time is a very significant threat to koalas that have established themselves in these areas, given the importance of the long-term relationship koalas have with their home range (Mitchell, 1990; Phillips, 1999 as referenced in Phillips 2013). A number of the management actions noted in this CKPOM are designed to address this.

In addition, a large portion of mapped vegetation is mapped as Unknown habitat. For vegetation mapped as Unknown habitat, there was insufficient data to enable classification. This vegetation may include both individual trees and clumps of trees which are unmapped owing to the resolution of the mapping.

In addition to the above, it is also known that preferred koala food trees may be scattered across land outside vegetation communities that are identified and mapped as preferred koala habitat. Where preferred koala food trees are identified (whether in groups or in isolation), they are to be considered to be potential koala habitat for the purposes of this Plan.

3.4 Core Koala Habitat

SEPP 44 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 definition of Core Koala Habitat within SEPP 44 means 'an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population'.

Figure 3 illustrates the complexity of the koala habitat and how vegetation communities work together to link and create habitat. It is therefore considered that all preferred koala habitat within the full geographic extent of the Important Population Boundary (Figure 1 and Figure 4 – Southern Koala Management Area) meets this descriptor given that it currently supports a permanent free living population.

The Ballina Koala Habitat Study (Phillips, 2013) notes that:-

- The extent of occurrence of koalas across the LGA has expanded by 24% over the last 3 koala generations.
- The area of occupancy has recorded a statistically significant increase in the Southern KMP.
- The Southern KMP appears to be a significant source population for regional population recovery over past 60 years.
- The number of koalas within the LGA is less than what was expected on the basis of historical records.

- Approximately 70% of the Ballina LGA koala population lives within the Southern KMP, which exposes the LGA's population as a whole from a risk management point of view.

Careful management of the Southern KMP is indicated to ensure that a permanent free living population continues into the future. This degree of care is doubly important given the Pacific Highway upgrade and potential threat from private native forestry in the Southern KMP.

3.5 Special Considerations

Windbreaks on the Alstonville Plateau and areas within East Ballina are identified as Preferred Koala Habitat under SEPP 44. They have not been identified as Core Koala Habitat despite supporting koalas over at least 3 koala generations for the following reasons:-

- Windbreaks on the Alstonville Plateau are typically exempt from clearing regulation due to their location, function and occurrence on agricultural lands. Notwithstanding this, their importance to the ongoing existence of approximately 30% of the Ballina LGA's koala population is evident.
- The East Ballina population is very small, approximately 3 or 4 individuals. This is not likely to be a sustainable population in itself and the population's ability to persist long term in this area is not clear.

Whilst the decision has been taken to place a greater planning emphasis on the Southern KMP as Core Koala Habitat, this does not mean that koalas living in the Plateau KMP or the East Ballina KMP are not a focus of this Plan. Core koala habitat may be present in these areas upon investigation as required in relation to development proposals.

3.6 Koala Management Area and Precincts

This plan provides for three koala management precincts, within one koala management area (KPA is shown in Figure 2). The precincts have been developed based on the recommendations made in the Koala Habitat Study (2013) and the habitat mapping undertaken to support this plan. The philosophy behind their selection has been to identify the locational characteristics of koala habitat and koala population, as well as land use and future land management.

This has resulted in the identification of three precincts managing different aspects of the Ballina koala population, each with a slightly different objective for long-term land management but each with the overall objective of supporting this Plan's vision of a self-sustaining, long-term koala population in Ballina Shire. The precincts are illustrated in Figures 4, 5 and 6.

In general, there is a greater regulatory focus in the southern parts of the shire, where the Important Population is resident. There is a greater emphasis on voluntary land management actions within the Alstonville Plateau and East Ballina areas, although regulatory provisions still apply as per SEPP 44 to areas of preferred koala habitat (see Section 3.4 for the definition of core koala habitat).

It is possible that during the life of this Plan that koala management precincts may change or expand, depending on the results of the Management Action 3 – four yearly reviews of koala activity across the shire.

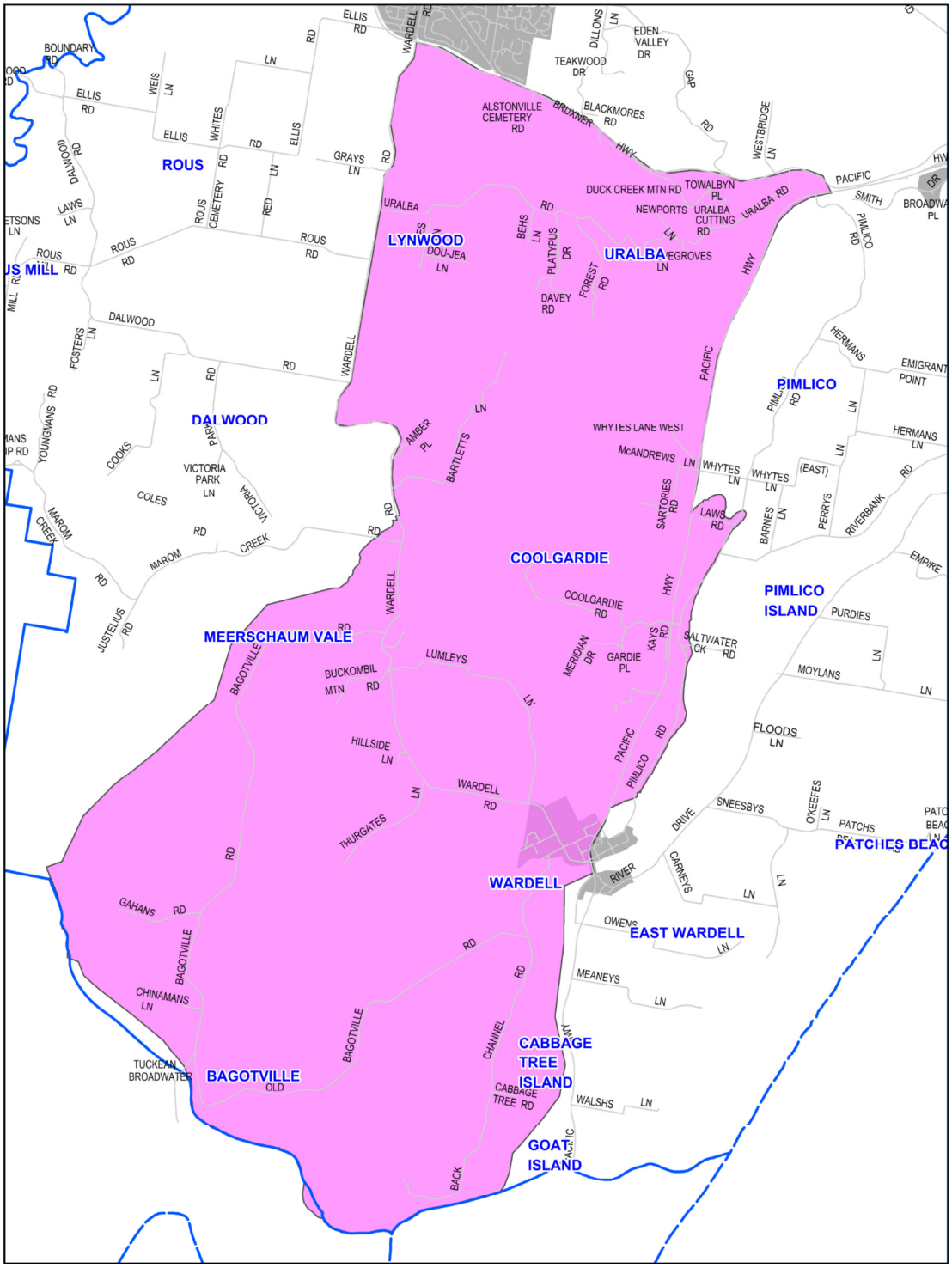


Figure 4 Southern Koala Management Precinct

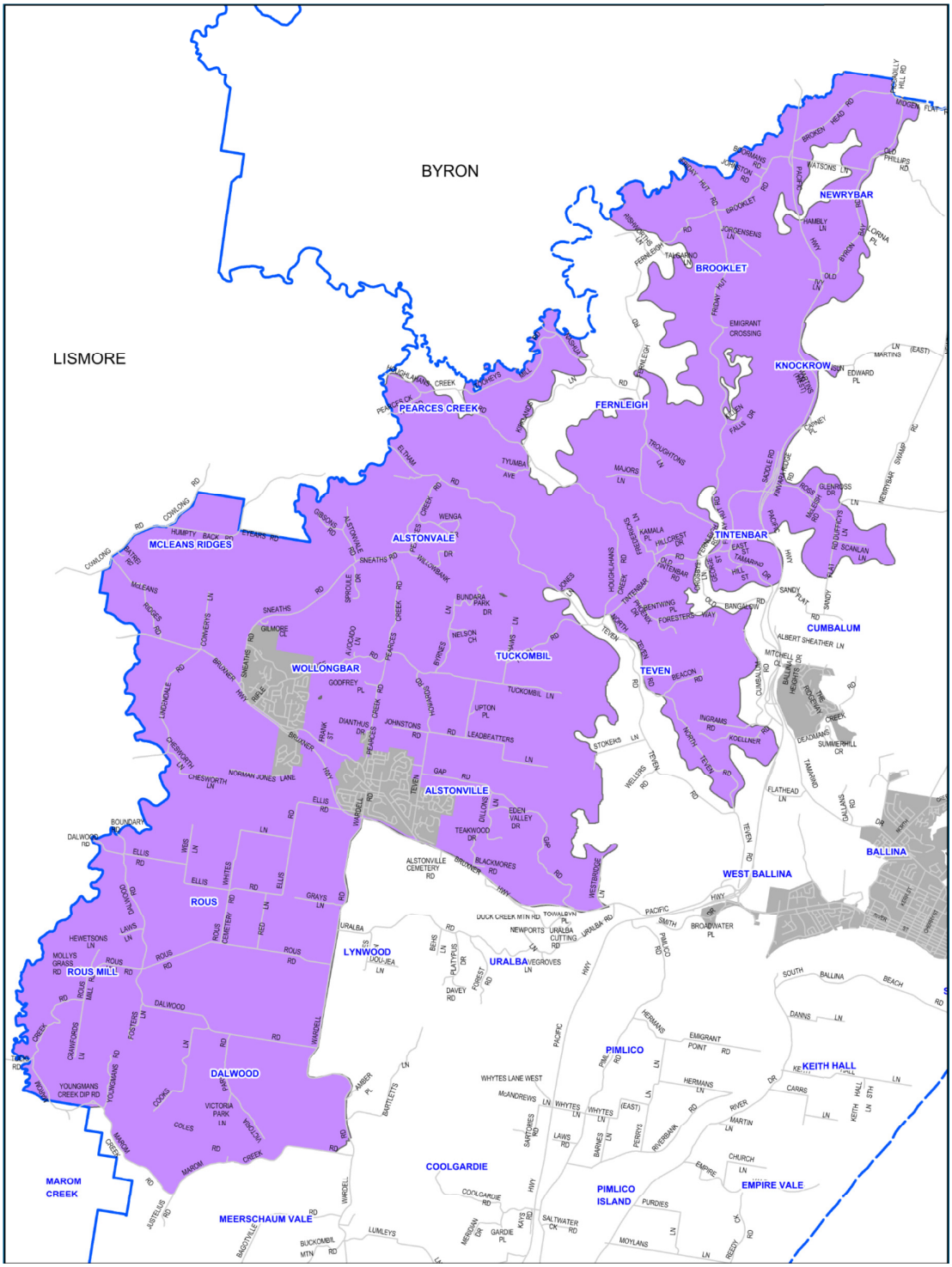


Figure 5 Plateau Koala Management Precinct

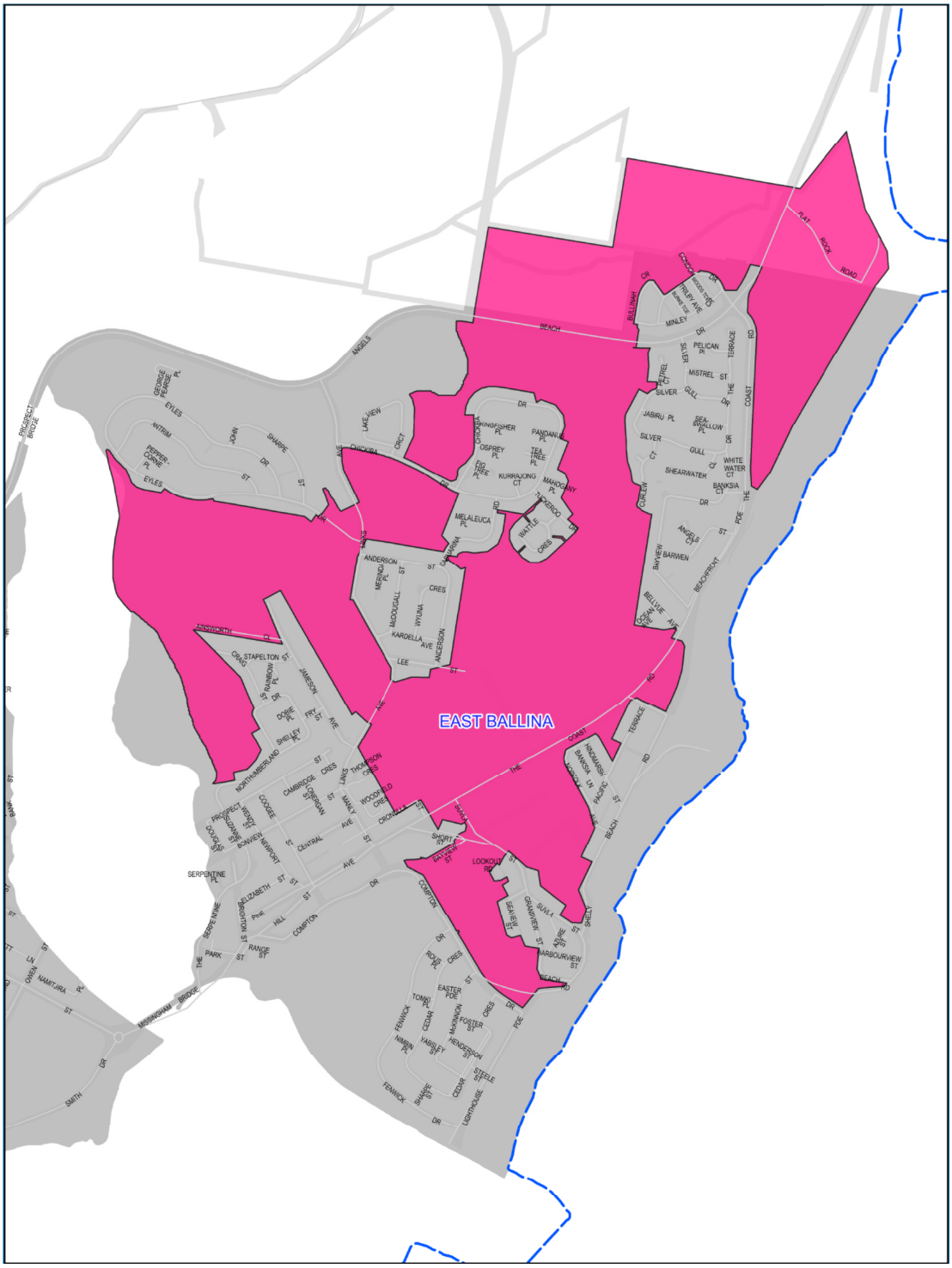


Figure 6 East Ballina Koala Management Precinct

As noted above, three koala management precincts (KMP) are identified within the *koala planning* area. Their role is to provide for a specific management focus for populations within these areas. The precincts are as follows:

Southern (Bagotville/Meerschaum Vale/Wardell/Blackwall Range/Uralba) KMP

The principle objective of this precinct is that of ensuring that the koala population can continue living in and colonising from the area. To this end, this Plan aims to:

a) Retain koala habitat and food trees.

b) Build on the above to extend linkages to other preferred koala habitat.

c) Reduce the incidence of koala mortality by addressing key threats such as habitat loss and fragmentation, road strike and dog attack.

d) Recognise the occupation of the broader landscape by koalas.

This precinct is the main area in which regulatory provisions are proposed to support retention of koala habitat. This is because the Southern KMP is the core area in which the koalas of Ballina Shire live. Remnant vegetation on lenses of residual soils within poorer erosional soils on slopes provide core koala habitat now, and a refuge from the large clearing events of the early to mid-1900s. The objectives of this KMP are therefore intended to retain koala habitat over time, encouraging the long-term preservation of remaining habitat. Areas that do not currently support trees may provide landholders with an opportunity to engage in the planting of koala habitat. Such planting may create linkages between areas of existing habitat important for this KMP.

Whilst the precinct currently exhibits some good contiguous vegetation with ecotones between topography, soil types and groundwater conditions (with koalas occupying this vegetation between Bagotville, Wardell, Uralba and Rous), construction of Section 10 of the new Pacific Highway has been approved to longitudinally transect this vegetation.

The koala population within the Southern KMP is an 'Important Population' under the provisions of the Environmental Protection and Biodiversity Conservation Act (1999). The approval issued by the Federal Government in relation to the highway upgrade notes that a Koala Management Plan must be prepared for Section 10 of the Pacific Highway upgrade to ensure that an unacceptable impact will not occur to the Ballina koala population. This condition indicates the importance of the objective of ensuring that the koala population is supported to continue living in and colonising from the area.

Plateau KMP

The principal objective of this KMP is to support the ongoing viability of the Plateau population in a highly fragmented and working farmland landscape. This area traditionally supported Big Scrub vegetation, but is now identified as an area of State Significant agriculture. As part of the agricultural history of the site, eucalypt windbreaks were planted during the 1980's which now support up to 30% of Ballina's koala population.

With respect to this KMP, this Plan aims to:

- Support collaboration between landholders and the community to manage koalas living in windbreaks and isolated pockets of vegetation on the Alstonville Plateau;
- identify strategic areas for planting of transitional linkage vegetation; and
- monitor the use of the area by koalas – that is, in terms of its permanent koala residents and those using the area as a transport corridor – to determine longer-term outcomes for this KMP.

It is understood that most of the trees in which koalas live in this KMP were planted by farmers in response to tree giveaways of Tallowwood and less often, Forest Red Gum, during the 1980s and 1990s. These species are not native to the vegetation communities which would previously have grown on the Plateau, but the fertile soils have resulted in long planted avenues of particularly nutritious trees, which have been, and are being, utilised by koalas. This has resulted in habitat in this KMP being held in small pockets of highly fragmented remnant vegetation supplementing the main koala food trees found in windbreaks. Landscape scale changes have significantly modified the Plateau and surrounding landscapes due to widespread clearing. Koalas are now utilising a niche which has effectively replaced habitat areas in which they previously lived.

Over time, it is envisaged that a collaborative approach to managing the availability of koala habitat will result in an increase in areas which are not utilised for agricultural purposes providing koala habitat.

East Ballina KMP

The East Ballina KMP recognises a very small population as an outlier population. Little is known about koalas in this area, and their potential for continuing as a viable population. Management actions within this Plan aim to improve understanding and monitoring of the koala population in East Ballina, to inform reviews of this CKPoM and support development of future management objectives.

The management objectives are:-

- to monitor the use of the area by koalas with the aim of reviewing the provisions of this Plan for this KMP if required, and
- to minimise threats to the persistence of the population.

Most vegetated land is held in public ownership here, although the only mapped area of Primary Koala Habitat is situated at North Angels Beach. There are possible adverse impacts from road strike and uncontrolled domestic animals or feral animals. Management actions will focus on these aspects in the initial phase of the Plan's implementation.

4.0 Management Activities

The aim of this section of the Plan is to provide a framework for management activities that complement the Development Assessment Framework presented in Section 4 of the Plan. It is necessary to undertake these management activities to:

- minimise threats to koalas and their habitat;
- increase the amount of koala habitat in the koala planning area;
- maintain and where possible improve the quality of existing *koala habitat* in the koala planning area;
- ensure effective implementation and monitoring of the Plan by Council.

Management activities to be conducted as part of this Plan are detailed in Table and have been classified into the following categories: implementation and monitoring; regulatory processes; habitat conservation, restoration and management; communication and education; road and traffic management; dog management; koala health and welfare; bushfire management; funding; research and economic development and tourism. The development of this management framework has been informed by the scientific background study commissioned by Council as part of the development of this Plan (Biolink Ecological Consultants, 2013).

Some of the management activities and actions outlined in (Table) can be completed under existing Council service levels and recurrent budgets.

However, it is noted that completion of all activities and actions is subject to the allocation of resources, whether time or budget, via Council's Delivery Plan process and/or successful applications for external funding.

Table3 Schedule of management activities and actions proposed to be conducted as part of this Plan.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
Implementation and monitoring						
1	Establish a Koala Advisory Group to monitor the implementation of management activities identified in this Plan.	1	Within one year of adoption of the Plan	Annually	$0 - $500	Monitor implementation of plan
2	Provide a bi-annual public report on the implementation of the plan and the status of the koala population and habitat in Ballina Shire.	M	Within two years of adoption of the Plan	Bi-annually	$501 - $5000	Provide transparency of process and consistent flow of information.
3	Establish a four-yearly monitoring program to assess the status of the koala population.	M	Four years after adoption of the Plan	Four yearly	$10 000 - $20 000	Monitor koala population. Monitor effectiveness of actions and provide scientific basis for decision-making.
4	Incorporate koala habitat outcomes associated with development approvals into a compliance program to ensure long-term viability of food tree and habitat compensation measures.	M	Within three years of adoption of the Plan	Ongoing	$0 - $500	Monitor effectiveness of conditions. Ensure equity of application of conditions. Ensure compliance with conditions.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
Regulatory processes						
5	Include preferred koala habitat in best available environmental protection zone.	1	Within one year of adoption of the Plan (subject to E zones review being undertaken by NSW Planning)	12 months	$500 - $5000	Recognition of habitat values in local planning instrument with accompanying regulatory provisions to retain habitat values.
6	Amend the *Ballina DCP* to explicitly refer to and apply the Development Assessment Framework of this Plan.	1	Within one year of adoption of the Plan	6 months	$0 - 500	Implementation of koala management provisions in local planning framework. Transparency and consistency in strategic and regulatory planning.
7	Apply impact assessment provisions of this Plan to LEP amendment processes.	1	On adoption of the Plan	Ongoing	$0 – 500	As above.
8	Establish standard conditions of consent giving effect to the regulatory provisions of this Plan.	1	Within six months of adoption of the Plan	Ongoing	$0 - 500	As above.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
9	Include information regarding the presence of mapped *preferred koala habitat* and/or additional koala habitat mapping (obtained through the development application process) on certificates issued under Section 149 (5) of the EP&A Act.	2	Within three months of adoption of the Plan	1 month	$0 - 500	Identification and communication of preferred koala habitat information to landowners and purchasers.
10	Develop and deliver a training program for Council staff involved in implementation of this Plan.	2	Within six months of the adoption of the Plan	3 months	$0 - 500	Ensure consistency in understanding of issues and application of planning processes.
11	Develop and deliver a training program for staff/consultants on the requirements of Koala Habitat Assessment Reports, the Spot Assessment Technique and its application for assessment purposes.	2	Within one year of adoption of the Plan	2 months	$5 000 to $10 000	Support consultants in understanding their obligations for development of habitat assessment and impact assessment reporting. Consistency in application of planning requirements.
12	Undertake an assessment of the economic value of preferred koala habitat and the koala population in Ballina Shire.	3	Within five years of adoption of the Plan	9 months	$20 000+	Provide an understanding of the economic contribution of the koala population in Ballina Shire.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
13	Prepare guidelines for the provision of new or compensatory habitat on public and private land.	2	Within two years of adoption of the Plan	9 months	$5 000 to $10 000	Benchmark quality of habitat planting. Provide clarity and support to end users. Improve communication in relation to koala management requirements.
Habitat conservation, restoration and management						
14	Engage the Minister and the responsible Department with regard to PNF to request preferred koala habitat not be approved for private native forestry in Ballina Shire.	1	Within one month of adoption of the Plan	6 months	$0 - 500	Address a primary mechanism for clearing of significant koala habitat
15	Engage the Minister and the responsible Department with regard to E zones to seek inclusion of preferred koala habitat in environmental protection zones.	1	Within one month of adoption of the Plan	2 months	$0 - 500	Support recognition of koala habitat in local planning framework.
16	Identify measures to address and manage PNF in Ballina Shire with respect to the aims and objectives of this Plan.	1	Within two years of adoption of the Plan	12 months	$5000 – $10 000	Reduce potential impact of PNF on koala habitat
17	Identify public lands (such as roads and road reserves, parks and other public lands) and areas of possible koala habitat in Council and public ownership potentially suitable for revegetation and restoration projects in partnership with rural landholders.	1	Within two years of adoption of the Plan	6 months	$30 000	Enhance extent of koala habitat. Support Plateau KMP koala population where windbreaks are cleared or lost.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
18	Prepare a priority koala habitat restoration program (including map) to prioritise restoration and revegetation of strategic areas within the koala planning area.	2	Within three years of adoption of the Plan	9 months	$5 000 to $10 000	Assist with prioritising grant funding for community, landholders and Council. Support revegetation programs.
19	Seek external funding for works identified under the restoration program.	2	After Action 18 complete	Ongoing	Unknown	Leverage funds from other levels of government to assist with resourcing restoration works (including Council funds). Enhance extent of koala habitat and quality.
20	Establish a register of landholders who are willing to use their land for habitat restoration, including those who wish to register their 'Koala Friendly' windbreaks.	3	Within two years of adoption of the Plan	Ongoing	$0 - 500	Assist with prioritising resources such as grant funding. Establish landholder communication network.
21	Investigate a windbreak replacement program for farmers and koalas utilising mutually beneficial species (including consideration of use of alternative eucalypt species for windbreaks)	1	Within one year of adoption of the Plan	Ongoing	$5 000 – $10 000	Support provision of koala friendly windbreaks on the Plateau that also recognise landholder requirements. Consider economic factors in these requirements.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
22	Establish a register of local nurseries that propagate suitable seedlings from local Northern Rivers provenance seed.	3	Within 18 months of adoption of the Plan	2 months, ongoing	$0 - $500	Assist community and Council in sourcing genetically appropriate plants.
23	Undertake the active restoration of a pilot site to restore or enhance koala habitat.	2	Within four years of adoption of the Plan	3 years (each site, plus a maintenanc e period)	$100 000 over three years	Demonstrate habitat restoration outcomes available. Enhance koala habitat.
Communication and education						
24	'Launch' the plan utilising a mix of activities 26 – 31, as well as a formal recognition of the local koala populations in Ballina Shire.	1	Within two months of adoption of the Plan	3 months	$2 000	Provide a formal starting point for collaboration on koalas in Ballina Shire. Encourage communication with Council and within the community.
25	Develop and implement an integrated communication program to inform and educate the community about threats to koalas and their habitat.	1	Within one year of adoption of the Plan	3 years	$500 to $5000	Enhance a collaborative approach to koala awareness and management in Ballina Shire.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
26	Provide the Comprehensive Koala Plan of Management and associated maps on the Council website.	1	Within one month of adoption of the Plan	1 month	$0 - $500	Ensure access and availability of information. Encourage communication with Council and within the community.
27	Write to all landholders subject to the CKPoM advising of the Plan and providing key information about koala and the function of the plan.	1	Within two months of adoption of the Plan	2 month	$0 - $500	Inform landholders of the status of koalas in the shire and the CKPoM.
29	Prepare a fact sheet explaining Plan requirements for development assessment.	2	Within three months of adoption of the Plan	1 month	$0 - $500	Provide a simple explanation of plan requirements with regard to koalas. Provide access to information.
29	Pursue, in partnership with rural industries on the Plateau, develop a Voluntary Code of Practice for managing koalas on agricultural land.	2	Within three years of adoption of the Plan	1 year	$500 - $5000	Consider windbreak management and options for the longer term to support koala populations. Work collaboratively with landholders

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
Road and traffic management						
30	Work collaboratively with NSW Roads and Maritime Service in relation to sharing of information and opportunities to enhance outcomes for the shire's koala population.	1	Within three months of adoption of the Plan	Ongoing	$0 - $500	Implement koala road safety measures across the road network, both regional and major roads. Keep community informed regarding road construction/use and koalas. Proactively collaborate on achievement of positive outcomes for koala management.
31	Apply the following for roads within the *koala planning area*,: a. audit existing koala road safety measures b. develop an integrated program of works for the implementation of a 'toolbox' of koala road safety measures to target vehicle strike black spots identified in the scientific background study (Biolink Ecological Consultants, 2013) that accompanies this Plan as well as any other existing roads. c. Utilise 'toolbox' in design and construction of roads within the Ballina Koala Planning Area.	2	Within one year of adoption of the Plan	6 months, ongoing	$15 000 (audit and plan)	Provide a suite of tools for use on local and regional roads, to minimise road hazards for koalas (e.g. speed reduction, signage, lighting, road verge maintenance, exclusion fencing and underpasses).

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
32	For any new roads proposed by Council within the *koala planning area*, apply the Development Assessment Framework of this Plan.	1	On adoption of the Plan	Ongoing	$0	Apply suitable assessment method in relation to implications of works and their potential for impact on koalas
33	Establish advisory signage on key roads within the Southern KMP.	2	Within one year of adoption of the Plan	6 months	$5000 - $10000	Improve road user awareness of koala population. Reduce incidence of road strike.
Dog management						
34	Apply the following in relation to dog management within the *koala planning area*: a. identify areas where koalas are at a high risk of contact with domestic dogs b. target monitoring of compliance in these areas in accordance with the provisions of the *Companion Animals Act* 1998 c. target education on responsible pet ownership to new dog owners and dog owners in high risk areas, including notations on 149(5) certificates d. review restrictions within existing dog exercise areas and ensure that use of these areas is compatible with the objectives of this Plan e. ensure any new leash-free areas are compatible with the objectives of the Plan	2	Within one year of adoption of the Plan	6 months, ongoing	$500 - $5000	Minimise risk and incidence of koala mortality from dog attacks.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
35	Liaise with North Coast Local Land Services with regard to wild dog management issues on an as needs basis.	2	Within one year of adoption of the Plan	3 months	$0 - $500	As above
Koala health and welfare						
36	Support a genetic study of koala populations in the Ballina, Lismore and Byron areas to establish the relationships between.	2	Within one year of adoption of the Plan (Note: RMS has funded a pilot program)	2 years	$0 - $500	Ascertain genetic characteristics and linkages between populations and movement corridors to aid future planning for koala populations.
37	Provide access to public land containing koala food trees for leaf harvest by koala care organisations.	2	Within two years of adoption of the Plan	Ongoing	$0 - $500	Demonstrate community and Council commitment to the koala population. Support local volunteer efforts. Provide a feed source to support koala care activities.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
38	Consult with Friends of the Koala and other like groups regarding: a. provision of records to the Atlas of NSW Wildlife b. standardising and improving the quality of data provided to the Atlas c. information sharing and community education opportunities.	3	Within three years of adoption of the Plan	6 months	$0 - 500	Ensure best possible information held in Atlas to inform Federal, State and Local Government decision-making. Utilise information to engage community about koala population.
Bushfire management						
39	Provide mapping of *preferred koala habitat* as a GIS layer to the Rural Fire Service and the Bushfire Risk Management Plan Committee	2	Within two years of adoption of the Plan	6 months	$0 - $500	Ensure best possible information held by RFS to inform decision-making.
40	Write to the Minister and the responsible Department with regard to the 10/50 Bushfire Management regulations and their impact on koala habitat	1	Within one month of adoption of the Plan	3 months	$0 - $500	Indicate potential impacts on koala (and other) habitat of 10/50 regulation.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
41	Consult with the Rural Fire Service and the Bushfire Risk Management Plan Committee regarding: a. updating the Bushfire Risk Management Plan for Ballina LGA to take into account the location and significance of *preferred koala habitat* b. providing a GIS layer that maps fire history within the Ballina LGA c. development and implementation of best practice fire management guidelines in relation to koala habitat by brigades located within the Ballina LGA.	2	Within one year of adoption of the Plan	Ongoing	$0 - 500	Ensure best possible information held by RFS and to inform decision-making. Consider koala management in bushfire planning.
Funding						
42	Provide annual financial support to koala welfare groups.	2	Within one year of adoption of the Plan	Ongoing	$500	Support provision of specialist management to sick and injured koalas.
Economic development and tourism						
43	Seek external funding to investigate feasibility of koala-based ecotourism opportunities within the shire.	3	Within five years of adoption of the Plan	12 months	$5000 – $10000	Identify economic development opportunities associated with the koala population.

Activity / Action ID	Management Action	Priority 1/2/3	Target for Implementation	Planned Duration	Estimated cost (per action per time, exclusive of staff time)	Rationale
44	Establish a brand, in conjunction with Lismore, for 'Koala Country' to enhance opportunities for accommodation and other tourism providers to leverage interest.	3	Within five years of adoption of the Plan	12 months, ongoing.	$5000 - $10000	Provide a point of interest for visitors to the area and a reason to visit hinterland areas. Support economic development opportunities associated with the koala population.
45	Establish an information display at appropriate locations to share information about the Important Koala Population in the shire.	2	Within 18 months of adoption of the Plan	6 months	$5000 - $10000	Identify importance of local population and vegetation supporting that population. Provide information to the community. Encourage communication and information sharing.

5.0 Development Assessment Framework

5.1 Overview

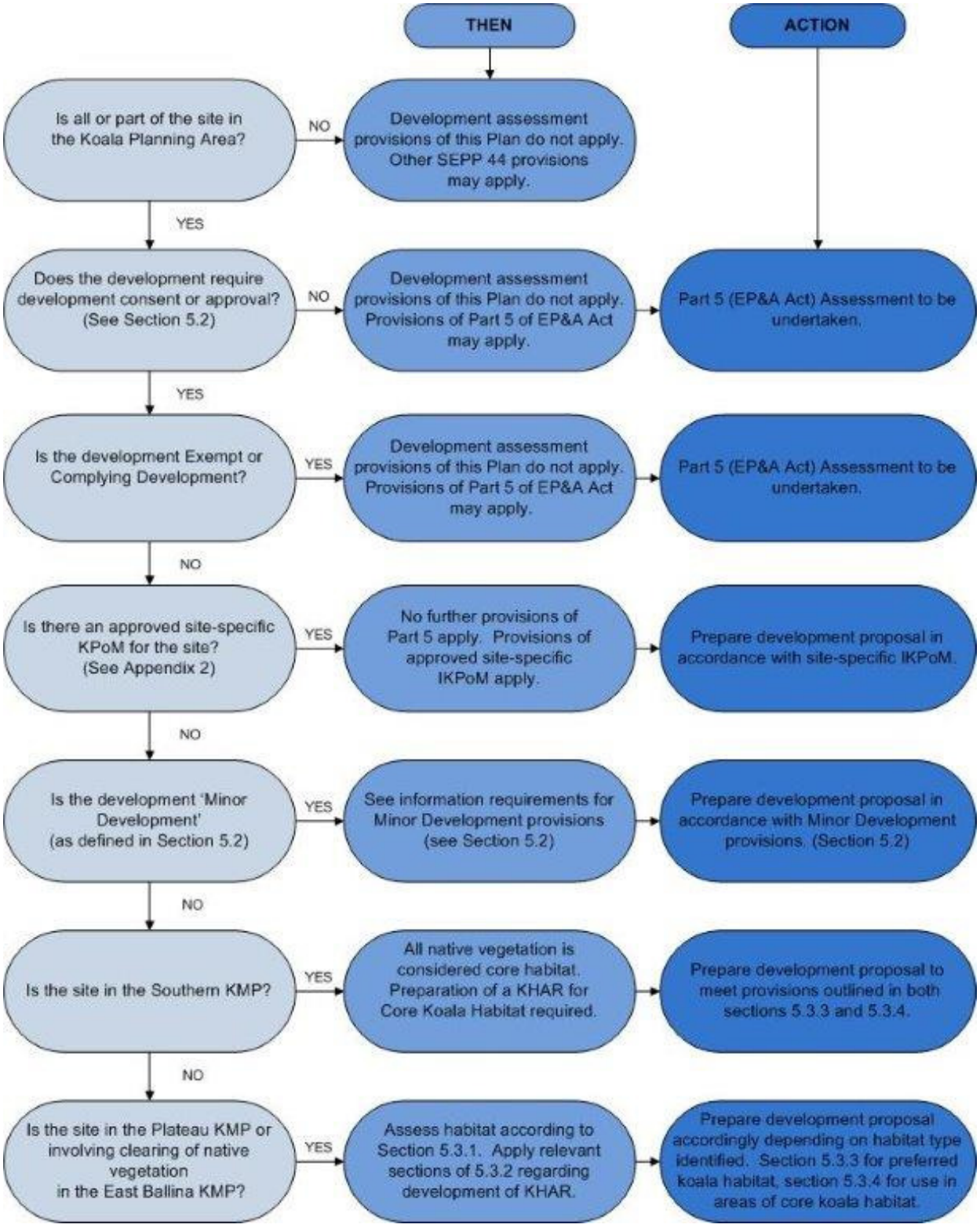
The provisions of this part of the Plan apply to development proposals within the Koala Planning Area that require the development consent.

The provisions of this part of the Plan apply to development that requires development consent regardless of the consent authority.

The provisions of this part of the Plan are also designed to be applied to development that requires approval under Part 5 of the *Environmental Planning and Assessment Act*, although such application is not the subject of SEPP 44

The following flowchart is a decision making framework to determine the application of the development assessment provisions of this Plan.

Figure 7 Development Assessment Pathway



5.2 Minor Development

Minor development is for the purpose of this Plan defined as follows:-

- New dwellings, or alterations to existing dwellings, where the proposed development envelope including any asset protection zones does not include Preferred Koala Habitat.
- Development on land that is consistent with a current previous approval granted over the same land in accordance with the provisions of this Plan.
- Boundary adjustments that do not provide the opportunity for intensification of development.

For all other development see Section 5.3

Information Required for Assessment of Minor Development

A development proposal for minor development shall include a description of the existing trees and vegetation including the following:-

a) a plan of the site showing the location and vegetation of existing trees and vegetation and its relationship to vegetation on neighbouring properties.
b) the above plan should identify the location of trees and vegetation proposed for removal, isolation (fenced), lopping or pruning and their position in relation to any proposed:
    a. dwelling or other building
    b. road or driveway
    c. bush fire asset protection zone
    d. or within 20 metres of any of the above.
c) the species and trunk diameter of each tree identified in (b) at 1.4m above the ground.

A suitably qualified Council officer will inspect any preferred koala food trees for evidence of koala activity. Should there be no suitably qualified Council officer available within a reasonable timeframe for assessment of the proposal, the proponent will be offered the opportunity to engage a suitably qualified person (see definitions) to undertake this survey at their own expense.

Framework for Consideration for Minor Development

a) The removal of preferred koala food trees is not permitted where the tree/s are actively used by koalas.

b) The proposed removal of any preferred koala food trees or preferred koala habitat is to be assessed on a case by case basis and if permitted will be conditioned to offset the loss in accordance with the Offset Requirements detailed in Appendix 3.

c) Buildings, driveways and other structures should be designed to avoid damage to (or from) any retained preferred koala tree(s) or preferred koala habitat.

d) Bush fire asset protection zones shall not encroach on preferred koala habitat.

e) In cases where approval is sought for a swimming pool, koala-proof fencing is to be installed if the development envelope is in or adjacent to core koala habitat, or if there is evidence of koala activity on or adjoining the subject property.

f) Minor development shall not otherwise result in or permit disturbance to koalas or their habitat.

Offsets will only be considered when all options to avoid or mitigate onsite impacts are considered and confirmed as unachievable. Offset provisions are available in Appendix 3.

5.3 Development Assessment Criteria

The purpose of this section is to ensure that new development positively contributes to the retention, protection, restoration and ongoing management of koala habitat consistent with the planning intent for the relevant Koala Management Precinct.

This section applies to all development proposals that required development consent that are within the Koala Planning Area (KPA) except development defined as minor development (Section 5.2).

For these development proposals, there is a requirement to undertake an assessment of koala habitat (including classification) in accordance with the following sections. Specific planning provisions apply to development proposals relating to areas of preferred and core koala habitat as outlined below.

5.3.1 Koala Habitat Assessment and Identification and Classification of Koala Habitat

Core Koala Habitat in Southern KMP

Given the complex nature and interdependency of habitat types in supporting the Important Population of the Southern KMP, all land supporting preferred koala habitat (Primary, Secondary A, Secondary B or Secondary C vegetation) and individual preferred koala food trees within this area are defined as core koala habitat. This includes areas mapped as preferred koala habitat under this Plan as well as areas identified as preferred koala habitat and individual koala food trees documented though detailed site assessment that is undertaken.

Assessment Criteria for Southern, Plateau and East Ballina KMPs

The following assessment criteria is to be applied to determine the presence of preferred and core koala habitat and koalas within the KMPs.

a) All development proposals must be accompanied by a koala habitat assessment report.
b) The koala habitat assessment report must be prepared by a *suitably qualified person* with relevant experience and training in both the application and interpretation of the RG-bSAT approach (Appendix 2).
c) Any land with vegetation identified as preferred koala habitat and contains one or more species of preferred koala food trees must be assessed as detailed in Table 4.

d) Any RG-bSAT grid cell where koala activity is categorised as greater than 10% on erosional or residual soils within the koala planning area or greater than 22.52% on coastal soils must be classified as core koala habitat within the meaning of SEPP 44;
e) Where there are historic koala records within a 2.5km radius of the study area that relate to koala sightings for any two of the three most recent koala generations then this land is to be classified as core koala habitat within the meaning of SEPP 44.

Table 4 Regularised Grid-based Spot Assessment Technique (RG-bSAT) Grid Cell Sampling Intensities for Various Land Areas

Area of study area	Initial RG-bSAT sampling intensity	Detailed RG-bSAT sampling intensity
>1 ha but <15 ha	150 m x 150 m	75 m x 75 m
15–50 ha	250 m x 250 m	125 m x 125 m
>50 ha	350 m x 350 m	175 m x 175 m

Vegetation communities that otherwise contain preferred koala food tree species but wherein significant koala activity is not recorded should be mapped a preferred koala habitat.

5.3.2 Koala Habitat Assessment Reports

This section applies to development proposals within the koala planning area. A koala habitat assessment report may be presented as a stand-alone report or included as part of the larger ecological assessment report, provided the minimum structure and content requirements in Table 5 are addressed. In this instance, content pertinent to koala habitat assessment and proposed future management options should be able to be read as one section or chapter.

The intent of a requirement for a koala habitat assessment report is to assist Council in determining the potential impacts a proposal may have on koalas, core koala habitat and preferred koala habitat.

The suggested framework for reporting in this document does not remove the obligation of proponents to present a holistic picture of the possible environmental or social impacts of the proposal as an integrated whole.

The amount of detail required within the report will be dependent on the size and potential impact of the proposed development and the type of koala habitat assessed as being present.

Koala Habitat Assessment Reports – Areas of Preferred Habitat

Development proposals must be accompanied by a stand-alone koala habitat assessment report or broader ecological assessment report that addresses impacts on koalas and koala habitat. The reporting must be prepared to address the matters set out in Table 5 and address the following:

1. Provide an accurate plan and/or aerial photograph indication the location of:
    - The subject site and proposed development footprint.
    - Location of any preferred koala habitat (an initial review of this is available from Council's Koala Habitat Layer but this should be supplemented with a survey of vegetation including all trees, specifically koala food trees, a review of understorey species and a classification of the vegetation community on the land (if there is one defined). Unique identifiers should be used to identify trees on the plan.
2. A table detailing the species, size class (<100mm dbhob, 100-300mm dbhob and >300mm dbhob) of all trees proposed to be removed, lopped or isolated from koala use (not only koala food trees). This table is also to include the total land area affected.
3. Assessment of the site specific impact of the removal of the identified trees and species.
4. Demonstration of the following:

a. That the development is located, designed, constructed and managed to avoid adverse impacts on koala food trees and/or preferred koala habitat. Where adverse impacts cannot be avoided, these impacts should not result in any overall net loss of koala food trees and/or preferred koala habitat.
b. That linkages between preferred koala habitat on site are maintained, and safe koala movement across the site is not impeded.
c. The development does not contribute to fragmentation or isolation of preferred koala habitat or koala linkages across the development area.
d. That proposed bushfire asset protection zones do not result in the clearing of koala food trees and/or preferred koala habitat unless this clearing has been explicitly addressed and compensated for as a part of the development proposal.
e. That there is no potential for offsite impacts to contribute to the loss of koala food trees and preferred koala habitat as a result of the granting of development consent.

Table 5 Minimum Requirement for Koala Habitat Assessment Report – Preferred Koala Habitat

1.0 Background
Briefly describe the nature of the proposed development.
Identify the *Ballina LEP* zoning(s) of the *study area* and adjacent areas.
2.0 Links to legislation, other plans and documents
Demonstrate how the report links to legislation, other plans and documents that relate to the proposed development.
3.0 Identification of Study Area/Methodology
Identify the subject site and proposed development footprint.
Describe the location, type, extent and current condition of existing koala habitat in the study area. (An initial review of this is available from Council's Koala Habitat Layer but this should be supplemented with a survey of vegetation including all trees, specifically koala food trees, a review of understorey species and a classification of the vegetation community on the land (if there is one defined). Unique identifiers should be used to identify trees on the plan.
Describe the methodology used to sample the vegetation on the study area.
Describe the broader context of other vegetation in the study area and the landscape in general.
Detail any environmental constraints and any significant or sensitive environmental features of the study area.
A table detailing the species, size class (<100mm dbhob, 100-250mm dbhob and >250mm dbhob) and the unique identifier of all trees proposed to be removed, lopped or isolated from koala use (not only koala food trees). The table is also to include the total land area affected.
4.0 Results and Conclusion
Assessment of the site specific impact of the removal of the identified trees and species
Contributory impact of vegetation removal to fragmentation of koala habitat in the locality.
5.0 References
Include a list of all references cited in the report.
6.0 Appendices
Include any additional information or supplementary material pertinent to the DA proposal.

Koala Habitat Assessment Reports – Areas of Core Koala Habitat

Where habitat is classified as core koala habitat, a higher degree of assessment is required in the KHAR. The report is to be prepared consistent with the requirements for reporting in relation to preferred koala habitat and address the matters set out in Table 6. Additional information over and above the structure and content requirements detailed in this table may also be required according to the nature of the proposed development and Council requirements.

Table 6 Additional Reporting Requirements for Koala Habitat Assessment Report – Core Koala Habitat

1.0 Background	
• Briefly describe the nature of the proposed development.	□
• Identify the *Ballina LEP* zoning(s) of the *study area* and adjacent areas.	□
2.0 Links to legislation, other plans and documents	
• Demonstrate how the report links to legislation, other plans and documents that relate to the proposed development.	□
3.0 Study Area	
• Identify the location and extent of the *study area* to be covered by the report, including the *study area* and any other areas that may be directly or indirectly impacted by the proposed development.	□
• Describe the type, extent and current condition of existing *koala habitat* in the *study area* with reference to Council's Koala Habitat Layer and the Koala Habitat Study 2013 (Biolink).	□
• Describe the broader context of other vegetation in the *study area* and the landscape in general.	□
• Detail any environmental constraints and any significant or sensitive environmental features of the *study area*.	□
4.0 Methods	
• Describe in detail the methodology used to sample the vegetation on the *study area*.	□
• Include a map/plan with the overlain grid used to identify detailed and initial RG-bSAT sampling sites (see Appendix 2 for method)*	□
5.0 Results	
• Include an accurate map/plan detailing the location of: o the subject site, proposed development footprint, associated *infrastructure* and any requirement for an asset protection zone; o all *food trees* including those that are proposed to be removed, lopped or isolated from koala use (e.g. fenced). Each tree should be marked with a unique identifier; o all vegetation including *food trees*, and any areas of *preferred koala habitat* or *core koala habitat* as determined by the RG-bSAT assessment (see Appendix 2 for method); o any *food trees* and/or *koala habitat* that are proposed to be directly and/or indirectly impacted, removed, regenerated and/or revegetated. Each tree should also be marked with a unique identifier.	□
Include a table detailing the: o area of all vegetation by vegetation type (including koala habitat), identifying any area of vegetation proposed to be removed, regenerated and/or revegetated; o a table detailing the species, diameter at breast height over bark (dbhob) and the unique identifier of all trees proposed to be removed, lopped or isolated from koala use; o species, size class (<100 mm dbhob, 100–300 mm dbhob and >300 mm dhob) and number of food trees that are proposed to be removed, lopped or permanently isolated from koala use.	□
6.0 Conclusion	
• Identify limitations to the assessment and further issues that might need to be addressed.	□
• Interpret and discuss the results of the koala habitat assessment. • Include discussion on any alternative options considered and why these options have been rejected as not feasible.	□
• Include a proposal for a Habitat Compensation Plan that meets the habitat compensation guidelines in this Plan.	□
• Assessment of the site specific impact of the removal of the identified trees and species. • Identification of likely indirect impacts on koalas, *preferred koala habitat* or *koala food trees*. • Consideration of the contributory impact of vegetation removal to fragmentation of koala habitat in the locality.	
7.0 References	
• Include a list of all references cited in the report.	□
8.0 Appendices	
• Include any additional information or supplementary material pertinent to the DA proposal.	□

In addition to the above, the koala habitat assessment report must demonstrate the following:

a. That there are no net adverse impacts on koala habitat as at the conclusion of the development, or one year, whichever is the shorter.

b. that the development is located, designed, constructed and managed to avoid adverse impacts on koala food trees and/or preferred koala habitat. Where adverse impacts cannot be avoided, these impacts should not result in any overall net loss of koala food trees and/or preferred koala habitat.

c. That linkages between preferred koala habitat on site are maintained, and safe koala movement across the site is not impeded.

d. The development does not contribute to fragmentation or isolation of preferred koala habitat or koala linkages across the development area.

e. That proposed bushfire asset protection zones do not result in the clearing of koala food trees and/or preferred koala habitat unless this clearing has been explicitly addressed and compensated for as a part of the development proposal.

f. That there is no potential for offsite impacts to contribute to the loss of koala food trees and preferred koala habitat as a result of the granting of development consent.

5.3.3 Framework for consideration for land identified as unoccupied areas of preferred koala habitat

The consent authority must consider a development proposal for land identified as containing unoccupied areas of preferred koala habitat consistent with the following. Conditions of development consent appropriate to address the impact of the proposed development may be imposed.

Potential direct and indirect impacts on food trees and/or koala habitat

a. Council may grant development consent only if it is satisfied that:

   i. the development does not result in any net loss of *food trees* and/or *koala habitat;*

   ii. the development is located, designed, constructed, and managed to avoid adverse impacts on *food trees* and/or *koala or their habitat*;

Maintain habitat linkages and safe koala movement

b. Council may grant development consent only if it is satisfied that the development:

i. maintains any linkages between areas of koala habitat across the study area;

ii. maintains any koala movement corridors across the study area;

iii. does not result in development which would impede safe koala movement across the study area (or beyond);

c. Measures which maintain habitat linkages and allow for safe koala movement may be incorporated into the design and construction of the development;

d. Council must consider the need to revegetate cleared land within *koala movement corridors*;

Location of bushfire asset protection zones

e. development consent may be granted only if Council is satisfied that any necessary bushfire asset protection zones to be created do not result in the clearing of *food trees* and/or koala habitat;

No-build zones

f. In assessing a proposal, Council should give consideration to:

i. establishing *no-build zones* of a minimum 15 metres distance from the trunk of retained trees such that retained trees do not pose a future hazard to persons or property 9refer to AS 4970-2009: protection of trees on development sites);

ii. precluding the construction of dwellings and buildings and the like within *no-build zones*;

iii. identifying the location of any *no-build zones* on the deposited plan and registering them as a restriction on the land title;

Retention of replacement trees and/or koala habitat

g. Council may grant development consent only if it is satisfied that:

i. where *food tree* replacement measures or habitat compensation measures (Appendix 3) are proposed, measures are in place to ensure the long-term retention of replacement *food trees* and/or *koala habitat*;

ii. such measures may include the erection of exclusion fencing and/or covenant restrictions on title;

iii. Council may apply a deferred commencement clause to allow time for the replacement food trees and/or koala habitat to establish sufficiently to support wildlife, including koalas;

Protection of koalas, food trees and koala habitat during construction works

h. Council may grant development consent only if it is satisfied that appropriate measures are in place to ensure retained *food trees* and/or *koala habitat* is/are protected during construction works on the site;

i. Appropriate protection measures include:

   i. erection of temporary fencing 1.8 metres high around the *tree protection zone* of any retained *food trees* to protect retained trees during construction works;

   ii. erection of signage to provide clear and accessible information to indicate that a *tree protection zone* has been established;

   iii. preclusion of activities such as construction, excavation, storage of materials and the parking of vehicles and plant within any *tree protection zone*;

j. A minimum of 7 days prior to approved clearing, temporary fencing that excludes koalas must be erected around trees approved to be cleared in order to minimise the risk of koalas occupying the trees on the day that clearing takes place;

k. Where approved clearing of vegetation is proposed, development consent may be granted only if Council is satisfied that measures are in place to ensure that:

   i. on the day of clearing and prior to any clearing taking place, all trees within 30 metres of those trees to be cleared are to be inspected for the presence of koalas from at least two locations by an *accredited person* experienced in koala spotting;

   ii. the *accredited* person will not be involved in the vegetation clearing works whilst responsible for identifying koalas present on the site and will remain on site during any vegetation clearing works to ensure that any tree occupied by a koala is not accidentally cleared or interfered with;

l. Should koalas be found on site during the clearing of native vegetation and/or earthworks:

   i. must be temporarily suspended within a range of 30 metres from any tree which is occupied by a koala;

   ii. must be avoided in any area between the koala and the nearest areas of habitat to allow the animal to move to adjacent undisturbed areas;

   iii. must not resume until the koala has moved from the tree of its own volition.

5.3.4 Framework for consideration for land identified as core koala habitat

The consent authority must consider a development proposal for land identified as containing core koala habitat consistent with the requirements set out in 5.3.3 and the following. Conditions of development consent appropriate to address the impact of the proposed development may be imposed.

Removal of trees

a. The removal of any preferred koala food tree is not permitted if actively used by koalas.

b. The removal of any preferred koala food tree is not permitted for trees with a trunk diameter greater than or equal to 250mm at 1.4m above the ground

c. The removal of any preferred koala food tree with a trunk diameter less than 250mm at 1.4m above the ground shall be assessed on a case by case basis and if permitted, will be conditioned, to offset the loss, in accordance with the offset requirements detailed in Appendix 3.

d. Any removal of preferred koala habitat will be conditioned, to offset the loss, in accordance with the Offset Requirements detailed in Appendix 3.

Lot boundary fencing

m. Pursuant to this clause, Council may grant development consent only if it is satisfied that any new lot boundary fencing on land containing or adjacent to core koala habitat does not impede safe koala movement across the subject site;

n. Fences that do not impede safe koala movement may include:

   i. hedges or screens of trees and/or shrubs;

   ii. fences where the bottom of the fence is a minimum of 300 mm above the ground to allow koalas to freely move underneath;

   iii. fences that are easy for koalas to climb (e.g. sturdy chain mesh fences not topped by barbed wire, or solid style fences with a timber 'post and bridge' system over the fence at regular intervals of less than 20 metres);

   iv. open post and rail fences;

   v. post and 4 or 5 strands of plain wire, barbed wire or some combination of plain and barbed wire, where the bottom strand of wire is a minimum 300 mm above the ground at any in-line fence post and/or dropper;

o. Pursuant to clause (r) above, for land where livestock agriculture is a permitted activity, the design of new lot boundary fencing is subject to the landholders' requirements to secure livestock; however, this does not remove their responsibility to ensure safe koala movement by use of a fence that will meet the requirements stated in clause (r).

Swimming pools

p. Before granting development consent for the installation of swimming pools on land containing or adjacent to core koala habitat, Council must include measures to ensure that all new swimming pools:

   i. incorporate features that allow koalas to easily escape from the pool, namely, a shallow ramp and/or a stout rope (minimum 50 mm diameter) that trails in the pool at all times and is secured to a stable poolside fixture;

   ii. notwithstanding the provisions of the Swimming Pools Act 1992, swimming pool fencing must exclude koalas (i.e. not be constructed of timber or have timber posts);

   iii. shrubs and/or trees that koalas could use to climb over the pool fence must not be planted within 1 metre of the swimming pool fence;

q. This clause does not apply to the installation of farm dams;

Keeping of domestic dogs

r. Council may grant development consent to a proposal on land containing or adjacent to core koala habitat only if it is satisfied that:
    i. the keeping of domestic dogs is prohibited by covenant restrictions on title; or
s. pursuant to Clause (v) above, any fence that is intended to contain dogs and exclude koalas should be located more than 2 metres away from any trees that koalas could use to cross the fence;

Road design standards

t. Council may grant development consent to proposals on land containing or adjacent to core koala habitat only if it is satisfied that the proposed development has made provision for:
    i. appropriate road design standards, warning signage, traffic calming devices, and roadside lighting which restrict motor vehicles to a maximum speed of 40 kilometres per hour within the subject site where possible;
    ii. for roads where the maximum speed of motor vehicles must be greater than 50 kilometres per hour in urban areas or greater than 60 kilometres per hour in rural areas, appropriate measures are required to exclude koalas from roads and minimise the likelihood of impediments to safe koala movement;
    iii. specifications for road design standards, signage, koala exclusion fencing, underpasses, traffic calming devices and any other mitigation measures must be explicitly included with the documentation supporting the DA;
    iv. the maintenance of any mitigation measures detailed in relation to the above.

5.4 Rezonings and Local Environmental Plans

The purpose of this section is to ensure that future strategic land use planning supports the retention, protection, restoration and ongoing management of koala habitat and koala food trees consistent with the planning intent for the relevant Koala Management Precinct. Land use planning processes must not compromise the existing or future ability of the land to support koalas and koala habitat.

Information requirements for the preparation of local environmental plans, including requests for a change to zonings applied to land, are the same as those for Section 5.3. Assessment requirements are also detailed within Section 5.3.

5.5 Removal of Noxious Weeds

It is not the intention of this Plan to impede the removal of noxious weeds. In the event that the provisions of this Plan are triggered in relation to noxious weed removal, the weed

removal activity is to be assessed in accordance with the requirements for minor development.

Dictionary

In this Comprehensive Koala Plan of Management, the following definitions apply:

"**accredited person"** means a person with experienced or with qualifications in koala spotting for the purposes of ensuring koala safety during works

"Assessment Report" means "Koala Habitat Assessment Report" for either "small impact development" or "large impact development" as detailed in Section 4.2 of this Plan.

"building envelope" means an area of land designated for construction of a dwelling, buildings and ancillary infrastructure as well as any land required to be cleared for a bushfire asset protection zone (inner zone), ancillary gardens and landscaping.

"Comprehensive Koala Plan of Management" means a plan of management prepared in accordance with *State Environmental Planning Policy 44 – Koala Habitat Protection*.

"core koala habitat" means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population. This is the same meaning as that defined by *State Environmental Planning Policy 44 – Koala Habitat Protection*.

"development" means:

(a) the use of land, and
(b) the subdivision of land, and
(c) the erection of a building, and
(d) the carrying out of a works, and
(e) the demolition of a building or works, and
(f) any other act, matter or thing referred to in section 26 (of the *Environmental Planning & Assessment Act 1979*) that is controlled by an environmental planning instrument, but does not include any development of a class or description prescribed by the regulations for the purposes of this definition.

This is the same meaning as that defined by the *Environmental Planning & Assessment Act 1979.*

"development application" or **"DA"** means an application for consent under Part 4 of the *Environmental Planning & Assessment Act 1979* to carry out development but does not include an application for a complying development certificate. This is the same meaning as that defined by the *Environmental Planning & Assessment Act* 1979*.*

"development footprint" means the land that is likely to be impacted by any "small impact development", including any asset protection zone and ancillary infrastructure.

"diameter at breast height over bark" or **"dbhob"** is the diameter of a tree measured 1.4 metres above the ground.

"EP&A Act" means the Environmental Planning and Assessment Act 1979.

"greenfield site" means land that is substantially undeveloped (except for agricultural use) that has not been previously developed for an urban and/or residential land use.

"ha" means hectares.

"infrastructure" means all structures associated with the construction of a single dwelling, dual occupancy and/or secondary dwelling and includes gardens, landscaping, water tanks, on-site waste water management systems, any access route, road or driveway; but excludes farm dams.

"koala habitat" means "core koala habitat" and/or "preferred koala habitat".

"koala movement corridor" means an area or tract of land that is used, or could be used, by koalas when moving between different areas of their home range or habitat. These areas may include cleared land; but do not include "koala habitat".

"koala planning area" means the land to which this Plan applies as described and mapped in this Plan.

"**koala management precincts**" means land within the Southern (Bagotville/Meerschaum Vale/Wardell) precinct, the Plateau precinct or the East Ballina precinct as described and mapped in this Plan.

"land" includes:

(a) the sea or an arm of the sea,
(b) a bay, inlet, lagoon, lake or body of water, whether inland or not and whether tidal or non-tidal, and
(c) a river, stream or watercourse, whether tidal or non-tidal, and
(d) a building erected on the land.

This is the same meaning as that defined by the *Environmental Planning & Assessment Act 1979.*

"Ballina DCP" means Ballina Development Control Plan.

"Ballina LEP" means the Ballina Local Environment Plan 2012.

"LGA" means local government area.

"mm" means millimetre.

"no-build zone" means a designated area of land where the construction of dwellings, buildings and the like are precluded.

"PoM" means plan of management.

"preferred koala habitat" means any area identified as either Primary, Secondary A or Secondary B koala habitat as defined in the table below.

Vegetation	Category	Definition
Vegetation classified as Preferred	Primary	Vegetation associations and/or communities wherein "primary food tree species" comprise the dominant or co-dominant (i.e. ≥ 50%) overstorey tree species.

Koala Habitat	Secondary A	Vegetation associations and/or communities wherein "primary food tree species" are sub-dominant components of the overstorey tree species and usually (but not always) growing in association with one or more "secondary food tree species".
	Secondary B	Vegetation associations and/or communities wherein "primary food tree species" are absent, habitat containing "secondary and/or supplementary food tree species" only.
Other Vegetation	Other	Native vegetation associations and/or communities within which "preferred koala food trees" are absent. In the Southern KMP, 'other vegetation' is included in the definition of Core Koala Habitat. See text for details.
	Unknown	Vegetation for which there is insufficient data available to enable classification. This includes both individual trees and clumps of trees which are unmapped owing to the resolution of the mapping. These trees may be verified as *koala habitat* by a Koala Habitat Assessment.

"preferred koala food tree" or **"food tree"** means any of the following tree species:

	Common Name	Scientific Name
Primary food tree species	Forest red gum*	*E. tereticornis*
	Tallowwood#	*E. microcorys*
	Swamp mahogany	*E. robusta*
Secondary and/or supplementary food tree species	White mahoganies	*E. acmeniodes/carnea*
	Blackbutt	*E. pilularis*
	Red Mahogany	*E. resinifera*
	Blackwood	*Acacia melanoxylon*
	Forest Oak	*Allocasuarina torulosa*
	Pink Bloodwood	*Corymbia intermedia*
	Brush Box	*Lophostemon confertus*

* includes the naturally occurring *E. tereticornis* x *E. robusta* hybrid referred to as *E. patentinervis* (Bale, 2003).
# on medium and high and nutrient soil landscapes, where occurring on low to medium soil landscapes, functions as a secondary koala food tree species.

"receiving land" means the area of land receiving the benefit of food tree compensation measures and/or habitat compensation measures.

"RG-bSAT" means Regularised Grid-based Spot Assessment Technique.

"SEPP 44" means State Environmental Planning Policy 44 – Koala Habitat Protection.

"stadia survey" means stadiametric survey, the recording of the precise location and species identity of all "preferred koala food trees" on a site, and is to be carried out by a registered surveyor and an appropriately qualified ecologist.

"study area" means the "subject site" and any additional areas that are likely to be directly and/or indirectly impacted by a "large impact development", including any asset protection zone, ancillary and off-site works.

"subject site" means the allotment(s) to which a development application applies.

"suitably qualified person" means a person with a minimum undergraduate qualification in ecology, environmental management, forestry or similar from a recognised university and with experience in flora and fauna identification, survey and management, including experience in conducting koala surveys. Where such person has less than five years experience, they shall be under the supervision of a suitably qualified person according to this definition. A Council Officer may meet these criteria.

"the Plan" or **"this Plan"** means the "Comprehensive Koala Plan of Management for Ballina".

"TSC Act" means the Threatened Species Conservation Act 1995.

"tree" means a perennial plant with a woody self supporting stem or trunk/s having a height of more than 3 metres and a trunk circumference of more than 300 millimetres when measured from 1 metre above ground level. This is the same meaning as that defined in the Ballina Development Control Plan Chapter 1 – Administration, Appendix 2 – Dictionary.

"tree protection zone" means the area above and below the ground and at a given distance from the trunk set aside to protect a tree's roots and crown from development activity.

"VMP" means vegetation management plan.

"VCA" means voluntary conservation agreement.

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Appendix 1

Approved Individual Koala Plans of Management within Ballina Shire

BSC DA No.	DoP File No.	Address	Lot(s)/DP(s)
2007/893		1 Bundaleer Road, Broken Head	Lot 1 DP 259078

Appendix 2

Sampling and assessment of koala habitat using the Spot Assessment Technique and the Regularised Grid-based Spot Assessment Technique

The SAT and RG-bSAT approach (Phillips & Callaghan 2011) is a standardised sampling tool. For the purposes of this Plan, it is intended that this assessment be undertaken by a *suitably qualified person* with relevant experience and training in both the application and interpretation of the RG-bSAT approach. The sampling principles of RG-bSAT, key elements of data analysis and modelling of associated koala activity data are currently the subject of a separate publication (Phillips *et al.*, 2011, submitted).

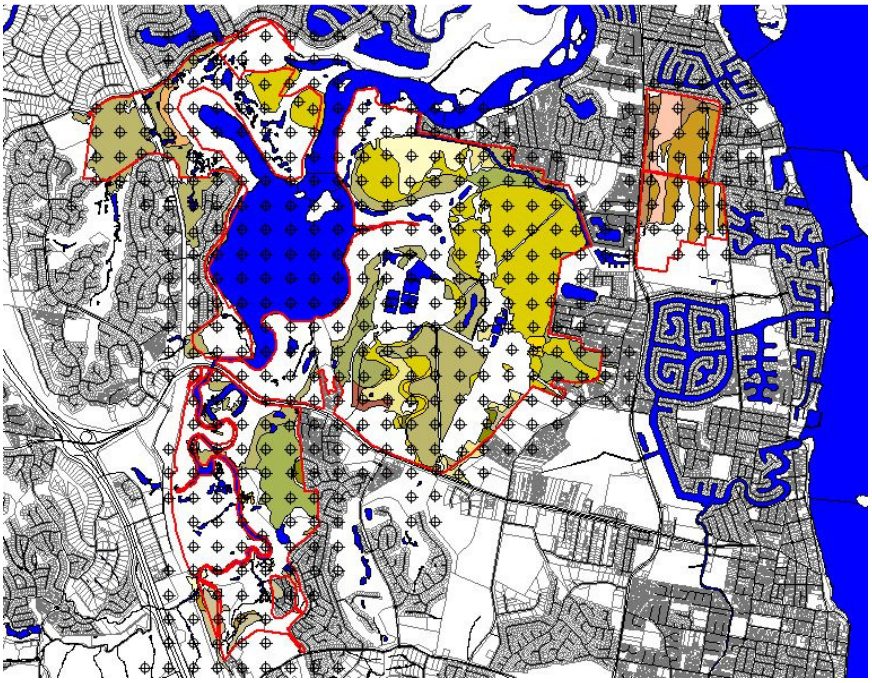
Following is a step-by-step account of how to work with the RG-bSAT approach using a notional 1500 hectare study site.

Step 1

Determine appropriate sampling intensities for the site to be assessed using Table 2 in this Plan.

Step 2

a. Overlay a map/aerial photo of the *study area* with a square grid the dimensions of which correspond to the "high sampling intensity" detailed in Table 2.



b. Then, use the resulting grid-cell intersections to identify those points that fall upon areas of land wherein 30 trees of any species that have a dbhob ≥ 100mm could theoretically

be sampled within a radius approximately equal to that of 50% of the sampling intensity being utilised (e.g. 75m = 38m radius, 125m = 73m etc). The map/aerial photo should look like the diagram below (⌖ indicate sampling site locations).

c. Disregard any potential field sites that fall within areas such as water bodies or areas that do not have measurable forest cover.

Step 3

a. Preliminary sampling of the *study area* should be undertaken at intervals commensurate with the "initial sampling intensity" sites specified in Step 1.

b. Sampling is to be undertaken at each sampling point using the Spot Assessment Technique (SAT) (Phillips & Callaghan, 2011). For the:-

i. Southern KMP

Resulting koala activity levels at each field site are then interpreted as significant if greater than 10% on erosional or residual soil landscapes (Morand, 1994) or greater than 22.52% if on low-lying aeolian or alluvial or swamp landscapes (Morand, 1994). For any of the "initial sampling intensity" sites that returned significant activity levels, sampling utilising the "detailed sampling intensity" (Table 2) surrounding these sites should also be undertaken.

ii. Plateau KMP

Resulting koala activity levels at each field site are interpreted as significant is greater than 10% on the residual or erosional soil landscapes within the Plateau KMP. For any of the "initial sampling intensity" sites that returned significant activity levels, sampling utilising the "detailed sampling intensity" (Table 2) surrounding these sites should also be undertaken.

c. It is not necessary to sample the "detailed sampling intensity" sites between any two sites that have recorded significant koala activity as defined in b above. The contours will be assumed to be constant.

d. If no "Medium (normal) use" or "High use" sites are detected, no further assessment of the site is required.

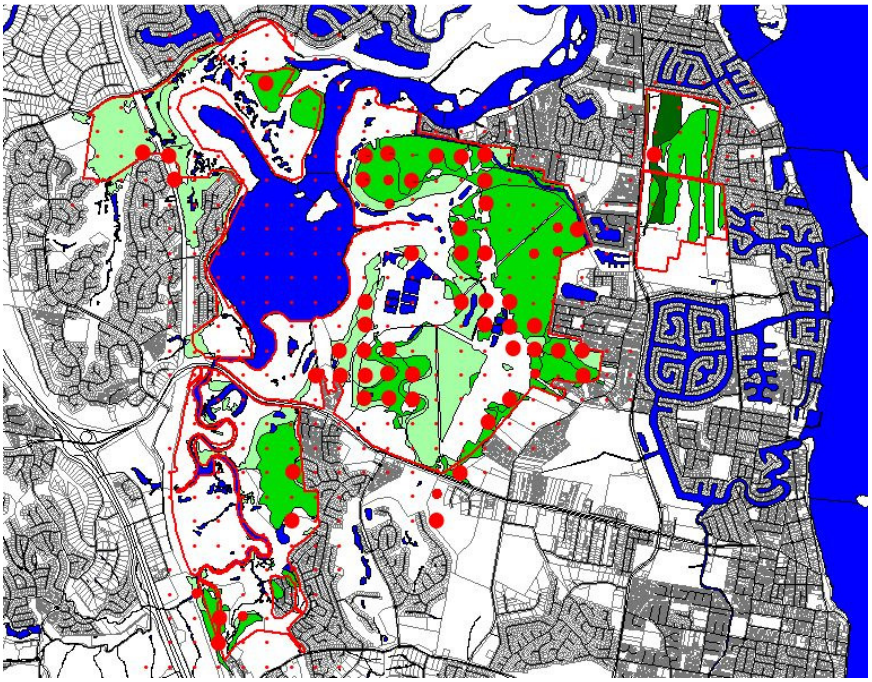
Step 4

a. In the absence of a suitable spatial modelling technique such as splining, all SAT sites wherein significant koala activity has been recorded must become the central point of a grid cell, the size of which must be commensurate with sampling intensity as follows.

- For 75m sampling intersections, the grid cell size will be 75m x 75m (0.56ha)
- For 125m sampling intersections, the grid cell size will be 125m x 125m (1.56ha)
- For 175m sampling intersections, the grid cell size will be 175 x 175m (3.06ha)

b. The map/aerial photo should now look like the diagram below (red circles indicate sampling site locations, and the centre of grid cells referred to in (a) above, with size graduations as appropriate to the soil landscape being sampled. The size of the cells should indicate "Low use"(•), "Medium (normal) use"(•) and "High use" sites(●)).

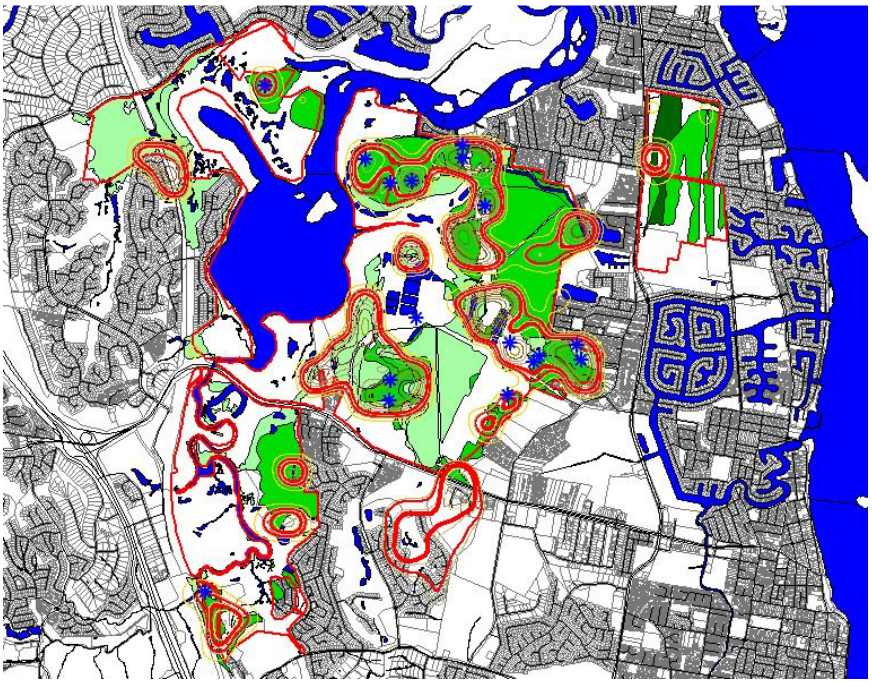
c. All areas within a grid cell identified that returned significant koala activity levels as defined by b above must be regarded as *core koala habitat* for the purposes of this plan.



Step 5

a. Koala activity data should then be interpolated to cover the assessment area using a suitable spatial modelling technique such as splining (see Phillips *et al.*, 2011, in review).

b. The map/aerial photo should now look like the diagram over page. The model below was created using lightly weighted thin plate splining techniques to delineate the boundaries (red lines) of areas of *core koala habitat*.



Final result from Regularised Grid Spot Assessment Technique

The *Spot Assessment Technique*: a tool for determining localised levels of habitat use by Koalas *Phascolarctos cinereus*

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ABSTRACT

In order to more effectively conserve Koalas, the National Koala Conservation and Management Strategy 2009 – 2014 promotes the need for reliable approaches to the assessment of Koala habitat. This work describes a point-based, tree sampling methodology that utilises the presence/absence of Koala faecal pellets within a prescribed search area around the base of trees to derive a measure of Koala activity. Confidence intervals associated with Koala activity data from 405 randomly selected field plots within which faecal pellets were recorded have been utilised to assign threshold values for three population density/habitat biomes in eastern Australia. Subject to the need for a precautionary approach to data interpretation in areas that support naturally occurring, low-density Koala populations, the approach is expected to assist field-based assessments by researchers, land managers and others interested in clarifying aspects of habitat utilisation by free-ranging Koalas, especially where identification of important areas for protection and management is required.

Key words: Spot Assessment Technique, Koala, *Phascolarctos cinereus*, SEPP 44.

Introduction

The primary aim of the National Koala Conservation and Management Strategy 2009 – 2014 (NKCMS) is to conserve the Koala (*Phascolarctos cinereus*) by retaining viable populations in the wild throughout the species' natural range (Natural Resource Management Ministerial Council (NRMMC) 2009). In order to assist this aim, Action 1.06 of the NKCMS promotes the need for development of standard monitoring/habitat assessment protocols as a means of addressing the issue of inconsistency and disagreement over how koala populations should be surveyed and mapped (NRMMC 2009).

The primary responsibility for conservation of free-ranging *P. cinereus* populations rests with State, Territory and Local Government authorities. In this regard State Government authorities in New South Wales and Queensland have enacted specific planning policies and/or strategic planning measures to assist *P. cinereus* conservation efforts. However, the ability of such approaches to achieve their stated conservation objectives is impeded in part by the lack of standardised and reproducible methods that can be applied to the task of *P. cinereus* habitat/population assessment in the first instance.

In this paper we present a technique that we believe contributes to the need for a reliable approach to objectively assessing aspects of habitat use by *P. cinereus*. An unreviewed progenitor to this work (Phillips and Callaghan 1995) was originally circulated to a limited audience following the Australian Koala Foundation's 1995 conference on the status of Koalas, its purpose at that time to promulgate an approach that could potentially assist field-based assessments by ecological consultants, land managers and others interested in quantifying aspects of habitat utilisation by free-ranging *P. cinereus*. The purpose of this paper is to further refine the initial approach in the light of feedback and additional field studies and in so doing, formally supersede the earlier work.

Background to the approach

Traditionally, knowledge relating to habitat utilisation by free-ranging *P. cinereus* has been primarily reliant on opportunistic observations or radio-tracking data (Robbins and Russell 1978; Martin 1985; Hindell *et al.* 1985; Hindell and Lee 1987; 1988; White and Kunst 1990; Reed *et al.* 1990; Hasegawa 1995; Melzer and Lamb 1996; Pieters and Woodhall 1996). In other instances, emphasis has been placed on benign indicators such as accumulated faecal pellet counts (Moon 1990; Munks *et al.* 1996; Pahl 1996) and scratch marks. However, all of these approaches can be problematic. Firstly, existing models for determining tree preferences by free-ranging *P. cinereus* (Hindell *et al.* 1985) require a number of assumptions to be met which do not appear to hold in heterogeneous forest communities (Phillips 1999; Ellis *et al.* 2002). Secondly, while careful analysis of accumulated faecal pellet counts can elucidate issues of *P. cinereus* abundance (Sullivan *et al.* 2002, 2004), such

counts have proved to be of limited value when used to infer the importance of various tree species (Munks *et al.* 1996; Pahl 1996). The ability to census and interpret faecal pellet deposits can also be influenced by other variables including visibility, tree morphometrics and insect activity (Achurch 1989; Jones 1994; Melzer *et al.* 1994; Pahl 1996; Ellis *et al.* 1998; Sullivan *et al.* 2003). Scratch marks on trees are also an unreliable indicator of habitat use – they cannot be detected on some species whereas others retain them for long periods of time - nor is it always possible to confidently distinguish scratches made by *P. cinereus* from those of other arboreal animals.

Studies of free-ranging *P. cinereus* populations have established that those in stable breeding aggregations arrange themselves in a matrix of overlapping home range areas (Lee and Martin 1988; Faulks 1990; Mitchell 1990). Home range areas vary in size depending upon the quality of the habitat (measurable in terms of the density of preferentially utilised food tree species) and the sex of the animal (males tend to have larger home range areas than females). Long-term fidelity to the home range area is generally maintained by adult *P. cinereus* in a stable population (Mitchell 1990; Phillips 1999, Kavanagh *et al.* 2007). An additional feature of *P. cinereus* home range use is the repeated use of certain trees, some of which may also be utilised by other members of the population (Faulks 1990; Mitchell 1990; Phillips 1999; Ellis *et al.* 2002).

Given the preceding considerations, it follows that areas being utilised by socially stable/resident *P. cinereus* populations must also be characterised by a higher rate of faecal pellet deposition (see Lunney *et al.* 1998). For the purposes of this paper, we propose the term "areas of major activity" to describe such localities, regarding them as synonymous with the term "*Core Koala Habitat*" (in so far as this term relates to the presence of a "*resident population of koalas*") as defined by the NSW Government's *State Environmental Planning Policy No. 44 (Koala Habitat Protection)*, as well as being a fundamental element of "Koala Habitat Areas" as defined by the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 – 2016* (Environment Protection Agency/Queensland National Parks and Wildlife Service 2006).

The Spot Assessment Technique

The Spot Assessment Technique (SAT) is a truncated form of the methodology originally developed by the Australian Koala Foundation for purposes of the Koala Habitat Atlas project (Sharp and Phillips 1997; Phillips *et al.* 2000; Phillips and Callaghan 2000). The Atlas approach is probability-based and utilises a binary variable (presence/absence of faecal pellets within a prescribed search area around the base of trees) to determine tree species preferences, along with a commensurate measure of *P. cinereus* "activity" (number of trees with faecal pellets divided by total number of trees in the plot) within a 40m x 40m ($1600m^2$) plot. Given that the selection of Atlas field plots is primarily based on stratification and replication using soil landscape and vegetation association data in the first instance, the data presented for the purposes of this paper reflects a random selection of field sites within which *P. cinereus* faecal pellets were recorded. The SAT approach arose from observations of consistency within the four smaller (20m x 20m) sub-quadrats that otherwise comprise Atlas field plots and the consequent realisation that a smaller plot size essentially provided the same empirical outcomes in terms of both tree species/faecal pellet associations and activity *per se*. However, the number of trees sampled in a smaller site is critical in terms of ascribing meaningful variance to the activity estimate hence we have adopted this measure as the more important variable for the purposes of the technique. Thus, in order to establish a meaningful confidence interval for the activity level of a given SAT site, a minimum of thirty (30) trees must be sampled. For assessment purposes, a tree is defined as "*a live woody stem of any plant species (excepting palms, cycads, tree ferns and grass trees) which has a diameter at breast height (dbh) of 100 mm or greater*" (Phillips *et al.* 2000); in the case of multi-stemmed trees, at least one of the live stems must have a dbh of 100 millimetres or greater in order to qualify.

Table 1 provides a data summary from Atlas field plots undertaken across a variety of habitat types and landscapes utilised by *P. cinereus* in eastern Australia. To this end, while we consider significant differences between mean activity levels from low and medium - high density *P. cinereus* populations of the eastern seaboard to reflect real differences in habitat carrying capacity (Table 1 - Southeast Forests/Campbelltown *vs* Port Stephens/Noosa: Levene's test: $F = 0.086$, $P > 0.05$; $t = -7.877$, $P < 0.001$), we speculate that similar differences between medium - high density populations of the eastern seaboard and those from more western areas (areas generally receiving less than 600mm of rainfall annually) (Port Stephens/Noosa *vs* Pilliga/Walgett – Levene's test: $F = 0.925$, $P > 0.05$; $t = -4.743$, $P < 0.001$) more likely reflect differences in faecal pellet longevity as a consequence of aridity than they do habitat quality *per se*. This said, we acknowledge that there are also likely to be both low and medium-high density populations in western areas of the species' range, the differentiation of which will require further investigation and evaluation.

Applying the SAT

The SAT involves a radial assessment of *P. cinereus* "activity" within the immediate area surrounding a tree of any species that is known to have been utilised by the species, or otherwise considered to be of some importance for *P. cinereus* conservation and/or management purposes. In the field the technique is applied as follows:

1. Locate and uniquely mark with flagging tape a tree (the centre tree) that meets one or more of the following selection criteria:

Table 1. Mean activity levels and related measures of central tendency (expressed as percentage equivalents) associated with habitat utilisation by Koalas from six areas in eastern Australia. Data relates to sites within which faecal pellets were recorded and has been pooled to reflect three major categories of activity which correspond to naturally occurring low and med-high density populations of the tablelands and areas east of the Great Dividing Range, and those of more western areas respectively. Koala densities for the east coast, low density category are arbitrarily defined at ≤ 0.1 Koalas/ha. (Data sources: [1]South-east Forests Conservation Council, unpub. data; [2]Phillips and Callaghan 1997; [3]Phillips and Callaghan 2000; [4]Phillips *et al.* 1996; [5]Phillips **et al.** 2000; [6]AKF, unpub.data; [7]Phillips 1999; [8,9]AKF unpub. data).

Area	Pop. Density	No. sites	No. trees	A/level	SD	SE	99% CL
East Coast							
S/E Forests[1]	Low	111	2979	11.85	6.84	0.65	1.70
Campbelltown[2,3]	Low	20	1194	6.52	4.72	1.06	3.02
Pooled		131	4173	11.03	6.82	0.60	1.56
East Coast							
Port Stephens[4,5]	Med - high	76	3847	23.65	23.63	2.71	7.16
Noosa[6]	Med - high	63	1647	32.55	22.05	2.78	7.38
Pooled		139	5494	27.68	23.27	1.97	5.16
Western Slopes & Plains							
Pilliga[7,8]	Med - high	98	3656	42.52	22.78	2.30	6.05
Walgett[9]	Med - high	37	990	38.01	27.66	4.55	12.37
Pooled		135	4646	41.28	24.19	2.08	5.44

a. a tree of any species beneath which one or more *P. cinereus* faecal pellets have been observed and/or
b. a tree in which a *P. cinereus* has been observed and/or
c. any other tree known or considered to be potentially important for *P. cinereus*, or of interest for other assessment purposes.

2. identify and uniquely mark the 29 nearest trees to the centre tree,
3. undertake a search for *P. cinereus* faecal pellets beneath each of the 30 marked trees based on a cursory inspection of the undisturbed ground surface within a distance of 100 centimetres around the base of each tree, followed (if no faecal pellets are initially detected) by a more thorough inspection involving disturbance of the leaf litter and ground cover within the prescribed search area.

Strict adherence to the 100 cm search area is a fundamental component of the SAT methodology. As detailed in Appendix 1, it is this distance that both optimises the probability of success in terms of actually finding faecal pellets, while at the same defining a workable search area. Any lesser search area and the probability of success will be significantly reduced (Figure 2 in Appendix 1 refers) such that the mean activity levels and associated activity level thresholds applicable to the approach cannot be justifiably applied.

In terms of search effort, an average of approximately two person minutes per tree should be dedicated to the faecal pellet search. In practice, more time will be spent searching beneath larger trees than smaller trees. For assessment purposes, the search should be concluded once a single faecal pellet has been detected or when the maximum search time has expired, whichever happens first. This process should be repeated until each of the 30 trees in the site has been assessed. Where the location of faecal pellets falls within overlapping search areas due to two or more trees growing in close proximity to each other, both should be scored for pellet(s). For more detailed reporting purposes, information relating to the site's location (UTM co-ordinates or Lat/Long), selection criteria, tree species assessed (and dbh), and the radial area searched (as measured by distance from the centre tree) should also be recorded. Faecal pellets should not be removed from the site unless some verification (i.e. that they are in fact *P. cinereus* faecal pellets) is necessary.

Calculation and interpretation of Koala activity levels

The activity level for a SAT site is simply expressed as the percentage equivalent of the proportion of surveyed trees within the site that had a *P. cinereus* faecal pellet recorded within the prescribed search area. For example, given a sample of 30 trees, 12 of which had one or more faecal pellets recorded – the resulting activity level would be determined as 12/30 = 0.4 = 40 per cent.

From the data sets presented in Table 1, we opted for a precautionary approach by proposing use of mean activity levels ± 99 per cent confidence intervals to define the limits of "normal" *P. cinereus* activity. Based on the threshold values that result, three categories of activity – "low", "medium(normal)" and "high" can thus be determined for each of the three area/population density categories detailed in Table 2. Subject to qualifications regarding the need for a cautious approach to low activity levels in some instances (see below), where the results of a SAT site returns an activity level within the low use range, the level of use by *P. cinereus* is likely to be transitory. Conversely, where a given SAT site returns an activity level within the prescribed range for medium (normal) to high use - the level of use is indicative of more sedentary ranging patterns and is thus within an area of major activity.

Table 2. Categorisation of Koala activity into Low, Medium (normal) and High use categories based on use of mean activity level ± 99 per cent confidence intervals (nearest percentage equivalents) from each of the three area/population density categories indicated in Table 1.

Activity category	Low use	Medium (normal) use	High use
Area (density)			
East Coast (low)	-	≥ 3.33% but ≤ 12.59%	> 12.59%
East Coast (med – high)	< 22.52%	≥ 22.52% but ≤ 32.84%	> 32.84%
Western Plains (med – high)	< 35.84%	≥ 35.84% but ≤ 46.72%	> 46.72%

A precautionary approach to activity levels in low use areas.

Ideally, SAT site activity levels should only be interpreted in the context of location-specific habitat utilisation data (e.g. Lunney *et al.* 1998; Phillips *et al.* 2000; Phillips and Callaghan 2000; Phillips and Hopkins 2009). Low activity levels recorded in what might otherwise be med-high carrying capacity *P. cinereus* habitat may be a result of contemporary population dynamics, landscape configuration and/or historical disturbances including logging, mining, fire, agricultural activities and/or urban development. Such considerations should not necessarily detract from the potential importance of such habitat for longer-term conservation, particularly if preferred koala food trees are present and populations of *P. cinereus* are known to occur in the general area. Ideally, any determination of the importance of activity levels in such instances should be informed by a broader, soil-based understanding of tree preferences (e.g. Phillips and Hopkins 2009), and in conjunction with an understanding of ecological history (e.g. Knott *et al.* 1998; Seabrook et al 2003).

Low activity levels are also associated with low-density *P. cinereus* populations. Stable, low-density *P. cinereus* populations occur naturally in some areas (Melzer and Lamb 1994; Jurskis and Potter 1997; Phillips and Callaghan 2000; Ellis *et al.* 2002; Sullivan *et al.* 2006). The density of *P. cinereus* in such areas generally reflects the absence of "primary" food tree species and reliance by the population on "secondary" food tree species only (Phillips and Callaghan 2000; Phillips 2000). While secondary food tree species will return significantly higher levels of utilisation when compared to other *Eucalyptus* spp. in the area, their level of use (as determined by field survey) will invariably be both size-class and/or density dependent when compared to a primary food tree species (Phillips and Callaghan 2000; Phillips 2000; Moore and Foley 2005). Because the autecology of *P. cinereus* occupying habitat areas that do not naturally support one or more "primary" food tree species remains poorly understood at this point in time, again we advocate a precautionary approach whereby the presence of any activity in areas occupied by naturally occurring, low density populations should be regarded as ecologically meaningful for conservation and management purposes until proven otherwise.

Concluding comment

The SAT is intended for application in conjunction with land-use planning activities that require *P. cinereus* habitat to be assessed, especially where identification of important areas for protection and management is required. The technique is suitable for use in conjunction with stratified/random or systematic survey techniques but has proved especially powerful when applied at the landscape-scale using a regularised grid-based sampling design and appropriate spatial modelling techniques (see Phillips et al 2007; Phillips and Hopkins 2007; Phillips and Hopkins 2009; Allen et al 2010; Phillips *et al.* submitted); it is also suitable for long-term monitoring purposes. Further information and advice regarding application and use of the technique and its application to the tasks of koala management can be supplied if required.

In refining the SAT approach over the intervening time period since its initial inception and development, we have deliberately opted for efficiency (in terms of time) and reproducibility in the field, all the while mindful that it must remain a robust sampling tool capable of answering the critical questions associated with koala conservation biology.

Acknowledgments

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APPENDIX

Some probabilistic aspects of the SAT approach

Over the years many individuals have contributed to development and refinement of the Koala Habitat Atlas methodology and its derivative progeny the Spot Assessment Technique.

In 1994, Southern Cross University student Maria Jones was set the task of examining the distribution of *P. cinereus* faecal pellets beneath trees used by the species. Thirty spatially independent Forest Red Gums *Eucalyptus tereticornis* were selected for assessment, each of which was confirmed to have been used by *P. cinereus* on the basis of one or more faecal pellets being observed beneath their respective canopies. Forest Red Gum was selected because it was known to be a preferred food tree throughout the range of *P. cinereus* in eastern Australia. Beneath each of these trees both the number and distribution of faecal pellets were recorded at 200 mm radial increments from the base, along with other data such as tree dbh and canopy configuration.

Collectively, Maria recorded 8,565 faecal pellets beneath (and sometimes beyond) the canopies of the 30 trees (mean dbh of sampled trees: 40.51cm ± 24.67(SD), range 95 – 895; mean no. faecal pellets tree^{-1}: 285.6 ± 341.8(SD), range 1 – 1433). From these data it was able to be demonstrated that (i) *P. cinereus* faecal pellets were not uniformly distributed beneath the tree canopy, but (ii) they occurred most commonly near the base of trees (Figure 1).

Given the problems of accumulated faecal pellet counts, one of us (SP) then asked of Maria's

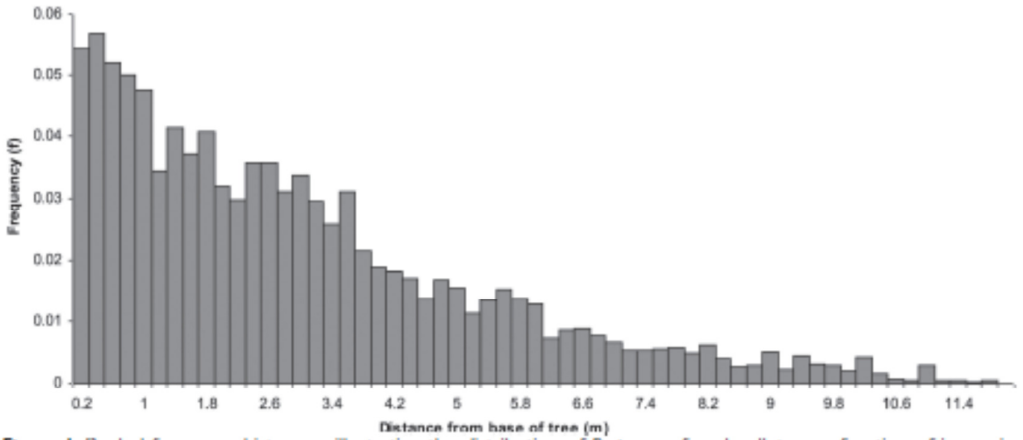

Figure 1. Pooled frequency histogram illustrating the distribution of *P. cinereus* faecal pellets as a function of increasing distance from the base of 30 sampled food trees (Source: Jones 1994).

APPENDIX I

data: "Given that each tree is a spatially independent replicate, what - on average - is the relationship between proportion (p) of the total faecal pellet count beneath each of the sampled trees as a function of distance from the base?" Figure 2 illustrates the answer to this question, demonstrating how the probability of success in terms of actually finding pellets can be related to the size of a radial search area. With this knowledge it then became a matter of looking for a search parameter that combined a meaningful probability of encountering one or more faecal pellets, yet also restricting the search to an area that could be efficiently worked. Further interrogation of the data established that, on average, the equivalent of 47% ± 12%(95% CI) of all *P. cinereus* faecal pellets will be located within a distance of 1m from the base of trees that have been utilized by the species. We figured the odds at that distance (i.e. ~50:50) were good. While a smaller search area (i.e. 0.6m) would clearly have increased search efficiency, the probability of finding pellets was almost halved! Conversely, increasing the search area beyond 1m resulted in not just minor increases in the probability of success but also substantively increased the search area in each instance.

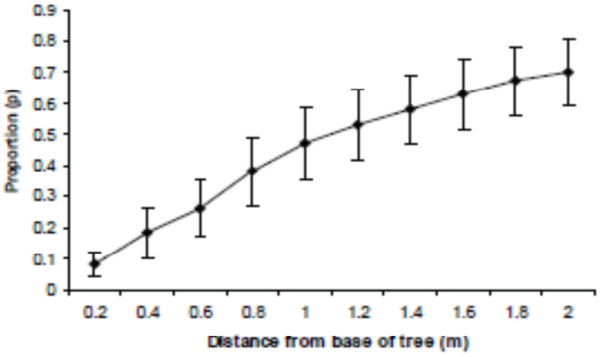

Figure 2. Mean proportional representation (± 95% Confidence Interval) of the total faecal pellet counts from beneath a sample of 30 trees known to have been utilised by *P. cinereus* (raw data sourced and re-analysed from Jones (1994)).

The results of the preceding analysis are generally in accord with the observations of other workers, Ellis et al (1998) also recording a disproportionately high density of pellets adjacent to the trunks of some trees utilized by *P. cinereus*, with approximately 18% of daily collection falling within a 1m x 1m area around the tree base. Sullivan et al (2002) used a 30cm search area around the base of trees, reporting a variable tendency (1.9 – 13.5%) for misclassification (i.e. recording absence when in fact pellets were actually present elsewhere beneath the canopy). Interestingly, the potential for such misclassification is strongly supported by Figure 2 which otherwise infers that the proportional representation of faecal pellets using a 30cm basal search area is very low (~10-15%).

Appendix 3

Offset Provisions

Background
This section details the provisions for the offsetting of impacts on koala habitat resulting from development activities. The provisions aim to provide a transparent framework for the planning and assessment of an offset proposal where there are unavoidable residual impacts from a proposed development activity.

The provisions are informed by the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Environmental Offsets Policy, the Lismore City Council Comprehensive Koala Plan of Management for south-east Lismore and the draft Comprehensive Koala Plan of Management for the Tweed Coast.

What are offsets?
Offsets are measures that compensate for residual adverse impacts of development on koalas or on the quantity, quality and connectivity of koala habitat. Offsets are only considered when all options to avoid or mitigate impacts on koalas and koala habitat have been considered and confirmed as unachievable.

What types of impacts require offsetting under the Plan?
While there are a range of potential impacts resulting from development proposals, this Plan only allows offsetting of Preferred Koala Habitat and Preferred Koala Food trees in the limited circumstances.

Other impacts such as increased impact from dogs, vehicles, fire or other recognised threats are required to be avoided or mitigated and are unable to be offset under the Plan.

What types of offsets are applicable under the Plan?
This plan requires the use of direct offsets resulting in a measurable conservation gain for koalas and koala habitat. The use of threat reduction measures or other compensatory measures (indirect offsets) are not acceptable under this Plan.

Offsetting is therefore limited to the creation of new koala habitat at a suitable location on the impact site, or an agreed offsite location, in accordance with Table 1 (over page).

A higher ratio is set for offsite offsetting to accommodate the greater risk and potentially lower value resulting from addressing impact at sites other than the impact site.

Council will not approve offsite offsets where suitable land is available on the same allotment (or adjacent allotment in the same ownership) as the proposed development.

What are the steps to use offsets under the Plan?
1. Ensure development proposal meets the requirements as per Section 5 of the Plan.
2. Describe any residual impact and ensure that it is allowable.
3. Develop and submit an offset proposal that is consistent with Table 1.

Calculating impacts and offsets for proposals
This Plan provides offset ratios to enable direct calculation of offsets based on the residual impact as either number of trees or area of habitat lost. As an example for calculation purposes, if the offset ratio is 1:5, five trees must be replanted for every one lost. Or in the case of habitat, five times the area of habitat lost must be restored.

The offset ratios have been developed to reflect the regional approach to offsets demonstrated by the Lismore CKPoM and the draft Tweed CKPoM. They also reflect the provisions of the scenario based application of the EPBC Act Offsets Policy.

The Important Population status of the koala in the Southern KMP is reflected in the relatively higher offset ratios required for development within this area. Fragmentation of existing habitat has already affected the population (Phillips, 2013) and therefore there is a focus within this precinct of consolidating existing habitat and increasing connectivity and habitat quality.

The offset ratios herein reflect the significant risk associated with further impact on existing habitat and use multiplication factors to address this risk relative to the impact. Further, the offset ratios required under the Plan have been developed to take into account the:

- extent of correlation of the offset with the impact
- conservation gain from the offset
- time delay involved in achieving the gain
- level of certainty of success
- suitability of the location
- risk associated with achievement of the offset
- required performance measures

Impact on:-	Preferred Koala Habitat – Southern KMP	Preferred Koala Habitat – East Ballina and Plateau KMP*	Preferred Koala Food Trees – East Ballina and Plateau KMP*
Offset ratio (onsite)	1:15	1:10	<100mm – 1:8 >100 - 250mm – 1:16
Offset ratio (offsite)	1:20	1:15	<100mm – 1:12 >100 - 250mm – 1:20
Clearing of trees over 250mm diameter at breast height in core koala habitat is not permitted.			

Table 1: Offset ratios by Koala Management Precinct and receiving site

Planning and offset proposal
Detailed planning is an integral part of developing an offset proposal. Offset proposals are required to be submitted as offset management plans and to be developed in consideration of the the following principles.

The principles that underpin this policy are:

1. The primary objective of offset plantings must be to protect, enhance or create ecologically viable *koala habitat*.
2. Offsets, and particularly offsite offsets, must only be considered once all options to avoid, minimise and mitigate any adverse impacts have been exhausted.
3. Clearing must not be approved where the impact of clearing cannot be satisfactorily compensated.

4. Offset plantings, also called habitat compensation works, should lead to a net gain in the area of *koala habitat*, and an improvement in the condition of *koala habitat* within the Koala Management Precinct.
5. The *land* receiving compensation works ('*receiving land*') must be ecologically suitable and appropriate for protection, enhancement or creation of *koala habitat*.
6. An activity that leads to the loss of *koala habitat* (especially clearing) should only proceed once the management arrangements on the *receiving land* are legally secure **and** habitat plantings are at an appropriate size to support koalas.
7. Compensation works must not lead to permanent adverse environmental impacts and must not be used as a justification for granting approval to a DA where the adverse environmental impacts of a development are greater than the benefit to be obtained from the compensation works.
8. Management and monitoring of habitat compensation activities should be undertaken over an ecologically meaningful timeframe (for example, a minimum of five years and preferably longer).

How will the land be secured to ensure retention of habitat outcomes?
Security of tenure for offsite sites is required and is best achieved through legal mechanisms that are permanent and secure. Acceptable options are:

- Application of a restrictive covenant under Part 6(Division 4) of the *Conveyancing Act 1919* to ensure that all areas contributing to the offset are protected from future development (including clearing) and managed for the ongoing benefit of koalas and their habitat.
- Dedicating the area to Council (if acceptable to Council) where the land can be secured for conservation purposes and agreement regarding management funding is achieved.
- Other mechanisms including a conservation land title covenant under the Nature Conservation Act 2001 or a voluntary planning agreement between Council or the NSW Department of Planning and the Environment and the proponent.

Koala offset management plans
A koala offset management plan is required for each offset site involved in an offsets proposal. The plan should detail:-

- The impact and subsequent offset ratios that have been applied to formulate the offset proposal
- Objectives and outcomes for the offset site with specific relation to the impact site values and quality
- Mechanism to secure the offset site
- Details of proposed revegetation to meet the required offset
- Ongoing management and maintenance arrangements
- Monitoring and reporting requirements
- Name and contact details of landholder/s
- Lot on plan property description
- Maps
- Any other supporting documentation.

The koala offset site management plan must be signed by all relevant parties to the land ownership and ongoing management arrangements.