

North Byron Parklands

Koala Plan of Management (KPoM)

Prepared for
Billinudgel Property Pty Ltd

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Glossary

BC Act	<i>Biodiversity Conservation Act 2016</i>
BCC KPoM	(Draft) Byron Coast Comprehensive Koala Plan of Management
KPoM	Koala Plan of Management
KSAT	Koala Spot Assessment Technique
Parklands	North Byron Parklands
SEPP44	The now repealed <i>State Environmental Planning Policy No. 44 (Koala Habitat Protection)</i>

1. Introduction

1.1 Background

Billinudgel Property Pty Ltd have engaged Eco Logical Australia Pty Ltd (ELA) to prepare an individual Koala Plan of Management (KPoM) for North Byron Parklands (Parklands). Parklands currently operates as a cultural events site with permanent State approval (app. No. SSD 8169). The approval allows use of the site as a cultural, education and outdoor events venue.

Billinudgel Property Pty Ltd have permanent approval to utilise the site as a cultural events centre with a maximum capacity of 50,000 patrons for one large event and a number of smaller events. This KPoM has been prepared to address safe ongoing management of Koala for the permanent approval.

Historically Koala have been observed sporadically at the Parklands site but after the implementation of the Pacific Highway upgrade no Koala have been sighted on the land. They have been seen in adjacent habitat areas. The most recent surveys were undertaken in September 2016 and found evidence of Koala visitation of at the site (i.e. scats). Under the NSW koala habitat protection framework '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. Small areas of the Parklands therefore may meet the definition of Core Koala Habitat under the framework (see **Section 2.3.1** for further discussion).

1.2 Regulatory requirements

This KPoM was originally drafted in 2019 in accordance with the now repealed *State Environmental Planning Policy No. 44 (Koala Habitat Protection)*, which commenced in 1995 and was repealed in 2019. SEPP44 aimed to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas. This was to ensure persistence of a permanent free-living population over the species' present range and reverse the current trend of Koala population decline by:

- Requiring the preparation of plans of management before development consent can be granted in relation to areas of Core Koala Habitat
- Encouraging the identification of areas of Core Koala Habitat
- Encouraging the inclusion of areas of Core Koala Habitat in environment protection zones

Over subsequent years, reporting requirements such as regular Koala monitoring in relation to the SEPP44, were issued by the NSW State Government as part of ongoing approval modifications issued by the Minister for Planning and Infrastructure. The *Planning Circular No. B35 - Director's Guidelines*, (22 March 1995) details the methods for identifying potential and core Koala habitat and outlines the requirements for Koala Management Plans.

Whilst SEPP44 was in operation, a number of significant events of direct relevance occurred to the coastal Koala population in the Tweed and Byron Local Government Areas including:

- Koala habitat and population assessments were completed for the Tweed and Byron coastal areas (including the North Byron Parklands site).
- Comprehensive Koala Plans of Management (CKPoM) for Tweed and Byron were prepared by the respective Councils.
- One of the outcomes arising from the Tweed and Byron Koala assessments was that the conservation status of Koalas along the Tweed Coast and the section of Byron Coast north of the Brunswick River was determined as precarious with wildfire events in 2004 and 2009 identified as major contributing factors to the Koala population decline.
- In April 2016, the Koala population between the Tweed and Brunswick Rivers east of the Pacific Highway (which includes the North Byron Parklands site) was listed as an Endangered Population under the now repealed NSW *Threatened Species Conservation Act 1995* (Biolink

2016). This population is also listed as endangered under the current *Biodiversity Conservation Act 2016*.

- *The Biodiversity Conservation Act 2016* also lists the Koalas within the area as a vulnerable species.

As the 2016 Koala survey (BioLink 2016) identified visitation of the Koala on the site, the original version of this KPoM was prepared on a precautionary basis.

At the time of revision and update of this KPoM (2023), SEPP44 had been repealed and replaced. The regulatory framework for koala protection in NSW is now integrated into *State Environmental Planning Policy (Biodiversity and Conservation) 2021* and includes savings and repeal provisions that allows this KPoM to remain in effect.

1.3 Purpose and scope of this report

This KPoM applies to the permanent program of events approved as part of Application SSD 8169, and specifically addresses D39 of the Development Consent (13 March 2019). The KPoM includes:

- Conservation objectives for Koala
- Details of Koala habitat and site usage at the Parklands and in surrounding areas
- An assessment of potential threats and impacts to Koala as a result of the cultural events program held at the Parklands
- Details of management measures that will be implemented to address potential impacts
- A monitoring and adaptive management program

The KPoM specifically addresses Koala habitat on the Parklands site, which includes the following lots:

- Lot 1 DP 1145020
- Lots 46 402, 403 and 404 DP 755687
- Lot 410 DP 755687
- Lots 2 and 12 DP 848618
- Lot 101 DP 856767
- Lot 30 DP 880376
- Lots 100 and 101 DP 1178907
- Lots 101 102, and 107 DP 1001878
- Lot 107 DP 1001878
- Lots 12 and 14 DP 875112

Adjacent lots are also assessed in terms of Koala population / core habitat estimates. However, management and mitigation measures are restricted to those areas that are under the property ownership of Billinudgel Property Pty Ltd.

At the time this KPoM was originally prepared, the pre-existing guideline for SEPP44 (Department of Planning 1995) informed the content of this KPoM. A checklist against the guideline's content requirements and the associated location in this document where the requirements are addressed is provided in **Appendix A**.

2. Koala at Parklands and surrounds

2.1 Regional context

The (Draft) Byron Coast Comprehensive KPoM (BCC KPoM; Phillips and Jardine 2013) has divided the region into Koala Management Areas (KMA). The Parklands site is located in the North Byron Coast KMA, which encompasses an area of approximately 2,814 ha located to the north of the Brunswick River and includes Billinudgel Nature Reserve and the localities of South Golden Beach, Ocean Shores and Billinudgel.

The importance of the Parklands site in the regional context lies in its connectivity to large areas of Koala habitat within Billinudgel Nature Reserve and adjacent areas to the south. The areas of potential Koala habitat on site provide important linkages, both across the Parklands site and more broadly in the region.

2.2 Koala presence 2007 – 2023

1. 2.2.1 Site Specific

Targeted Koala surveys have been undertaken at Parklands in 2007, 2008, 2013, 2016 (Biolink 2007, 2008, 2013, 2016) and 2022 (Bower Ecology 2023), along with eleven Event Impact Monitoring (EIM) surveys (North Bryon Parklands 2014a, 2014b, 2015, 2016; Bower Ecology 2022). Results of these surveys include:

- 2007 – small area of core Koala habitat (3 ha) mapped on site; Koala scats observed at four locations within the Parklands; results suggest use of the site by 1 – 2 Koalas
- 2008 – significantly reduced evidence of activity, such that activity level does not reach the threshold that indicates active, ongoing use by resident animals
- 2013 – no evidence of Koala within the Parklands
- 2016 – evidence of Koala (scats and scratches) at 7 sites (see **Figure 1** and **Table 1**). Mixed age scats suggest significant, repeat use of sites by Koala individuals with home ranges that encompass the north-west corner of the Parklands (individuals may be coming to the Parklands from the Billinudgel Nature Reserve and/or areas to the west of the Pacific Highway). It is likely that these Koalas have begun using this area of the Parklands within the previous 1 – 3 years
- Event Impact Monitoring – no evidence of Koala within the Parklands or surrounds (based on general observations and non-targeted survey for the first 10 EIM events). The EIM event for the 2022 Splendour in the Grass (SITG) event did not observe koala despite undertaking targeted search.
- The 2022 KPoM monitoring in accordance with this plan (Bower Ecology 2023) observed faecal pellets at one of the five sites that were monitored (in and around Site BPT27 as shown on **Figure 1**). The activity level (Phillips and Callaghan, 2011) was calculated to be low, indicating the probable transitory or occasional use of the site by koalas.

2. 2.2.2 Surrounding Areas

Koala presence surrounding Parklands is reported in the BCC KPoM (2016), the Tweed Coast Comprehensive KPoM (Tweed Shire Council 2015) and The KPoM monitoring undertaken in 2022 (Bower Ecology 2023). Combined, the BCC KPoM (2016) and the Tweed Coast Comprehensive KPoM (Tweed Shire Council 2015) reports state that a population of approximately 384 Koalas is present across the regions. NBP is situated within North Ocean Shores Koala Management Precinct (NOS KMP) in the North Byron Coast Koala Management Area (NBC KMA). This area (NOS KMP) is the southernmost extension of the Tweed & Brunswick Coast population which includes known populations approximately 8km north near Pottsville. The NOR KMP has low habitat occupancy rates and no individuals or specific sub-population has been recorded in the KMP.

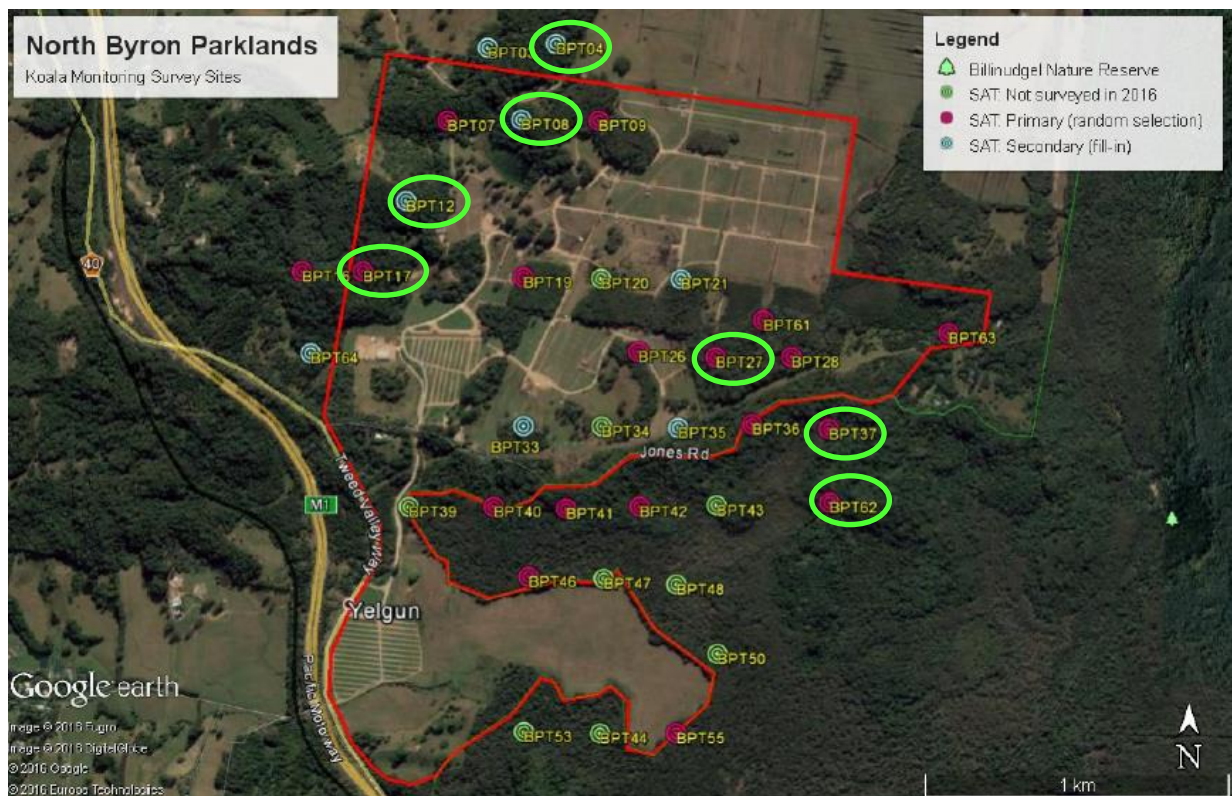


Figure 1: 2016 Survey Results. Scats were observed in 2016 at the green circled SAT sites (from Biolink 2016)

Table 1: Koala activity levels recorded for baseline SAT surveys in 2007 compared to 2016 survey results. Percentage representation of Preferred Koala Food Trees (PKFT) at each site and the age-class of pellets (old, mixed age, fresh) observed in 2016 are also shown. Note: significant Koala activity levels (i.e. high or medium use) are bolded. (From Biolink 2016)

SAT sites	2007 Activity (%)	2016 Activity (%)	2016 Pellet age-class	2016 Proportion PKFT (%)	Considered Core Koala Habitat
BPT03	0	0	-	13.33	
BPT04	0	6.67	Mixed Age	3.33	
BPT07	0	0	-	0	
BPT08	0	30	Mixed Age	16.67	Yes
BPT09	0	0	-	13.33	
BPT12	0	10	Old	26.67	Yes
BPT16	0	0	-	0	
BPT17	0	30	Mixed Age	3.33	Yes
BPT19	0	0	-	0	
BPT20	0	NS	NS	NS	
BPT21	0	0	-	0	
BPT26	0	0	-	0	
BPT27	13	3.33	Old	13.33	
BPT28	0	0	-	6.67	
BPT33	0	0	-	43.33	
BPT34	0	NS	NS	NS	
BPT35	0	0	-	6.67	
BPT36	0	0	-	0	
BPT37	0	3.33	Fresh	0	
BPT39	0	NS	NS	NS	
BPT40	0	0	-	6.67	
BPT41	4	0	-	0	
BPT42	0	0	-	3.33	
BPT43	0	NS	NS	NS	
BPT44	0	NS	NS	NS	
BPT46	0	0	-	10	
BPT47	0	NS	NS	NS	
BPT48	0	NS	NS	NS	
BPT50	0	NS	NS	NS	
BPT53	0	NS	NS	NS	
BPT55	0	0	-	6.67	
BPT61	30	0	-	6.67	
BPT62	43	16.67	Mixed Age	23.33	Yes
BPT63	NS	0	-	0	
BPT64	NS	0	-	16.67	

2.3 Koala habitat

Approximately 60% of the Parklands property is cattle pasture comprising exotic grasses, dominated by *Setaria sphacelata* (South African Pigeon Grass) and *Paspalum mandiocanum* (Broad-leaved Paspalum). Native vegetation of the site comprises mainly fragmented floodplain forests and hill slope *Eucalyptus* and *Lophostemon* forests. The related Plant Community Types (PCTs) mapped within the Parkland site are shown on **Figure 2**, and further described in **Appendix C**. The PCTs are further broken up into vegetation zones according to their broad ecological condition. The vegetation zones provide differing vegetation types provide potential habitat areas for Koala.

2.3.1 Koala habitat and food trees

Koalas are obligate folivores feeding on species primarily in the genus *Eucalyptus*. Parklands contains a number of distinct vegetation communities that support a diversity of *Eucalyptus* species, which are largely confined to the better drained hill slopes. Of these, the following food trees have been observed at the Parklands site:

- *E. microcorys* (Tallowwood)
- *E. tereticornis* (Forest Red Gum)
- *E. robusta* (Swamp Mahogany)
- *E. propinqua* (Grey gum)
- *E. tereticornis* x *E. robusta* hybrid

There are a range of methods that can be used to define what Koala habitat is. Under SEPP 44 (which was the relevant SEPP at the time this planned was originally drafted), potential Koala habitat is defined as “Areas of native vegetation where the trees of the types listed in Schedule 2 (of SEPP44) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component”. This is consistent with the definition in the current koala habitat protection framework – i.e. within the *State Environmental Planning Policy (Biodiversity and Conservation) 2021*.

At Parklands, species listed on Schedule 2 of the now repealed SEPP44 (Tallowwood, Forest Red Gum and Swamp Mahogany) were recorded in 14 of the field sites formally assessed in 2016. The species composition of Schedule 2 species at these sites ranged from 4% - 56%, with a mean of 15% (Biolink 2016), suggesting that these sites should be formally considered potential Koala habitat.

Furthermore, Core Koala Habitat is separately defined in the now repealed SEPP44 (and within the current framework) as 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.

Based on the results of the most recent Koala surveys, small areas of potential Core Koala Habitat have been identified within the Parklands. With reference to **Figure 1** and **Table 1**, Biolink (2016, pp. 6) note that:

“Activity levels that were considered significant (i.e. > 10% in upland areas on low-nutrient substrates and > 22.52% in lowland areas and other sites on high-nutrient substrates, falling into the ‘Medium (normal) use’ or ‘High use’ categories indicative of utilisation by resident Koalas with established home ranges) and therefore indicative of Core Koala Habitat were recorded at 4 sites; BPT08 (30%-High), BPT17 (30%-High), BPT62 (16.67%-High) and BPT12 (10%-Medium); refer to Phillips & Callaghan (2011).”

These sites are mapped in **Figure 1** and are located in the north-west corner of the Parklands site and in the adjacent Billinudgel Nature Reserve.

For this KPOM, Koala habitat has also been mapped across the site (**Figure 2** and **Figure 3**) according to Plant Community Types and floristic sampling undertaken as part of an assessment using the Framework for Biodiversity Assessment Method . The terms ‘primary’ and ‘secondary’ habitat have been used to distinguish habitat categories, in accordance with the *Byron Coast Comprehensive KPOM*. That is:

- “Primary Koala Habitat” means any area of vegetation dominated by one or more primary Koala food tree species.
- “Secondary (Class A) Koala Habitat” means any area of vegetation where one or more primary Koala food tree species occur as sub-dominant components of the over-storey species.

- “Secondary (Class B) Koala Habitat” means any area of vegetation on erosional soil landscapes that contains one or more secondary Koala food tree species.

Figure 3 shows that Primary and Secondary (Class A) Koala Habitat exists across most of the site and this correlates with records of Koala from both BioNet and North Byron Parkland records. The Primary Koala Habitat is represented by the community where *Eucalyptus tereticornis* is generally dominant. The other PCTs are not dominated by Koala habitat trees however Koala habitat trees do occasionally occur as a sub-dominant component.

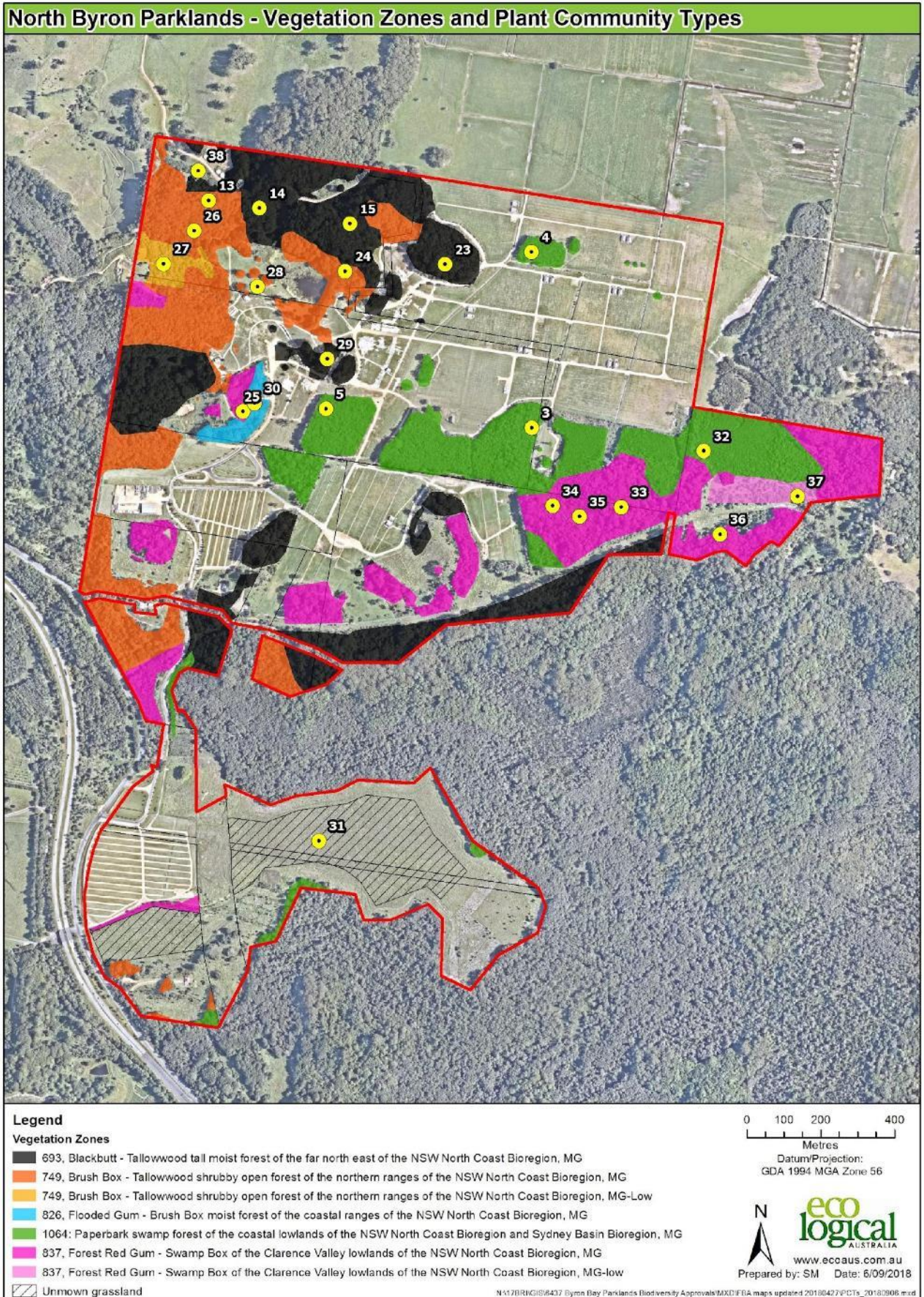


Figure 2: Plant Community Types and Vegetation Zones

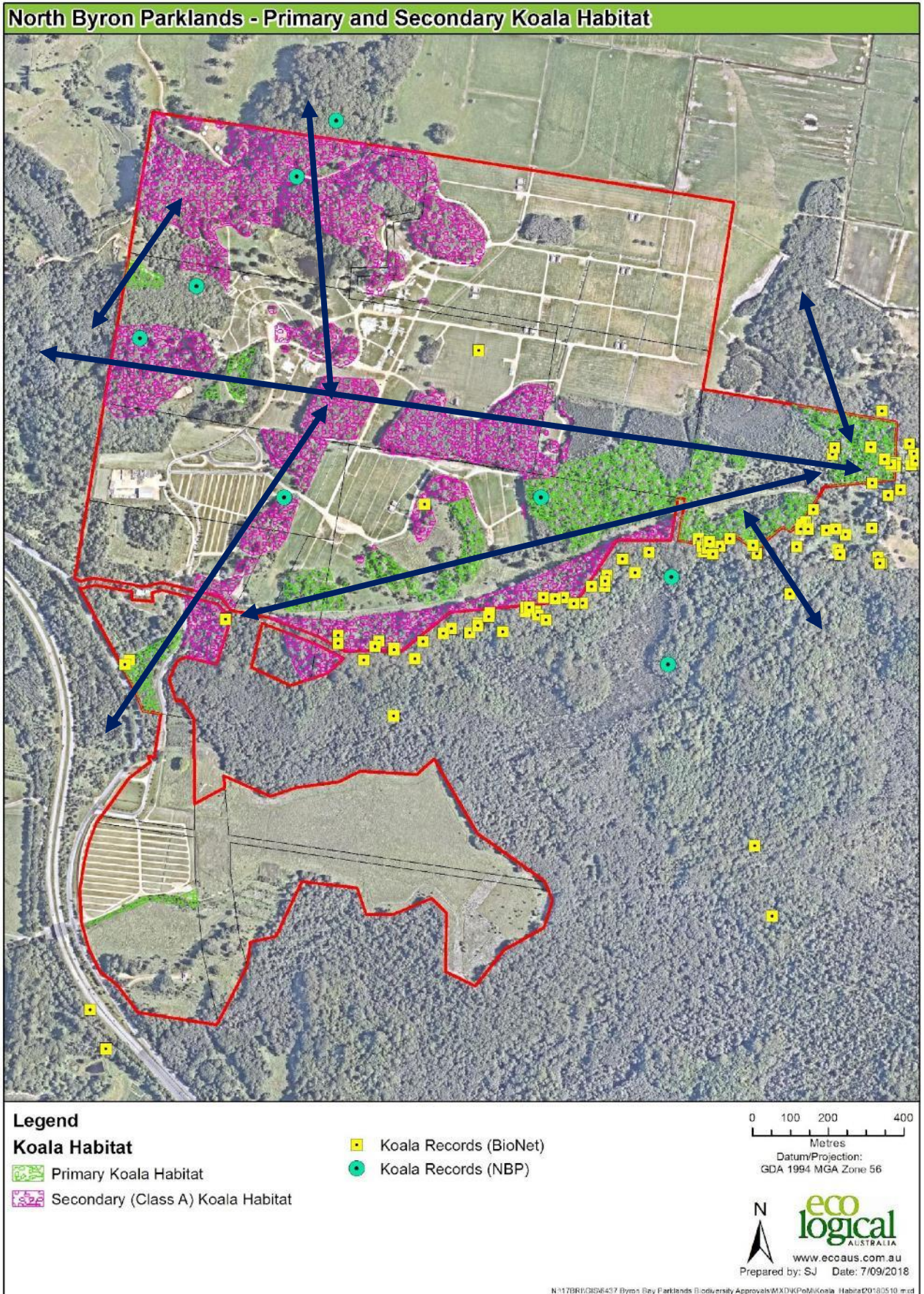


Figure 3: Primary and Secondary Koala Habitat (arrows represent generalised Koala movement corridors)

3. Conservation outcomes

As highlighted above, the presence of Koala at Parklands has been highly variable over time. There is also no evidence of a sustained or sizable population of Koalas on site. Therefore, the conservation outcomes for Koala are focused on the provision of habitat and allowing Koala to use the site freely if and when they may be in the region.

The desired conservation outcomes for Koala are:

- The condition of Koala habitat at the Parklands site will continue to be enhanced via the on-going program of successful vegetation management and bush regeneration.
- Events will not prevent the safe on-going use of the Parkland site by Koala.

These outcomes are also consistent with the overarching management aim for the North Byron Coast KMA, which is to recover the important sub-population of the Tweed and Brunswick Coast Population of the Koala (Phillips and Jardine 2013). Habitat enhancement is discussed further in **Section 5.2** and in detail in Eco Logical 2017a.

4. Potential impacts and threats

No Koala habitat or Koala feed trees will be cleared as result of the project. All Koala habitat on site will be preserved and protected for the duration of the project. All areas of remnant vegetation within event areas will be fenced during events to prevent disturbance. These measures have also been in place during the approved trial period. During this time, monitoring detected no adverse impacts to the native vegetation on site.

Ongoing vegetation management and restoration measures will continue across the site with the objective of improving the ecological condition of the vegetation and therefore its value as Koala habitat over time.

Impacts from more generalised disturbance such as noise, lighting and human disturbance will be short-lived and contained within the event areas of the Parklands site. Noise, lighting and human disturbance may indirectly impact surrounding areas however, this indirect impact has been assessed as not significant (NBP Cultural Events Site – BAR, ELA 2017). Koalas are likely to move away from disturbance during events, and good connectivity to suitable habitat is available adjacent to areas of disturbance. Koalas have moved back into Parklands area during the approved trial period i.e. the results of the most surveys suggest Koala use of the north-western areas of the Parklands has begun within the last one to three years. This suggests the ongoing use of the site for events has not precluded the area from providing suitable habitat for Koala.

Key threats to Koala including dog attack and vehicle strike will not be exacerbated by the project. Dogs (apart from restrained assistance and security dogs) are not allowed on site and on-site vehicle speed limits are restricted to 25 km/hr. There is no current wild dog management program undertaken by Parklands, though continued monitoring (via incidental sightings) is undertaken. If evidence of significant wild dog population is observed, management will be undertaken (see more information within Eco Logical 2017a).

Bushfire presents a significant threat to Koala populations. Strict fire management procedures are implemented at the site for public safety, however these measures also benefit habitat within and adjacent to the site and the wildlife in these areas. In accordance with fire management guidelines in the BCC KPoM, Parklands has adopted a minimal use of fire policy and does not propose the use of fire for hazard reduction and aims to extinguish any bushfire at the first practical opportunity. With these measures in place the potential threat to Koala from bushfire is not significantly increased.

Koalas will be discouraged from entering event areas due to the erection of temporary fencing (**Appendix D**) and the proposed permanent security fencing (see **Figure 4**). Permanent security fencing will be fully closed only for short periods of time at discrete intervals over the year (see **Section 5.1**). It is also unlikely that Koalas would be seeking to traverse the busy event area. The implementation of the security fence is documented Infrastructure Staging Plan approved by the Department of Planning and Environment on 24 April 2019.

The site forms part of an east-west wildlife corridor between large areas of suitable habitat in the adjacent Billinudgel Nature Reserve and to the west of the Parklands. During event times, disturbance, human activity and fencing barriers will reduce the potential for Koala movement across this corridor. These restrictions will only be in place for short periods of time at discrete intervals over the year (i.e. a maximum of 20 event days per year). Over time restoration works across the site will increase the area of potential habitat and improve connectivity across this corridor. Therefore, the overall impact of the proposal on the potential for dispersal and movement of Koalas in the local area is considered to be minimal.



Figure 4 Proposed location of permanent security fence (red)

5. Impact avoidance and minimisation

5.1 Measures to avoid and minimise impact

The event areas and ancillary infrastructure have been designed to ensure that no Koala habitat will be cleared as result of the project. All Koala habitat on site will be preserved and protected for the duration of the project. This will also ensure that connectivity to large areas of adjacent potential habitat is maintained.

Additionally, the following measures will be implemented at Parklands to avoid and/or minimise impacts to Koala and their habitat during events:

- Friends of the Koala Inc. (located in Lismore) are to be contacted if any seriously sick or injured Koalas are observed by Parklands and/or event staff (per staff, contractor and volunteer site induction requirements).
- Stringent bushfire management during events for public safety.
- Continued police enforcement and deterrence associated with illegal access to events that may result in trampling of vegetation (bearing in mind that the low occurrence results in negligible impacts).
- Event operators will only operate within the approved event areas.
- No event activities (including slashing) will occur within the 30m minimum buffer around the southern car parking areas surrounding the Billinudgel Nature Reserve (as far as practicable and within public safety constraints).
- No-go zones will be designated (**Figure 5**), which fence off areas of intact native vegetation. Events are contained within areas that consist of managed exotic pasture with scattered native trees, with these trees being protected during events.
- Temporary human exclusion fencing closely bordering forest blocks within event areas will be provided (see **Appendix D**). All temporary human exclusion fencing used in these locations will be 'fauna-friendly', incorporating a minimum 100mm continuous gap at the base of the fence for movement of smaller fauna. The 1.8m high fence is made of wire strands covered with hessian, which Koalas are able to climb over.
- There will be incidental checking of Koala presence during the event set up (bump-in) period. In the future if Koala presence is confirmed in the surrounding bushland, a more formal method of pre-event check will be undertaken 24 hours before the start of events and will cover all event areas systematically checking all Koala habitat trees for the presence of individuals.
- The bump-in days for event set-up will provide a disturbance to Koalas, allowing them to move away from the event area before patrons arrive. Nonetheless, a procedure will be in place if Koala are observed in the event area during events (including set-up and pack-down). The procedure is as follows. (It should be noted, however, that the probability of this type of scenario occurring is considered very low given the limited occurrence of Koala on and surrounding the site in recent surveys, incidental monitoring during pre-event set-up, and the disturbance caused due to pre-event set up).
 - All staff and contractors are to be briefed on the notification requirements of the below procedure as part of Parkland's Environmental Induction prior to accessing the site. Documented records shall be maintained covering the environmental induction process.
 - If a Koala is observed in an event area, the event control centre will be notified and will coordinate the implementation of this procedure.

- If a Koala is identified within a tree within event areas (either immediately prior to, during or immediately following an event) where there is a high level of disturbance (i.e. near crowds, campers, stages or other busy work areas etc.):
 - The Koala will not be physically forced to come down from the tree.
 - A 10m (radial) exclusion zone will be set up. The exclusion zone will be fenced by orange plastic barrier mesh. The fence will reach to the ground to prevent the Koala from moving into other event areas. If practical however, a strategic 20cm gap at the base of a section of the exclusion fence should be considered. This is to allow the Koala to pass under, and to funnel the Koala in a preferred direction i.e. towards surrounding bushland outside of the event area. The latter will only be applied where surrounding bushland occurs adjacent to the subject tree.
 - Security staff are to ensure that people do not enter the exclusion zone.
 - An inducted staff member will remain with the Koala until a qualified fauna spotter/catcher arrives. At this point, a fauna spotter/catcher will remain with the Koala at all times until it comes down from the tree, or until the event ends. Due to the level of disturbance, it is considered likely that the Koala will come down as Koalas are known to exhibit avoidance behaviours to noise and crowds (Larsen et al 2014).
 - If the Koala does move, the fauna spotter/catcher is to shepherd to Koala from crowds and into surrounding bushland outside of the event area. Or if the Koala is not proceeding to the nearest bushland area outside of the event area, the fauna spotter/catcher is to handle the Koala and relocate it.
- If a Koala is identified within a tree within event areas (either immediately prior to, during or immediately following an event) where there is not a high level of disturbance (i.e. not near crowds, campers, stages or other busy work areas etc.):
 - If the Koala is in area away from high levels of disturbance due to crowds, campers, stages, work areas etc., exclusion zone fencing will be erected and the Koala will be left to move on its own accord. The exclusion zone will consist of a 10m radial orange plastic barrier mesh fence with no entry signs hung upon it. Generally, the fence will reach to the ground. However, there will also be a strategic 20cm gap at the base of a section of the exclusion fence to allow the Koala to pass under, and to funnel the Koala in a preferred direction - towards surrounding bushland outside of the event area. The latter will only be applied where surrounding bushland occurs adjacent to the subject tree.
 - If practical, further fencing will be established to funnel the Koala back into surrounding bushland (outside of the event area) should it come down from the tree.
 - If there is no clear path back to surrounding bushland a fauna spotter catcher will remain with the Koala until it comes down or until the event ends. If the Koala does move, the fauna spotter/catcher is to shepherd to Koala from crowds and into surrounding bushland outside of the event area. Or if the Koala is not proceeding to the nearest bushland area outside of the event area, the fauna spotter/catcher is to handle the Koala and relocate it.
- If the Koala is observed traversing the event area:
 - Staff/security will shepherd the Koala from crowds until it climbs a tree or enters surrounding bushland outside of the event area. At this stage, the procedure stated above will be implemented.

- All Koala observations / incidents are to be recorded and reported on within the Event Impact Monitoring Reporting and Biennial Koala Monitoring Reporting.

Outside of event times, the proposed permanent security fencing will be opened to allow movement of Koalas. That is, every 5th or 6th panel will be on hinges (acting as a gate) and will be permanently open except during events. The gates will be closed the day before the first event day and opened the day after the last event day. Gates would only be closed for large and medium events. Each fencing panel is approximately 2.5m long. The fence will also be set 100mm off the ground to allow movement of smaller fauna.

In addition to the above event-based measures, the following will be implemented at Parklands to minimise potential impacts to Koala and their habitat during the construction of ancillary infrastructure (associated with permanent approval):

- Clear delineation of the clearing area (approx. 300m²) associated with proposed vehicular access track in the north-west (see ELA 2018). This will include the establishment of Tree Protection Zones and arborist advice to reduce impacts to surrounding vegetation.
- A qualified fauna spotter catcher will be present during clearing activities.
- Machinery and vehicles that are accessing site to install temporary and permanent infrastructure will adopt the following measures when within the project area:
 - All machinery onsite should be cleaned for weeds and soil deposit off site.
 - Minimise soil disturbance during vehicle movement.
 - Promote the hygiene of construction vehicles to minimise spread of weeds and pathogens,
- All staff and contractors to be appropriately inducted on appropriate measures to minimise impacts to biodiversity

5.2 Habitat enhancement

A significant program of bush regeneration and plantings has occurred on site since 2007, with establishment works complete for all areas. To date over 24,000 trees and shrubs have been planted, including Koala food trees. Habitat enhancement works improve Koala habitat across the Parklands site in two important ways:

- Providing additional areas of Koala feed tree species
- Providing improved habitat connectivity and movement corridors within and across the site

All planting areas are regularly inspected and weed control undertaken. The majority of these plantings are well established with a greater than 90% establishment rate, and in many areas, trees are now in excess of 5 m in height.

The earlier plantings are now developing good quality habitat structure and facilitating native regeneration and an understory. Parklands' ecologists have recorded a wide range of birds and small vertebrate fauna occupying these forest blocks. Most plantings only need once yearly follow up to prevent the establishment of woody weeds such as *Senna pendula* (Easter Cassia) and *Cinnamomum camphora* (Camphor Laurel). The extensive regeneration of eucalypts in the north-western area of Parklands increases the area of available habitat for Koalas.

The Ecological Restoration Plan (**Figure 4**) divides the Parklands into different management zones formed by the ecological restoration works. The zones include:

- Habitat, Existing – Large patches of existing mature vegetation that will undergo ongoing weed management where required. Due to their condition, limited works are required to manage these patches.
- Habitat, Improved – Areas of vegetation in various condition that undergo weed management.
- Habitat, Regeneration – Areas of existing native vegetation that may require significant weed removal and supplementary planting.

- Habitat, Planting – areas that have undergone broad scale planting and are being managed towards mature vegetation communities.
- Managed Parklands, Regeneration – Event areas that are managed to maintain the scattered native trees and to reduce weed incursion.
- Managed Parklands, Plantings – Event areas where native trees have been planted.

Note: Use of the word ‘habitat’ in the above dot points reflects general wildlife habitat and not specific Koala habitat; although Koala habitat values will also be present.

The overall aim is to restore target areas to provide functioning native vegetation communities (see Eco Logical 2018a for details). The target PCT rehabilitation targets reflect adjacent native vegetation and the majority of restoration zones contain Koala food tree species including *Eucalyptus microcorys* (Tallowwood), *E. tereticornis* (Forest Red Gum) and *E. propinqua* (Small-fruited Grey Gum). The broad key performance indicators relative to Koala habitat restoration are:

- Locally occurring species present for target PCTs
- Koala food trees present in restoration areas
- Resilient vegetation communities are created, which require minimal management of exotic species
- Regeneration assists Koala movement across the site

Habitat restoration and management will continue as an ongoing program of works. These works will both enhance Koala habitat within and build further connectivity across the Parklands site. The Ecological Restoration Plan will result in a broadened east-west wildlife corridor across the site, in particular, near the western end of Jones Road (Marshall’s Ridge Wildlife Corridor). This coincides with the location of a large number of Koala records and a corridor identified as a Strategic Linkage Area in the BCC KPOM. Koala movements will only be restricted during event times (up to 20 days per year), and therefore the overall habitat connectivity for Koala in the locality is expected to improve as a result of the project.

North Byron Parklands - No-go Zones within Development Site

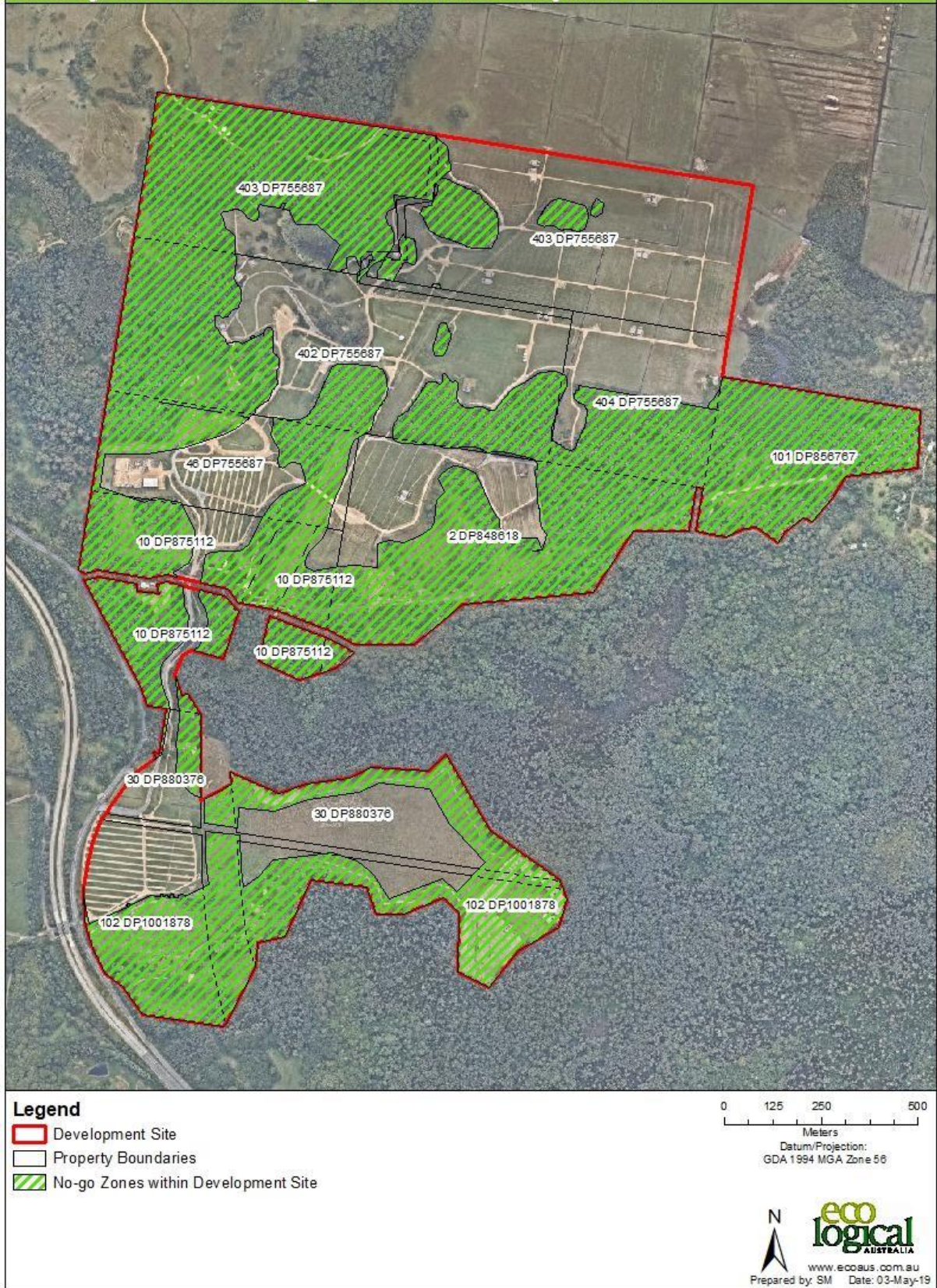


Figure 5 No-go Zones

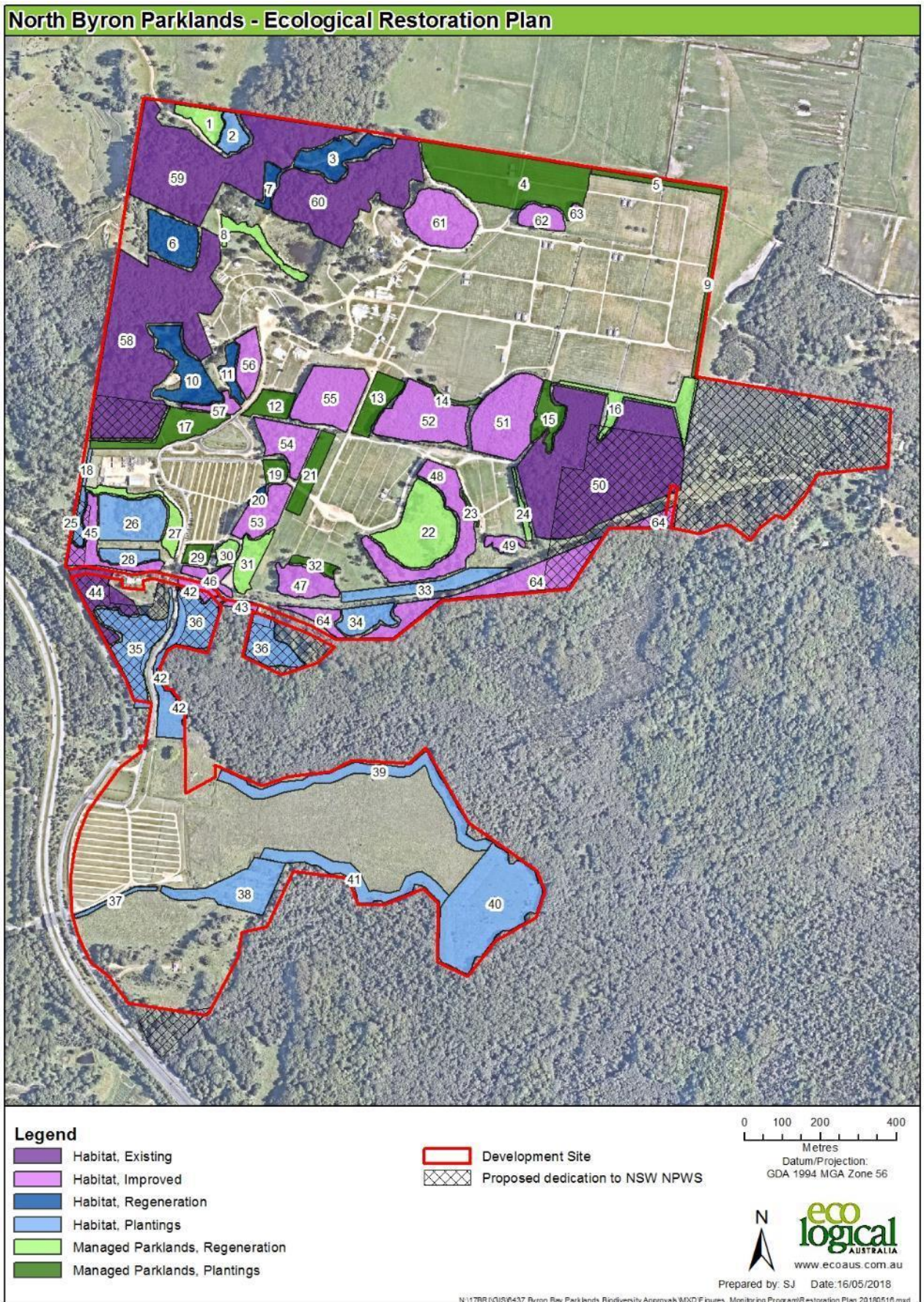


Figure 6: Ecological Restoration Plan

6.0 Monitoring and adaptive management

Ongoing monitoring of Koala at the Parklands will be undertaken as part of a broader program of monitoring and adaptive management. This project is detailed in Eco Logical Australia 2017a. Parts of the program relevant to Koala are provided below.

6.1 Monitoring objectives

It is predicted that the impacts from the ongoing program of cultural events at the Parklands will be minor and temporary, as evidenced by the results of extensive monitoring undertaken during the trial period. However, to ensure that no unexpected impacts occur as a result of ongoing events and/or the increased capacity and frequency of events, the following monitoring objectives have been developed:

- The condition of threatened species habitat will continue to be enhanced via the on-going program of successful vegetation management and bush regeneration.
- Events will not prevent the on-going use of the Parkland site by threatened fauna species.

6.2 Monitoring Program

Long-term monitoring for Koala will occur every two years at five locations where the Koala (or evidence of Koala) has previously been observed (see **Figure 6**). Where possible, monitoring will be linked to surveys being undertaken in the wider region, as guided by the BCC KPoM. Parklands staff will consult with relevant stakeholders at Byron Shire Council prior to each round of monitoring commencing, to seek opportunities for alignment of efforts with wider surveys of local populations being undertaken in the region.

Event Impact Monitoring will also be undertaken for Koala during the largest event each year as per **Section 6.3**.

6.3 Monitoring Method

Long-term monitoring surveys for Koala will be undertaken using the standardised KSAT method, used in previous surveys at the site (Biolink 2016; **Appendix B** for details). Incidental observations will be recorded throughout operations of parklands, both during and outside of events. The quality of Koala habitat will also be monitored over the long term as part of the Flora and Fauna Monitoring and Adaptive Management Program (see ELA 2017a).

Event Impact Monitoring for Koala using the Before-After Control-Impact (BACI) design is incorporated into the Parkland's flora and fauna monitoring and adaptive management program (see Eco Logical Australia 2017a for full details). Koala event monitoring methods are detailed below in **Table 2**.

Health of Koalas will also be recorded, if it can be determined, from observation (i.e. wet bottom (chlamydia) etc). The assessment will be undertaken by a qualified fauna ecologist or fauna spotter catcher with demonstrated experience.

North Byron Parklands - Biennial Monitoring Locations



Figure 7: Biennial KSAT monitoring locations

Table 2: Koala event impact monitoring methods and timing

Timeframe	Survey timing	Methodology
First two years of SITG operation at full capacity (50,000 patrons)	Annual monitoring before, during and after largest event Scale back to 2-yearly only if no significant new/ongoing impacts detected	The following will occur: - Spotlighting transects at the five sites identified on Figure 7. A 50m (radial) area will be searched. This method will allow a measure of Koala/hectare usage. This is to occur before events (and after events if Koala is detected). - Incidental observations of Koala or evidence of Koala at sites (before and after event only) will also in areas where Event Impact Monitoring is occurring for birds and bats (see ELA 2017a). This includes scat and scratch mark searches along the transects as well as direct observation of Koala. - Health of Koalas will also be recorded if it can be determined from observation i.e. wet bottom (chlamydia) etc. The assessment will be undertaken by a qualified fauna ecologist or fauna spotter catcher with demonstrated experience. - Vegetation surveys (undertaken as a component of the Flora and Fauna Monitoring Program and Adaptive Management Plan) will include recording observations of habitat and vegetation condition (including photo points). - Recording of other incidental sightings of Koala (or evidence of the species) elsewhere on site by staff and contractors will occur via notification to the event control centre.
Subsequent and ongoing operation of SITG operation at full capacity (50,000 patrons)	2-yearly monitoring before, during and after largest event	

6.4 Adaptive management

The monitoring results will be used to assess any adverse impacts Koala. If data analysis indicates a trigger has been exceeded, or is likely to be exceeded, further investigation and risk assessment will be undertaken, and an appropriate response will be prescribed to remediate or prevent further adverse impact. Components of the adaptive management plan are outlined in **Table 3** below. The nature of the response will be scaled according to the extent to which triggers have been exceeded. External factors (e.g. regional population trends, climate variables) will also be considered.

Table 3: Adaptive management actions for Koala and habitat

Monitored parameter	Extent of trigger exceedance	Action
Presence of Koala	Biennial surveys or EIM detect Koala usage in the event area or in surrounding bushland.	Formal pre-event survey for Koala are to be undertaken 24 hours prior to events commencing (as per Section 5.1).
Presence of Koala	Absence of individuals and/or no evidence of activity during monitoring	Consult with local Koala experts and Byron Shire Council to understand regional drivers of change Review on-site actions to determine if contributing to absence. If so, implement appropriate changes to event or site management protocols Review appropriateness of monitoring extent and frequency. Update as needed Liaise with OEH as appropriate
Presence of Koala	Negative incidents: displaced/dis-oriented	Respond immediately to any injured/diseased Koalas as appropriate e.g. wildlife carers

Monitored parameter	Extent of trigger exceedance	Action
	individuals, increase of diseased animals, vehicle strike and changes in habitat use	Consult with local Koala experts and Byron Shire Council to understand regional drivers of change Review on-site actions to determine if contributing to injury or illness. If so, implement appropriate changes to event or site management protocols Review appropriateness of monitoring extent and frequency. Update as needed Liaise with OEH as appropriate
Changes in vegetation structure, damage, weed invasion in areas of Koala habitat	Minor edge effects on vegetation areas e.g. litter, trampling Small-scale weed invasions	Undertake routine vegetation management activities to reduce and remediate impacts
	Vegetation damage e.g. trees damaged, small fire, reduction in eucalypt cover Moderate weed invasions	Review on-site actions to determine if contributing to change. If so, implement appropriate changes to event or site management protocols Prepare and implement rehabilitation plan
	Major vegetation damage e.g. large fire, dieback of vegetation, clearing Extensive weed invasions	Notify OEH Review on-site actions to determine if contributing to change. If so, implement appropriate changes to event or site management protocols Prepare and implement rehabilitation program

6.5 Reporting

Koala monitoring results will be reported separately for long-term and event impact monitoring. Results of event impact monitoring for the Koala will be included in the Event Impact Monitoring report, which covers all monitored flora and fauna. As per the existing monitoring program, a Koala Monitoring Report will be prepared following each long-term monitoring survey.

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Appendix A – KPoM content requirements

Requirement	Location in this document
Estimate of population size	Section 2.2
Identification of preferred feed tree species for the locality and the extent of resource available	Section 2.3.1
An assessment of the regional distribution of Koalas and the extent of alternative habitat available to compensate for that to be affected by the actions	Section 2..2 and section 2.3
Identification of linkages of Core Koala Habitat to other adjacent areas of habitat and provision of strategies to enhance and manage these corridors	Section 2.3 and section 5.2
Provision of detailed proposals for amelioration of impacts on Koala populations from any anticipated development within zones of Core Koala Habitat	Section 5
Identification of any opportunities to increase size or improve condition of existing Core Koala Habitat	Section 5.2
The plan should clearly state what it aims to achieve	Section 1.3 and section 3
The plan should state criteria against which achievement of those objectives is to be measured	Section 6.4
The plan should also have provisions for continuing monitoring, review and reporting	Section 6

Appendix B – 2016 Survey Report (Biolink)

Appendix C – Plant Community Type Descriptions

Description of Plant Community Types

Vegetation Zone 1: Blackbutt - Tallowwood tall moist forest of the far north east of the NSW North Coast Bioregion

This community consists of regrowth forest (>70 years old) in good condition on the foothills within the development area. The canopy (approx. 20-30 m high) is dominated by Blackbutt, with Pink Bloodwood, *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus microcorys* (Tallowwood), *Eucalyptus propinqua* (Small-fruited Grey Gum), *Eucalyptus siderophloia* (Grey Ironbark), Brush Box and *Syncarpia glomulifera* (Turpentine) also common.

The mid story generally consists of *Pittosporum undulatum* (Native Daphne), *Notelaea longifolia* (Large-leaved Olive), *Hovea acutifolia* (Purple Pea Bush), *Acmena smithii* (Common Lilly Pilly), *Acacia obtusifolia* (Blunt Leaf Wattle) and Guioa, amongst others. The weeds Camphor Laurel and *Lantana camara* (Lantana) were also common, though not abundant.

The ground layer generally consisted of *Doodia aspera* (Prickly Rasp Fern), *Blechnum cartilagineum* (Gristle Fern), *Pteridium esculentum* (Common Bracken), and *Lomandra multiflora* (Many-flowered Mat-rush). The climbers *Smilax* spp., *Geitonoplesium cymosum* (Scrambling Lily) and *Marsdenia rostrata* (Milk Vine) were also common.

This community would provide good fauna habitat due to the community's age and contiguousness with other large patches of vegetation. Large standing trees, fallen logs, trees with hollows, native ground covers, and coarse and fine litter were present.

An indicative photograph of this community is shown in **Figure 8**.



Figure 8: Vegetation Zone 1

Vegetation Zone 2: Brush Box - Tallowwood shrubby open forest of the northern ranges of the NSW North Coast Bioregion

This vegetation zone consisted of remnant vegetation in good condition and was more often on southerly facing aspects. The canopy (20-30m high) was dominated by Brush Box, with Pink Bloodwood and Blackbutt also occasionally present in the canopy. Broad-leaved paperbark was also sometimes present on lower slopes.

The mid-story of this PCT generally consisted of *Synoum glandulosum* (Scentless Rosewood), *Wilkiea huegeliana* (Veiny Wilkiea), *Cryptocarya microneura* (Murrogun), *Eupomatia laurina* (Copper Laurel), *Pilidiostigma glabrum* (Plum Myrtle), Native Daphne, and *Ripogonum elseyanum* (Hairy Supplejack). The exotics Lantana and Camphor laurel was also occasionally present.

In the ground layer, *Blechnum cartilagineum* (Gristle Fern), *Davallia pyxidata* (Hare's-foot Fern), *Ottocloa gracillima* (Pademelon Grass) were occasionally present, though the ground layer was often sparse.

Similarly to Vegetation Zone 1, this community would provide good fauna habitat due to the community's age and contiguousness with other large patches of vegetation. Large standing trees, fallen logs, trees with hollows, native ground covers, and coarse and fine litter were present.

An indicative photograph of this community is shown in **Figure 9**.

This vegetation zone also includes an area of scattered *Araucaria cunninghamii* (Hoop Pine) among pasture grasses (Plot 28), as this was the most appropriate PCT given the plot's location and likely pre-existing vegetation community.

Vegetation Zone 3: Brush Box - Tallowwood shrubby open forest of the northern ranges of the NSW North Coast Bioregion (rehabilitation area)

The area within Zone 3 has recently been subject to rehabilitation works and was previously used for cultivation of bananas. It was likely to be Brushbox tall moist forest prior to clearing and will develop into this community over time. It is in a poor condition due to weed infestation, though the community did not meet thresholds for low condition under the FBA methodology, as the canopy cover exceeded the minimum threshold for moderate to good condition.

As the site is in poor condition (relative to the target PCT), it has been mapped as a separate vegetation zone.

The canopy was low (approx. 5 to 10m high) and dominated by *Acacia* sp.; however other native species were also observed to be common, including Brush Box, *Macaranga tanarius* (Macaranga), *Melicope elleryana* (Evodia), *Mallotus philippensis* (Red Kamala) and *Jagera pseudorhus* (Foam Bark).

The mid-story and ground layer was dominated by exotic species, namely Lantana and Easter Cassia, as well as *Ageratina riparia* (Mist Flower), *Ageratina adenophora* (Crofton Weed), *Melinis minutiflora* (Molasses Grass) and *Setaria sphacelata* (Setaria). *Passiflora suberosa* (Corky Passionflower) and Pademelon Grass (a native) was also common.

Despite its current condition, the community provides some habitat resources for native fauna such as small birds and reptiles due to the thick mid-story and ground cover.

An indicative photograph of this community is shown in **Figure 10**.



Figure 9: Vegetation Zone 2



Figure 10: Vegetation Zone 3

Vegetation Zone 4: Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast

This community exists on the lower slopes within the development site.

The canopy of this community is dominated exclusively by Flooded Gum (20-30m tall). In the mid-storey, the natives *Cupaniopsis anacardioides* (Tuckeroo), *Acacia disparrima* (Hickory Wattle), Murrogun, *Maclura cochinchinensis* (Cockspur thorn) and Guioa were common, with Camphor laurel* also common.

Paspalum mandiocanum (Broad-leaved paspalum*), Pademelon Grass and *Smilax australis* were common in the ground layer.

This community would provide moderate fauna habitat as it is fragmented and subject to weed incursion on the edges. Nonetheless large standing trees, fallen logs, trees with hollows, native ground covers, and coarse and fine litter were present.

An indicative photograph of this community is shown in **Figure 11**.



Figure 11: Vegetation Zone 4

Vegetation Zone 5: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion

This community exists on the lowland alluvial flats within the eastern portion of the development area.

It is dominated by Broad-leaved paperbark, with Swamp Oak also occasionally present in patches. Common Lilly Pilly and Camphor Laurel* was observed to be common in the *midstorey*, with Tuckeroo, *Cryptocarya triplinervis* var *pubens*, Evodia, *Croton verreauxii* (Green Native Cascarilla), Guioa, Native Daphne, *Rhodamnia rubescens* (Scrub Turpentine), Scentless Rosewood, *Glochidion sumatranum* (Umbrella Cheese Tree), *Ficus coronata* (Sandpaper Fig) and *Litsea australis* (Brown Bolly Gum) occasionally occurring. Lantana* and Easter Cassia* was also occasionally present.

A diversity of ground covers exist in this community depending on location, topography and levels of disturbance. Common species observed include Swamp Water Fern, *Morinda jasminoides* (Sweet Morinda) *Geitonoplesium cymosum* (Scrambling Lily), Common Silkpod, *Smilax australis*, *Stephania*

japonica var. *discolor* (Snake Vine), *Calochlaena dubia* (Rainbow Fern), *Cyclosorus interruptus*, *Viola hederacea* (Ivy-leaved Violet), *Oplismenus hirtellus* var. *imbecillis* (Creeping Beard Grass), *Carex* sp., and *Gahnia clarkei* (Tall Saw-sedge).

This community would provide good fauna habitat due to low level of weed infestation, and the presence of fallen logs, native ground covers, and coarse and fine litter. No trees with hollows were observed however.

An indicative photograph of this community is shown in **Figure 12**.



Figure 12: Vegetation Zone 5

Vegetation Zone 6: Forest Redgum - Pink Bloodwood open forest of the foothills and ranges of the NSW North Coast Bioregion

The zone is comprised of several areas, including remnant vegetation in the east of the development and two areas of rehabilitation. The two areas of rehabilitation are adjacent to the Flooded Gum forest and also along Yelgun Creek.

The remnant vegetation patches in the east are dominated by Forest Red Gum, with a 20 to 30m canopy. Other common canopy species observed include Pink Bloodwood, Swamp Box, Grey Ironbark (*Eucalyptus siderophloia*) and White Mahogany. The mid-layer was often dominated by Swamp Box, *Elaeocarpus obovatus* (Hard Quandong), Guioa and *Acacia melanoxylon* (Sally Wattle). The ground layer was often dominated by Broad-leaved paspalum*, *Marinda jasminoides* (Sweet Marinda), *Cissus antarctica* (Kangaroo Vine), *Ottochloa gracillima*, *Panicum lachnophyllum*, *Smilax australis* (Lawyer Vine) and *Marsdenia rostrata* (Milk Vine).

The area of rehabilitation has a canopy height of approximately 5 metres. It is considered of good enough quality (in terms of site attributes relevant to the FBA method) to be included within this vegetation zone. At the rehabilitation areas Forest Red Gum, Bloodwood, Blackbutt, White Mahogany, Brush Box and *Acacia melanoxylon* (Black Wattle) were present. A similar mix of species was also present along Yelgun

Creek. Along the creek the eucalypts were much older, numbered less than 10 altogether and formed a canopy approximately 20m high.

Other tree and shrub species observed in the area of rehabilitation included Lantana*, Turpentine, Evodia, *Acacia longifolia* (Sydney Golden Wattle) and Cockspur Thorn. Ground species observed include Common Bracken Fern, *Hibbertia scandens* (Golden guinea vine), Broadleaf Paspalum, *Imperata cylindrica* (Blady Grass), Gristle Fern, Purple Pea Bush, *Echinostephia aculeata*, *Pratia purpurascens* (White Root) and *Ageratum houstonianum* (Blue Billy-goat Weed).

The rehabilitaotin areas currentlty provide limited habitat value due to the lack of overstorey. Nonetheless the ground covers and shrub layer (along Yelgun Creek) provide habitat resources for native fauna such as small birds and reptiles.

An indicative photograph of this community is shown in **Figure 13**, with the the area of rehabilitation where a plot was located shown in **Figure 14**.

This community is not considered to meet *the Subtropical coastal floodplain forest of the NSW North Coast bioregion* endangered ecological community listing as it occurs on lower hillslopes in the study area and not within the floodplain.

Vegetation Zone 7: Forest Redgum - Pink Bloodwood open forest of the foothills and ranges of the NSW North Coast Bioregion

This vegetation zone comprises a small patch of Acacia regrowth, with an understory of exotic pasture grass. Prior to clearing, the area was likely to be Forest Redgum - Pink Bloodwood open forest due to its location in the landscape and proximity to remant areas of this PCT. Over time, it is assumed that this community will regenerate into Forest Redgum - Pink Bloodwood open forest.

The Forest Redgum - Pink Bloodwood open forest PCT was the most appropriate choice for PCT description due to the area's likely preclearing PCT and that there are no regrowth Acacia forest PCTs.

An indicative photograph of this community is shown in **Figure 15**.



Figure 13: Vegetation Zone 6



Figure 14: Vegetation Zone 6 (rehabilitation area)



Figure 15: Vegetation Zone 7

Pasture (cleared land)

This area was dominated by *Setaria**, with *Paspalum urvillei* (Vasey's grass*) and *Verbena bonariensis* (Common Verbena*) also common. A photo of this area is provided in **Figure 16**.

Other areas of the grounds are regularly mown and managed to facilitate events.



Figure 16: Unmanaged grassland

Appendix D – Temporary exclusion fencing

Temporary exclusion fencing is detailed in the below figure. The blue lines indicating 10m fire hardstand are where the temporary fencing will be located.

