



North Byron Parklands Cultural Events Site

Biodiversity Assessment Report

Prepared for
Billinudgel Property Pty Ltd

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Abbreviations

Abbreviation	Description
BAR	Biodiversity Assessment Report
BBCC	BioBanking Credit Calculator
BC Act	Biodiversity Conservation Act 2016
BNR	Billinudgel Nature Reserve
CEEC	Critically Endangered Ecological Communities
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DWLC	NSW State Groundwater Dependent Ecosystem Policy
EEC	Endangered Ecological Community
EIM	Event Impact Monitoring
EIS	Environmental Impact Statement
EPBC Act	Commonwealth Environment Protection and Biodiversity Act (1999)
FBA	Framework for Biodiversity Assessment
FM Act	NSW Fisheries Management Act (1994)
GDE	Groundwater Dependent Ecosystem
MNES	Matters of National Environmental Significance
NBP	North Byron Parklands
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEARs	Secretaries Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TEC	Threatened Ecological Community
TSC Act	NSW Threatened Species Conservation Act (now repealed)
WM Act	NSW Water Management Act (2000)

Executive Summary

North Byron Parklands (Parklands) is currently operating as a cultural events site under short-term State approval. The existing approvals include a trial period to allow use of the site as a cultural, education and outdoor events venue. Billinudgel Property Pty Ltd, as the owners and operators of the site, seek to obtain 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.

The NSW approvals process requires an Environmental Impact Statement (EIS) for permanent approval as a State Significant Development (SSD) Project. A component of this is to assess impacts to biodiversity under a SSD using the Framework for Biodiversity Assessment (FBA). This Biodiversity Assessment Report (BAR) has been prepared to address this requirement and in line with the Secretary's Environmental Assessment Requirements (SEARs), which were issued for the project on 18 January 2017.

The Parklands site is located on Tweed Valley Way and Jones Road in the Yelgun Valley within the Byron Shire local government area. The site forms a natural amphitheatre comprising a low lying and level central plain surrounded by steep rising hillsides on the northern, western and southern sides of the site. The Billinudgel Nature Reserve is immediately south and east of the site. Historically, the site was used as a cattle grazing property and experienced significant vegetation clearance. Acquired in 2007, the site has been used since July 2013 for cultural events and large areas have been successfully rehabilitated.

The total Parklands (Development Site) comprises an area of 229.34 ha. Within this, an area of approximately 134 ha will be directly utilised for the development, with approximately 95 ha preserved or rehabilitated as natural bushland habitat. This proposal is to obtain permanent approval to utilise the site as a cultural events venue with a maximum capacity of 50,000 patrons for one large event and a number of smaller events (up to 20 event days p.a.). The increased utilisation of the site will be implemented in multiple phases, with staged increases in maximum patron size over several years. The gradual increase in site utilisation will allow any potential impacts to be monitored and appropriate modifications to events to be implemented.

The proposal also incorporates the construction of several new buildings and infrastructure. The proposed buildings include a new conference and health retreat centre, bus shelters and amenities blocks. The proposed infrastructure includes a new security fence, water tank, internal roads and site enhancements, potable water supply works, toilet and water treatment facility works and environmental works.

Parklands plans to undertake events and functions in the proposed conference centre, in a manner that is generally consistent with the approved concept plan. Functions in the conference centre may include a range of events such as corporate functions, conferences, celebrations, or health and wellbeing retreats.

The conference centre would operate year-round, and cater for up to 180 patrons per day. Accommodation would be provided for up to 120 guests a day in 30 on-site cabins. Accommodation would be limited to guests associated with functions and events only, and would be permitted on event days and for up to one day prior to and one day after event days.

The proposed development will not result in broadscale clearing of native vegetation within the Parklands. However, a small area of vegetation clearing/pruning is required to facilitate the construction of a new access track. This access track has been positioned to minimise vegetation clearing and follows an existing farm track. Nonetheless, some minor vegetation clearing will be required on either side of the track in a small patch of vegetation.

There will also be some clearing / slashing of exotic pasture in the southern areas of the site to increase car parking capacity, as well as removal of Camphor Laurels (a weed species) near the proposed conference centre. Areas of existing native vegetation will be designated no-go zones and where required, will be fenced off during all events.

Extensive survey and monitoring has been undertaken at the site and these results have been used to support the development of this BAR, along with recent surveys undertaken as per the requirements of the FBA. The overall survey and monitoring results to date indicate that the cultural events at the Parklands site and adjacent Billinudgel Nature Reserve have caused only very minor, temporary and reversible impacts on the ecological attributes of this locality, including threatened species, populations and communities. Increased light and noise levels are an inevitable occurrence associated with events, and these factors will impact on local fauna movements and site usage during the period of each event. However comprehensive event impact monitoring has shown that once these factors cease to operate and the site returns to pre-event conditions, fauna presence and habitat values return to baseline conditions. Moreover, there are no evidence of declines in any environmental values at the Parklands, indicating no cumulative effects of holding multiple events.

As per the requirements of the FBA, a number of analyses have been undertaken to document the ecological values of the site, including vegetation mapping and assessments of the presence of threatened and migratory species. The assessments concluded the following:

- There are six Plant Community Types (PCTs) present within the Parkland site, along with large areas of pasture (cleared land / exotic pasture grassland)
- Four plant communities listed as Endangered Ecological Communities (EECs) under the BC Act or Threatened Ecological Communities (TEC) under the EPBC Act are present within and/or immediately surrounding the Parklands
- Habitats present within the development site are generally in moderate to good condition. There are large tracts of vegetation, which are connected to patches of vegetation in the region. Within 1 km of the site there are areas of high ecological value
- Thirty-one (31) 'ecosystem credit species' relevant to the site were identified and 23 'species credit species' were found to be known, likely or as having the potential to occur on site
- Threatened and migratory species are known to occur on site including both Commonwealth and NSW-listed species. Most commonly, these include flora, birds and microbats

Only very minor clearing / pruning of vegetation is required as part of the project; and there will be no direct impacts to EECs, CEECs or threatened flora. Accordingly, nor will there be any direct impact to threatened fauna or flora habitat, with exception of minor areas of habitat for the Eastern Grass Owl (an ecosystem credit species). This species has been recorded once within the exotic grassland that will be partially cleared to accommodate the south-eastern carpark. As per the requirements of the FBA, no further assessment of ecosystem credit species was undertaken as no native vegetation will be cleared due to the project. Furthermore, no species credit species are likely to be directly impacted by the project. Offsets are therefore not required.

Indirect impacts were also assessed using both the results of previous event impact monitoring and an assessment of the likely impacts from future events. Previous monitoring has provided good evidence that indirect impacts from events held to date have been very minor, temporary and reversible. The future program of events will include both more event days per year and an increased number of patrons at the largest event. Potential impacts of the new program of events are associated with more traffic (both vehicles and people), increased noise and light as well as increased trampling and bushfire risk. There are a number of impact management mitigation measures that have been successfully implemented and

these will continue to be used to address further impacts. Consequently, all future indirect impacts have been assessed as low risk and are likely to result in a similar pattern of minor, temporary and reversible effects to current operations. Monitoring and adaptive management arrangements will be in place to ensure this is the case, and if not, an appropriate response implemented.

Overall, this report has provided the results of a biodiversity impact assessment for the proposed operation of Parklands as a permanent event venue. As per requirements of the SEARS, it has included an assessment in accordance with the FBA, whilst also addressing additional biodiversity assessment requirements associated with indirect impacts. A key aspect of the project is that only a very minor area of native vegetation will be cleared ($>0.001\%$ of native vegetation on site). For this reason, no offsets are considered to be required. Nonetheless, a significant and voluntary program of bush regeneration and plantings has occurred on site since 2007. Impacts from construction or operations will also be managed through the implementation of effective measures, along with ongoing monitoring and adaptive management processes. The permanent use of the site is expected to result in negligible to minor impacts to biodiversity, which are considered temporary and reversible.

1 Introduction

Billinudgel Property Pty Ltd engaged Eco Logical Australian Pty Ltd (ELA) to undertake a biodiversity assessment of North Byron Parklands (Parklands).

Parklands is currently operating as a cultural events site under short-term State approval. The existing approvals include a trial period to allow use of the site as a cultural, education and outdoor events venue.

Billinudgel Property Pty Ltd seek to obtain 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 Biodiversity Assessment Report (BAR) has been prepared as part of an Environmental Impact Statement (EIS) for the State Significant Development (SSD) Project. The Secretary's Environmental Assessment Requirements (SEARs) were issued for the project on 18 January 2017. Accordingly, impacts to biodiversity under a SSD must be assessed using the Framework for Biodiversity Assessment (FBA).

This report responds specifically to the SEARs requirements that relate to biodiversity assessment, as outlined in **Table 1**. Comments from various agencies that were included in the SEARs (see **Appendix A**) are also addressed within this report.

Table 1: Relevant draft SEARs addressed in this BAR

SEARs	Response
Biodiversity – including: an assessment of the development and all biodiversity values on the site under the <i>Framework for Biodiversity Assessment 2014</i> that is to include: • Identification of species on site; • Detail of the potential direct and indirect impacts on any threatened species, populations, endangered ecological communities or their habitats, groundwater dependant ecosystems; and • A detailed description of the measures to avoid, minimise, mitigate and/or offset biodiversity impacts	This BAR has been prepared under the FBA (OEH 2014) for major projects. Under this framework, a detailed assessment must be undertaken on the vegetation to be impacted within the development site, as well as any impacts to threatened species, populations, or endangered ecological communities. This BAR also outlines the offsetting requirement due to unavoidable impacts of the project. This BAR details all measures to avoid and minimise direct and indirect impacts to biodiversity as specified within Section 8 of the FBA. An Assessment of Significance (7-Part Test) has also been undertaken for threatened species and EECs (Appendix M).

1.1 Project Description

1.1.1 Location

The Parklands site is located on Tweed Valley Way and Jones Road in the Yelgun Valley within the Byron Shire local government area (**Figure 1**). The emergency access road leading from the site northwards to Wooyung Road is located within Tweed Shire. The site forms a natural amphitheatre comprising a low lying and level central plain surrounded by steep rising hillsides on the northern, western and southern sides of the site. The Billinudgel Nature Reserve is immediately south and west of the site. Lot / DP of the properties comprising the site are presented in Figure 1. An emergency bushfire assembly area is also located on a neighbouring property to the north.

The total Parklands (Development Site) comprises an area of 229.34 ha. Within this, an area of approximately 134 ha will be directly utilised for the development, with approximately 95 preserved or rehabilitated as natural bushland habitat.

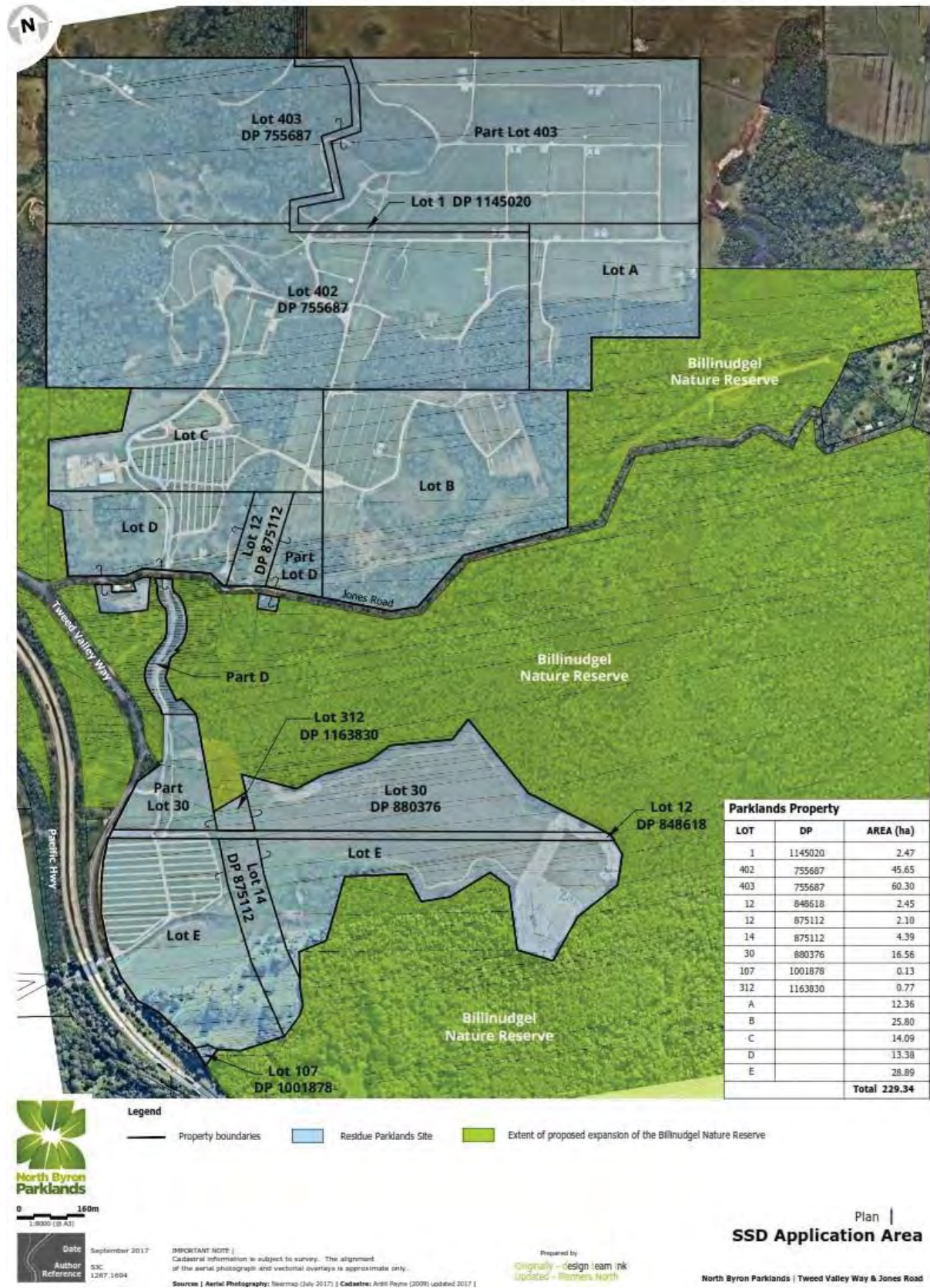


Figure 1: State Significant Development Application Area

1.1.2 Overview of Project

The Parklands is currently operating as a cultural events site under short-term State approval. The current approvals are for a trial period and allow the use of the site for cultural, education and outdoor events, including ancillary camping and car parking, the construction of temporary event infrastructure (completed), a permanent spine road (completed) and vegetation rehabilitation works within the site (underway). Current approval is for a maximum of three events per year, over a combined maximum of 10 event days (or 20 days including minor community events).

This proposal is to obtain permanent approval to utilise the site as a cultural events venue with a maximum capacity of 50,000 patrons for one large event and a number of smaller events (see below). The increased utilisation of the site will be implemented in multiple phases, with staged increases in maximum event size over several years. The gradual increase in site utilisation will allow any potential impacts to be monitored and appropriate modifications to events to be implemented. The proposed events and staging are:

- Splendour in the Grass event (up to an ultimate 50,000 patrons over a maximum of 5 days), subject to meeting KPIs for the following patron capacity scenarios:
 - o Increase from current 35,000 to 42,500 subject to meeting KPIs
 - o Increase from 42,500 to 50,000 subject to meeting KPIs
- Falls Festival Byron (up to 35,000 patrons & maximum of 5 days)
- Three event days with up to 25,000 patrons (cumulative or separate)
- Five community events with up to 5,000 patrons (cumulative or separate)
- Corresponding bump in and bump out time (up to 21 days in; 14 days out).
- 2 one-day community events up to 1,500 patrons (not-for-profit/educational)

In total, there will be a maximum of 20 event days per annum.

The layout of events is subject to event size.

The proposal also incorporates the construction of several new buildings and infrastructure. The proposed buildings include a new conference centre and associated accommodation, bus shelters and amenities blocks. The proposed infrastructure includes a 1.8m high security fence, water tank, internal roads and site enhancements, potable water supply works, toilet and water treatment facility works and environmental works.

Parklands plans to undertake events and functions in the proposed conference centre, in a manner that is generally consistent with the approved concept plan. Functions in the conference centre may include a range of events such as corporate functions, conferences, celebrations, or health and wellbeing retreats.

The conference centre would operate year-round, and cater for up to 180 patrons per day. Accommodation would be provided for up to 120 guests a day in 30 on-site cabins. Accommodation would be limited to guests associated with functions and events only, and would be permitted on event days and for up to one day prior to and one day after event days.

The drawings provided as part of the Development Application (prepared by Dominic Finlay Jones Architects Pty Ltd) show the location and design of the proposed buildings and infrastructure, whilst the masterplan is also presented in **Figure 2**.

The proposed alignment of the new vehicular access track in the north-west of the site (west of the proposed cabins) is shown in **Figure 2**. Although the proposed access track has minimised vegetation clearing by utilising cleared areas, existing farm tracks and avoiding trees (**Figure 4**), some minor clearing is required to widen the track and to remove overhanging branches. The proposed access track will allow the construction of cabins to the east of the track. The existing vehicular track directly east of the proposed vehicular track will be closed and rehabilitated into managed lawn.

The location of the proposed 1.8m high palisade security fence is shown on **Figure 5**. A large portion of the alignment of the security fence will be erected along existing roads and fence lines. There is one area behind the existing amphitheatre where the fence will be erected within native vegetation, however this area is subject to lantana infestation and no native vegetation will be removed as part of installation. Furthermore, for the fence's entire length, every 5th or 6th panel will be on hinges (acting as a gate) and will be permanently open except during events to allow wildlife movement. Each fencing panel is approximately 2.5m long. The fence will also be set 100mm off the ground to allow wildlife movement.

The proposed development will not result in broadscale clearing of native vegetation within the Parklands. However, a small area of vegetation clearing/pruning is required to facilitate the construction of a new access track (as mentioned above and further discussed in **Section 9.1**). There will also be some clearing / slashing of exotic pasture in the southern areas of the site to increase car parking capacity, as well as removal of Camphor Laurels (a weed species) near the proposed conference centre. Areas of existing native vegetation will be designated no-go zones and where required, will be fenced off during all events.

The proposed development includes the implementation of a flora and fauna rehabilitation program across the site, which will build on extensive habitat restoration works that have occurred on the site to date. Habitat restoration works completed at the site include planting of over 22,000 trees and shrubs, weed management and maintenance of existing native habitat and landscaped areas of the Parklands.

Impacts associated with the proposed development will primarily be limited to the proposed 20 event days per year (and associated bump-in; bump-out time), with activity at the site throughout the remainder of the year primarily limited to ongoing management of the site. The conference centre will be available for use year-round. With the exception of the proposed minor clearing/pruning described above, direct impacts associated with the proposed development will be limited to existing cleared grassland areas within the Parklands. Construction of temporary infrastructure, and high human and vehicle activity will be limited to these areas. The only operational activities proposed to occur outside of existing cleared areas of the site are management (opening and closing) of the proposed security fence, flora and fauna monitoring and habitat restoration, including revegetation and weed management. Indirect impacts during event days such as light and noise may impact bushland areas within the Parklands and adjacent habitat areas.

The location of the development site including event areas and no-go zones is presented in **Figure 6**. The extent of the development site is as per the *Request for Secretary Environmental Assessment Requirements* (Planners North, 2016). The event areas (i.e. development footprint) include all areas within the development site excluding no-go zones. No clearing of the extant scattered native trees will occur within the event areas.

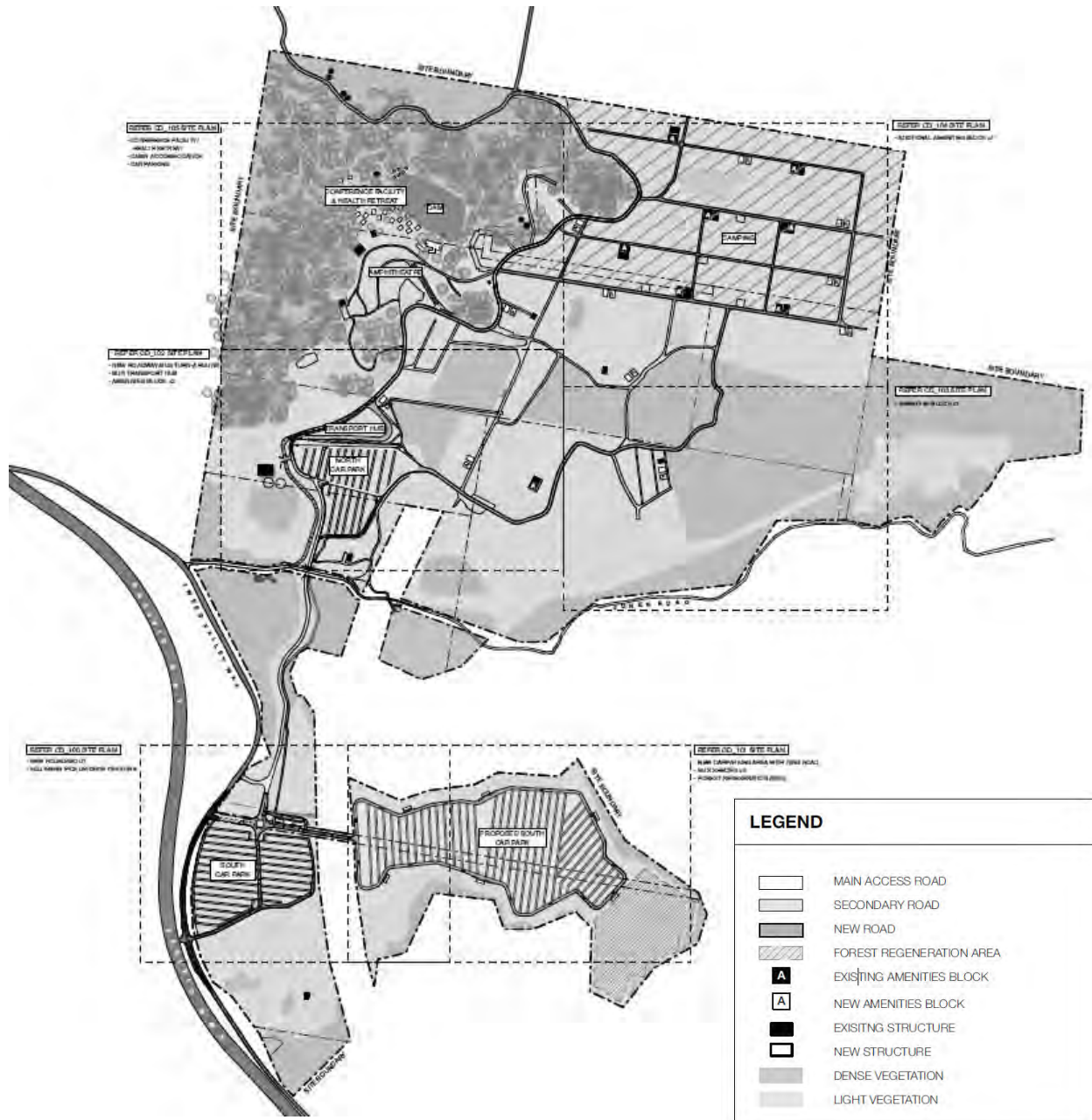


Figure 2: Proposed Masterplan



Figure 3: Proposed Vehicular Track



Figure 4: An existing track to be utilised for the proposed new vehicular access track



Figure 5: Proposed security fence location (shown in red)



Figure 6: Development site and no-go zones

1.1.3 Existing Approvals

In 2008, Byron Shire Council granted consent for a temporary place of assembly with camping and associated infrastructure at the site. The consent allowed for the 2009 Splendour in the Grass event to be held with a patron capacity of 22,500. However, following an appeal against the legal validity of Council's consent, the Land & Environment Court ruled the approval invalid on the basis that a relatively small but integral part of the proposal was prohibited.

In 2009 Parklands sought permanent and concurrent Concept and Project Approval under the former State Environment Planning Policy (Major Development) 2005 given the project constituted development for the purpose of tourist facilities, major convention and exhibition facilities or multi-use entertainment facilities that would employ 100 people or more.

In April 2012, following a 3 year development assessment process (Ref. DP&I, 2011), the NSW Planning Assessment Commission (PAC), under delegation from the then Minister for Planning approved both the Concept Plan and Project applications (Ref. PAC, 2012).

Since then, the following modifications have been submitted to and approved in relation to the Concept Approval and Project Approval.

- On 3 December 2012, Modification 1 was approved for minor typographical amendments to Conditions B4 and E18 of the Project Approval;
- On 29 January 2013, Modification 2 was approved to modify a typographical error in Condition C32 of the Project Approval relating to a miss-description of Yelgun Creek;
- On 22 April 2016, Modification 3 was approved to the Project Approval relating to noise management measures, a request for small community events and various administrative amendments;
- On 12 September 2017, modification 4 was approved to modify the Concept Plan and Project Approval to allow trial events to operate per the parameters of the existing approval up to 31 August 2019.

As part of the Concept Approval and Project Approval (including modifications) commitments, several relevant plans and programs were required to be prepared and implemented. This included a:

- C19 - Flora and Fauna Management Plan
- C20 - Flora and Fauna Monitoring Program and Rehabilitation Program
- C21 - Koala Plan of Management
- E17 - Vegetation Management and Biodiversity Plan

Each of these are discussed below.

C19 - Flora and Fauna Management Plan

A Flora and Fauna Management Plan was prepared by a suitably qualified ecologist, in order to manage the impacts to flora and fauna arising from the carrying out of events at the site. The Plan was prepared in consultation with the New South Wales Office of the Environment and Heritage (NSW OEH), Byron Shire Council (BSC) and the Regulatory Working Group (RWG) having regard to 1) the Ecological Assessment and Response to NSW Department of Planning and Infrastructure Director-General's Environmental Assessment Requirements – prepared by Mark Fitzgerald, Ecological Consultant, June 2010; and 2) Parklands Environmental Health and Safety Management Manual.

The Flora and Fauna Management Plan included all requirements specified in the Project Approval and was submitted for the approval of the Director-General within 60 days prior to commencement of the first

event. The Flora and Fauna Management Plan was approved by NSW Department of Planning and Infrastructure (DPI) on July 18th 2013.

Implementation of the plan is reported within the Annual Environmental Performance Report, which is prepared and supplied to the OEH under consent condition B7 of the Planning and Assessment Commission Project Approval.

C20 - A Flora and Fauna Monitoring Program

A Flora and Fauna Monitoring Program was prepared prior to the commencement of the first event by a suitably qualified ecologist. The Flora and Fauna Monitoring Program was implemented with monitoring of the impact of the project on flora and fauna within and adjacent to the site from before March to September 2013. The Program was prepared in consultation with the Regulatory Working Group (RWG) and was approved by NSW DPI on July 18th 2013.

The Program addressed requirements provided in the Project Approval. Results of monitoring undertaken under the Flora and Fauna Monitoring Program are summarised in **Section 6.1**.

C20 - Flora and Fauna Rehabilitation Program (Modification 3)

As part of the DP&E and Planning Assessment Commission (PAC) assessment processes relating to Modification 3, government agencies and members of the community were invited to make submissions during the public exhibition period. On the 22nd of April 2016 the PAC approved the modification covering noise limits and small non-music focussed community events (up to five community events in the first year). As part of this approval the PAC deleted the existing C20 – Flora and Fauna Monitoring Program consent condition (discussed above) and replaced it with the requirement to prepare the Flora and Fauna Rehabilitation Program (FFRP) to monitor and assess the impact of the project on flora and fauna within and adjacent to the site. Results of monitoring undertaken under the Flora and Fauna Rehabilitation Program are summarised in **Section 6.1**.

C20 - Flora and Fauna Monitoring and Rehabilitation Program (Modification 4)

Modification 4 required a Flora and Fauna Monitoring and Rehabilitation Plan (FFMRP) to be provided within three months of the determination of Modification 4. This plan has been prepared and submitted as part of the development application.

C21 – Updated Koala Plan of Management

C21 required a Koala Plan of Management (KPom) to be prepared if a resident population (within the meaning of SEPP 44) of koalas became established at the site.

A SEPP 44 Koala Survey and habitat reassessment carried out by Biolink Consultants in April 2013 followed earlier assessments undertaken in 2007 and 2008. An interim Koala Plan of Management was prepared in 2007 after the location of a small area of 'core' Koala habitat 'on the Parklands site in 2007. However the 2008 reassessment "...documented a decline in the extent of Koala activity within the aforementioned Core Koala Habitat area over the intervening 12 month period to the extent that the level of use was considered to be relic and/or transient, while no other evidence of Koala activity was recorded elsewhere on the site (Biolink 2013).

To provide a contemporary assessment of Koala presence in the area, Biolink conducted an investigation of the NBP site and surrounding areas in September 2016, as well as reviewing recent OEH Bionet Atlas records for the locality. Evidence of Koala activity in the form of variably aged scats was found at several

sites in the north and west of the NBP site, as well as in the adjoining BNR. No Koalas were observed and the significance of these findings was discussed in the 2016 report.

The Biolink report (2016) notes that the discovery of scats in these areas within the NBP site has occurred during operation of the site, including two festival events annually. The Biolink report (2016) concludes with recommendations that monitoring studies be ongoing on a biennial basis, and this recommendation has been adopted as part of future monitoring (refer to the Flora and Fauna Monitoring Program and Adaptive Management Plan 2017 – 2027, prepared by Eco Logical Australia [2017]).

A KPOM specific to the development site is included in 0.

E17 – Vegetation Management and Biodiversity Management Plan

A Vegetation Management and Biodiversity Management Plan was prepared in 2012, with the objectives to maintain and where possible improve conditions in existing native forest of the site; restore native vegetation in new habitat areas; provide low density tree cover in managed parklands zones; control and remove weeds from native forest and habitat areas; and deliver control programs for feral animals.

Vegetation and biodiversity management outcomes are reported within the Annual Environmental Performance Report, which is prepared and supplied to the OEH under consent condition B7 of the Planning and Assessment Commission Project Approval. Revegetation efforts are also described below in **Section 3.3**.

1.1.4 Results of the Trial period 2012 – 2017

The Parklands site has been operating under a trial arrangement since 2012 (see EPBC2012/6475) with the first event commencing in July 2013. During that time a total of nine major and medium events have been held. The most recent event was held in July 2017 (Splendour in the Grass 2017).

Event impact monitoring data and reports are available for the first eight events (refer to **Appendix F**), with data on any remaining events to be provided in the next Annual Performance Report due in December 2017. Extensive monitoring effort and data collection has been undertaken proceeding, during and following events using the Before-After Control-Impact (BACI) design, to enable evaluation of potential ecological impacts attributable to holding events at the Parklands site. Extensive data analysis shows that no ongoing adverse ecological impacts have been attributed to the trial events at the site, with only minor and temporary impacts during events.

The results demonstrate that the effects of events have been relatively less than natural ecological influences in the project area. Changes that have occurred on site can be attributed to weather conditions, or changes in resources such as food sources. Minor changes have been observed, such as avoidance of the areas by wallabies and flying foxes during illumination (associated with events). However, these have been short-term and reversible. No long-term adverse impacts have been detected during monitoring.

Overall, the biodiversity characteristics of the site are being permanently improved by the current site managers and utilisation patterns. On-going benefits will continue to be realised via active habitat creation and preservation, major site bush regeneration, maximising down times between larger events, and utilising best practice with soil and water systems.

1.1.5 The Proposed land swap

Parklands is also progressing a land swap with NSW NPWS. This includes 37.27 ha being transferred to NPWS, with Parklands gaining ownership of 7.56 ha (i.e. ~30 ha gain for conservation estate). The land going to NPWS is adjacent to and will enhance Billinudgel Nature Reserve. The land going to the Parklands is highly disturbed with no remnant vegetation and will be included in the event footprint. The location and lot numbers of the proposed site reconfiguration is presented in **Figure 7**.

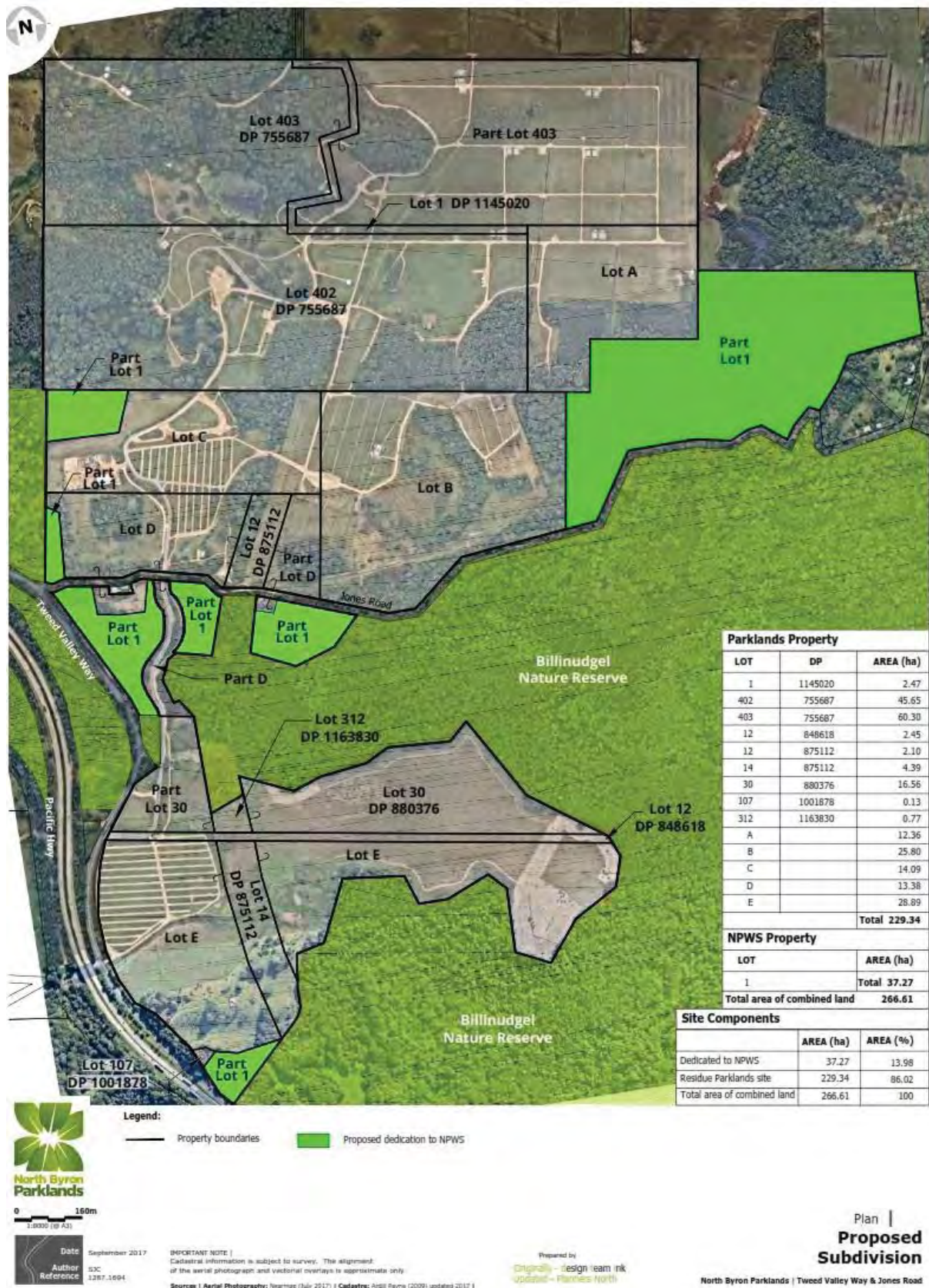


Figure 7: Proposed land swap

2 Data Sources

A desktop assessment and review of previous ecological studies, environmental databases, maps and relevant literature was undertaken to evaluate existing data relating to environmental values within the Parklands.

The following was reviewed:

- EPBC Act Protected Matters Search Tool
- Bionet Atlas Database
- OEH Vegetation Information System (VIS) maps
- Coastal Wetlands (State Environmental Planning Policy No. 14) - SEPP 14
- Atlas of Living Australia
- Aerial photography
- Applicable Threatened Species Profiles, Approved Conservation Advice, Recovery Plans and Survey Guidelines for threatened species occurring within the Parklands (as referenced)

Numerous ecological studies have previously been carried out at Parklands since 2007. These reports collectively provide a comprehensive picture of the listed threatened species, their habitats and ecological communities that occur within and directly adjacent to Parklands. These include:

- Performance Report #1 – #4 Appendices B1 Environmental Performance Report and B2 Results and Analyses of Event Impact Monitoring Data (North Byron Parklands 2014a, 2014b, 2015, 2016)
- Preliminary Results: Event Impact Monitoring Falls Festival 2016-17 (Fitzgerald 2017)
- August 2007 Fauna Survey of the Parklands (Fitzgerald 2007)
- February 2009 Fauna Survey of North Byron Parklands (Fitzgerald 2009)
- North Byron Parklands Biennial Fauna Survey (Fitzgerald 2014)
- North Byron Parklands Flora and Fauna Rehabilitation Program (Fitzgerald 2016)
- Yelgun Koala Survey and Koala Plan of Management (Biolink 2007)
- Yelgun Koala Survey Koala Habitat Reassessment (Biolink 2008)
- North Byron Parklands SEPP No. 44 Koala Survey and Habitat Reassessment (Biolink 2013)
- North Byron Parklands SEPP No. 44 Koala Monitoring Report (Biolink 2016)

Furthermore, targeted surveys were undertaken to provide specific information for this assessment. These are detailed in section 6.2 below.

2.1 Terminology

The terms “Study Area”, “Development Site” and “Development Footprint” are used within this document. The meanings of these terms are consistent with the definition provided in the FBA.

Throughout this report, first mention of species names are given as scientific names with common names following in parentheses. After first mention, common names are then used except where common names do not exist for the species.

3 General Description of the Development Site

3.1 Landform, Geology & Soils

The site forms a natural amphitheatre comprising a low lying and level central plain surrounded by steep rising hillsides on the northern, western and southern sides of the site. A topographic map is provided in **Figure 8**.

Soils vary from dark organic loams to grey metasediment derived stoney clays. Approximately 60% of the Parklands property is managed exotic grassland.

3.2 Vegetation

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 eucalypt forests.

In summary, lowland forest patches are floodplain swamp sclerophyll forest dominated by *Melaleuca quinquenervia* (Broad-leaved Paperbark); with *Lophostemon suaveolens* (Swamp Turpentine), *Casuarina glauca* (Swamp Oak) and *Cinnamomum camphora* (Camphor Laurel) occurring variously as canopy sub-dominants. *Eucalyptus tereticornis* (Forest Red Gum) stands occur in adjacent more elevated areas with Swamp Turpentine, occasional *Corymbia intermedia* (Pink Bloodwood) and *Eucalyptus siderophloia* (Northern Grey Ironbark).

Better drained hill slope forests include *Eucalyptus pilularis* (Blackbutt) and *E. propinqua* (Grey Gum) with Forest Red Gum and *Lophostemon confertus* (Brush Box) dominated stands and a smaller area of rainforest with emergent *Araucaria cunninghamiana* (Hoop Pines).

Approximately three hundred plant species are recorded from the site. This includes 51 exotic or non-native species have been recorded on site; including noxious and environmental weeds e.g. *Chrysanthemoides monilifera* ssp. *Rotundata* (Bitou Bush), *Lantana camara* (Lantana), *Ligustrum sinense* (Small-leaved Privet).

Most forest communities within the development site are regenerating communities <70 years old. Few old growth trees are present, large logs and hollows are uncommon and very large trees are also rare. Cattle have previously used most of the forest and this has clearly affected the condition and species composition of ground layer plant communities. Most of the Parklands site appears to be pasture in a 1947 aerial photo of the site (**Figure 9**), and the site has more recently been grazed by cattle. Sugar cane and bananas were formerly cultivated in the central and southern portions of the property. Bee-keeping is a continuing activity on the property.

3.3 Habitat Restoration

A significant program of bush regeneration and plantings has occurred on site since 2007, with establishment works in most areas complete (see **Appendix C**). To date over 22,000 trees and shrubs have been planted, with other areas also earmarked for regeneration in the future (**Figure 10** and **Appendix C**).

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 type and condition of native vegetation within the development site is further discussed within **Section 6**.

3.4 Hydrology

A long established 1.8 ha dam is located in the northwest of the property, a new smaller dam has been recently constructed in the central west of the site, and an established network of constructed drains is present in all lowland or floodplain areas. These vary from <1 m to ~2 m width and are up to 3 m depth. Yelgun Creek is present (in a highly-modified condition) in the south of the property and Billinudgel Creek crosses the property in the south.

3.5 Land Uses

Billinudgel Nature Reserve is located adjacent to the Parklands site. The reserve is 713 ha in area and forms one of several coastal nature reserves which protect important remnants of coastal habitat in an otherwise highly modified environment.

Billinudgel Nature Reserve has the following key features:

- A large tract of natural lowland coastal vegetation and a significant remnant in an otherwise highly modified environment.
- An extensive SEPP 14 listed wetland containing *Melaleuca* swamp forest.
- A diversity of habitat which supports a wide range of fauna and flora including rare, threatened, significant and migratory species.
- Aboriginal sites and landscapes of significance.
- Features of scientific interest.

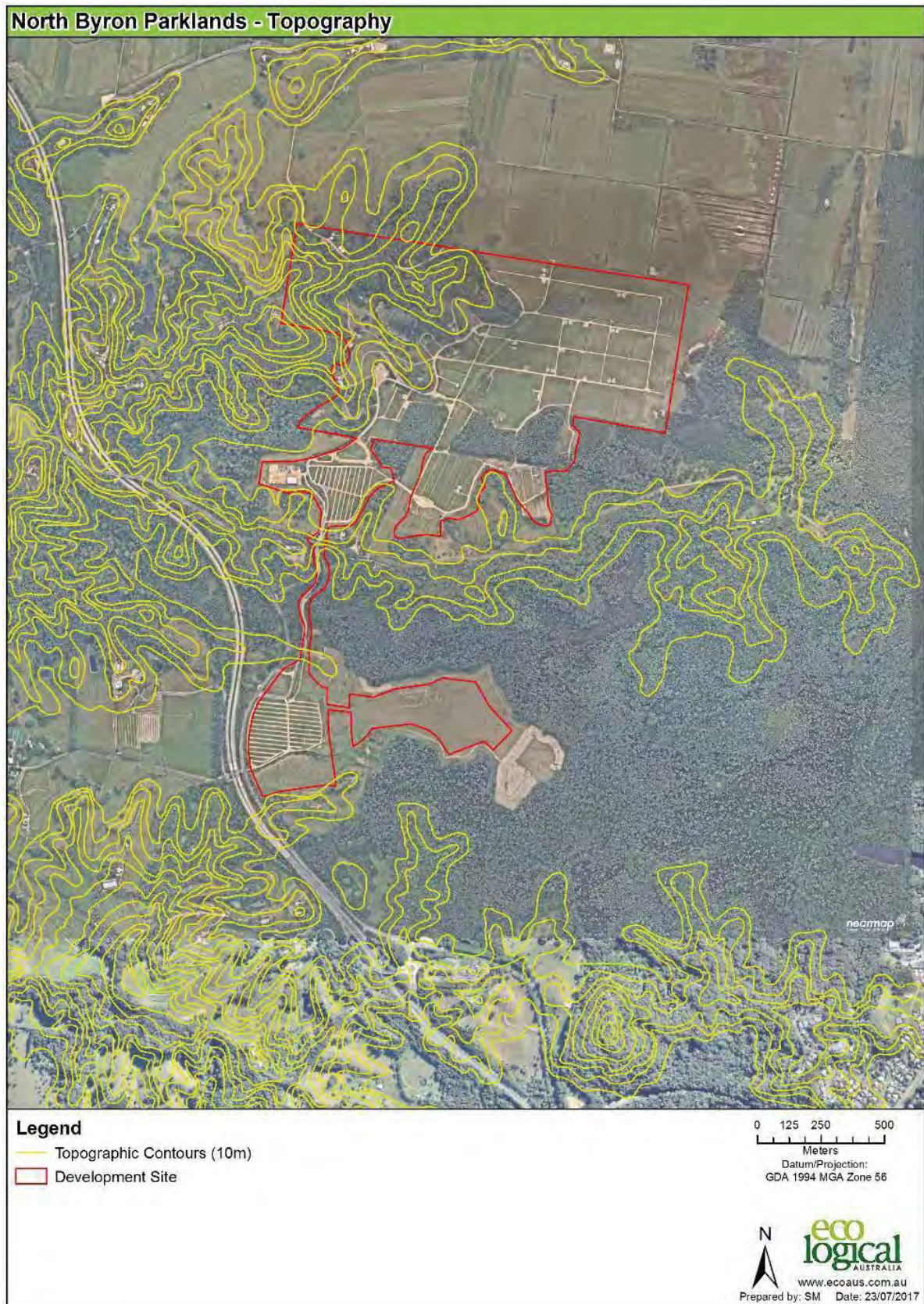


Figure 8: Topography



Figure 9: Aerial photo from 1947



Figure 10: Ecological Restoration Plan – green areas will be the focus of ecological restoration

4 Policies and Legislation

4.1 New South Wales Legislation

4.1.1 Environmental Planning and Assessment Act 1979

The proposal involves two applications under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Firstly, a modification to the existing concept approval (MP 09_0028) is proposed to allow for changes to patron numbers and to update the approval to reflect a permanent cultural events site.

Secondly, development consent is sought to allow the permanent use of the cultural events site, including the continuing use of existing site infrastructure and the development of additional infrastructure to support the cultural events site.

The NSW Minister for Planning is the consent authority for both applications, and the applications will be assessed concurrently.

The NSW Department of Planning & Environment (DP&E) has issued Secretary's Environmental Assessment Requirements (SEARs) for the development application (SSD 8169), which is classified as State Significant Development and will be assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The modification application will be assessed under the former Part 3A of the EP&A Act.

This BAR directly responds to the SEARs that have been issued for the project (see **Appendix A**).

4.1.2 NSW Biodiversity Offsets Policy for Major Projects

As the project is identified as a State Significant Development, under the NSW Biodiversity Offsets Policy for Major Projects, the SEARs require the proponent, to apply the FBA to assess impacts on biodiversity. The FBA must be applied to identify reasonable measures and strategies that can be taken to avoid and minimise impacts to biodiversity. This BAR describes the biodiversity values present on the development site and the impact of the project on these values.

4.1.3 State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44)

The development site is located within the Byron local government area, which is listed under Schedule 1 of the State Environmental Planning Policy 44 (SEPP 44). This policy applies to land to which a development application has been made, which covers an area of more than 1 hectare. The aim of this policy is to promote the conservation and management of natural vegetation that may contain koala habitat. Plans of management are required for areas of core koala habitat.

Biolink Ecological Consultants have undertaken a number of koala surveys and these are summarised in the review of monitoring data (**Appendix F**). A survey conducted in 2007 by Biolink identified approximately 3 ha of Core Koala Habitat (as defined by SEPP 44). A 12-month Individual Koala Plan of Management (IKPoM) was prepared, which required a reassessment of the habitat to identify any changes, prior to the commencement of development. The reassessment undertaken in 2008 indicated a decline in koala activity with the Core Koala Habitat, to the extent that usage at that time was considered to be “relic and/or transient”. No Koala activity was recorded during an additional survey in 2013.

Biolink was again engaged in 2016 to further investigate for evidence of koala activity with the Parklands site. This included 25 km radial searches for koalas at over 26 sites. Opportunistic inspections were also undertaken at the base of preferred koala food trees.

The results from the 2016 survey indicate that the cell of Core Koala Habitat in the south-eastern section of the site was likely to exist at the periphery of a larger cell to the south in Billinudgel Nature Reserve. Koala faecal pellets were recorded at 7 sites in the north-western corner of the Parklands, which is an increase in sightings from previous years.

As per the 2016 results, continued monitoring is recommended however (see **Appendix G**).

Furthermore, a KPoM specific to the development site is provided in **0**.

4.1.4 NSW Policy and guidelines for fish habitat conservation and management

This document focuses on promoting compliance with legislation relating to fish habitat conservation and management. Under Part 4 of the EP&A Act, NSW DPI is a 'determining authority' for local development that requires a permit under the Fisheries Management Act 1994 (NSW) (FM Act):

- Section 144 - aquaculture permit
- Section 201 - permit to carry out works of dredging or reclamation
- Section 205 - permit to harm (cut, remove, injure, destroy, shade etc.) marine vegetation (saltmarshes, mangroves, seagrass and seaweeds),
- Section 219 – permit to obstruct the free passage of fish.

A development that requires consent on the above approvals is deemed an integrated development under s91, Part 4 of the EP&A Act.

No activities requiring a permit will be undertaken as part of the development and no works will be occurring within the waterways.

4.1.5 NSW State Groundwater Dependent Ecosystem Policy (DWLC)

The NSW State Groundwater Dependent Ecosystem Policy (DWLC) is a component of the State Groundwater Framework Policy (1997). This policy was developed in order to enhance the protection of groundwater-dependent ecosystems.

A GDE is defined as an ecosystem which has a species composition and a number of ecological processes that are determined by the groundwater. Such ecosystems include, as per the DWLC Policy, terrestrial vegetation, base flows in streams, aquifer and cave ecosystems and wetlands.

Development and use of land is listed as a potential threat to groundwater. The EP&A act requires the potential impacts to groundwater of proposed developments be assessed through the environmental impact assessment process. The *Protection of the Environment Operations Act 1997* is administered by the EPA and is one of the tools for the control of water pollution, including groundwater.

There will be no significant changes in relation to the management or use of groundwater and surface water flows as a result of the proposed development, and therefore, there will be no impacts to GDEs within the development site and within the broader area. This includes the SEPP14 wetland to the south-east of the development site (**Figure 12**), as well as the Paperbark swamp forest of the coastal lowlands within the development site, and any GDEs that may occur within Billinudgel Nature Reserve.

4.2 Commonwealth Legislation

4.2.1 Environment Protection and Biodiversity Conservation Act 1999

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Matters of National Environmental Significance (MNES) are protected. The FBA requires proponents to identify and assess the impacts on all nationally listed threatened species and threatened ecological communities that may be on the development site. Other MNES are not considered under the FBA.

A referral covering all events at the Parklands from 2017 onwards was determined by the Department of the Environment and Energy to be a not controlled action (NCA) on the 27th July 2017 (provided in **Appendix N**). No future assessment or approval under the EPBC Act is required.

5 Landscape Features

Landscape features have been identified consistent with the FBA methodology.

5.1 Landscape features

For all analysis of landscape features within this BAR, a 1,000-ha inner and 10,000-ha outer assessment circle has been utilised in accordance with Appendix 4, Table 8 of the FBA methodology.

5.1.1 Interim Biogeographic Regionalisation of Australia

Bioregions

The development site and outer assessment circle occur wholly within the North Coast Bioregion. The total area of the bioregion is 5,924,130 ha (IBRA 5.1) and the NSW portion is 5,692,351.6 ha or 96.1% of the bioregion. The NSW portion of North Coast Bioregion occupies 7.11% of the state (NSW NPWS, 2003).

The development area is also within the Murwillumbah (Qld - Southeast Hills and Ranges) IBRA sub-region. This subregion is characterised by finely dissected steep ranges, with narrow alluvial plains. Relief is generally to 250 m. Vegetation typically includes wet and dry sclerophyll forests, including Blackbutt (*Eucalyptus pilularis*), Sydney Blue Gum (*Eucalyptus saligna*), Forest Red Gum *Eucalyptus tereticornis* on lower slopes and plains.

5.1.2 Mitchell Landscapes

As per **Table 2**, the outer circle predominantly overlays the *Byron – Tweed Alluvial Plains* and the *Mount Warning Exhumed Slopes* Mitchell Landscapes (**Figure 11**). Other Mitchell Landscapes that are overlain by the outer circle include the Byron - Tweed Coastal Barriers and the Lamington Volcanic Slopes, however these do not occur in the development site and are therefore not discussed further.

The *Byron – Tweed Alluvial Plains* is described as including channels, floodplain, terraces and estuary of the Tweed River and other coastal streams on Quaternary alluvium. Elevation is generally between 0 to 50m and soils are generally comprised of uniform brown earths and structured brown clays on floodplains.

The *Mount Warning Exhumed Slopes* Mitchell Landscapes occur in the east of the project area (**Figure 11**). This is characterised by moderately steep hills and ridges with central drainage to the Tweed River, which are formed on the slopes of a pre-Tertiary landscape exposed by erosion of the Lamington volcanics. Geology generally includes Silurian Devonian greywacke, slate, phyllite and quartzite, Triassic rhyolite, tuff and claystone and Jurassic shale sandstone and coal. Soils generally include shallow structured and friable red and brown loam and clay loam gradational profiles. General elevation is 25 to 300m.

Table 2: Mitchell Landscapes Occurring within the Development Site and Outer Assessment Circle

Mitchell Landscape	Proportion of inner circle	Proportion of Outer Assessment Circle
Byron – Tweed Alluvial Plans	73.3%	48.5%
Mount Warning Exhumed Slopes	26.7%	48.3%
Byron - Tweed Coastal Barriers	0%	2.3%
Lamington Volcanic Slopes	0%	0.7%

5.1.3 Streams and rivers

Drainage lines across the site and their associated stream orders are shown on **Figure 12**. The development site is traversed by several constructed drainage and natural lines, as well as Billinudgel Creek (Stream Order 2) and Yelgun Creek (Stream Order 4).

The mapping of Yelgun Creek is slightly inaccurate within the development site as this creek actually flows along the southern boundary of the carpark (and not through the current carpark). This is visible on **Figure 12**.

5.1.4 SEPP14 Wetlands

The development site does not overlay any SEPP14 wetlands; however a SEPP14 wetland exists to the south-east of the project area. This wetland is associated with Billinudgel Nature Reserve and is not directly impacted by the project (**Figure 12**).

Further afield, there are also SEPP14 wetlands at Wooyung (north) and Brunswick Heads (south) that exist within the outer circle.

5.1.5 Native vegetation extent

Native vegetation within the outer assessment circle is disjunct as a result of land clearing for agriculture and urban development. Within the 10,000 ha outer assessment circle native vegetation was mapped using the VIS data for the Tweed and Byron LGAs.

Native vegetation extends over approximately 3,875 ha within the outer assessment circle (38.75 %), and is shown on **Figure 13**.

5.1.6 State or Regionally Significant Biodiversity Links

No state significant or regionally significant biodiversity links have been identified within a plan by the Chief Executive of the OEH. As mentioned above, there is a SEPP14 wetland adjacent to the project area. This is within 50m of the development site and therefore is considered to be a State Significant Biodiversity Link. Nonetheless, the Biobanking Credit Calculator (BBCC) accounts for direct impacts to biodiversity links only. As the project is not impacting vegetation, inclusion of the SEPP14 wetland as a State Significant Biodiversity Link is not required.

This is also applicable to the fourth order stream (Yelgun Creek) and the associated 20m buffer that exists in the south of the development site.

5.2 Landscape Value Score

The development was assessed as a site based assessment.

5.2.1 Attributes

Percent Native Vegetation Cover

In accordance with Appendix 4 of the FBA, the current and future native vegetation cover was assessed in Geographic Information Systems (GIS) using VIS data for Byron and Tweed Heads LGA. The project will not result in the loss of native vegetation therefore the current and future extent of vegetation is the same (**Table 3**).

Table 3: Current and Future Extent of Native Vegetation with the Inner and Outer Assessment Circles

Assessment Circle	Current Native Vegetation Extent			Future Native Vegetation Extent		
	Area (ha)	% Cover	Category	Area (ha)	% Cover	Category
Inner Assessment Circle	3,875	38.75	36-40	3,875	38.75	36-40
Outer Assessment Circle	486	48.60	46-50	486	48.6	46-50

Connectivity Value

Connectivity of the development site was assessed using Tables 11 – 14 in Appendix 4 of the FBA. There are no connectivity value classes that will be impacted by the project. The connectivity value class score is therefore 0.

The current linkage width across site is 0-5m (very narrow). There are no linkage width classes that are lost due to the project.

The vegetation within the development site is classed as a woody vegetation type with both the over story condition and mid story / ground cover conditions being at benchmark.

Patch Size

Patch size was calculated using available VIS vegetation mapping. The patch size included all vegetation patches linked to the development footprint within the outer assessment circle. Patches within the development site were considered linked when the adjacent vegetation was:

- In moderate to good condition
- Has a patch size of > 1 ha
- Is separated by a distance of < 100 m; and
- Is not separated by a large water body, dual carriageway, wider highway, or similar hostile link.

Vegetation within the development site is connected to a wider patch of vegetation associated with Billinudgel Nature Reserve and surrounds. This patch is shown in Figure 13 and is approximately 1,500 ha. This corresponds to >1,000 in Table 15 of the FBA Methodology (regardless of the Mitchell Landscape), and therefore is considered extra-large, with a patch size score of 12.

5.2.2 Score

Based on the assessment of landscape attributes above, the Landscape Value Score has been calculated to be 12.

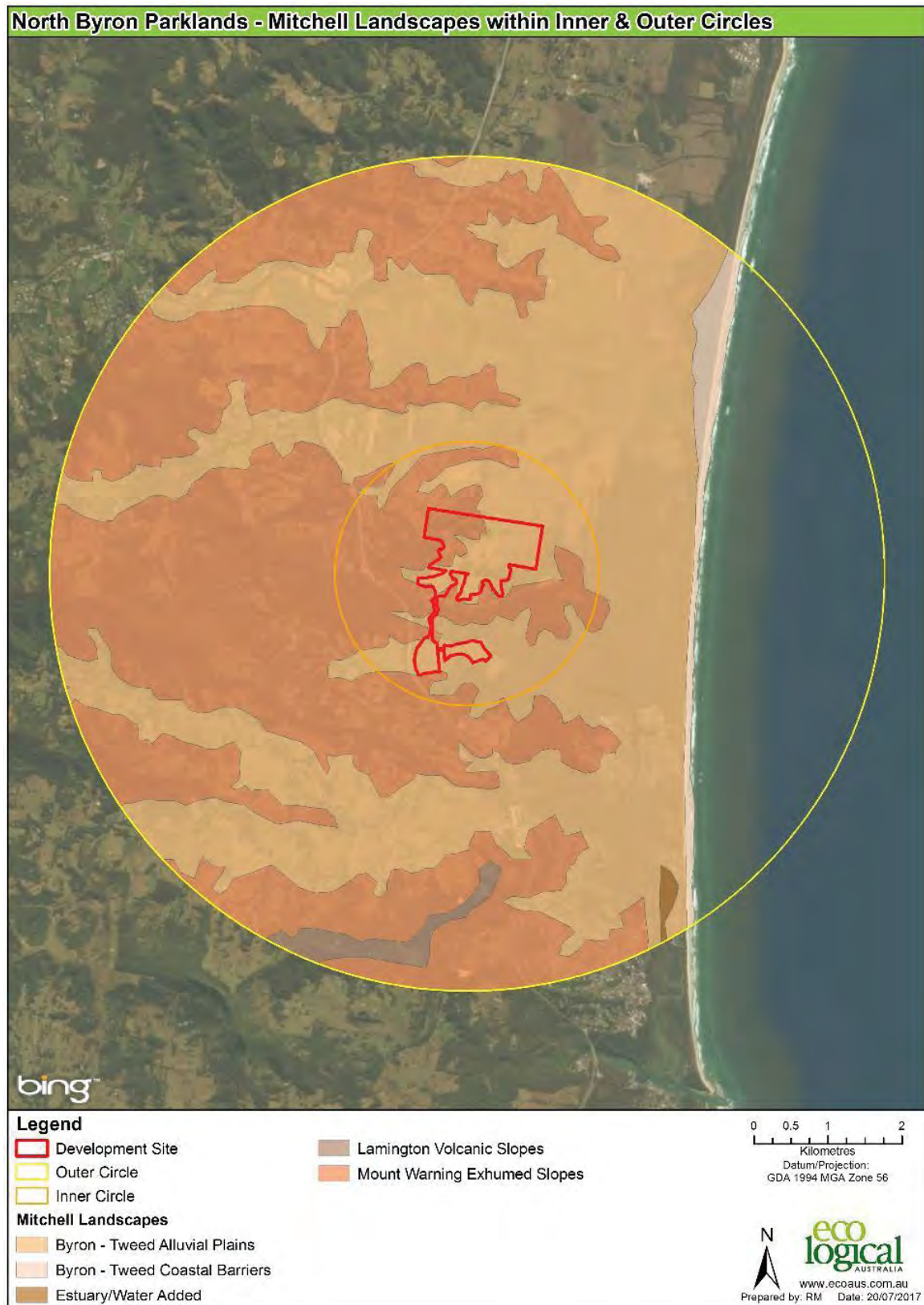


Figure 11: Mitchell Landscapes within the inner and outer circles

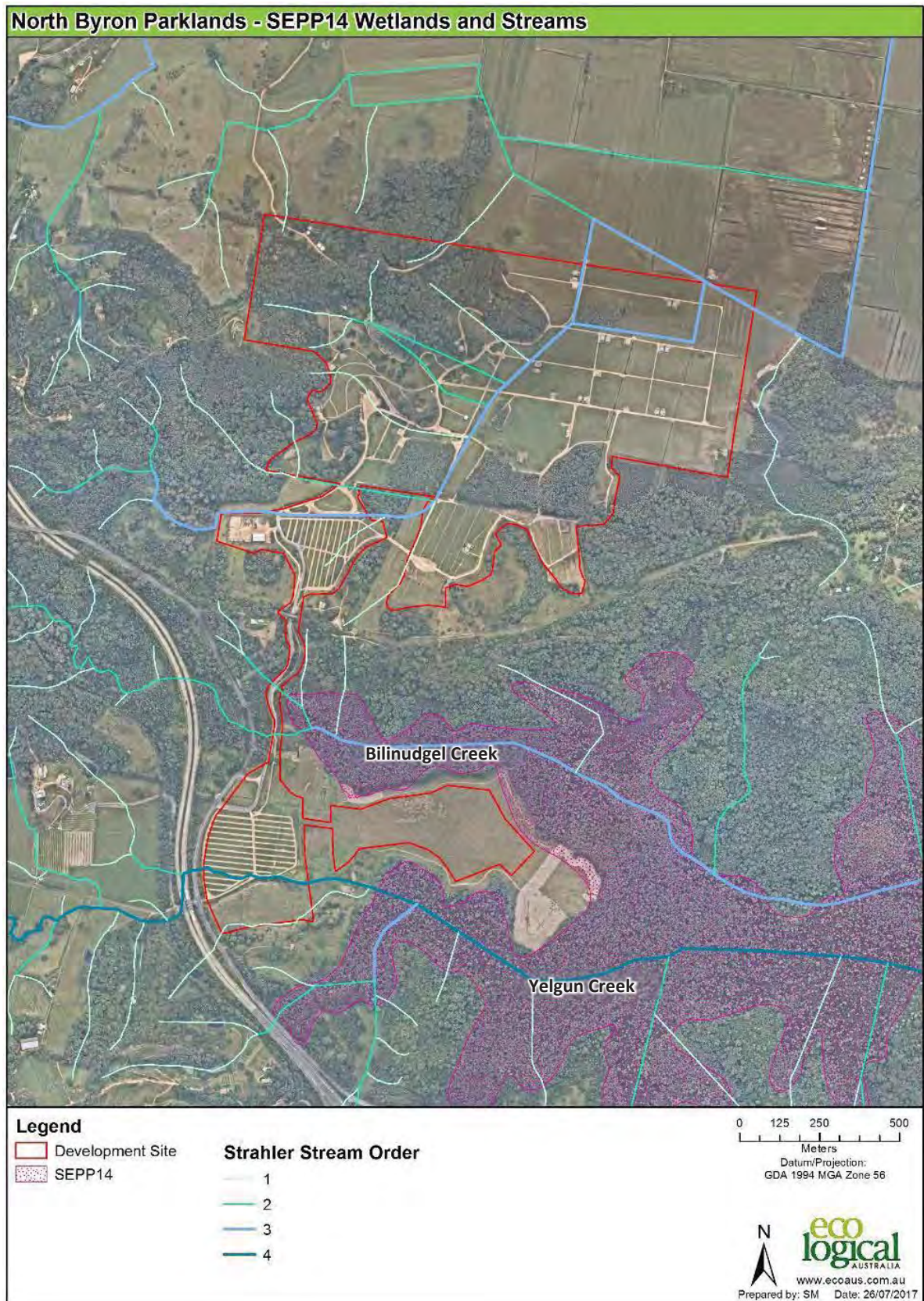


Figure 12: SEPP14 Wetlands and Streams

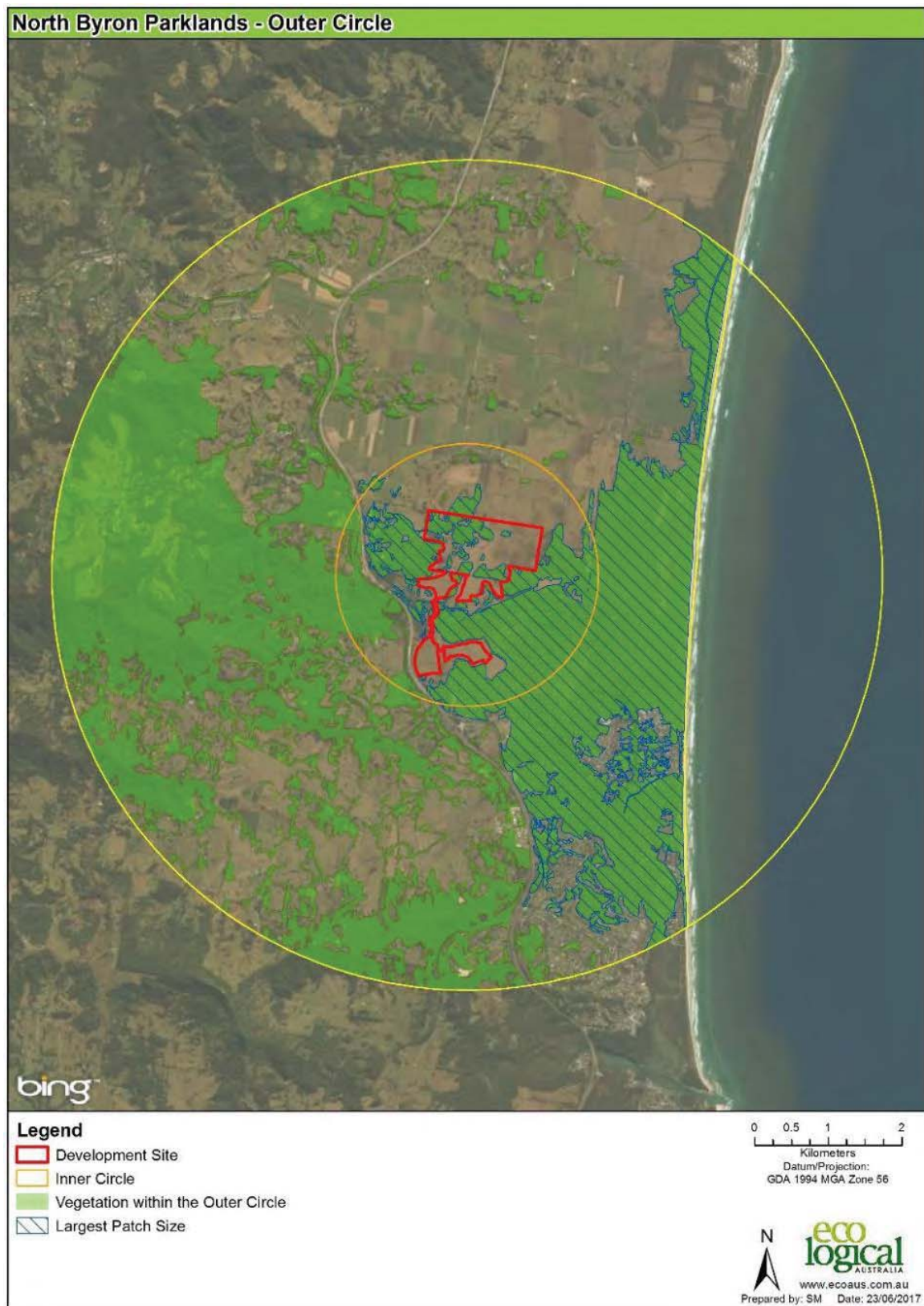


Figure 13: Largest patch size

6 Ecological Surveys Undertaken

The surveys have been designed to provide an overview of the biodiversity values of the development site, as well as the extent of vegetation communities and flora species. This includes historical surveys as well as recent surveys undertaken in accordance with the FBA methodology. Each of these are discussed in the below sections.

6.1 Historical surveys

Numerous surveys have been undertaken within the development site from 2007 to 2016, including nine Event Impact Monitoring (EIM) events and seven other surveys. This includes:

- Performance Report #1 – #4 Appendices B1 Environmental Performance Report and B2 Results and Analyses of Event Impact Monitoring Data (North Byron Parklands 2014a, 2014b, 2015, 2016)
- Preliminary Results: Event Impact Monitoring Falls Festival 2016-17 (Fitzgerald 2017)
- August 2007 Fauna Survey of the Parklands (Fitzgerald 2007)
- January 2009 Vegetation Assessment and Monitoring (Kooyman 2009)
- February 2009 Fauna Survey of North Byron Parklands (Fitzgerald 2009)
- North Byron Parklands Biennial Fauna Survey (Fitzgerald 2014)
- North Byron Parklands Flora and Fauna Rehabilitation Program (Fitzgerald 2016)
- Yelgun Koala Survey and Koala Plan of Management (Biolink 2007)
- Yelgun Koala Survey Koala Habitat Reassessment (Biolink 2008)
- North Byron Parklands SEPP No. 44 Koala Survey and Habitat Reassessment (Biolink 2013)
- North Byron Parklands SEPP No. 44 Koala Monitoring Report (Biolink 2016)

Sampling methods for EIM and other surveys are summarised below, with full details available in the documents listed above. Monitoring locations are presented in **Figure 14** and **Figure 15**.

Event Impact Monitoring (EIM)

The monitoring methods for EIM were developed and approved as part of the Flora and Fauna Monitoring Program (2013) and are summarised in **Table 4** below. This program has been implemented during the nine events listed in **Table 5**.

Table 4: Summary of EIM survey and monitoring methodology across the development site (2007 – 2017)

Target Group	Sampling Methodology
Vegetation and Flora	Establishment of 22 permanent vegetation plots (as 20 x 20m quadrats with 10 x 10m subplots) to sample the range of native vegetation community types on the site, inclusive of floristic and structural components.
Targeted Flora Sampling	Targeted sampling for threatened flora across the site incidentally whilst undertaking vegetation and fauna surveys. This has included a targeted assessment for <i>Arthraxon hispidus</i> (Hairy Joint Grass) in 2009 in potential habitat areas (pers. comm M. Fitzgerald, March 2017)
Vegetation	Vegetation condition and changes before and after each event recorded at 27 permanent photo-points across the Parklands.
Forest Birds	Monthly samples (ten X 20 minute / 200m transects) taken before, during and after each event over three consecutive days between December to January, and from June to August. Sampling events are undertaken by three experienced observers. Impact sites within the Parklands; control sites within Billinudgel Nature Reserve
Forest Birds – plantings	Birds monitored at two sites in established (~9 year old) native plantings in the Marshall's Ridges area – commenced 2015
Waterbirds	20-minute point counts of waterbirds around the 2 ha constructed dam on-site recording species and abundance since 2007
Eastern Grass Owl	Targeted survey and call playback each July during event years – 2013, 2014, 2015, 2016, 2017
Terrestrial Mammals	Ten hair funnels deployed at each of 5 locations at 20 m intervals along a bird transect. The sampling for four nights before, during and after each event.
Terrestrial Fauna	Two sand traps deployed (within an area of 20 m ²) on three nights before, during and after each event at eight locations along tracks. Traps raked the night before sampling and checked each morning. Two motion sensor wildlife cameras deployed in the Marshall's Ridges area to monitor fauna presence – commenced 2015.
Microchiropteran Bats	Three locations sampled by Anabat call detectors. Anabats deployed for three nights before, during and after each event. Two locations are within the event area (dam and flyway) and the third nearby within Billinudgel Nature Reserve.
Flying-foxes	Incidental survey whilst ecologist on site during events
General Fauna	Incidental road kill observations
Koala	Targeted searches (KSAT) and habitat assessments.

Note: Minor methodology changes have been made during the life of the project.

Table 5: List of events monitored, including number of patrons

Event	Monitoring dates	Number of patrons per day
Splendour in the Grass 2013	Before: June; During: July; After: August	25,000
Splendour in the Grass 2014		27,500
Splendour in the Grass 2015		30,000
Splendour in the Grass 2016		32,500
Splendour in the Grass 2017 ⁺		32,500
Falls Festival 2013-14	Before: December; During: January; After: February	15,000
Falls Festival 2014-15		17,500
Falls Festival 2015-16		20,000
Falls Festival 2016-17		22,500

⁺ Results not yet available

Other Historical Surveys

A number of other surveys have been undertaken at the Parklands. Prior to 2013, these were to support the environmental approvals process. Subsequent surveys have been undertaken as part of the approvals requirements. This is primarily the 2014 biennial fauna survey. A summary of these surveys and the method employed is provided in **Table 6**.

Table 6: Summary of other surveys undertaken at the Parklands

Survey type	Year	Methods employed	Reference
Fauna survey	2007	Anabat detection Bird survey (incl. call playback) Drift fence and pitfall traps Elliot traps Flying-fox census Frog survey Harp trapping Incidental observations incl. of tracks, scats, diggings and remains Reptile survey Spotlighting	Fitzgerald 2007
Fauna survey	2009	As per 2007 fauna survey above	Fitzgerald 2009
Fauna survey	2014	Anabat detection Bird survey incl. call playback Elliot traps Frog survey	Fitzgerald 2014

Survey type	Year	Methods employed	Reference
		Harp traps Sand traps Spotlighting Waterbird surveys Incidental observations incl. of tracks, scats, diggings and remains	
Koala survey	2007	Analysis of historical records Site assessment – habitat quality and koala searches (KSAT)	Biolink 2007
Koala survey	2008	Site assessment – habitat quality and koala searches (KSAT)	Biolink 2008
Koala survey	2013	Site assessment – habitat quality and koala searches (KSAT)	Biolink 2013
Koala survey	2016	Site assessment – habitat quality and koala searches (KSAT)	Biolink 2016

6.1.1 Historical Survey effort

The surveys described above have resulted in extensive survey effort for target species and species groups at the Parkland since 2007. The tables below provide details of total survey effort (**Table 7**), effort during targeted fauna surveys (**Table 8**) and effort during EIM (**Table 9**).

Table 7: Total fauna survey effort 2007 – 2017, including general fauna survey, targeted Koala survey and all Event Impact Monitoring (9 events)

Target fauna group	Method	Total survey effort
Mammals	Elliot trapping	1,125 trap nights
	Hair tube sampling	5,000 tubes
Koala	Koala Spot Assessment Technique (KSAT)	97 assessments
	Habitat assessment and incidental observations	27 days
Reptiles	Pitfall traps	75 traps days
Reptiles and amphibians	Targeted habitat searches	13 days
Mammals and reptiles	Sand traps and motion cameras	420 nights
Nocturnal species	Spotlighting	59 nights
Microbats	Harp netting	26 trap nights
	Anabat deployment	255 nights
Forest birds	Timed bird census	270 hours
Water birds	Timed bird census at dam	11.2 hours
Owls and cryptic birds	Call playback	33 sessions

Table 8: Total fauna survey effort during general fauna surveys 2007, 2009, 2014

Target fauna group	Method	Total survey effort
Mammals	Elliot trapping	1,125 trap nights
Reptiles	Pitfall traps	75 traps days
Reptiles and amphibians	Targeted habitat searches	13 days
Nocturnal species	Spotlighting	11 nights
Microbats	Harp netting	26 trap nights
	Anabat deployment	21 nights
Owls and cryptic birds	Call playback	25 sessions

Table 9: Total fauna survey during Event Impact Monitoring (9 events)

Target fauna group	Method	Total survey effort
Mammals	Hair tube sampling	5,000 tubes
Mammals and reptiles	Sand traps and motion cameras	420 nights
Nocturnal species	Spotlighting	48 nights
Microbats	Anabat deployment	255 nights
Forest birds	Timed bird census	270 hours
Water birds	Timed bird census at dam	11.2 hours
Eastern Grass Owl	Call playback	8 sessions

6.1.2 Historical Survey conclusions

A detailed analysis of the survey results was undertaken to support this assessment (**Appendix F**). The overall survey and monitoring results to date indicate that the cultural events at the Parklands site and adjacent Billinudgel Nature Reserve have caused only very minor, temporary and reversible impacts on the ecological attributes of this locality, including threatened species, populations and communities. Increased light and noise levels are an inevitable occurrence associated with event, and these factors will impact on local fauna movements and site usage during the period of each event. However comprehensive EIM has shown that once these factors cease to operate and the site returns to pre-event conditions, fauna presence and habitat values return to baseline conditions. Moreover, there are no evidence of declines in any environmental values at the Parklands, indicating no cumulative effects of holding multiple events.

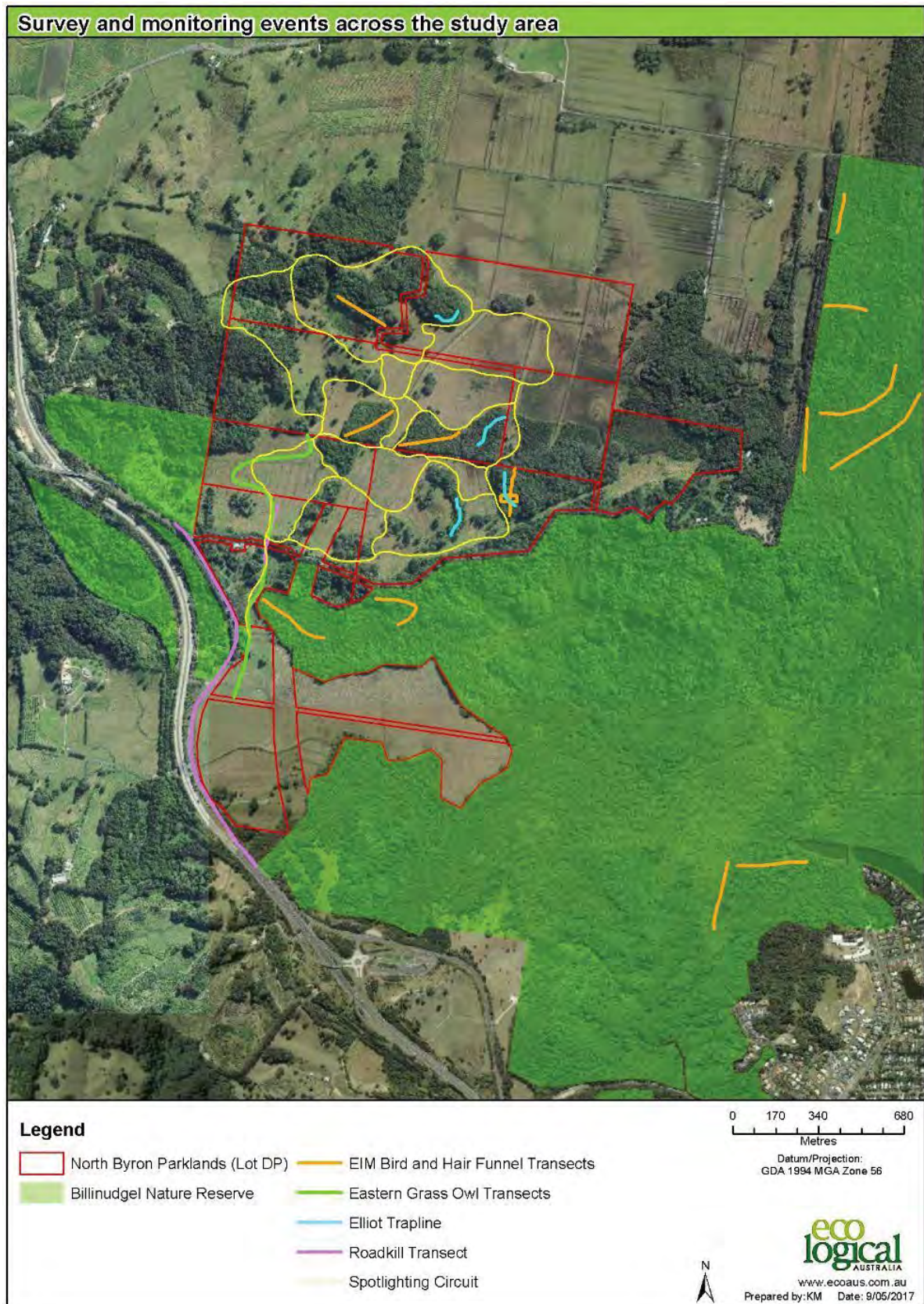


Figure 14: Transect survey and monitoring locations within the Parkland and surrounds



Figure 15: Survey and monitoring locations within the Parklands and surrounds

6.2 Recent Surveys for FBA

Additional surveys were undertaken within the development site to support the FBA. These included:

- Vegetation survey on 22 – 24 March 2017 by two ecologists, one of which was a qualified, accredited assessor.
- Further targeted survey for *Arthraxon hispidus* (Hairy Joint Grass) was undertaken on 6 June 2017. This was undertaken in line with the FBA methodology in pasture in the south-east of the project area. Survey targeted this area as it has been left unmanaged (i.e. no mowing or grazing), in contrast to the rest of the pasture areas in the project area.

The extent of recent survey effort is shown in **Figure 16**.

Areas of native vegetation were delineated using site observation and aerial photography. The assessment met the full requirements of the FBA including full floristic survey, as well as plot and transect survey within any PCTs identified within the development site.

To identify PCTs within the development site, plot-based full floristic surveys and plot and transect surveys were undertaken within vegetation zones as identified in Table 1 of the FBA. Plot and transect surveys were undertaken at all survey points. Previous flora data was utilised (and checked on site) for the full floristic plots, and where this data was not available, full floristic plots were undertaken. The surveys were primarily undertaken in existing woodland vegetation, with a single plot also undertaken in the grassland vegetation present in the south-east of the development site. The grassland vegetation in this area has previously been unmanaged. Photographs and site notes were also recorded within the development site and adjacent vegetation.

The location of the surveys was chosen based on the location of pre-existing vegetation survey points. Where pre-existing survey points were not available, new points were established within areas considered representative of the vegetation type.

The minimum number of plot and transect sites required, based on the condition and extent of each vegetation zone, is shown in **Table 10**. Additional plots, surplus to the requirement of the FBA, were gathered within the development site. All data collected within each of the PCTs on the development site and adjacent areas have been used for this assessment.

At each survey site, the following information was collected:

- Site ID
- Name of recorder(s)
- Date
- Plot orientation, slope, and aspect
- Easting and northing at either end of the 50 m transect
- Site photographs
- A plot-based 400 m² full floristic survey (except where existing flora data existed. In this case, data was ground-truthed and utilised).
- A plot and transect survey.

Table 10: Vegetation zone size and number of plots required

Vegetation zone	PCT	Condition	Area (ha)	Plots required	Plots completed
1	PCT 697 (NR124) - Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	Moderate to good	14.84	3	4
2	PCT 755 (NR144) - Brush Box tall moist forest of the northern ranges of the NSW North Coast Bioregion	Moderate to good	11.39	3	4
3	PCT 755 (NR144) - Brush Box tall moist forest of the northern ranges of the NSW North Coast Bioregion	Moderate to good (Poor)	1.67	1	1
4	PCT 826 (NR159) - Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast	Moderate to good	1.91	1	1
5	NR1064 (NR217) - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Moderate to good	12.28	3	3
6	PCT 686 (NR117) - Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion	Moderate to good	1.39	1	1
Total native vegetation			43.48	10	12
Cleared land	No PCT assigned	N/A	112.04	0	1
Total			155.52	10	13

6.2.1 Plot-based Full Floristic Survey

Within the 20 m x 20 m quadrats, the following data was collected:

- **Species name:** Scientific name and common name
- **Cover:** an estimate of the appropriate cover measure for each recorded species: from 1-5 and then to the nearest 5%
- **Abundance:** A relative measure of the number of individuals or shoots of a species within the plot using the following intervals: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000, or specify a number greater than 1000 if required
- **Form:** (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (D) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad.

6.2.2 Plot and Transect Surveys

Within each plot and transect survey, the following information was collected:

- Within a 20 m x 20 m quadrat:
 - o The number of native species present
- Along a 50 m transect every 5 m:
 - o Native over-storey cover (%)
 - o Native mid-storey cover (%)
 - o Exotic over-storey cover (%) and
 - o Exotic mid-storey cover (%)
- Along a 50 m transect every 1 m:
 - o Native ground cover (grasses)
 - o Native ground cover (shrubs)
 - o Native ground cover (other) and
 - o Exotic ground cover.
- Within a 50 m x 20 m quadrat:
 - o Number of trees with hollows and
 - o Total length of fallen logs > 10 cm width (m);
- Within whole vegetation zone:
 - o All canopy species and
 - o Proportion of regenerating canopy species.

6.2.3 Hollow Bearing Tree Surveys

Hollowing bearing tree surveys were also undertaken in response to OEH requirements within the SEARs. The surveys were undertaken in February 2017 to identify hollow-bearing trees within the 200m buffer zone. Two experienced ecologists conducted walking transects through all habitats within the available search area, occasionally extending beyond the 200 m boundary, as determined by GPS and mapping, but excluding freehold lands. The location of all hollow-bearing trees which conform with the FBA definition was recorded, and notes made on the condition and location of habitat features.

Binoculars were used to assess size and suitability of hollows, and a GPS (Garmin, Etrex) was used to identify the location of hollow-bearing trees. Location accuracy varied from +/- 5-20metres. Trees were identified to species where possible, and the height, diameter at breast height, number of trunk hollows (truhol) and number of branch hollows (brahol) were counted. The condition of the tree was recorded: Live, Senescent or Dead.

6.2.4 Surveys to assess habitats within 1km of the Development Site

An assessment of the importance of habitats within 1 km of the Development Site was also undertaken to satisfy OEH requirements within the SEARS. This was mainly based on >5 years of field data from within the Parklands site and Billinudgel Nature Reserve. Access to lands within the 1 km buffer was limited to the areas of National Parks estate, NBP holdings and road reserves, as neighbours did not provide permission for access to freehold lands in the buffer areas.

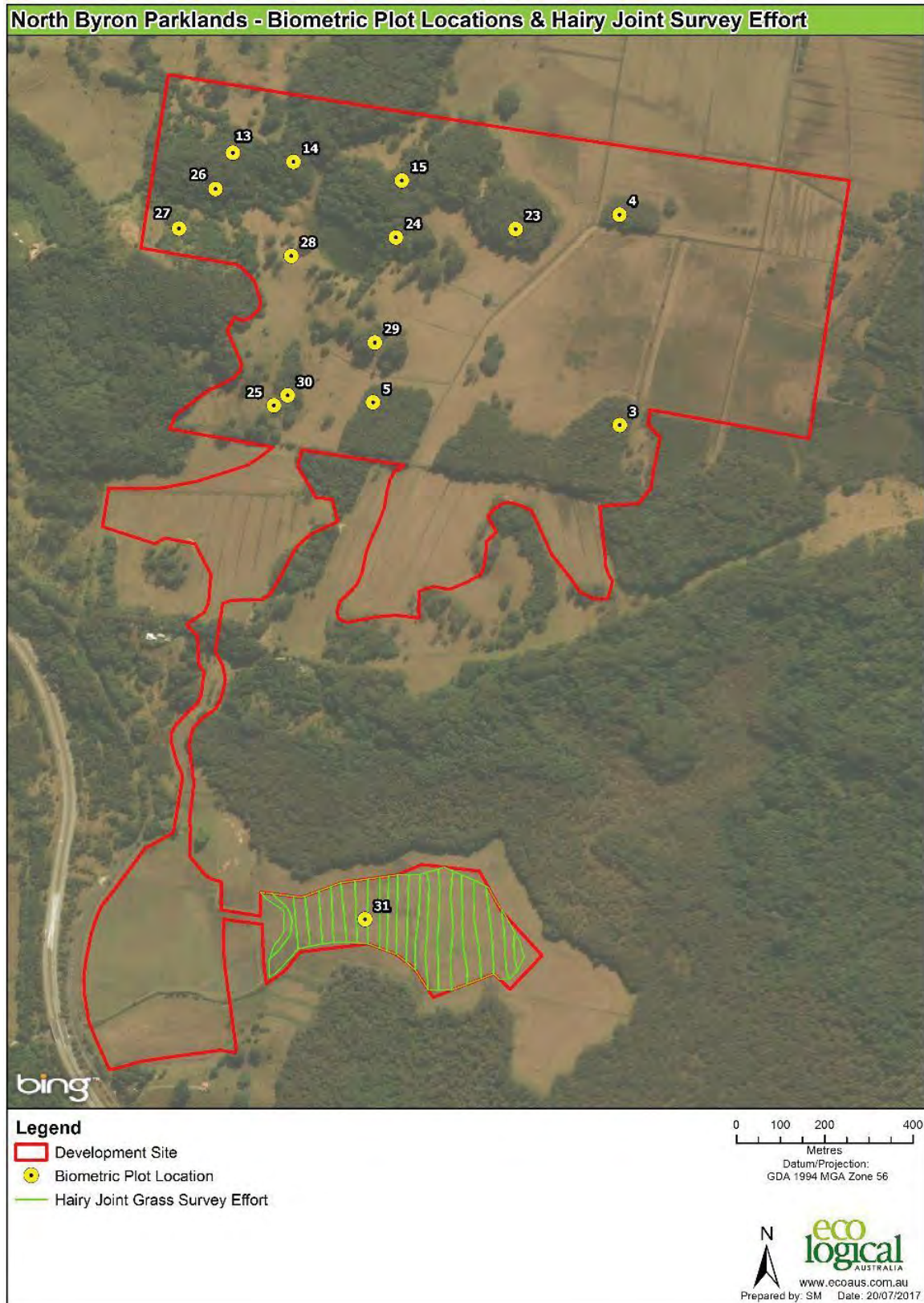


Figure 16: Survey Locations and Hairy Joint Grass survey effort

7 Native Vegetation

7.1 Review of Existing Data

The following documents and databases were reviewed during assessment of native vegetation within the development site:

- VIS Classification Database and mapping;
- Aerial photography from NearMaps from April and May 2017; and
- Previous vegetation surveys of the site (see above).

7.2 Identification of Plant Community Types and Vegetation Zones

The FBA requires that PCTs are mapped within the Development Site.

A map of vegetation within the development site is provided in **Figure 17**. This figure shows both the distribution of PCTs within the Development Site, as well as the areas of unmown exotic grassland. A general description of vegetation across the site is also provided in **Section 3.2** whilst the five associated PCTs are described in **Table 11**. Although these PCTs have been mapped and described, none of them will be directly impacted by the proposed development, except for a small patch of vegetation associated with the proposed new road in the north-west, west of the proposed cabins.

Table 10 above provided details of patch size.

Identification of PCTs was determined by incorporating field data with available databases and mapping. PCTs and vegetation zones within the development site were identified by incorporating the following hierarchy of factors in conjunction with site data:

- Occurrence of the PCT within the IBRA subregion;
- Vegetation formation;
- Landscape position;
- Dominant native canopy, mid-storey, and groundcover species; and
- Availability of the PCT within the BBCC.

Following assessment of landscape position, and vegetation survey results, selection criteria were used to determine PCTs and vegetation zones within the development site as shown in **Table 11**.

Table 11: Selection criteria for PCTs and Vegetation Zones

Veg Zone	PCT code / Condition	PCT name	Selection criteria	Species relied upon for assigning PCT	Site Value Score
1	PCT 697 (NR124): Moderate to Good	Blackbutt - Turpentine open forest of the foothills of the NSW North Coast Bioregion	IBRA Subregion: Murwillumbah (Qld - Southeast Hills and Ranges) Vegetation Formation: Wet Sclerophyll Forests (Grassy sub-formation) Vegetation Class (Keith): North Coast Wet Sclerophyll Forests Landscape Position: Foothills	Upper Stratum Species: <i>Eucalyptus pilularis</i> (Blackbutt), <i>Syncarpia glomulifera</i> (Turpentine), <i>Eucalyptus microcorys</i> (Tallowwood). Mid Stratum Species: None matching Ground Stratum Species: <i>Lomandra longifolia</i> (Spiny-headed Mat-rush).	70.00
2	PCT 755 (NR144) – Moderate to Good	Brush Box tall moist forest of the northern ranges of the NSW North Coast Bioregion	IBRA Subregion: Murwillumbah (Qld - Southeast Hills and Ranges) Vegetation Formation: Wet Sclerophyll Forests (Grassy sub-formation) Vegetation Class (Keith): North Coast Wet Sclerophyll Forests Landscape Position: Ranges	Upper Stratum Species: <i>Lophostemon confertus</i> (Brush Box) Mid Stratum Species: None matching Ground Stratum Species: None matching	65.33

Veg Zone	PCT code / Condition	PCT name	Selection criteria	Species relied upon for assigning PCT	Site Value Score
3	PCT 755 (NR144) – Moderate to Good (Poor)	Brush Box tall moist forest of the northern ranges of the NSW North Coast Bioregion	IBRA Subregion: Murwillumbah (Qld - Southeast Hills and Ranges) Vegetation Formation: Wet Sclerophyll Forests (Grassy sub-formation) Vegetation Class (Keith): North Coast Wet Sclerophyll Forests Landscape Position: Ranges	Upper Stratum Species: <i>Lophostemon confertus</i> (Brush Box) Mid Stratum Species: None matching Ground Stratum Species: None matching	24.67
4	PCT 826 (NR159) – Moderate to Good	Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast	IBRA Subregion: Murwillumbah (Qld - Southeast Hills and Ranges) Vegetation Formation: Wet Sclerophyll Forests (Shrubby sub-formation) Vegetation Class (Keith): North Coast Wet Sclerophyll Forests Landscape Position: Ranges	Upper Stratum Species: <i>Eucalyptus grandis</i> (Flooded Gum) Mid Stratum Species: <i>Guioa semiglauc</i> (Guioa) Ground Stratum Species: <i>Smilax australis</i> (Lawyer Vine)	44.67

Veg Zone	PCT code / Condition	PCT name	Selection criteria	Species relied upon for assigning PCT	Site Value Score
5	PCT 1064 (NR217): Moderate to Good	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	IBRA Subregion: Murwillumbah (Qld - Southeast Hills and Ranges) Vegetation Formation: Forested Wetlands Vegetation Class (Keith): North Coast Wet Sclerophyll Forests Landscape Position: Lowlands / alluvial flats	Upper Stratum Species: <i>Melaleuca quinquinervia</i> (Broad-leaved Paperbark); <i>Lophostemon suaveolens</i> (Swamp Box); <i>Casuarina glauca</i> (Swamp Oak) Mid Stratum Species: <i>Parsonsia straminea</i> (Common Silkpod) Ground Stratum Species: <i>Blechnum indicum</i> (Swamp Water Fern); <i>Gahnia</i> sp.	78.00
6	PCT 686 (NR117): Moderate to Good	Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion	IBRA Subregion: Murwillumbah (Qld - Southeast Hills and Ranges) Vegetation Formation: Wet Sclerophyll Forests (Shrubby sub-formation) Vegetation Class (Keith): North Coast Wet Sclerophyll Forests Landscape Position: Lowlands / alluvial flats	Upper Stratum Species: <i>Corymbia intermedia</i> (Pink Bloodwood); <i>Eucalyptus pilularis</i> (Blackbutt) Mid Stratum Species: None matching Ground Stratum Species: <i>Pteridium esculentum</i> (Common Bracken); <i>Imperata cylindrica</i> (Blady Grass)	53.65

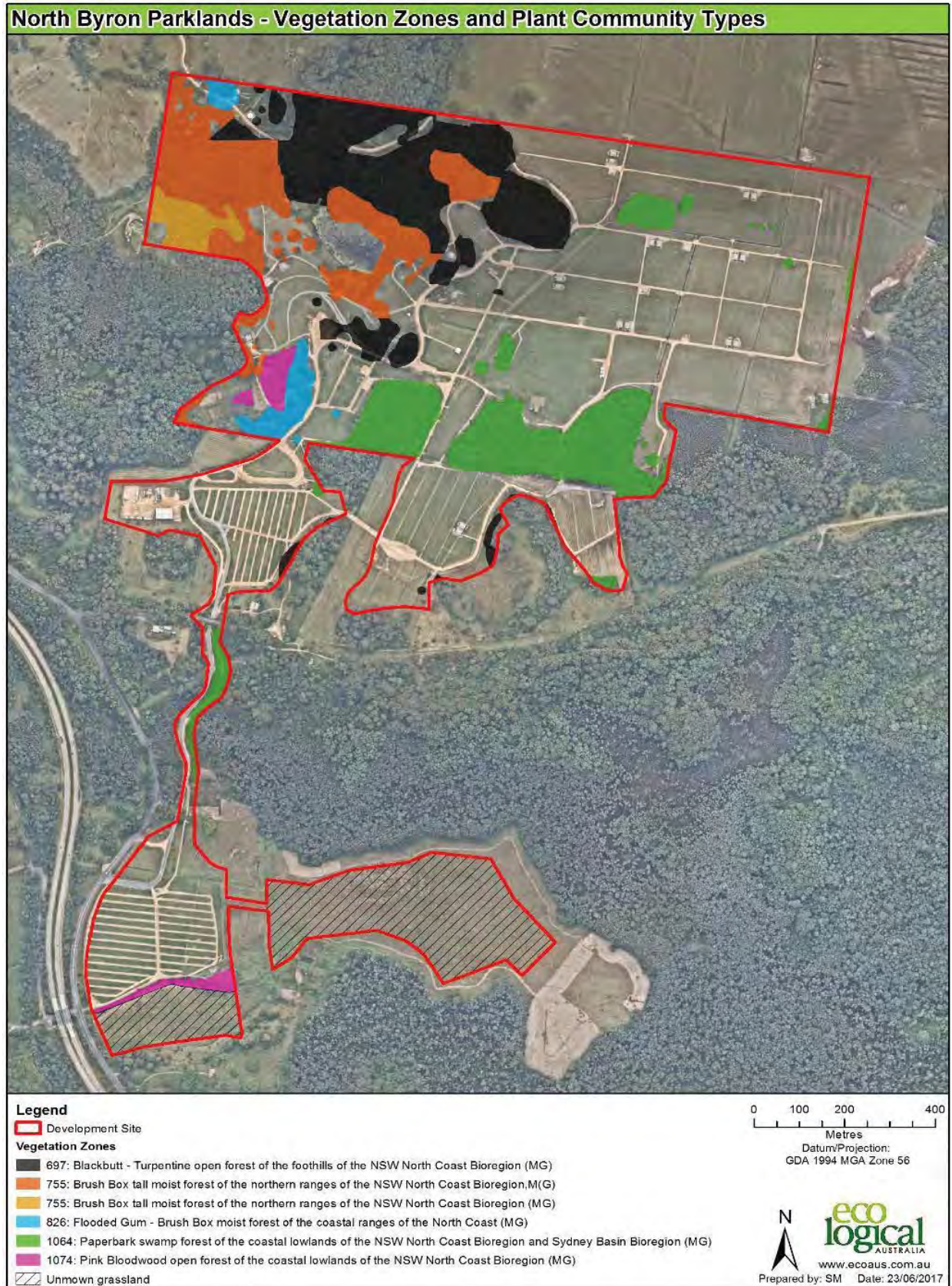


Figure 17: PCTs within the development site

7.3 Description of Plant Community Types

7.3.1 Vegetation Zone 1: Blackbutt - Turpentine open forest of the foothills 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 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 that are noted in **Appendix H**. 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 18**.



Figure 18: Vegetation Zone 1

7.3.2 Vegetation Zone 2: Brush Box tall moist 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), *Ptilidostigma 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 contiguity 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 19**.

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.

7.3.3 Vegetation Zone 3: Brush Box tall moist 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.

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 20**.



Figure 19: Vegetation Zone 2



Figure 20: Vegetation Zone 3

7.3.4 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 21**.



Figure 21: Vegetation Zone 4

7.3.5 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 22**.



Figure 22: Vegetation Zone 5

7.3.6 Vegetation Zone 6: Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion

The zone is comprised of two areas (see Figure 17). The first area is an area of rehabilitation adjacent to the Flooded Gum forest, whilst the second area exists along Yelgun Creek.

The area of rehabilitation is only a few years old and has a canopy height of approximately 5 metres. At this site, Blackbutt, *Eucalyptus tereticornis* (Forest Red Gum), White Mahogany, Bloodwood, 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 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).

Both areas 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 23.



Figure 23: Vegetation Zone 6

7.3.7 Pasture (cleared land)

A single plot (Plot 31) was located in an area of unmanaged pasture. 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 24**.

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

All areas of pasture have been excluded from the BBCC as they are cleared of native vegetation.



Figure 24: Unmanaged grassland

7.4 Threatened Ecological Communities

Four plant communities listed as Endangered Ecological Communities (EECs) under the BC Act or Threatened Ecological Communities (TEC) under the EPBC Act are present within and/or immediately surrounding the Parklands. These are further outlined in **Table 12**, with general descriptions of the communities provided in **Appendix I**. **Figure 25** shows EECs that exist within the development site.

There are no Threatened Ecological Communities listed under the EPBC Act within the development site; however, a small patch (0.75 ha) of Lowland Rainforest of Subtropical Australia Ecological Community (Lowland Rainforest), listed as Critically Endangered under the EPBC Act, occurs to the west of site (**Table 12**). The patch of Lowland Rainforest is surrounded by other native vegetation and grassy areas that provide a buffer between the event area and the TEC of ~30 m at its minimum. Lowland Rainforest and associated bushland areas are outside of proposed event areas and will be preserved.

Table 12: EECs and TECs within and/or immediately adjacent to the development area

EEC Name	Area within development site (ha)	Notes
Swamp sclerophyll forest on coastal floodplains of the NSW north coast bioregion	12.28	Represented in Vegetation Zone 5, although a large patch of this EEC exists within the adjacent SEPP14 Wetland / Billinudgel Nature Reserve.
Sub-tropical floodplain forest of the NSW north coast bioregion	3.3	Represented in Vegetation Zone 4 and 6. Patches also exist to the south of the development site.
Lowland rainforest of the NSW north coast bioregion	0	This area also meets the definition of Lowland Rainforest of Subtropical Australia Ecological Community, which is listed as critically endangered under the EPBC Act. A small patch (0.75 ha) of Lowland Rainforest occurs to the west of the site though is outside of the project area. This patch of Lowland Rainforest is surrounded by other native vegetation and grassy areas that provide a buffer between the event area and the TEC of ~30 m at its minimum.
Coastal Cypress Pine of the NSW north coast bioregion	0	Outside and immediately adjacent to the development area boundary.

7.5 Vegetation Zones within the BBCC

Vegetation zones have been input into the BBCC to enable a list of threatened species to be generated. Despite this, no clearing within the vegetation zones will occur, except for a small area of vegetation associated with the proposed vehicular access track in the north-west (west of the proposed cabins).



Figure 25: BC Act Endangered Ecological Communities within the development site

8 Threatened and Migratory Species and Populations

This section provides an assessment of the presence of threatened and migratory species and populations. It is supported by the likelihood assessments in **Appendix J**, **Appendix K** and **Appendix L**. It is also supported by **Appendix F**, which provides detailed results of past surveys.

8.1 Review of Existing Data

The following resources were reviewed as part of the assessment of threatened species and populations:

- Atlas of NSW Wildlife (Bionet)
- Threatened Species Profile Database (OEH, 2016)
- Previous survey results and associated reporting (Section 6)
- The BBCC (OEH 2016a).

Information reviewed was incorporated into the assessment of candidate species.

8.2 Habitat present within the development site

Habitats present within the development site are generally in moderate to good condition. There are large tracts of vegetation, which are connected to patches of vegetation in the region. **Figure 13** shows the largest patch size within the outer circle, and this is in exceedance of 1000 ha.

Vegetation of the site varies from: aquatic and fringing vegetation of drains, closely grazed pasture and various coastal and hillslope forest communities. More elevated parts of the NBSP property support eucalypt and rainforest communities. The composition and condition of grassland communities reflect current management, and comprises predominantly mowed grassland. As previously mentioned, there is also a patch of unmanaged (unslashed) grass in the south-east of the development site.

A mosaic of remnant forest patches is present within the pasture matrix and includes EECs (see **Section 7.4**).

Swamp Oak elements are present within some patches of the Swamp Sclerophyll Forest, but are localised minor or sub-dominant components of the upper stratum. Forest communities within the event footprint vary considerably in their canopy species dominance, species composition and ground layer characteristics according to diverse environmental influences. However, they share several characteristics: all are regenerating communities, few or no old growth trees are present, large hollows are rare and very large trees are also rare or absent from all patches within the event site footprint.

Cattle have historically used all unfenced forest patches within the event footprint and this has clearly affected the stature and species composition of ground layer plant communities, the substrate, and terrestrial habitat values. Cattle had access to and occupied most forest patches in the site, and had trampled and browsed ground layer vegetation, causing pugging or compaction of soils in the floodplain, and influencing ground layer vegetation in these areas. Cattle were removed from areas north of Jones Road in 2011 with the remaining cattle removed from pasture areas south of Jones Road in April 2014. This has allowed some natural restoration of ground layers to occur, particularly north of Jones Road.

The following habitat features are not present within the development site:

- Coastal headlands, grassland, grassy open forest or woodland on fertile or moderately fertile soils
- Shallow soil or rocks near cliff edges or gorge rims
- Cliff tops, steep cliff faces or rocky outcrops
- Land within 40 m of fresh/brackish/saline waters of larger rivers or creeks; estuaries, coastal lagoons, lakes and/or inshore marine waters
- Mangrove vegetation associations of coasts, estuaries and offshore islands

8.3 Ecosystem Credit Species

8.3.1 Habitat Constraints

The BBCC generates a list of predicted species known as 'ecosystem species'. These are threatened species that can be predicted at the site based on the habitat constraint criteria shown in **Table 13**.

Table 13: Ecosystem species constraints within development site

Habitat Constraint	Development site
IBRA Subregion	Murwillumbah (Qld - Southeast Hills and Ranges)
Associated PCTs	NR124, NR144, NR159, NR217, NR117
Percent Native Vegetation within Outer Assessment Circle	36 – 40 %
Condition of Vegetation	Moderate - Good
Patch Size	Very Large (>1000 ha)

8.3.2 Predicted Species

A complete list of all predicted ecosystem species is shown in **Table 14** below. This table has been generated by the BBCC. No further assessment of ecosystem species was undertaken as only a very minor area of habitat will be cleared due to the project (see **Section 11.2** for further discussion).

Table 14: Ecosystem Credit Species

Common Name	Species Name	T _G Value
Barking Owl	<i>Ninox connivens</i>	3
Barred Cuckoo-Shrike	<i>Coracina lineata</i>	1.5
Bush Stone-Curlew	<i>Burhinus grallarius</i>	2.6
Common Blossom-Bat	<i>Syconycteris australis</i>	1.2
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	2.2
Eastern Freetail-Bat	<i>Mormopterus norfolkensis</i>	2.2
Freckled Duck	<i>Stictonetta naevosa</i>	1.3
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	1.8
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	2.2
Hoary Wattled Bat	<i>Chalinolobus nigrogriseus</i>	2.1
Little Eagle	<i>Hieraaetus morphnoides</i>	1.4

Common Name	Species Name	T _G Value
Little Lorikeet	<i>Glossopsitta pusilla</i>	1.8
Long-nosed Potoroo	<i>Potorous tridactylus</i>	1.3
Masked Owl	<i>Tyto novaehollandiae</i>	3
New Holland Mouse	<i>Pseudomys novaehollandiae</i>	2.6
Northern Free-tailed Bat	<i>Mormopterus lumsdenae</i>	2.2
Powerful Owl	<i>Ninox strenua</i>	3
Red-legged Pademelon	<i>Thylogale stigmatica</i>	2.6
Rose-crowned Fruit-dove	<i>Ptilinopus regina</i>	1.3
Sooty Owl	<i>Tyto tenebricosa</i>	3
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	2.6
Square-tailed Kite	<i>Lophoictinia isura</i>	1.4
Superb Fruit-dove	<i>Ptilinopus superbus</i>	1.3
Swift Parrot	<i>Lathamus discolor</i>	1.3
Varied Sittella	<i>Daphoenositta chrysoptera</i>	1.3
Wompoo Fruit-dove	<i>Ptilinopus magnificus</i>	1.3
Yellow-bellied Glider	<i>Petaurus australis</i>	2.3
Yellow-bellied Sheath-tail-Bat	<i>Saccolaimus flaviventris</i>	2.2

In addition to the table above, the following ecosystem species were also considered as they have been observed either on or near the parklands:

- Eastern Grass Owl (*Tyto longimembris*)
- Eastern subspecies of the Brown Treecreeper (*Climacteris picumnus victoriae*)
- Golden-tipped Bat (*Kerivoula papuensis*)

The Eastern Grass Owl was not recorded in the main event area (north of Jones Rd) in any year; however, a pair responded to call playback in July 2016 in the exotic grassland in the south of the parklands (south of Jones Rd). This was the first observation of this species within the site since 2007. A single owl also responded to call play-back in July 2017, again in the exotic grassland to the south of the parklands.

The unmanaged exotic pasture in the south of the site (**Figure 1**) is likely to represent potential foraging and nesting habitat for this species. This exotic grassland will be directly impacted for the construction of the southern carpark. Outside of the area of exotic grassland, all areas of remnant forest vegetation will be fenced during events to prevent disturbance and strict fire management procedures are also implemented. These measures have been in place during the trial period. During this time, monitoring has 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 potential value as Eastern Grass Owl habitat over time.

No native vegetation associated with the Eastern Grass Owl will be directly impacted by the proposed development.

Brown Treecreeper was recorded in transects within the 1 km buffer area, while the Golden-tipped Bat was recorded from Anabat call detection in the development site, and are considered likely to also occur within the 1 km buffer area. As above, no native vegetation associated with these species will be directly impacted by the proposed development. The exotic pasture in the south of the site would represent potential foraging habitat for these species.

Regarding these three species, Section 5.1.1.3 of the FBA states, “*Areas that are not native vegetation (i.e. land not included in native vegetation extent) do not require further assessment in the FBA except where it is assessed as habitat for threatened species according to Section 6.4.*” (Section 6.4 pertains to species credit species only and all three of the species mentioned above are ecosystem credit species.

See **Appendix F** for more information about fauna survey and impact monitoring results for these species.

8.4 Species Credit Species

Species credit species are threatened flora and fauna species that cannot be predicted by habitat characteristics and vegetation types within the development site. Species credit species that are likely to occur within the development site based on habitat assessment, must be surveyed to determine presence/absence, or an expert report provided.

The accredited assessor may determine that the habitat is unsuitable or too degraded for species credit species. These species do not require further assessment.

8.4.1 Candidate Species within the development site

Both historical and recent surveys (see **Section 6** and **Appendix F**) have provided thorough insight into habitats that are available and species that exist within the development site. Generally speaking, faunal assemblages of the Parklands site exhibit substantial variations both seasonally and according to habitat preferences as evidenced from monitoring. External and large-scale regional influences also contribute to changes in faunal abundance. The number of fauna species recorded on the Parklands site has gradually increased over time from 130 species in 2007 to approximately 200 species in 2017. This is largely due to ongoing survey effort but is also likely to include a number of species that have recently occurred or returned to the site as a result of habitat improvements over time. Notably, both bird and mammal diversity is high, with more than 120 bird species and 26 mammal species (including bats and flying foxes) recorded on site. Common pest fauna observed on the site, includes cane toads, common mynah, common starling, house mouse, black rat and dogs.

Survey results, combined with the habitat preferences and distributions of species, has been used to assess the likelihood of candidate species (species credit species) existing within the development site. The likelihood of occurrence listing these species is provided in **Appendix J** and **Appendix L**.

The species within **Appendix J** and **Appendix L** include those generated as part of the BBCC, with additional species credit species also considered where relevant. **Table 15** shows those species credit species that are considered to have some likelihood of existing within the development site, or are known to exist in the development site.

Despite their likelihood of occurrence in the development site, only a very minor area of vegetation clearing is proposed as part of the project. This is related to the widening of an existing track in the north-west of the development site. Therefore, direct impacts to species credit species are not included within the BBCC.

Figure 26 shows the location of the observed threatened flora, as well as other BioNet records in the wider area. Similarly, **Figure 27** shows the location of observed fauna.

Table 15: Species credit species likely or known to exist within the development site

Species	Likelihood	Notes on occurrence within development site
Flora		
<i>Arthraxon hispidus</i> (Hairy Joint Grass)	Potential (low) to occur within the development site	This species was recognised as having a greater potential to occur within the development footprint, specifically within the area of unmanaged pasture grass in the south of the development site. Targeted surveys were undertaken in 2009 and again in May 2017 in association with this FBA. The recent surveys were undertaken in the pasture to the southeast of the project area, where the area had been left unmanaged. No individuals were found, and habitat suitability was poor. The potential occurrence of this species onsite was deemed unlikely, and the proposed developments are not considered a threat to this species, or its habitat. Hence this species has been excluded from further assessment. This is consistent with Section 6.5.1.3 of the FBA method.
<i>Corokia whiteana</i> (Corokia)	Potential to occur within the development site, however will not be directly impacted	Marginal habitat on site, records within BNR 1.5 km from site. Species not observed during targeted flora survey 2009 or subsequent site inspections.
<i>Cryptocarya foetida</i> (Stinking Cryptocarya)	Known to occur within the development site, however will not be directly impacted	Recorded during targeted threatened flora surveys 2009. A single tree specimen is present in an area of swamp sclerophyll forest habitat on Lot 402 DP755687 near the centre of the development site.
<i>Davidsonia jerseyana</i> (Davidson's Plum)	Potential to occur within the development site, however will not be directly impacted	A small stand of mature Davidson's Plum trees occurs to the west of the development site, in association with an area of Lowland Rainforest Threatened Ecological Community
<i>Endiandra hayesii</i> (Rusty Rose Walnut)	Potential to occur within the development site, however will not be directly impacted	Suitable habitat, several records adjacent to site (<500 m), one within BNR. Species not observed during targeted flora surveys 2009 or subsequent site inspections.
<i>Endiandra muelleri</i> subsp. <i>bracteata</i> (Green-leaved Rose Walnut)	Known to occur within the development site, however will not be directly impacted	One individual exists within the development site, with two others to the west of the site. Observed during targeted threatened flora surveys 2009.
<i>Fontainea australis</i> (Southern Fontainea)	Potential to occur within the development site, however will not be directly impacted.	Southern Fontainea is found in lowland subtropical rainforest, usually on basaltic alluvial flats, and also in cooler subtropical rainforest in the Nightcap Range. No individuals of these species have been detected within the development site. However,

Species	Likelihood	Notes on occurrence within development site
		suitable habitat is present within the stands of native remnant vegetation on site.
<i>Geodorum densiflorum</i> (Pink Nodding Orchid)	Potential to occur within the development site, however will not be directly impacted	Four of these orchids were located at a single point to the west of the development area and within the Swamp Sclerophyll EEC
<i>Macadamia tetraphylla</i> (Rough-shelled Bush Nut)	Known to occur within the development site, however will not be directly impacted	Three Rough-shelled Bush Nut trees are located in the northwest corner of the development site. They are associated with an old agricultural structure. It is possible that they represent planted specimens. These individuals are currently being impacted by historical competition from Camphor Laurel and Mango Trees (Fitzgerald 2016a). Observed during targeted threatened flora surveys 2009.
<i>Marsdenia longiloba</i> (Slender Marsdenia)	Potential to occur within the development site, however will not be directly impacted	Observed during targeted threatened flora surveys 2009.
<i>Syzygium moorei</i> (Durobby / Coolamon Rose Apple)	Known to occur within the development site, however will not be directly impacted	One plant is located in the north of the development site, whilst another is outside of the development site to the west.
Fauna		
<i>Carterornis leucotis</i> (White-eared Monarch)	Known to occur within the development site, however will not be directly impacted	Low probability of foraging within the event area.
<i>Chalinolobus dwyeri</i> (Large-eared Pied Bat)	Known to occur within the development site, however will not be directly impacted	Known from Anabat call results, Annual Performance reports.
<i>Cyclopsitta diophthalma coxeni</i> (Coxen's Fig-Parrot)	Potential to occur within the development site, however will not be directly impacted	Systematic fauna surveys in 2007, 2009, and 2014 did not detect this species. However, potential habitat present adjacent to development site.
<i>Miniopterus australis</i> (Little Bentwing-bat)	Known to occur within the development site, however will not be directly impacted	Known from Anabat call results, Annual Performance reports.
<i>Miniopterus schreibersii oceanensis</i> (Eastern Bentwing-bat)	Known to occur within the development site, however will not be directly impacted	Known from Anabat call results, Annual Performance reports.
<i>Mormopterus norfolkensis</i> (Eastern Freetail-bat)	Known to occur within the development site, however will not be directly impacted	Known from Anabat call results, Annual Performance reports.

Species	Likelihood	Notes on occurrence within development site
<i>Myotis macropus</i> (Southern Myotis)	Known to occur within the development site, however will not be directly impacted	Known from Anabat call results, Annual Performance reports.
<i>Nyctophilus bifax</i> (Eastern Long-eared Bat)	Known to occur within the development site, however will not be directly impacted	Detected only during harp trapping (2007 and 2014).
<i>Pandion cristatus</i> (Eastern Osprey)	Known to occur within the development site, however will not be directly impacted	Recorded in Parklands during targeted bird surveys (2015).
<i>Phascolarctos cinereus</i> (Koala)	Known to occur within the development site, however will not be directly impacted	Species not recorded in systematic fauna surveys on the site in 2007, 2009 and 2014. Biolink surveys found scats outside the development area in 2007, 2008, & 2016. Considered an endangered population between the Tweed and Brunswick Rivers east of the Pacific Highway (BioNet Profile ID 20300).
<i>Planigale maculata</i> (Common Planigale)	Potential (low) to occur within the development site.	Not detected in systematic fauna surveys that targeted this species. Note that survey effort to date includes 75 pitfall trap days, 1,125 Elliott trap nights and 5,000 hair tube days. Potential, though not likely to occur in development site. This species has potential to inhabit forests within the development site. It is less likely to inhabit pasture areas (particularly the unmanaged pasture areas in the south of the site) as this area lacks the microhabitat features such as hollow logs, bark and rocks.
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)	Known to occur within the development site, however will not be directly impacted	Numerous Grey-headed Flying-fox and Black Flying Foxes observed in 2007, with only single number of individuals observed subsequently. This decline is attributed to the abandonment of the maternity camp in Brunswick Heads Nature Reserve, as well as a lack of foraging resources (blossom) on site during survey periods.
<i>Thersites mitchellae</i> (Mitchell's Rainforest Snail)	Potential to occur within the development site, however will not be directly impacted	Annual Performance Reports 2015, 2016. Evidence of the species observed in the Billinudgel Nature Reserve.

No species polygons have been prepared for the above species credit species (as per Step 5 in Section 6.5 of the FBA) because only a very small area of vegetation clearing / pruning will occur as part of the project. Species points associated with observation to species credit species are presented in **Figure 26** and **Figure 27**.

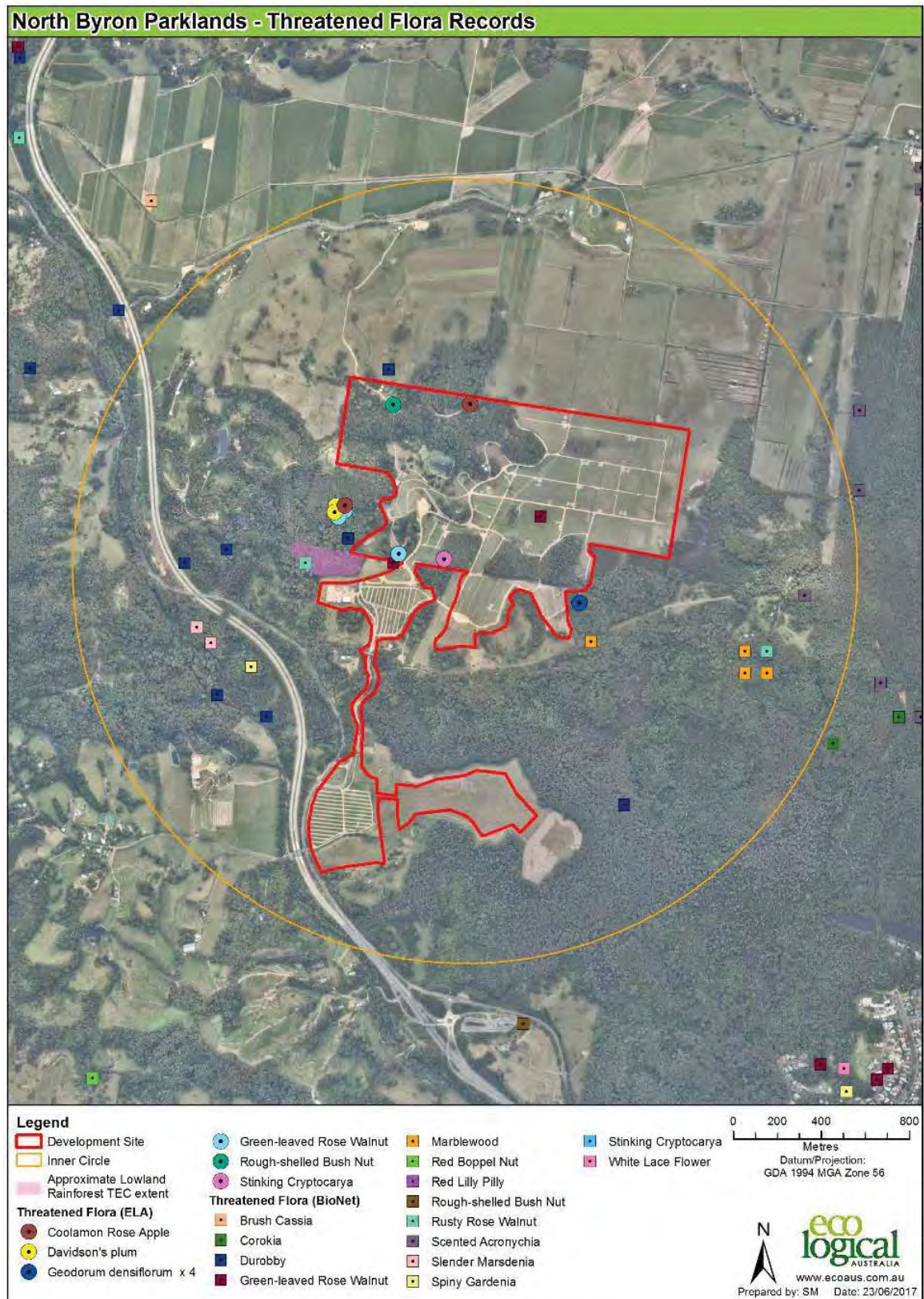


Figure 26: Location of previous threatened flora records

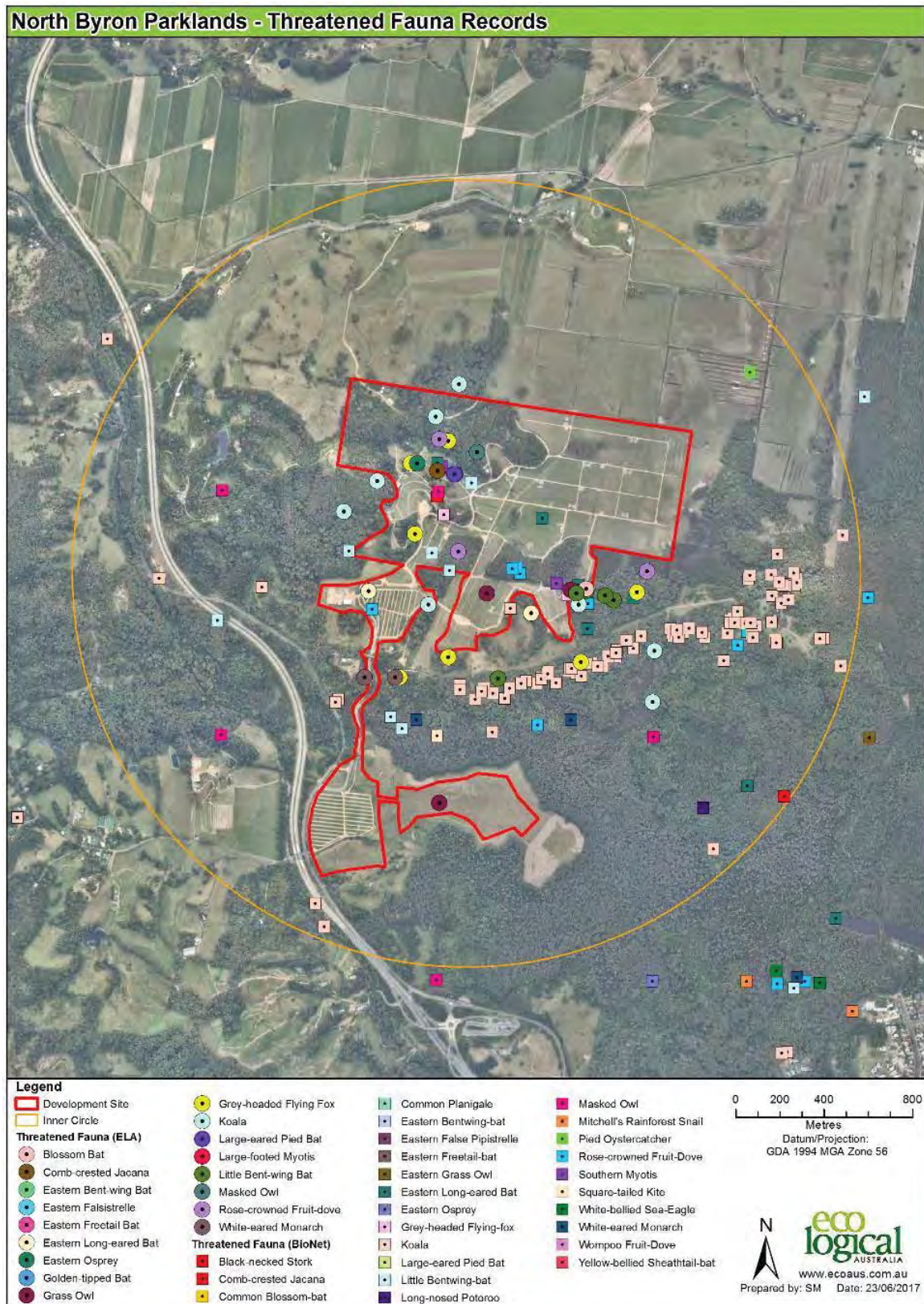


Figure 27: Location of previous threatened fauna records

8.5 Additional biodiversity assessment, as per the SEARs

The FBA requires an assessment of impact on all nationally listed threatened species and TECs that may occur within the development site. However, migratory species have also been assessed in this report, as per the requirements of the SEARs (see **Appendix A**). Additionally, the SEARs also requires that an additional set of biodiversity impacts, largely relating to fauna habitat within 1 km of the development site, be assessed for potential impacts (see **Appendix A**).

8.5.1 Habitat present within 1km of the development site

Data on local fauna are also available from Event Impact Monitoring of forest birds and small mammals (**Appendix F**). Six of ten transects regularly monitored before-during-after events at NBP are located within 1km of the development site; two are located just outside a 1km buffer, and two are located within the development site. Timed bird counts and hair funnel sampling have been undertaken at these sites since before 2012. Considering the eight transects (six within and two outside of a 1km buffer), at least 810 twenty minute bird counts, and 5000 hair funnel samples have been undertaken.

Large areas of Billinudgel Nature Reserve (BNR) are located to the south and southeast. Areas of North Byron Parklands (NBP) are located outside of and within 1km of the development site. To the west, north and northeast the area includes freehold lands.

Approximately half of the area enclosed within a 1km buffer around the development site is agricultural land supporting sugar cane and grazing (in the north) and grazing and horticulture in the south and southwest. The Pacific Highway, a fenced dual carriageway freeway and the parallel Tweed Valley Way and Brunswick Valley Way are included in the southwestern quarter of the 1km buffer as is the Yelgun interchange rest area. These areas are of relatively low ecological value and the two parallel main roads are significant physical and ecological barriers for terrestrial fauna.

High ecological value forested habitats are present in NBP and in freehold lands to the west of NBP, but mainly in small forest blocks surrounded by grazing lands. The highest quality habitats within the 1km buffer include forested lands in the eastern part of NBP and the extensive swamp sclerophyll and floodplain forests in BNR in the south-eastern quarter of the 1km buffer area. However, while these forests are highly ecologically significant, they are predominantly regrowth from an historical clearing event and, based on surveys undertaken to support this assessment, contain few old-growth trees and relatively few tree hollows. See **Figure 9**, which provides a 1947 aerial photo showing the general absence of forest within NBP, along the Jones Road ridge and in parts of the Nature Reserve.

Recent (~10 year old) plantings of native vegetation are present within the buffer, both within National Parks Estate as compensation for tree removal on the Pacific Highway, and within NBP to improve connectivity for fauna, especially south of Jones Road. While this vegetation provides resources for fauna, tree hollows are not present, and hollow-dependent fauna are unable to fully exploit this habitat.

A survey for tree hollows within 200m of the development site has been undertaken and results are provided in **Appendix E**. Forty-four hollow-bearing trees were located during surveys, including some trees that were just outside of the 200m buffer. These are presented in **Table 16** and **Figure 28**.

Table 16: Hollow-bearing trees within the 200m buffer area.

Common Name	Scientific Name	Count
Camphor Laurel**	<i>Cinnamomum camphora</i>	1
White Mahogany	<i>Eucalyptus acmenoides</i>	12
Flooded Gum	<i>Eucalyptus grandis</i>	3

Common Name	Scientific Name	Count
Hard Quandong	<i>Elaeocarpus obovatus</i>	1
Pink Doughwood	<i>Melicope elleryana</i>	1
Blackbutt	<i>Eucalyptus pilularis</i>	9
Grey Gum	<i>Eucalyptus propinqua</i>	2
Swamp Mahogany	<i>Eucalyptus robusta</i>	2
Forest Red Gum	<i>Eucalyptus tereticornis</i>	3
Eucalypt sp. unk.	<i>Eucalyptus</i> species unknown	1
Brush Box	<i>Lophostemon confertus</i>	4
Swamp Box	<i>Lophostemon suaveolens</i>	2
Broad-leaved Paperbark	<i>Melaleuca quinquenervia</i>	3
TOTAL		44

** Camphor Laurel is an exotic species, & considered an environmental weed.

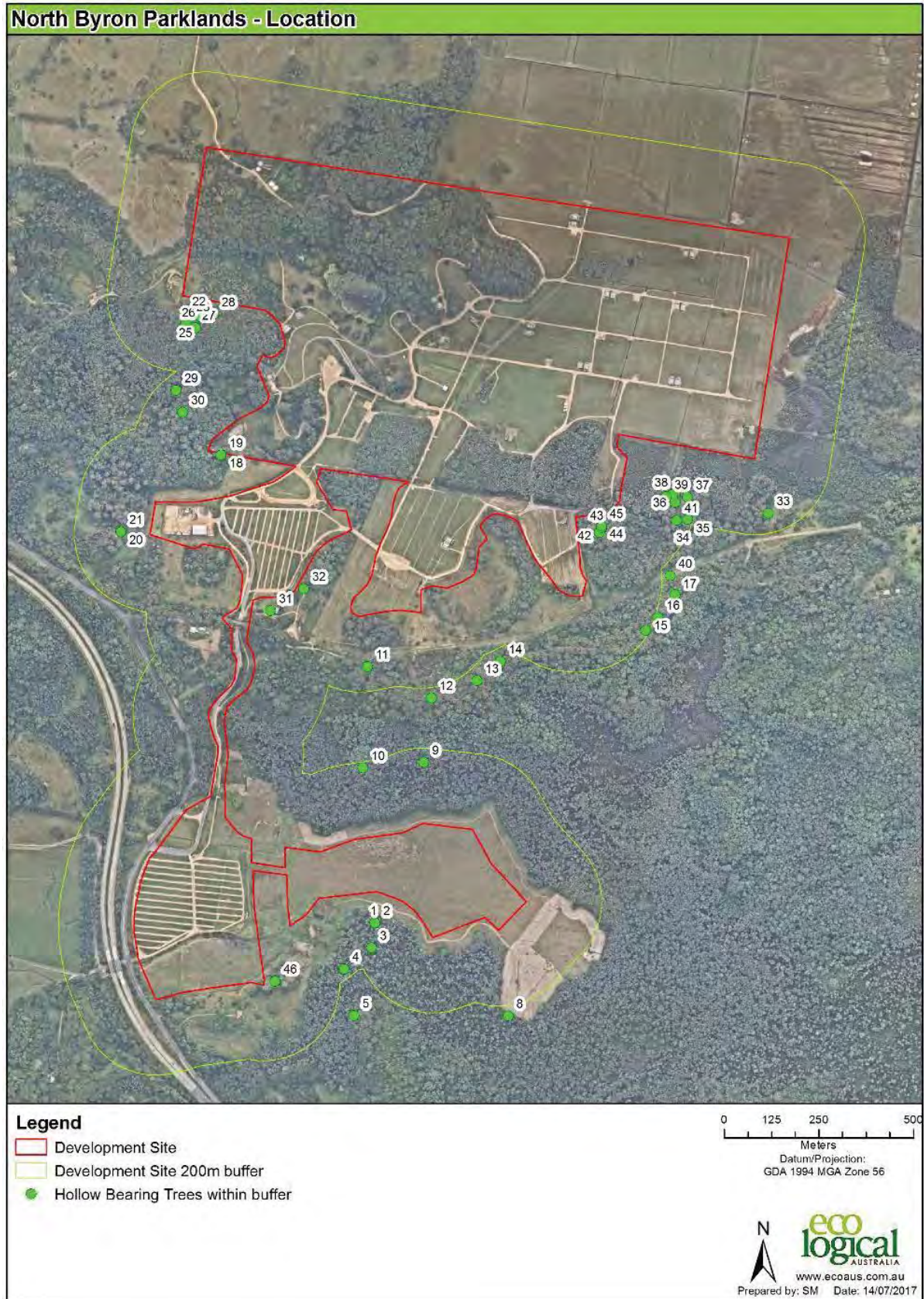


Figure 28: Hollow-bearing trees within 200m of the development site

8.5.2 Migratory Species within the development site

Table 17 lists those migratory species that are either known to occur within the development site or have potential to occur. Refer to the likelihood assessment in **Appendix K** for more detail.

Table 17: Migratory Species within the development site

Known to occur	Potential to occur
Black-faced Monarch (<i>Monarcha melanopsis</i>)	Fork-tailed Swift (<i>Apus pacificus</i>)
Oriental Cuckoo (<i>Cuculus optatus</i>)	Latham's Snipe (<i>Gallinago hardwickii</i>)
Osprey (<i>Pandion haliaetus</i>)	
Rufous Fantail (<i>Rhipidura rufifrons</i>)	
Satin Flycatcher (<i>Myiagra cyanoleuca</i>)	
Spectacled Monarch (<i>Symposiachrus trivirgatus</i>)	
White-throated Needletail (<i>Hirundapus caudacutus</i>)	

8.5.3 Threatened and migratory fauna species within 1km of the development site

To assist in the assessment of fauna that may inhabit an area within 1km of the development site, a wider OEH Bionet Atlas database search area has been utilised. **Table 18** lists threatened fauna species records from the NSW OEH Bionet Atlas database for a 10km by 10km area based on a point at the centre of the development site. Records from the Bionet 10km by 10km area search, numbers of OEH Bionet Atlas records are provided in **Table 18** for the Byron LGA for comparison.

In consideration of **Table 18**, threatened species recorded from the Bionet Atlas search area, but which are occasional visitors (*Anthochaera phrygia* [Regent Honeyeater], *Lathamas discolor* [Swift Parrot]) or only likely to occur during extensive flood events (*Anseranas semipalmata* [Magpie Goose], *Ephippiorhynchus asiaticus* [Black-necked Stork], *Grus rubicunda* [Brolga]) are excluded from further consideration, given the extremely low probability of their presence within the 1km buffer area and of any impact from the project. *Ixobrychus flavicollis* (Australasian Bittern), Black-necked Stork, Glossy Black-cockatoo, Coxen's Fig Parrot and *Turnix melanogaster* (Black-breasted Button-quail) are also considered unlikely to occur, considering the habitats within the 1km buffer area.

Table 19 lists threatened species either known from or considered likely or possible occurrences within 1km of the development site boundary. The list of species is based on those species records returned in the 10km by 10km search area mentioned above.

Threatened Species which have not been recorded from the Byron LGA and are considered unlikely to be present, or to use habitats within 1km of the project boundaries, include *Poephila cincta* (Southern Black-throated finch), *Rostratula australis* (Australian Painted Snipe) and *Coeranoscincus reticulatus* (Three-toed Snake-toothed Skink).

Habitats within the 1km buffer area are considered unsuitable for the *Dasyurus maculatus* (Spotted-tailed Quoll), *Phascogale tapoatafa* (Brush-tailed Phascogale), *Petauroides volans* (Greater Glider) and *Pseudomys novaehollandiae* (New Holland Mouse).

Table 20 lists migratory species likely to occur within 1km of the development area. The list of species is based on those species records returned in the 10km by 10km search area mentioned above. Only *Motacilla flava* (Yellow Wagtail) is considered unlikely to be present or to use habitats within 1km of the project boundaries.

Table 18: BioNet Atlas Records for a 100km2 area around the development site

Common Name	Scientific Name	NSW status*	Comm. Status*	Bionet	Byron LGA
Amphibians					
Wallum Froglet	<i>Crinia tinnula</i>	V		5	200
Wallum Sedge Frog	<i>Litoria longiburensis</i>	V	V		
Birds					
Barred Cuckoo-shrike	<i>Coracina lineata</i>	V		1	27
Black Bittern	<i>Ixobrychus flavicollis</i>	V		1	77
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E1		5	50
Brolga	<i>Grus rubicunda</i>	V		1	3
Comb-crested Jacana	<i>Irediparra gallinacea</i>	V		3	20
Eastern Grass Owl	<i>Tyto longimembris</i>	V		2	27
Eastern Osprey	<i>Pandion cristatus</i>	V	Mi. Ma	11	80
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V		6	60
Little Lorikeet	<i>Glossopsitta pusilla</i>	V		1	11
Magpie Goose	<i>Anseranas semipalmata</i>	V		1	1
Marbled Frogmouth	<i>Podargus ocellatus</i>	V		2	37
Masked Owl	<i>Tyto novaehollandiae</i>	V		5	18
Pale-vented Bush-hen	<i>Amauornis moluccana</i>	V		1	213
Regent Honeyeater	<i>Anthochaera phrygia</i>	E4A	CE	1	1
Rose-crowned Fruit-Dove	<i>Ptilinopus regina</i>	V		41	270
Sooty Owl	<i>Tyto tenebricosa</i>	V		3	90
Square-tailed Kite	<i>Lophoictinia isura</i>	V		1	16
Swift Parrot	<i>Lathamus discolor</i>	E1	CE	1	1
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V	Ma	17	53
White-eared Monarch	<i>Carterornis leucotis</i>	V		10	222
Wompoo Fruit-Dove	<i>Ptilinopus magnificus</i>	V		2	99
Mammals					
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V		1	K
Common Blossom-bat	<i>Syconycteris australis</i>	V		3	40
Common Planigale	<i>Planigale maculata</i>	V		1	45

Common Name	Scientific Name	NSW status*	Comm. Status*	Bionet	Byron LGA
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V		11	34
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V		1	3
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V		7	11
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	V		7	112
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V		2	7
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	7	202
Koala	<i>Phascolarctos cinereus</i>	V	V	133	1961
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	3	4
Little Bentwing-bat	<i>Miniopterus australis</i>	V		46	205
Long-nosed Potoroo	<i>Potorous tridactylus</i>	V	V	2	193
Northern Free-tailed Bat	<i>Mormopterus lumsdenae</i>	V		1	K
Southern Myotis	<i>Myotis macropus</i>	V		11	226
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	E	3	24
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V		3	5
Invertebrates					
Mitchell's Rainforest Snail	<i>Thersites mitchellae</i>	E1	CE	2	157

* Under BC Act: E1 = Endangered; E2 = Endangered Population, E4 = Presumed Extinct, E4a = Critically Endangered; P = Protected; and V = Vulnerable. Under the EPBC Act: CE = Critically Endangered; E = Endangered; V = Vulnerable; Mi = Migratory, Ma = Marine.

** Additional threatened fauna species known from the area include: the Eastern subspecies of the Brown Treecreeper (*Climacteris picumnus victoriae*) is listed as Vulnerable in NSW and has recently been recorded at transects within the 1km buffer area. Golden-tipped Bats (*Kerivoula papuensis*) have been recorded from Anabat call detection in NBP and are considered likely to also occur within the 1km buffer area. The Bush-stone Curlew (Endangered in NSW) was observed for the first time in August 2017 and is also likely to exist in the 1km buffer area.

Table 19: Threatened species either known from or considered likely or possible occurrences within 1km of the development site boundary

Common Name	Scientific Name	NSW status	EPBC status	Bionet Search
Amphibians				
Wallum Froglet	<i>Crinia tinnula</i>	V		X
Wallum Sedge Frog	<i>Litoria olongburensis</i>	V	V	
Birds				
Barred Cuckoo-shrike	<i>Coracina lineata</i>	V		X
Bush-stone Curlew	<i>Burhinus grallarius</i>	E		
Black Bittern	<i>Ixobrychus flavicollis</i>	V		X
Brown Treecreeper	<i>Climacteris picumnus victoriae</i>	V		
Comb-crested Jacana	<i>Irediparra gallinacea</i>	V		X
Eastern Grass Owl	<i>Tyto longimembris</i>	V		X
Eastern Osprey	<i>Pandion cristatus</i>	V	Mi, Ma	X
Little Lorikeet	<i>Glossopsitta pusilla</i>	V		X
Marbled Frogmouth	<i>Podargus ocellatus</i>	V		X
Masked Owl	<i>Tyto novaehollandiae</i>	V		X
Pale-vented Bush-hen	<i>Amauornis moluccana</i>	V		X
Rose-crowned Fruit-Dove	<i>Ptilinopus regina</i>	V		X
Sooty Owl	<i>Tyto tenebricosa</i>	V		X
Square-tailed Kite	<i>Lophoictinia isura</i>	V		X
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V	Ma	X
White-eared Monarch	<i>Carterornis leucotis</i>	V		X
Wompoo Fruit-Dove	<i>Ptilinopus magnificus</i>	V		X
Mammals				
Common Planigale	<i>Planigale maculata</i>	V		X
Koala	<i>Phascolarctos cinereus</i>	V	V	X
Bats				
Common Blossom-bat	<i>Syconycteris australis</i>	V		X
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V		X
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V		X
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V		X
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	V		X

Common Name	Scientific Name	NSW status	EPBC status	Bionet Search
Golden-tipped Bat	<i>Kerivoula papuensis</i>	V		
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V		X
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	X
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	X
Little Bentwing-bat	<i>Miniopterus australis</i>	V		X
Northern Free-tailed Bat	<i>Mormopterus lumsdenae</i>	V		X
Southern Myotis	<i>Myotis macropus</i>	V		X
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V		X
Invertebrates				
Mitchell's Rainforest Snail	<i>Thersites mitchellae</i>	E1	CE	X

Table 20: Migratory species likely to occur within 1km of the development area.

Common Name	Scientific Name	Habitats	Likely to occur < 1km	NBP
Black-faced Monarch	<i>Monarcha melanopsis</i>	Woodland, sclerophyll and rainforest	Yes	X
Cattle Egret	<i>Bubulcus ibis</i>	Pasture, associates with livestock.	Yes	X
Eastern Osprey	<i>Pandion cristatus</i>	Rivers, estuaries, coasts	Yes	X
Fork-tailed Swift	<i>Apus pacificus</i>	Aerial	Yes	--
Latham's Snipe	<i>Gallinago hardwickii</i>	Swamps, marshes wetlands	Yes	
Oriental Cuckoo	<i>Cuculus optatus</i>	Woodland, Forest	Yes	X
Rainbow Bee-eater	<i>Merops ornatus</i>	Woodland and timbered plains.	Yes	X
Rufous Fantail	<i>Rhipidura rufifrons</i>	Forest, rainforest	Yes	X
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	Forest, gully forest	Yes	X
Spectacled Monarch	<i>Monarcha* trivirgatus</i>	Rainforest, gully forest	Yes	X
White-throated Needletail	<i>Hirundapus caudacutus</i>	Aerial, roost in forest	Yes	X
Yellow Wagtail	<i>Motacilla flava</i>	3 records in NSW, not recorded in Byron LGA	No	

* Named '*Symposiachrus trivirgatus*' in NSW OEH lists.

9 Predicted Impacts of the Project

This section discusses the predicted impacts of the project. The conclusions have been founded in the results of the previous 10-years of survey and monitoring data from the site. In particular, the EIM has been specifically designed and implemented to detect any impacts from running events. The overall survey and monitoring results to date indicate that the events at the Parklands site and adjacent Billinudgel Nature Reserve have caused only very minor, temporary and reversible impacts on the ecological attributes of this locality, including threatened species, populations and communities (**Appendix F**). It is acknowledged that the future proposal will increase both the intensity and duration of events and the impact of this is explicitly considered below.

9.1 Direct Impacts relevant to the FBA

Only very minor vegetation clearing / pruning will occur due to the project. This is associated with the widening of an existing track in the north-east of the development site. The clearing area consists of an approx. 1.5m widening (each side) of an existing track for a length of approximately 100m. This results in a clearing area that is approximately 300m² in area and represents an estimated loss of approximately 20 native trees (+/- 10). The approximate extent of clearing is shown in **Figure 3** whilst the existing track is shown in **Figure 4**. This clearing area also includes potential pruning of overhanging branches. The area of clearing represents less than 0.001% of the 43.48ha of native vegetation on the development site. As this area is very minor in the context of a major development, it has not been included in impact calculations as part of the BBCC.

There will be no direct impacts to EECs, CEECs or threatened flora. Nor will there be any direct impact to threatened fauna or flora, with exception to an area of exotic grassland, which represents habitat for the Eastern Grass Owl.

The Eastern Grass Owl was not recorded in the main event area (north of Jones Rd) in any year; however as mentioned in **Section 8.3**, the species responded to call playback in July 2016 and July 2017 in the exotic grassland in the south of the parklands. The 2016 observation was the first observation of this species within the site since 2007. Approximately 14.8 ha of potential habitat in the form of exotic grassland will be directly impacted for the construction of the southern carpark (see **Figure 2**). As the area constitutes exotic grassland, it was not deemed assessable as a part of the FBA, and therefore offset for this loss is not required. A number of mitigation measures have been assigned directly to the Eastern Grass Owl to ensure that any potential direct impact to this species is minimised (see **Table 21** and **Section 10**).

Similarly, the Bush-stone Curlew (also an ecosystem credit species, first sighted at the Parklands in July 2017) is likely to occasionally forage in exotic grassland areas (outside of the forest areas), however due to the height and density of grasses, the unmanaged exotic pasture area in the south is unlikely to represent suitable habitat for this species. No direct impacts to this species due to the project are expected.

9.2 Indirect Impacts relevant to the FBA

The consistent conclusion across all EIM surveys has been that there are no significant adverse effects on any flora or fauna group as a consequence of events held at the Parklands (See **Appendix F**).

Nonetheless, the proposal will result in different impacts to those monitored during the trial period. These predicted indirect impacts are specifically related to:

- The proposed increase in patron numbers
- The increased number of events
- The increased frequency of events
- The maximum number of events days per event, and in aggregate per year
- Use of the conference centre throughout the year
- Minor barrier effects due to the installation of the 1.8m high security fence

With these aspects in mind, the following impacts are identified:

- An increase in the maximum number of patrons from the current scenario (maximum of 35,000 patrons currently to a maximum of 50,000 patrons for one of the events only under the ultimate proposed scenario) is predicted to result in the following impacts:
 - o The risk of vehicular strike is expected to increase to a small degree during event times due to increased traffic.
 - o The risk of fauna attack by dogs is likely to have a negligible increase during event times.
 - o The risk of fauna entanglement with event infrastructure and trampling is expected to have a negligible increase during event times due to increased foot traffic.
 - o The increases in noise impacts due to the number of patrons is not expected to be significantly different. Additional amplified stages may be established as part of events to cater for additional patron numbers, which may represent some potential additional noise sources. However, the proposal does not involve any change to existing noise limits, and Parklands will still be required to achieve its approved noise criteria offsite. Noise impacts will influence local fauna movement in varying ways during event periods. Predicted impacts to fauna species is outlined in **Table 22**. Previous surveys indicate that these impacts are temporary and rapidly reversible at the conclusion of events (see **Appendix F**). It is not expected that increases in noise levels associated with the proposal will result in longer times before wildlife return to the area (if they display avoidance behaviours due to noise).
 - o Lighting impacts are not expected to increase significantly as the number of powered lights within event areas is determined by event area and not by patron numbers. Nonetheless, if new event areas are established to support additional patrons (e.g. new parking areas), then some additional light impacts may occur. One recent change is as a result of counter terrorism risk assessments undertaken by NSW Police for SITG17, which has required an increase in lighting levels at some points throughout the event for greater safety. Light spillage is also reduced by use of appropriate technologies (see **Section 10**).
 - o The risk of vegetation trampling is not expected to be significantly different with increase patron numbers due to effective mitigation measures that are put in place during events (see **Section 10**). The potential for vegetation trampling is minimised by fencing off areas of native vegetation during events. There is a very limited risk of vegetation trampling from people without tickets to events trying to access the site through vegetated areas. Over the previous events, the instances of this were very low (and have continued to decrease with the assistance of NSW

Police prosecuting trespassers). Trampling risk is greatest, but still very low, where recruitment of native tree and shrub species has occurred within the project area.

- o Increased numbers of people / vehicle movements on site presents a weed and plant pathogen pathway. However, the site has a long history of disturbance, with over 50 exotic flora species known to occur across the Parklands. As part of the ongoing environmental stewardship of the site, the Parklands have implemented a program of bush regeneration. This includes weed management throughout areas of remnant vegetation, and as such, habitat for threatened flora species. Ongoing management has significantly reduced the presence of weeds across the site and has resulted in an overall improved condition of the vegetation. This program will continue moving forward, and will more than offset any introduction of weeds during events.
- o The risk of bushfire is increased during events due to the large numbers of people occupying the site. However, this also poses a significant safety issue for the event patrons and therefore stringent fire management protocols are implemented. The primary aim of these measures is to prevent fire and manage it effectively, from a public safety perspective, if a fire occurs. However, these measures will also benefit the vegetation and habitat on site.
- o The increases in patron numbers will be staged over several years and will only be increased subject to the meeting of KPIs (see **Section 10.2.2**).
- All else being equal, an increase in the number of events days (excluding community events) from a maximum of 10 (currently) to 13 (proposed) event days per year increases the frequency and duration of all indirect impacts as well as increasing the likelihood of risks (such as vehicle strike and bushfire). Impacts observed during and immediately after events have included limited sediment movement, littering and trampling of grasses within the event area, and avoidance of illuminated areas by mobile fauna. Surveys indicated that these impacts are temporary and reversible at the conclusion of events (**Appendix F**).
- An increased number of events per year results, on average, in a shorter duration between events and therefore reduced time for recovery from any impacts. Nonetheless, a majority of events will be minor events with much less impact compared to the major events. In addition, there will often be months between events, meaning that will be ample time between events for ecological recovery.
- The maximum number of days per event is proposed to increase from four to five. Any fauna that are dispersed due to indirect impacts are expected to return within timeframes consistent with the current scenario.
- There is a minor risk that the frequency and length of events will tip certain species to leave habitats within the project area; however this risk is considered to be minor given the evidence collected to date, and all events will be monitored against KPIs to identify this kind of potential impact (see **Section 10.2.2**). Such an impact would also be reversible.
- As mentioned in **Section 1.1.2**, it is proposed that the conference centre and associated accommodation will be used for a range of events such as corporate functions, conferences, celebrations, or health and wellbeing retreats. The conference centre would operate year-round, and cater for up to 180 patrons per day. Accommodation would be provided for up to 120 guests a day in 30 on-site cabins. Impacts are likely to include the following:
 - o The dam adjacent to the proposed conference centre is not considered an important habitat for migratory species. Furthermore, there is only one significant species that has a likelihood to exist in the dam and to utilise the dam (refer to **Appendix J** and **Appendix K**): Latham's Snipe, which is a migratory species, is not listed as threatened in NSW, and despite intensive bird survey, has not been observed on the Parklands site. During times of use, patronage is likely

to disturb foraging and potential nesting behaviour of waterbirds in areas of the dam adjacent to the conference centre (due to noise and visual disturbance) where activities occur within the flight-initiation distances of each resident species. Over the long term, a level of habituation may occur, potentially bringing an increased level of tolerance to the presence of humans at the dam. This may partially reduce the impact on waterbirds, however it is acknowledged that there is a paucity of data on this issue (Weston et al. 2012). Further to this, the impact that this disturbance will have on resident waterbirds at the dam is expected to be minor, and as mentioned above, is unlikely to significantly affect threatened or migratory species.

- o The level of noise generated at the conference centre is likely to be minimal with most noise generating activities being undertaken within the proposed buildings. Therefore the associated impact to adjacent aquatic and forest habitats are likely to be negligible.
- o Use of the conference centre throughout the year will result in an increase frequency of light impact, as well an increase in light spillage due to the number of lights at the centre. Light spillage can be managed to reduce spillage into adjacent habitat areas and any light impacts are predicted to be localised and not significant.
- The installation of the 1.8m high palisade security fence (**Figure 5**) will create a potential barrier effect for some wildlife across the site. However, the impact on fauna movement is considered to be negligible as the fence will be designed so that every 5th or 6th panel (approx. 2.5m in length) can be open during non-event times. This is mainly to reduce the barrier effect for macropods and koalas. Furthermore, the fence will be set 100mm off the ground and will also have space between the palisade pales to allow wildlife movement through the fence. This will not hinder movement of small mammals, reptiles, birds or others small wildlife.

These indirect impacts will have a negligible to minor impact on threatened species, should they occur within the development site. However, the Koala, Brown Tree creeper and Mitchell's Rainforest Snail are considered to be at a higher risk due to their small population sizes, observed regional declines (Koala), dependence upon forest habitats in the broader study area, and their susceptibility to fire. Effective implementation of a Bushfire Management plan which specifically addresses and minimises fire risk for BNR is considered a reliable means of managing and reducing this risk.

A summary of potential indirect impacts to flora and fauna are provided in **Table 21** and **Table 22**.

Table 21: Summary of potential impacts to threatened flora species

Species	Impact
Davidson's Plum (<i>Davidsonia jerseyana</i>) endangered Known to occur in project area	Direct impacts: nil, as all areas will be fenced off during events Indirect impacts: • Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety • Trampling associated with unauthorised access, considered low risk due to fencing and previously low incidence • Increased weed invasion, considered low risk due to few event days and ongoing rehabilitation of the site

Rough-shelled Bush Nut (<i>Macadamia tetraphylla</i>) Known to occur in project area	As above
Stinking Cryptocarya (<i>Cryptocarya foetida</i>) Known to occur in project area	As above
Durobby / Coolamon Rose Apple (<i>Syzygium moorei</i>) Known to occur in project area	As above
Slender Marsdenia; Clear Milk Vine (<i>Marsdenia longiloba</i>) Potential to occur in project area	As above
Southern Fontainea (<i>Fontainea australis</i>) Potential to occur in project area	As above
Rusty Rose Walnut (<i>Endiandra hayesii</i>) Potential to occur in project area	As above
Pink Nodding Orchid (<i>Geodorum densiflorum</i>) Known from outside the development site	As above
Green-leaved Rose Walnut (<i>Endiandra muelleri</i> subsp. <i>bracteata</i>) Known to occur in development site	As above

Table 22: Summary of potential impacts to threatened fauna species

Species name	Indirect impacts to species
Birds	
<i>Carterornis leucotis</i> (White-eared Monarch) Known to occur in project area	- Potential fauna strike and/or entanglement, considered low risk with no previous evidence of this occurring, low probability of bird foraging on site - Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk as monitoring has shown birds returning to areas soon after disturbance has ceased. There is also significant suitable habitat adjacent to site - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety
<i>Climacteris picumnus victoriae</i> (Brown Treecreeper)	As above

Species name	Indirect impacts to species
Potential to occur within the development site	
<i>Cyclopsitta diophthalma coxeni</i> (Coxen's Fig-Parrot) Potential to occur in project area	- Potential fauna strike and/or entanglement, considered low risk with no previous evidence of this occurring, site does not appear highly utilised by this species (seasonal migrant only potentially present during winter events) - Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk as monitoring has shown birds returning to areas soon after disturbance has ceased. There is also significant suitable habitat adjacent to site - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety
<i>Glossopsitta pusilla</i> (Little Lorikeet) Known to occur in development site	- Direct impacts: potential fauna strike and/or entanglement, considered low risk with no previous evidence of this occurring, development site does not contain potential habitat for this species - Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk as monitoring has shown birds returning to areas soon after disturbance has ceased. There is also significant suitable habitat adjacent to site - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety
<i>Irediparra gallinacean</i> (Comb-crested Jacana) Potential to occur in development site	As above
<i>Lathamus discolour</i> (Swift Parrot) Potential to occur in development site	As above
<i>Ptilinopus magnificus</i> (Wompoo Fruit-Dove) Known to occur in project area	As above
<i>Pandion cristatus</i> Eastern Osprey Potential to occur in development site	- Potential fauna strike and/or entanglement, considered low risk with no previous evidence of this occurring, species likely to occur intermittently at site - Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk as monitoring has shown birds returning to areas soon after disturbance has ceased. There is also significant suitable habitat adjacent to site - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety

Species name	Indirect impacts to species
<i>Ptilinopus regina</i> Rose-crowned Fruit-Dove Known to occur in project area	- Potential fauna strike, considered low risk due to low numbers recorded on site, few event days and traffic controls during events, development site does not contain any potential habitat for this species - Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk due to lack of previous species records in area and all habitat areas will be fenced off during events. There is also significant suitable habitat adjacent to site - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety
<i>Tyto longimembris</i> Eastern Grass Owl Known to occur in project area	- Removal of potential foraging and nesting habitat associated with the establishment of the carpark in the south of the development site. - Potential fauna strike and/or entanglement, considered low risk with no previous evidence of this occurring. - Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk as monitoring has shown birds returning to areas soon after disturbance has ceased. There is also significant suitable habitat adjacent to site - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety
Invertebrates	
<i>Thersites mitchellae</i> Mitchell's Rainforest Snail Known to occur in project area	- Potential trampling, considered low risk as all habitat areas will be fenced off during events, low previous incidence of attempted unauthorised access - Potential disturbance from vibrations caused by noise (gastropods do not have a sense for hearing but feel vibration), light and people presence leading to temporary alienation of the project area, considered low risk as habitat areas will be fenced off during events - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety
Mammals	
<i>Phascolarctos cinereus</i> Koala Potential to occur in development site	- Potential fauna strike, considered low risk due to few event days and traffic controls during events. - Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk and temporary. There is also significant suitable habitat adjacent to site - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety - Negligible barrier effect to connectivity due to installation of security fence.

Species name	Indirect impacts to species
<i>Planigale maculata</i> Common Planigale Potential to occur in development site	- Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk due to lack of previous species records in area and all habitat areas will be fenced off during events. There is also significant suitable habitat adjacent to site - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety
Bats	
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat Known to occur in project area	- Potential fauna strike and/or entanglement, considered low risk with no previous evidence of this occurring - Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk as monitoring has shown no negative impacts to other microbat species. - Potential increased bushfire risk, considered low risk due to stringent bushfire management during events for public safety
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle Known to occur in project area	As above
<i>Kerivoula papuensis</i> Golden-tipped Bat Known to occur in project area	As above
<i>Miniopterus australis</i> Little Bentwing-bat Known to occur in project area	As above
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat Known to occur in project area	As above
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat Known to occur in project area	As above
<i>Myotis macropus</i> Southern Myotis Known to occur in project area	As above The events may also provide a minor benefit to these species. There is evidence from monitoring (Appendix D) that suggests that increased predation on insects that are attracted to event lighting can occur. This may also apply to the other microbat species that occur in the area.
<i>Nyctophilus bifax</i> Eastern Long-eared Bat Known to occur in project area	As above
<i>Pteropus poliocephalus</i>	As above

Species name	Indirect impacts to species
Grey-headed Flying-fox Known to occur in project area	
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat Known to occur in project area	As above
<i>Syconycteris australis</i> Common Blossom-bat Known to occur in project area	As above

Table 23: Potential Impacts to Migratory Species

Species	Potential impacts
Black-faced Monarch (<i>Monarcha melanopsis</i>) Known to occur in project area No important habitat or ecologically significant proportions of the population	- Potential fauna strike and/or entanglement, considered low risk with no previous evidence of this occurring - Potential disturbance from noise, light and people presence leading to temporary alienation of the project area, considered low risk as monitoring has shown bird species returning to areas soon after disturbance has ceased
Eastern Osprey (<i>Pandion cristatus</i>) Known to occur in project area No important habitat or ecologically significant proportions of the population	As above
Fork-tailed Swift (<i>Apus pacificus</i>) Potential to occur in project area No important habitat or ecologically significant proportions of the population	As above
Latham's Snipe (<i>Gallinago hardwickii</i>) Potential to occur in project area No important habitat or ecologically significant proportions of the population	As above Use of the conference centre throughout the year may result in disturbance to this species if it utilises the adjacent dam. Flight-initiation distance for this species is around 20m (Weston et al 2012), and due to the size of the dam, this species is unlikely to be disturbed by activities at the conference centre. This species has potential to occur at the dam, however it has not been observed within the area despite intensive survey effort at the dam.
Oriental Cuckoo (<i>Cuculus optatus</i>) Known to occur in project area No important habitat or ecologically significant proportions of the population	As above
Rufous Fantail (<i>Rhipidura rufifrons</i>) Known to occur in project area No important habitat or ecologically significant proportions of the population	As above
Satin Flycatcher (<i>Myiagra cyanoleuca</i>) Known to occur in project area No important habitat or ecologically significant proportions of the population	As above
Spectacled Monarch (<i>Monarcha trivirgatus</i>) Known to occur in project area No important habitat or ecologically significant proportions of the population	As above

Species	Potential impacts
White-throated Needletail (<i>Hirundapus caudacutus</i>)	As above
Known to occur in project area	
No important habitat or ecologically significant proportions of the population	

9.2.1 Impact to important habitat within 1km of the development site

Appendix D lists the individual species and the importance of their habitat within 1km of the development site. For the majority of species considered, habitats within the 1km buffer area are not considered important, and no impact on movement patterns or use of habitat is considered likely, given the proposed use of the NBP site.

Additionally, four years of monitoring of forest birds, small terrestrial mammals and microchiropteran bats have revealed no significant adverse impacts for these fauna groups within the development site or at 8 transects within Billinudgel Nature Reserve. No adverse effects for threatened species or for habitats outside the development site have been detected. Therefore the likelihood of adverse impacts from the project within the 200m or 1km buffer area for threatened, migratory or hollow-dependent species is considered to be low.

9.2.2 Impacts to Hollow-Bearing Trees within 1km of the development footprint

Many of the larger hollow-bearing trees may potentially provide shelter for microchiropteran bats and potentially for small maternity colonies. However the majority of these are sufficiently distant from the development site as to experience little adverse effect from the permanent operation of the NBP.

Two trees are however in locations which expose them to illumination which could be adverse for roosting or nesting bats. These large Blackbutts #31 & #32 are to varying extents illuminated by the lights in the northern car park. Tree #32 in particular has large and deep hollows and is exposed to lighting during events. The importance of this tree for fauna is not known, however its availability as a shelter or roost site is influenced by the duration and extent to which it is illuminated. Overall however, the potential indirect impacts upon hollow bearing trees is considered minor to negligible.

10 Measures to Avoid and Minimise Impacts

This section is divided into two main parts – one that discusses the avoidance of impacts (**Section 10.1**), whilst another that discusses the minimisation of residual impacts (**Section 10.2**).

10.1 Avoidance of Impacts

10.1.1 Avoidance of direct impacts

Direct and indirect impacts to threatened flora, fauna and EECs will be significantly reduced utilising mitigation measures outlined in **Table 24**. Direct impacts to be avoided listed in **Table 24** are consistent with Section 8.3.1.1 of the FBA methodology.

Table 24: Avoidance of Direct Impacts

Direct Impact to be Avoided	Method to Avoid Impact
Impacts to Endangered Ecological Communities (EECs) and Critically Endangered Ecological Communities (CEECs)	- Site rehabilitation as well as weed management within vegetation communities will continue. - Temporary human exclusion fencing closely bordering (within 10 m of) forest blocks within event areas will be provided. All temporary human exclusion fencing used in these locations will be 'fauna-friendly', incorporating a minimum 250 mm continuous gap at the base of the fence or 250 mm square gaps at 10 m intervals along the base of the fence. - 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 shall only operate within the approved event areas. - No activities (including slashing) will occur within the 30m minimum buffer around the southern car parking areas surrounding the Billinudgel Nature Reserve. - All staff and contractors to undertake Parkland's Environmental Induction prior to accessing the site. Documented records shall be maintained covering the environmental induction process.
Impacts to PCTs that contain threatened plant species habitat	As above
Impacts to areas that contain habitat for Vulnerable, Endangered, or Critically Endangered threatened species or populations in accordance with Step 5 in Section 6.5 of the FBA	Not applicable. No species polygons have been prepared for the above species credit species (as per Step 5) because only exotic pasture will be impacted and only a very minor area of clearing / pruning of vegetation will occur due to the proposed vehicular access track in the north-west. Exotic pasture areas have been excluded from the BBCC as they do not constitute native vegetation.
Impacts to areas of land that the Minister for Environment has declared as critical habitat	No areas of land within the Parklands property have been declared as critical habitat by the Minister for Environment.

Direct Impact to be Avoided	Method to Avoid Impact
Impacts to riparian areas of 4th order or higher streams and rivers, important wetlands and estuaries	No development or event activities will occur within 20m of the 4th order stream. The development site does not overlay any SEPP14 wetlands; however a SEPP14 wetland exists to the south-east of the development site. This wetland is associated with Billinudgel Nature Reserve and is not directly impacted by the project.
Impacts to state significant biodiversity links	No state significant or regionally significant biodiversity links have been identified within a plan by the Chief Executive of the OEH. As mentioned above, there is a SEPP14 wetland adjacent to the project area. This is within 50 m of the development site and therefore is deemed to be a State Significant Biodiversity Link. Nonetheless, the Biobanking Credit Calculator (BBCC) accounts for direct impacts to connectivity value classes only. As the project is not impacting SEPP14 vegetation, inclusion of the SEPP14 wetland as a State Significant Biodiversity Link is not required.

10.1.2 Site Selection

Impacts relevant to site selection have been assessed using criteria within Section 8.3.2 of the FBA methodology. The assessment is presented in **Table 25**.

Table 25: Avoidance and Minimisation of Direct Impacts through Site Selection

Site Selection Criteria	Method to Avoid Impact
Selecting a suitable development footprint for a Major Project or a route for linear projects, should be informed by knowledge of biodiversity values. An initial desktop assessment of biodiversity values would assist in identifying areas of native vegetation cover, EECs or CEECs, and potential habitat for threatened species	The area utilised for these events contains no remnant intact vegetation and is comprised of cleared pasture grass only, with scattered trees that are protected during events. The proposed vehicular access track to the north-west has been sighted along an existing track to minimise vegetation clearing. Furthermore the northern parts of the alignment have been designed to weave around vegetation/trees to avoid clearing.
Stage 1 of the FBA will provide the preliminary information necessary to inform project planning. Early consideration of biodiversity values is recommended in site selection, or route selection for linear projects, and the planning phase.	The direct impact of the proposed activities will be primarily restricted to the area of cleared pasture grass. As previously mentioned, there is also a very minor area of clearing / pruning associated with the proposed vehicular access track. The clearing area of approx. 300m² is less than 0.001% of 43.48ha of native vegetation present on the site and therefore, the current and future extent of remnant vegetation will practically remain the same. Additionally, The Parklands site has been operating under trial since 2012, during which time a total of nine major and medium events have
The site/route selection process should include consideration and analysis of the biodiversity constraints of the proposed development footprint and consider the suitability of the Major Project based on the types of biodiversity values present on the development footprint	

Site Selection Criteria	Method to Avoid Impact
When considering and analysing the biodiversity constraints for the purpose of selecting a development footprint, the following matters should be addressed: (a) whether there are alternative sites within the property on which the proposed development is located where siting the proposed Major Project would avoid and minimise impacts on biodiversity values (b) how the development footprint can be selected to avoid and minimise impacts on biodiversity values as far as practicable (c) whether an alternative development footprint to the proposed development footprint, which would avoid adversely impacting on biodiversity values, might be feasible.	been held. Monitoring during each of these events showed that impacts to biodiversity values were short-term and reversible and no adverse impacts to biodiversity have yet been detected. As such, no alternative sites within or outside of the property were considered for the proposed developments. The current site selection is deemed to be the most appropriate for the proposed actions as it has the least biodiversity constraints and previous monitoring has demonstrated minimal impact on biodiversity due to events.
For linear projects, the route selection process must include consideration and an analysis of the biodiversity constraints of the various route options. In selecting a preferred option, loss of biodiversity values must be weighed up and justified against social and economic costs and benefits.	

10.1.3 Planning

Impacts relevant to project planning have been assessed using criteria within Section 8.3.2 of the FBA methodology. The assessment is presented in **Table 26**.

Table 26: Avoidance and Minimisation of Direct Impacts through Planning

Planning Criteria	Method to Avoid Impact
Siting of the project – the Major Project should be located in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower site value score) or which avoid an EEC or CEEC	The project has established no-go zones, which fence off intact native vegetation. Events are contained within areas that consist of managed exotic pasture with scattered native trees that are protected during events.
Minimise the amount of clearing or habitat loss – the Major Project (and associated construction infrastructure) should be located in areas that do not have native vegetation, or in areas that require the least amount of vegetation to be cleared (i.e. the development site is	The proposal also incorporates the construction of buildings and infrastructure. With the exception of the proposed vehicular track in the north-west, construction activities will occur within currently cleared areas only. Therefore the extent of native vegetation within the development site will practically remain the same (and will actually increase due to the voluntary efforts to rehabilitate cleared areas into native vegetation). The following methods will be adopted in order to confine works to the project area:

Planning Criteria	Method to Avoid Impact
minimised), and/or in areas where other impacts to biodiversity will be the lowest	• Temporary human exclusion fencing closely bordering (within 10 m of) forest blocks within event areas will be provided. All temporary human exclusion fencing used in these locations will be 'fauna-friendly', incorporating a minimum 250 mm continuous gap at the base of the fence or 250 mm square gaps at 10 m intervals along the base of the fence. • 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 shall only operate within the approved event areas. • No activities (including slashing) will occur within the 30m buffer around the southern car parking areas surrounding the Billinudgel Nature Reserve. • All staff and contractors to undertake Parkland's Environmental Induction prior to accessing the site. Documented records shall be maintained covering the environmental induction process. • Site rehabilitation as well as weed management within vegetation communities will continue. • Clear delineation of the clearing area associated with proposed vehicular access track in the north-west. This will include the establishment of Tree Protection Zones and arborist advice to reduce impacts to surrounding vegetation.
Loss of connectivity – some developments can impact on the connectivity and movement of species through areas of adjacent habitat. Minimisation measures may include providing structures that allow movement of species across barriers or hostile gaps	There are no connectivity value classes that will be impacted by the project. The connectivity value class score is therefore 0. The current linkage width across site is 0-5m (very narrow). There are no linkage width classes that are lost as the project will not result in vegetation clearing to the degree that connectivity will be affected.

Other – increase in site capacity	An increase in the maximum capacity to 50,000 patrons for one large event will be implemented in multiple phases, with staged increases in maximum event size over several years. The gradual increase in site utilisation will allow any potential impacts to be monitored and appropriate modifications to events to be implemented. The proposed events and staging are: • Splendour in the Grass event (up to an ultimate 50,000 patrons over 5 days), subject to meeting KPIs of the following patron capacity scenarios: - o Increase from current 35,000 to 42,500 subject to meeting KPIs - o Increase from 42,500 to 50,000 subject to meeting KPIs In total, there will be a maximum of 20 event days. The down times between larger events will be maximised. Furthermore, a rigorous monitoring and adaptive management approach will be undertaken to ensure impacts to biodiversity do not rise in relation to an increased event capacity (See Section 10.2.2).
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10.2 Measures to Minimise Impacts

Impacts relevant to construction and operations have been assessed using criteria within Section 8.3.2 of the FBA methodology. The assessment is presented in **Table 27** to **Table 29** for construction and operations respectively.

Within this section, ‘construction’ relates to any actions required to establish the site as a permanent events venue. As per **Section 1.1.2**, this includes the construction of buildings and infrastructure.

‘Operations’ refers to the set-up, operations and pack down of events.

Table 27: Minimisation of Impacts through during the Construction Phase

Matter considered to Minimise Impacts	Method to Avoid Impact
Method of clearing – using a method of clearing during the construction phase that avoids damage to retained native vegetation and reduces soil disturbance. For example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	Clear delineation of the clearing area associated with proposed vehicular access track in the north-west. This will include the establishment of Tree Protection Zones and arborist advice to reduce impacts to surrounding vegetation. Arborist advice on pruning requirements will also be sort. No other native vegetation will be cleared as a result of construction activities.
Clearing operations – minimising direct harm to native fauna during actual construction operations through onsite measures such as undertaking pre-clearing surveys, daily fauna surveys and the presence of a trained ecologist during clearing events	A pre-clearing survey will be undertaken prior to works associated with the proposed vehicular track in the north-west commencing. A qualified fauna spotter catcher will be present during clearing activities.

Matter considered to Minimise Impacts	Method to Avoid Impact
	In order to minimise any potential impacts to the Eastern Grass Owl and the Common Planigale, the following measures will be undertaken: - An ecologist will undertake a targeted search for these species in the lead up to construction works associated to the southern carpark and/or initial slashing in this area - Slashing in the southern grassland area should be undertaken incrementally to allow any potential animals to escape The Common Planigale was deemed to have a low likelihood of occurring within the development site, however it has been included in the above measures as a precautionary measure.
Timing of construction – identifying reasonable measures that minimise the impacts on biodiversity. For example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting, can minimise the impacts of construction activities on biodiversity	Slashing of grassland and/or works associated with the southern carpark should occur outside the Eastern Grass Owl breeding season, and following a targeted site search for this species, to ensure no animals are killed or disturbed during nesting.
Other measures that minimise inadvertent impacts of the Major Project on the biodiversity values – measures such as installing temporary fencing to protect significant environmental features such as riparian zones, promoting the hygiene of construction vehicles to minimise spread of weeds or pathogens, appropriately training and inducting project staff and contractors so that they can implement all measures that minimise inadvertent adverse impacts of the Major Project on biodiversity values.	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 A Construction Environmental Management Plan will be prepared and implemented for all construction works to further minimise impacts to biodiversity.

Table 28: Minimisation of Impacts during the Operational Phase

Operational Phase Impact	Method to Avoid Impact
Seasonal impacts – whether there are likely to be any impacts that occur during specific seasons. Minimisation measures	Impacts associated with the proposed action will primarily be limited to the proposed 20 event days per year, with a maximum event period of 5 consecutive days. Additionally, a program of

Operational Phase Impact	Method to Avoid Impact
may include amending operational times to minimise impacts on biodiversity during periods when seasonal events such as breeding or species migration occur.	extensive monitoring of potential impacts of events at Parklands on MNES (and other values) has been undertaken since 2012. This work has clearly demonstrated little to no impact to flora and fauna at the site (Eco Logical Australia 2017, Fitzgerald 2016). The proposed future events will be undertaken in accordance with the same event management arrangements as previously employed and as such, there is no reason to suggest future significant impacts are likely. An ongoing program of monitoring and adaptive management (Appendix G) will ensure this conclusion remains valid.
Artificial habitats – using ‘artificial habitats’ for fauna where they may be effective in minimising impacts on such fauna. These include nest boxes, glider-crossings or habitat bridges.	Impacts to fauna during the event operations has thus far indicated minimal impact to faunal movement. Additionally, impact has mostly been confined to temporary site avoidance of Flying foxes and wallabies. Therefore, artificial habitats are deemed unnecessary. Parklands has also demonstrated a range of voluntary environmental management arrangements including significant on-going rehabilitation of the site, which collectively demonstrate good environmental stewardship.

10.2.1 Minimising Indirect Impacts during Operations

A range of measures to avoid and/or reduce impacts have been successfully implemented during the trial period and have been effective in minimising impacts to flora and fauna during events. These will continue to be implemented for future events and will be included in the detailed Environmental Health and Safety Management Manual that determines how events will be operated on site. This will include environmental management requirements such as erosion and sediment control, lighting, noise, dust, exclusion fencing amongst others.

Table 29 discusses how indirect impacts will be minimised.

Table 29: Minimisation of Indirect Impacts

Operational Phase Impact	Method to Avoid Impact
Feral pest, weed and/or pathogen encroachment into vegetation on land adjoining the development footprint – one example is using protocols for hygiene that minimise the likelihood of construction vehicles spreading weeds or pathogens from the development footprint into native vegetation on land adjoining the development footprint	Increased numbers of people and vehicle movement on site presents a weed and plant pathogen pathway. However, the site has a long history of disturbance, with over 50 exotic flora species known to occur across the Parklands. Ongoing management has significantly reduced the presence of weeds across the site and has resulted in an overall improved condition of the vegetation. This program will continue moving forward, and will more than offset any introduction of weeds during events. Additional measure that will be adopted, include: Event operators shall only operate within the approved event areas.

Operational Phase Impact	Method to Avoid Impact
	- Only minimal activities will occur within the 30 m buffer around the southern car parking areas surrounding the Billinudgel Nature Reserve (e.g. slashing between plantings if required). - All staff and contractors to undertake Parkland's Environmental Induction prior to accessing the site. Documented records shall be maintained covering the environmental induction process. - Temporary human exclusion fencing closely bordering (within 10 m of) forest blocks and other native vegetation within event areas will be provided. All temporary human exclusion fencing used in these locations will be 'fauna-friendly', incorporating a minimum 250 mm continuous gap at the base of the fence or 250 mm square gaps at 10 m intervals along the base of the fence.
Impacts that are infrequent, cumulative or difficult to measure – where there are likely to be indirect impacts on biodiversity that are infrequent, cumulative or difficult to measure over time, consideration should be given to how an operational monitoring program can be used to assess the timing and/or extent of these impacts. A proposal for an operational monitoring program should be set out in the BAR. Development of a monitoring program may involve determining the base-line information that will be necessary to measure the impact over time. It should also consider how the results of the monitoring program could be used to inform ongoing operations in order to reduce the extent of indirect impacts	Extensive monitoring has been undertaken during the trial period to quantify potential impact of events at the Parklands on flora and fauna species (Eco Logical Australia 2017). This work has demonstrated some minor and temporary impacts to some species (Fitzgerald 2016). No further investigations or action has been required under the existing adaptive management framework. It is not anticipated that the ongoing and increased event schedule will alter the severity or duration of these impacts. In order to ensure this is the case, and as a component of an adaptive management strategy, ongoing monitoring of vegetation and key fauna will be undertaken. The adaptive management strategy will include provision for additional monitoring and/or investigation if increased impacts are detected. An updated environmental monitoring and adaptive management plan has been developed (Appendix G).
Impacts during the operational phase – measures to avoid or minimise the indirect impacts on threatened species and threatened species habitat on land adjoining the development footprint, migratory species or flight pathways as a result of the operation of the development. Such measures may include those adopted to avoid and minimise: (i) trampling of threatened flora species (ii) rubbish dumping	The following measures will be implemented during events to minimise indirect impacts: - Event operators shall only operate within the approved event areas. - Only minimal activities will occur within the 30 m buffer around the southern car parking areas surrounding the Billinudgel Nature Reserve (e.g. slashing between plantings if required). - All staff and contractors to undertake Parkland's Environmental Induction prior to accessing the site. Documented records shall be maintained covering the environmental induction process.

Operational Phase Impact	Method to Avoid Impact
(iii) noise (iv) light spill (v) weed encroachment (vi) nutrient run-off (vii) increased risk of fire, and (viii) pest animals.	• Temporary human exclusion fencing closely bordering (within 10 m of) forest blocks and other native vegetation within event areas will be provided. All temporary human exclusion fencing used in these locations will be 'fauna-friendly', incorporating a minimum 250 mm continuous gap at the base of the fence or 250 mm square gaps at 10 m intervals along the base of the fence. • Duration that temporary fencing is erected will be minimised to reduce barriers to fauna • As previously mentioned, the proposed security fence will include large gate panels that allow fauna movement (i.e. for large mammals). Furthermore, design allows for smaller fauna to travel through the fence. The fence also avoids designs that typically entangle or injure bats and birds (i.e. barbed or thin wire). • No dogs (with the exception of trained assistance dogs) are permitted on the site. Trained security guard dogs are allowed at all times, while under the control of an authorised person. • All temporary drain crossings shall be managed to minimise sedimentation and potential discharge of contaminants. • Lighting controls will be implemented taking public safety considerations into account. These will include: a. Lighting levels to provide adequate illumination for safety purposes b. Over-night lighting (i.e. after performances have ceased each evening) will be minimised to that necessary for public safety c. Forest blocks will not be illuminated d. Illumination of individual trees within the site may occur providing they are not currently in blossom and/or are occupied by fauna • Fireworks are prohibited • All internal traffic not to exceed 25 km/h (or 15 km/hr in designated event areas) • Higher levels of passengers per vehicle combined with higher public transport mode shares to reduce traffic. • Arrangement for an experienced fauna rescue person to be available to attend the venue if required to rescue and/or relocate fauna • An environmental monitoring and adaptive management program will be developed and implemented (Appendix G).

10.2.2 Monitoring and adaptive management

The key components of the monitoring plan are included in **Table 30** and **Table 31** below. For continuity of data, monitoring will be undertaken at the existing 'impact' and control sites (**Figure 14**). Ongoing monitoring and adaptive management will be geared towards the following objectives:

- The condition of Endangered Ecological Communities and associated threatened species habitat will continue to be enhanced via the on-going program of successful vegetation management and bush regeneration.
- Threatened flora species will continue to be present at the Parklands.
- Events will not prevent the on-going use of the Parkland site by threatened fauna species.

The adaptive management framework is provided in **Appendix G**.

Table 30: Proposed Monitoring program

Timeframe	Target species/groups	Timing and methodology
Present to end of approved trial period	• Vegetation • Forest birds • Flying foxes • Terrestrial mammals • Microchiropteran bats	Methodology as currently required under existing approvals
Splendour in the Grass (SITG) 'capacity increase' period (from current, to 42,500 then 50,000 patrons)	BACI monitoring of the following elements: • Vegetation and threatened flora condition monitoring – forest blocks and regeneration areas • Forest birds • Threatened microchiropteran bat species	Annual monitoring before, during and after largest event Event increase viable only if no significant new/ongoing impacts detected
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
Subsequent and ongoing operation of SITG operation at full capacity (50,000 patrons)		2-yearly monitoring before, during and after largest event
Associated with SITG monitoring	Full floristics of vegetation quadrats in EECs to confirm status and condition (esp. weeds and other edge effects)	Every four years or after any large-scale environmental event e.g. bushfire
Associated with Koala Plan of Management	Koala	Every two years per KPoM

Table 31: Proposed Monitoring Methods post August 2019

Target Group	Proposed Sampling Methodology
Vegetation Condition	Photo-point monitoring before and after events consistent with current methodology. Full floristics to be undertake within EECs every four years, and is to be undertaken as per current methodology.
Forest Birds	In forest areas: Samples before-during-after SITG of ten x 20minute/200m transects undertaken by experienced observers. This is consistent with the current method. In areas of regeneration: As per existing method, forest birds will be monitored at two sites in established (~9 year old) native plantings in the Marshall's Ridges area. Additional sites may be established in new regeneration areas if deemed appropriate. All observations of threatened bird species at the Parklands to be recorded.
Threatened Microchiropteran Bats	As per current method, three locations are sampled by Anabat Call detectors for each event monitored. Two locations are within the event area and the third nearby within Billinudgel Nature Reserve.
Koala	Biennial Koala surveys undertaken consistent with the Koala Plan of Management and contextualised using data from the Byron Coast Comprehensive Koala Plan of Management. Incidental observations of Koala and evidence of use during event based monitoring for birds and microbats (above).

11 Assessment and Offsetting Requirement for Unavoidable Impacts

11.1 Direct Loss of Native Vegetation

This assessment is required to identify all impacts and classify them under the following criteria:

- Impacts that the assessor is required to identify for further consideration by the consent authority
- Impacts for which the assessor is required to determine an offset
- Impacts for which the assessor is not required to determine an offset
- Impacts that do not require further assessment by the assessor

A summary of the guidelines for these is provided in **Table 32** below.

Table 32: Impact Thresholds for Landscape Features, Native Vegetation, and Threatened Species and Populations

Indirect Impact	Present within the Development footprint
Impacts that Require further consideration by consent authority	None identified within the SEARs
Impacts for which the assessor is required to determine an offset	See Section 11.2 .
Impacts for which the assessor is not required to determine an offset	None present within the development footprint
Impacts that do not require further assessment by the assessor	All cleared areas within the development footprint

11.2 Impacts Requiring Offsetting

11.2.1 Native Vegetation

The clearing area associated with the proposed vehicular track is estimated to be approximately 300m². This represents less than 0.001% of the 43.48ha of native vegetation that exists on the parklands site.

As part of the Vegetation Management and Biodiversity Plan, the remaining 43.48ha of native vegetation is managed to improve the capacity of the site to support biodiversity. This includes feral animal and weed control, a nest box program, and ongoing fauna monitoring and surveys. These activities will continue as part of standard operations at the parklands.

As mentioned above, a significant program of voluntary bush regeneration and plantings has also occurred on site since 2007. All planting areas are regularly inspected and weed control undertaken. To date over 22,000 trees and shrubs have been planted, with other areas also earmarked for regeneration in the future (**Figure 10**). 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 Cassia and Camphor laurel.

Offsets are a tool designed to provide a net gain for residual impacts to the environment. Due to the:

- voluntary efforts of North Byron Parklands to revegetate the grounds;
- the continued management of 43.48ha of existing native vegetation across the site to improve habitat quality;
- the efforts undertaken to avoid and minimise clearing requirements across the development site; and
- the very minor extent of clearing required.

Operations of the site are expected to provide a significant net benefit to biodiversity value within the development site. Therefore it is suggested an offset is not required to account for the negligible loss of native vegetation and associated biodiversity values associated with the clearing for the vehicular track in the north-west.

11.3 Impacts Not Requiring Offsetting

Impacts to cleared land within the development site do not require offsetting.

12 Conclusions

This report has provided the results of a biodiversity impact assessment for the proposed operation of North Byron Parklands as a permanent event venue. As per requirements of the SEARS, it has included an assessment in accordance with the FBA, whilst also addressing additional biodiversity assessment requirements associated with indirect impacts.

A key aspect of the project is that only a very small area of native vegetation is required to be cleared, and construction and operations is overwhelmingly situated in already disturbed areas. For this reason, no offsets will be required. Nonetheless, a significant and voluntary program of bush regeneration and plantings has occurred on site since 2007, and vegetation management of the 43.48ha of native vegetation on site will continue to improve biodiversity value within the development site.

Significant survey effort and monitoring has been undertaken over the last 10 years at the site. This has provided important and useful data to assist in the assessment of potential indirect impacts. Results of event impact monitoring have shown that there is very minimal and temporary impact to biodiversity during major events and that time between events has allowed for impacts to reverse. Nonetheless, a robust adaptive management framework has been in place to guide event activities and minimise impacts. This framework for management has been revised and is proposed to be continued with the permanent use of the site. The updated monitoring and adaptive management framework has been provided as part of this report.

Impacts from construction or operations will also be managed through the implementation of relevant Construction Environmental Management Plans as well as a revised Environmental health and Safety Management Manual.

Overall, permanent use of the site is expected to result in negligible to minor impacts to biodiversity. Impacts from events are also considered temporary and reversible.

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Appendix A – Content Checklist

Table 33: Relevant draft SEARs addressed in this BAR

Organisation (page number)	SEARs	Response
SEARs, general requirements (page 8)	Biodiversity – including: an assessment of the development and all biodiversity values on the site under the <i>Framework for Biodiversity Assessment 2014</i> that is to include: • Identification of species on site; • Detail of the potential direct and indirect impacts on any threatened species, populations, endangered ecological communities or their habitats, groundwater dependant ecosystems; and • A detailed description of the measures to avoid, minimise, mitigate and/or offset biodiversity impacts	This BAR has been prepared under the FBA (OEH 2014) for major projects. Under this framework, a detailed assessment must be undertaken on the vegetation to be impacted within the development footprint, as well as any impacts to threatened species, populations, or endangered ecological communities. This BAR also outlines the offsetting requirement due to unavoidable impacts of the project. This BAR details all measures to avoid and minimise direct and indirect impacts to biodiversity as specified within Section 8 of the FBA. An Assessment of Significance (7-Part Test) has also been undertaken for threatened species and EECs (Appendix M).
Traditional Home of the Bundjalung People, 11 th January 2017 (page 22).	The existing cap for the trial development is for a maximum of 35, 000 patrons. The proposed development is for up to 50, 000 patrons and includes the physical expansion of the site. The previous trial events should not be considered as an acceptable baseline for ecological assessment and outcome. A full ecological assessment of the impacts of the proposed development is required.	Flora and fauna monitoring undertaken during the trial period indicated that the cultural events held within the development site had minor, irreversible impacts to fauna species (refer to Appendix F). This data was used to indicate whether cultural events held within the development site had any a negative impact on flora and fauna during the trial period only. While this data was used to consider the appropriateness of site selection for such events, it will not be used as baseline data for potential future events. To reach a maximum capacity of 50, 000 patrons, event capacity will increase gradually over two years (refer to Section 1). This will allow for monitoring effort to identify any potential impacts to biodiversity. Details of the monitoring and adaptive management plan is provided. The adaptive management strategy will include provision for additional monitoring and/or investigation if increased impacts are detected. An updated environmental monitoring and

Organisation (page number)	SEARs	Response
		adaptive management plan will be developed and implemented, focusing on both MNES and threatened species listed under NSW legislation. It will be developed as part of the NSW environmental approvals process and include consultation with NSW OEH. This BAR has assessed the predicted impacts of the project with an understanding that the impacts of the project will generally have greater duration and frequency when compared to the impacts monitored as part of the trial period.
NSW Department of Planning and Environment, 16 December 2016 (page 24)	In relation to key issues for the land, we would suggest that the SEARs regurgitate the requirements of DGR09_0028 or alternatively include a general requirement that a review of the information required and submitted under MP09_0028 be undertaken. The previous proposal and DGRs covered the key issues for the land and in particular land use conflict, Koala management, protection of adjoining nature reserve, construction and operational management plans.	N/A
	Critical for the project, will be demonstrating that suitable management plans will be implemented to handle 50,000 patrons and minimise impacts during works and operations/events - covering matters such as traffic, access and parking (including buses), noise, lighting, flood, fire, dust, water cycle and waste management, flora and fauna management (including buffers, weed, litter, runoff, offsets) anti-social, safety and land use conflict with surrounding agricultural and rural/residential land.	The following management plans will be prepared and implemented for works: - Construction Environmental Management Plans relevant to each scope of work - An Environmental Health and Safety Management Manual that determines how events will be operated on site, including provisions for environmental management and risk management. - A Monitoring and Adaptive Management Framework (Appendix G).
NSW Department of Primary	The EIS should include a range of effective strategies to avoid, mitigate and offset any direct or indirect impacts expected to occur to	Works will not occur within 20m of waterways with a stream order of 4. No works will occur

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Industries (NSW DPI), 16 January 2016) (pages 28-29)	key fish habitat located on and adjacent to the site. All works should be carried out in accordance with DPI Fisheries Policy and Guidelines for Fish Habitat Conservation and Management (2013)	within the waterway. Yelgun Creek is earmarked to revegetation.
	The EIS should be required to include the following: • Identification of all riparian areas on the site, including any creeks, rivers, drainage lines, and wetlands, and outline any impacts the development may have on these areas, outline the intended management of these areas, including monitoring and mitigation measures, or any works proposed for these areas. All watercourses and drainage lines in the area should be clearly located on a plan in the EIS • Consideration of appropriate buffers to be provided adjacent to all watercourses and drainage lines affected by the development • Design and construction of works within 40 m of watercourses are to be in accordance with the DPI Water Guidelines for Controlled Activities (2012) • Erosion and sediment control measures on site during the construction and operations. It is important any riparian areas adjacent to the site are not affected by the proposed development.	The location of riparian areas, including creeks, rivers, drainage lines and wetlands within and directly adjacent to, the development site it provided in Figure 12, Section 1.1. The application of the DPI Water Guidelines for Controlled Activities (2012) is discussed within the EIS. The Environmental Health and Safety Management Manual will discuss environmental management on site, including erosion and sediment control.
Office of Environment and Heritage, 16 January 2017 (pages 30-33)	The proponent should ensure that the EIS will be sufficiently comprehensive to enable unambiguous determination of the extent of the direct and indirect impact(s) of the proposal. The EIS should include an appropriate assessment of the potential impacts on OEHS estate, Aboriginal cultural heritage and biodiversity	An assessment of the potential impacts on biodiversity is outlined in Section 9 . Impacts to individual threatened flora and fauna is addressed in Table 21 and Table 22 . The likely risk of these impacts, and any appropriate mitigation measures are provided in Section 10 . Ongoing monitoring and adaptive management strategies will ensure that these impacts are minimised.
	Biodiversity impacts related to the proposed project are to be assessed and documented	This BAR has been prepared under the FBA (OEHS 2014) for major projects. Under this

Organisation (page number)	SEARs	Response
	in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by OEH	framework, a detailed assessment must be undertaken on the vegetation to be impacted within the development footprint, as well as any impacts to threatened species, populations, or endangered ecological communities. Potential impacts to biodiversity are outlined in Section 9 .
	The EIS must: a) Identify the threatened and migratory species likely to be present or likely to use habitat within 1 km of the project area. b) Identify hollow-bearing trees within 200 m of the project area. c) Describe the importance of the habitat/habitat features within 1km of the development site (including the hollow-bearing trees from (b) above) for the life cycle of the entities identified in (a) above. d) Identify and provide an assessment of potential indirect impacts on those species and their habitat identified in (a), (b) and (c) above, including changes to movement patterns and impacts on use of habitat. e) Describe measures proposed to avoid, minimise and manage the indirect impacts identified in (d) above including an evaluation of the effectiveness and reliability of the proposed measures. f) Identify monitoring requirements for the measures in e) above.	The response to each criterion can be found in the following sections and appendices: a) Section 8.5.2 Migratory Species within the development site b) Section 8.5.1 Habitat present within 1km of the development site c) Section 9 – predicted impacts d) Section 10 – Mitigation and monitoring e) Appendix F – Monitoring results