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BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT - FINAL

November 2020

HEARTWOOD COMMUNITY RESIDENTIAL AREA

Executive summary

Ecosure Pty Ltd was engaged by Steven and Jen Smith on behalf of Heartwood Bellingen to provide a Biodiversity Development Assessment Report in accordance with the Biodiversity Assessment Method and to address more broadly the requirements in the *Biodiversity Conservation Act 2016*.

The proposed development area consists of a low-density residential development within an area of 17.13 ha and will include 66 residential lots to be constructed in two stages. The development footprint (roads, lots and subdivision infrastructure) will encompass 15.88 ha of the 17.13 ha lot. The proposed development is defined in this report as Lot 456 on DP755557, within the Bellingen Shire Council Local Government Area.

Plot-based vegetation surveys were undertaken in accordance with the Biodiversity Assessment Method to confirm Plant Community Types, the extent of native vegetation and patch size, and to calculate vegetation integrity. Assessments of habitat suitability for threatened species were conducted in addition to targeted surveys for threatened flora and fauna.

The proposed development is expected to impact 12.6 ha of native vegetation consisting of three Plant Community Types and includes 9.09 ha of mapped preferred koala habitat as defined by the Bellingen Shire Council Coastal Area Koala Management Strategy and Plan. An assessment of impacts was undertaken, with a focus on matters that are likely to impact on native vegetation and listed threatened species. The assessment identified that with mitigation measures the level of impact would be low. Clearing of vegetation and associated threatened species habitat will require offsets under the Biodiversity Offset Scheme. Credits will be retired in an area to be conserved in perpetuity under a Biodiversity Stewardship Agreement in an adjoining lot to the south of the development site.

This Biodiversity Development Assessment Report is certified by Nigel Cotsell who is a certified Biodiversity Assessment Method assessor, accreditation number BAAS18026. The report has been prepared based on the requirements of, and information provided under the Biodiversity Assessment Method and submitted via the Biodiversity Offsets and Agreement Management System on X Month 2020, case number 000XXXXX.

Glossary, acronyms and abbreviations

APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method
BAMO	Biodiversity Assessment Method Order 2017
BC Act	*Biodiversity Conservation Act 2016*
BC Regulation	Biodiversity Conservation Regulation 2017
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
BSA	Biodiversity Stewardship Agreement
BSC	Bellingen Shire Council
BSSAR	Biodiversity Stewardship Site Assessment Report
DPIE	Department of Planning, Industry and Environment
HTE	High Threat Exotic
IBRA	Interim Biogeographic Regionalisation for Australia
KPA	Koala Planning Area
KPoM	Comprehensive Koala Plan of Management
LGA	Local Government Area
LLS Act	*Local Land Services Act 2013*
OEH	Office of Environment and Heritage
PCT	Plant Community Type
SAT	Spot Assessment Technique
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
VI	Vegetation Integrity

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1 Introduction

1.1 Overview

Ecosure Pty Ltd was commissioned by Steve and Jen Smith on behalf of Heartwood Bellingen to prepare a Biodiversity Development Assessment Report (BDAR) in accordance with the *Biodiversity Assessment Method Order 2017* (Office of Environment and Heritage [OEH], 2017) (BAMO), and to address more broadly the requirements in the *Biodiversity Conservation Act 2016* (BC Act).

1.2 Background

This BDAR has been prepared to assess the biodiversity values of the land, and the associated impacts of the proposed development which exceeds the clearing threshold of 0.25 ha, and also contains a large portion of land mapped as preferred koala habitat (PKH) (Bellingen Shire Council 2019).

The North Coast Regional Plan (NCRP) identifies the following future projections and priorities for Bellingen. The number of dwellings in 2011 was 6,150, and the number of dwellings projected to be required by 2036 is 6,550. Therefore, additional dwellings needed by 2036 is 250 to 300 (NSW Government 2017a).

Regional priorities include identifying additional land for inclusion in urban growth areas, and to secure future housing and employment in proximity to Bellingen and Urunga. Additionally, the NCRP plans for the delivery of housing to North Bellingen, South Urunga and East Dorrigo, enhancement of the variety of housing options to cater for an ageing population in Bellingen and Dorrigo, and support for the distinctive character of Bellingen Shire's towns and villages. A review of land supply to identify proposed urban land for extra dwellings recognised that Bellingen may not have sufficient capacity within urban growth areas to achieve a 20-year supply of housing (NSW Government 2017a).

The NSW Government committed to working with relevant councils to identify proposed urban land to assist in meeting demand for housing and amend the relevant urban growth area maps to deliver housing supply. A significant proportion of the undeveloped land in the Bellingen urban growth area has been rezoned, however it has not been developed for residential purposes.

The vendors are committed to progressing residential development of the northern part of the land while conserving the southern forested land. It is anticipated that subject to a rezoning and development approval, residential lots would contribute to meeting demand for housing in Bellingen by 2020. The Master Plan showing the development and construction footprint is provided in Appendix 1.

1.3 The site

The site is located in the regional town of Bellingen on the NSW mid north coast. It is located on the southern periphery of Bellingen urban area with access to Endeavour Drive to the north, Hill Street to the west and Nobles Lane to the south-east. It is identified as Lot 456 on DP755557 with a total area of 75.03 hectares.

The land is an existing holding with a single dwelling entitlement and is zoned RU1 Primary Production. The site adjoins land zoned R1 General Residential to the north-west, R5 Large Lot Residential to the north and north-east, RU1 Primary Production to the south and south-east, and E3 Environmental Management to the south-west.

The site is characterised by cleared areas containing a mixture of exotic and native grasses interspersed with small patches of remnant vegetation contained within gullies and along steeper slopes. Large, scattered paddock trees exist throughout including approximately eight individual eucalypt trees within the proposed residential footprint with a diameter at breast height (DBH) greater than 100 cm. An area of continuous native vegetation exists along the proposed southern boundary with the BSA site. Preferred Koala Habitat (PKH) classed as Secondary A is mapped across a large portion of the site containing species of koala feed tree (KFT).

1.4 Historical land use

The Gumbaynggirr Nation are the traditional owners and first inhabitants from the Bellingen region. The Gumbaynggirr Nation is one of the largest coastal Aboriginal Nations extending from the Nambucca River in the south to the Clarence River in the north, and west to the Great Dividing Range. The exact use of the site by the Gumbayngirr people is unknown. A pedestrian survey for cultural heritage was undertaken on 20 December 2017 by Coffs Harbour and District Local Aboriginal Land Council (CHDLALC) Senior Aboriginal Sites Officer Ian Brown, and Aboriginal Sites Officer Luana Ferguson, together with Everick Senior Archaeologists Tim Hill and Morgan Disspain.

In consideration for the potential of the ridge crest to contain Aboriginal sites, it was noted that the foot slopes of the ridgeline to the north would have provided better access to resources along the river, floodplain and wetlands. The ridge crest is a component of the site that was not considered to be a ‘pathway’ as there were no obvious landscape features identifiable as a destination to the south of Bellingen. The survey concluded with a number of recommendations including a find procedure to be followed throughout any development works.

Logging commenced following European settlement during the 1840s. The original forest was axe-cut, as demonstrated by ‘spring-board’ notches still present in several old stumps. The site was also reportedly used for dairying.

1.5 The project

The project has been established over a three-year period with the overall intention of developing a portion of the site for low density residential purposes. The entire site includes an area of 75.03 hectares. The northern portion is proposed as the Heartwood Community residential area (17.13 ha) and is the subject of this BDAR (Figure 1). The southern portion of land is proposed as a BSA site (58.07 ha), to be named the Heartwood Forest Conservation Area (Figure 2) and will be conserved in perpetuity. The proposed development includes 74 residential lots to be constructed in two stages. The development footprint (roads, lots and subdivision infrastructure) will impact 12.6 ha of the 17.54 ha lot.

The proposed subdivision will include two fauna habitat links, one situated along the western boundary of the lot and another located east of Endeavour Drive that follows a drainage line leading to Connell Creek. A buffer zone along the southern boundary will adjoin the BSA site. Two stormwater retention basins are proposed in the west and south-west of the Stage 1 development, and a third basin proposed in the eastern part of Stage 2.

The proposed Heartwood development will also include:

- retention of significant trees
- two fauna corridors
- fauna underpass/crossing in two locations in Stage 2 (eastern section)
- walking trails
- water tank (for fire management)
- emergency exit point connecting to nearby street.

1.6 Sources of information

Data and/or resources used or consulted in the assessment include:

- Biodiversity Offsets and Agreement Management System (BOAMS)
- Biodiversity Assessment Method calculator
- BioNet Atlas
- BioNet Threatened Biodiversity Data Collection (TBDC)
- BioNet Vegetation Classification
- BioNet Web Services
- Department of Agriculture, Water and the Environment Environmental Data
- Department of Planning, Industry and Environment Data Portal
- PlantNet NSW.

Spatial data used or consulted in the assessment include:

- Cadastre (NSW Department of Finance, Services and Innovation 2018)
- Interim Biogeographic Regionalisation for Australia (IBRA) Regions and Subregions (OEH 2016)
- NSW (Mitchell) Landscapes – version 3.1 (OEH 2016)
- Directory of Important Wetlands in Australia (Australian Government Department of the Environment, Water, Heritage and the Arts, 2019)
- Fauna Corridors for North East NSW (OEH 2018)
- SEED Portal (Acid Sulfate Soil Risk) (NSW Government 2018)
- NSW Hydrography (Department of Finance, Services and Innovation 2018)
- 2018 Aerial imagery (Nearmap 2018).

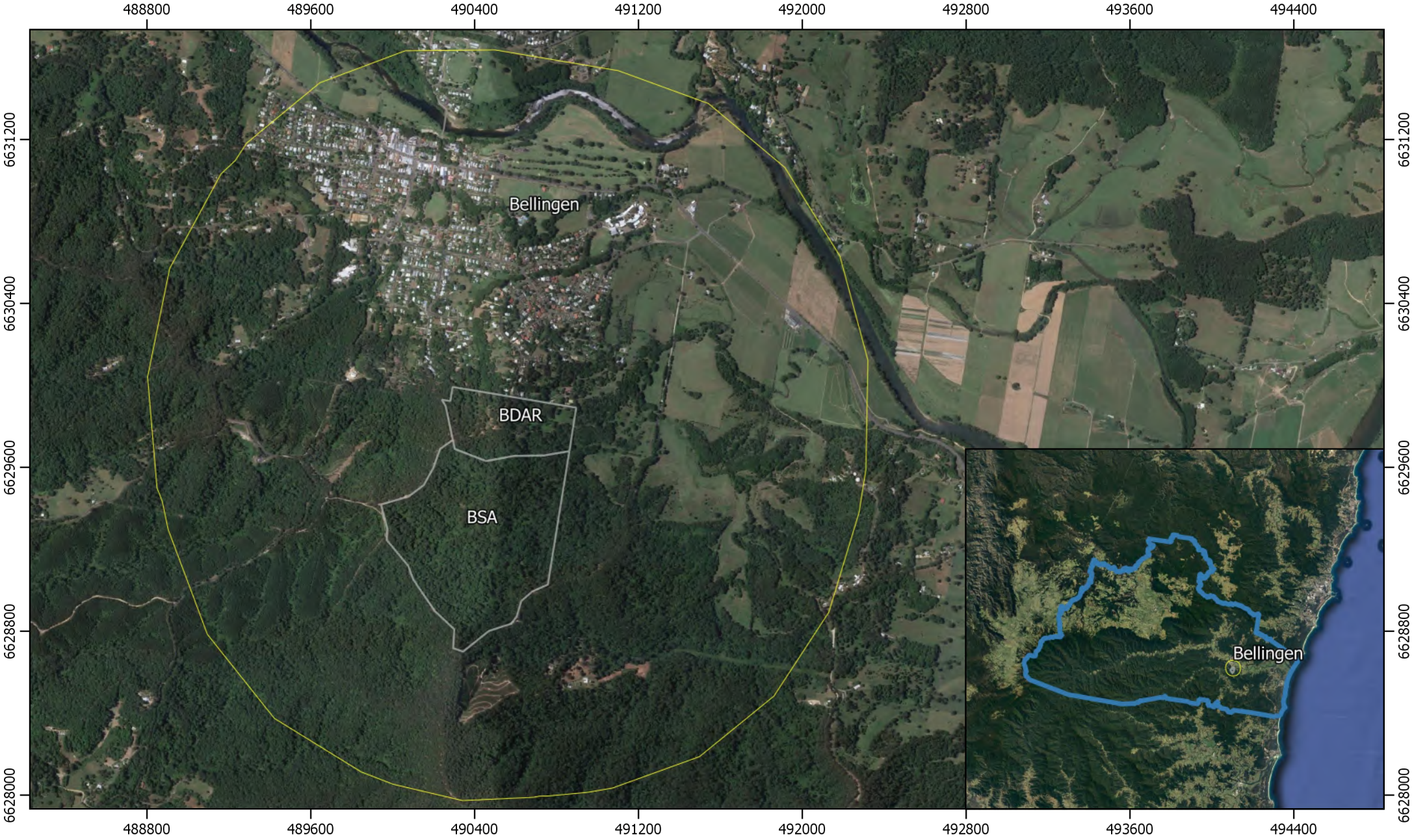

Figure 1: Location Map

Steve and Jen Smith
BDAR Bellingen, NSW

Property boundary
BDAR 1500m Buffer
Bellingen LGA

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2019-05-01T15:30:58.657

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GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

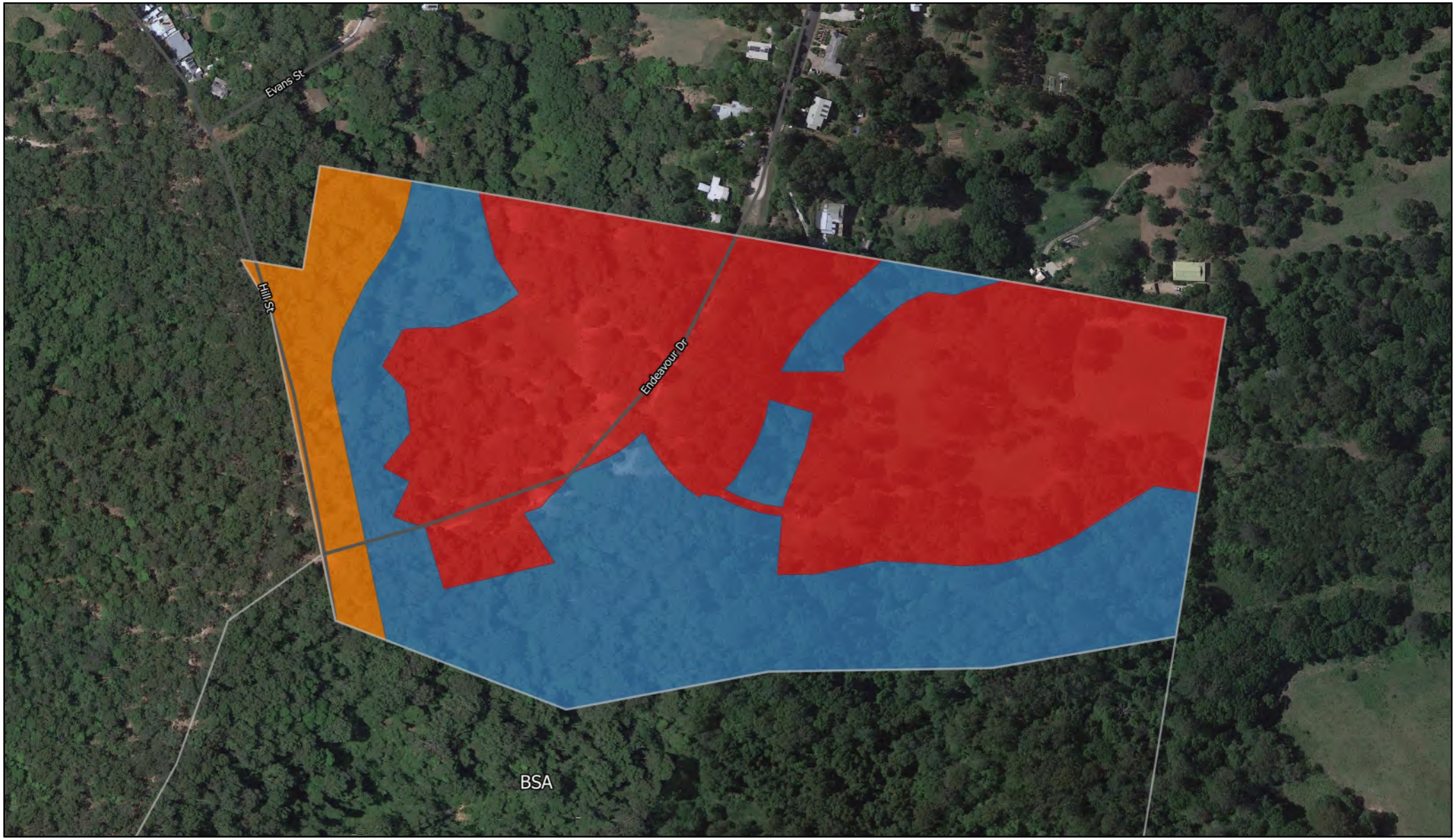

Figure 2: Site map

Steve and Jen Smith
BDAR Bellingen, NSW

Property boundary
Asset protection zone
Clearing area
Environmental management area

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2019-05-01T16:09:35.480

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GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

2 Stage 1 – Biodiversity Assessment

A number of important biodiversity features currently exist on the site and are expected to be impacted by the proposed development. Large scattered, hollow-bearing paddock trees and critically endangered scrub turpentine (*Rhodamnia rubescens*) are present on the site. Preferred koala habitat (PKH) is mapped across a large portion of the site together with a number of species of KFTs including tallowwood (*Eucalyptus microcorys*).

There is potential for species with a high biodiversity risk weighting (i.e. koala, *Phascolarctos cinereus*) to be impacted due to vegetation removal and habitat loss. However, native vegetation has previously been impacted through clearing resulting in reduced species richness, and is considered moderately degraded due to encroachment by weed species.

2.1 Biodiversity values not present on the site

In accordance with Part 2.3 of the Biodiversity Assessment Method Order 2017 (BAMO), the following biodiversity values are not assessed under the Biodiversity Assessment Method (BAM):

- marine mammals
- wandering sea birds
- biodiversity that is endemic to Lord Howe Island
- biodiversity values associated with the assessment of the impacts of any clearing of native vegetation and loss of habitat on Category 1 – exempt land (within the meaning of Part 5A of the Local Land Services Act), other than the additional biodiversity impacts in accordance with clause 6.1 of the Biodiversity Conservation Regulation 2017 (NSW) (BC Regulation).

These values are not present on the site and therefore do not require additional assessment outside of the scope of the BDAR.

2.2 Landscape context

2.2.1 Landscape features

This section addresses the requirements set out in Section 4.2.1.1 to Section 4.2.1.18 of the BAM.

The defining geophysical feature of this region is the escarpment associated with the Great Dividing Range which can be viewed from the ridgeline of the subject site and the expansive views over Bellingen and the Promised Land further north. A prominent ridge, with an east-west orientation, borders the southern boundary of the proposed residential area.

The site falls within the NSW North Coast IBRA bioregion and the Coffs Coast and Escarpment

Subregion (Figure 3). Additionally, the site is within the NSW North Coast Manning – Macleay Mitchell Landscape and Ingalba Coastal Hills landscape which is characterised by coastal hills and slopes with a general elevation of up to 830 m that supports a variety of coastal hardwood forests that include species such as blackbutt (*Eucalyptus pilularis),* tallowwood (*E. microcorys*), Sydney blue gum (*E. saligna*), and small-fruited grey gum (*E. propinqua*) (Department of Environment and Climate Change [DECC], 2002) (Figure 4).

Based on mapping provided in the NSW Hydrography dataset (NSW Government 2015), Strahler stream ordering of both 8th and 9th order streams exist within the gully areas across the site. Connell Creek comprises the catchment area for the entire site (Figure 5).

State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP) defines the coastal zone and establishes state-level planning priorities and development controls to guide decision-making for development. No significant wetlands mapped under the Coastal Management SEPP are located on the site, however there are significant wetlands east of the site on the Bellinger River within the 1,500 m buffer area, and a number of other significant wetlands located surrounding Urunga (Figure 6).

The site is mapped adjacent to a significant habitat and connectivity features as defined by the Office of Environment and Heritage (now Department of Planning, Industry and Environment [DPIE]) in the Key Habitats and Climate Change Corridors dataset (Figure 7). The site joins this corridor along the south-western boundary where on-site vegetation connects to the corridor along the east-west ridgelines. This portion of the site in the south-west is also mapped by Bellingen Shire Council as preferred koala habitat (PKH).

There are no Areas of Outstanding Biodiversity Value (AOBV) as defined in the BC Act, or areas of geological significance located at the site.

2.2.2 Soil hazard features

Acid sulphate soils are mapped as potentially occurring within a small portion in the north-east of the subject land (Figure 8). A low probability of occurrence is mapped along Connell Creek and associated tributaries which extend inside the north eastern boundary of the property. A high probability of occurrence of acid sulphate soils is mapped along the extent of the Bellinger River from Bellingen Township to the coast (NSW Government 2018b).

Figure 3: Interim Biogeographic Regionalisation for Australia (IBRA) mapping

Steve and Jen Smith
BDAR Bellingen, NSW

BDAR boundary
1500m Buffer

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2019-05-02T13:44:29.687

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Units: Meter

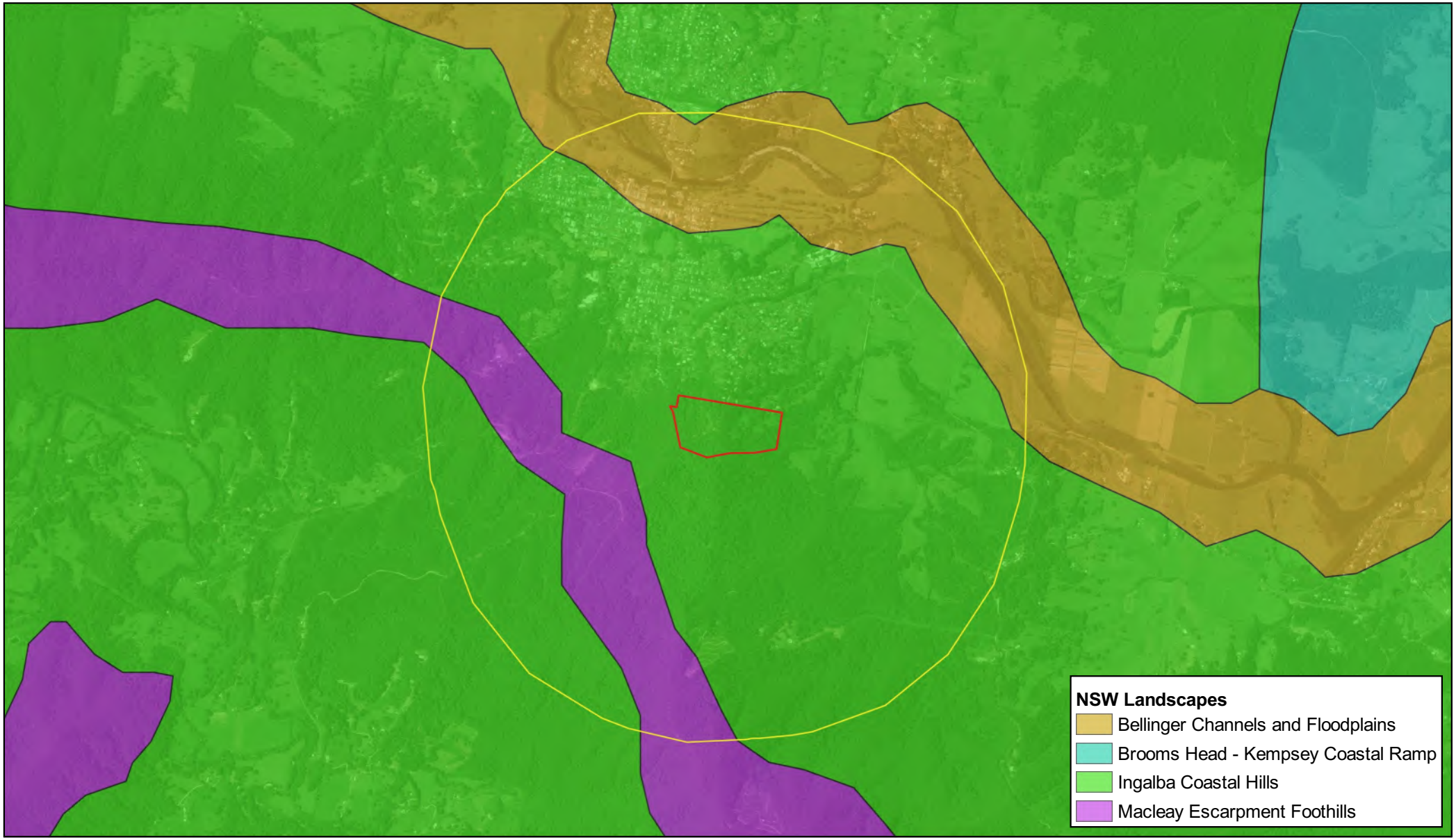

Figure 4: NSW (Mitchell) Landscapes

BDAR_boundary 1500m Buffer

Steve and Jen Smith
BDAR Bellingen, NSW

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2019-05-02T13:30:28.909

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Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

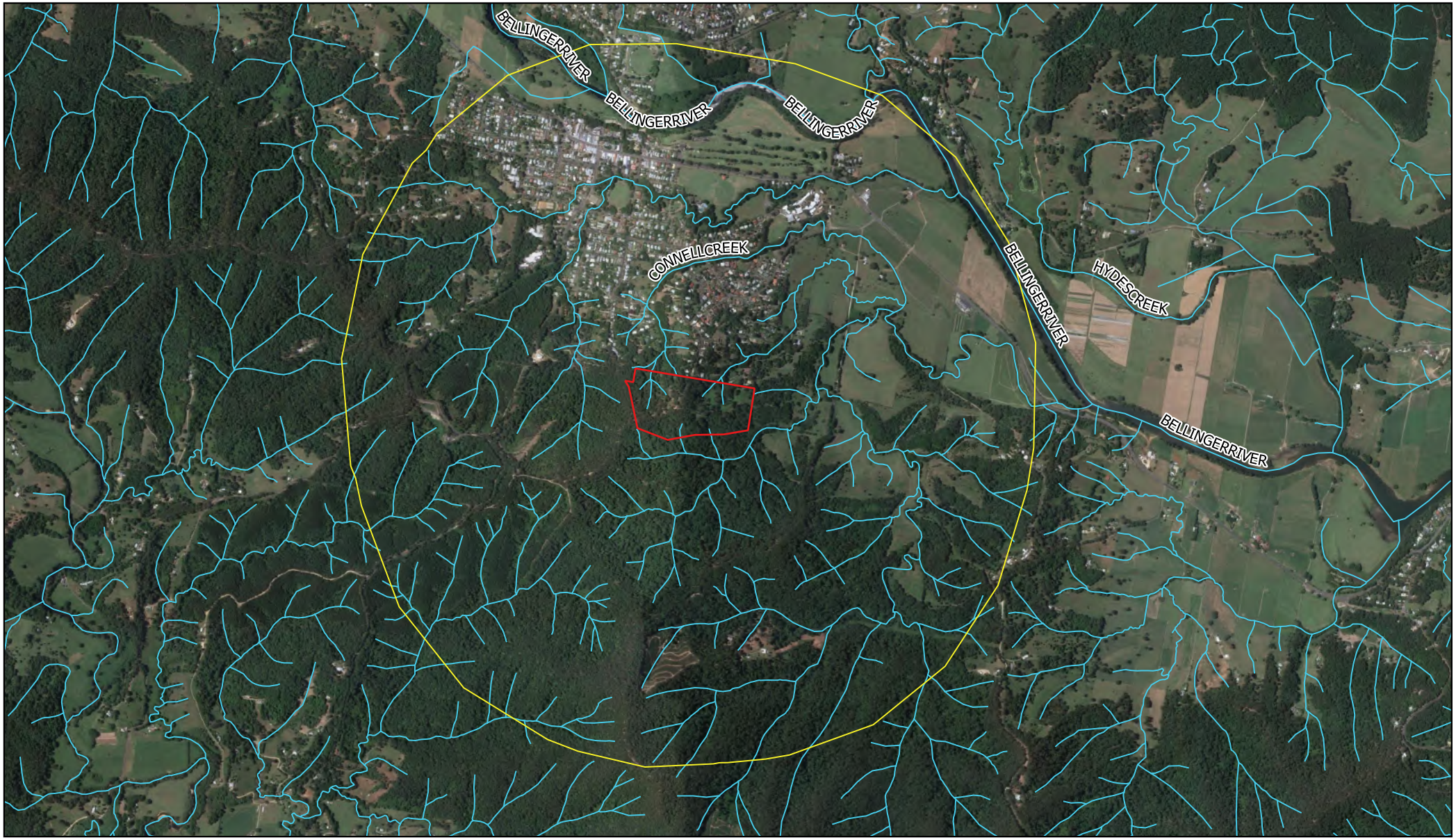

Figure 5: Rivers, Streams and Estuaries

Steve and Jen Smith
BDAR Bellingen, NSW

BDAR boundary
1500m Buffer
Bellingen Hydrolines

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2019-05-02T13:52:26.179

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GDA 1994 MGA Zone 56
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Units: Meter

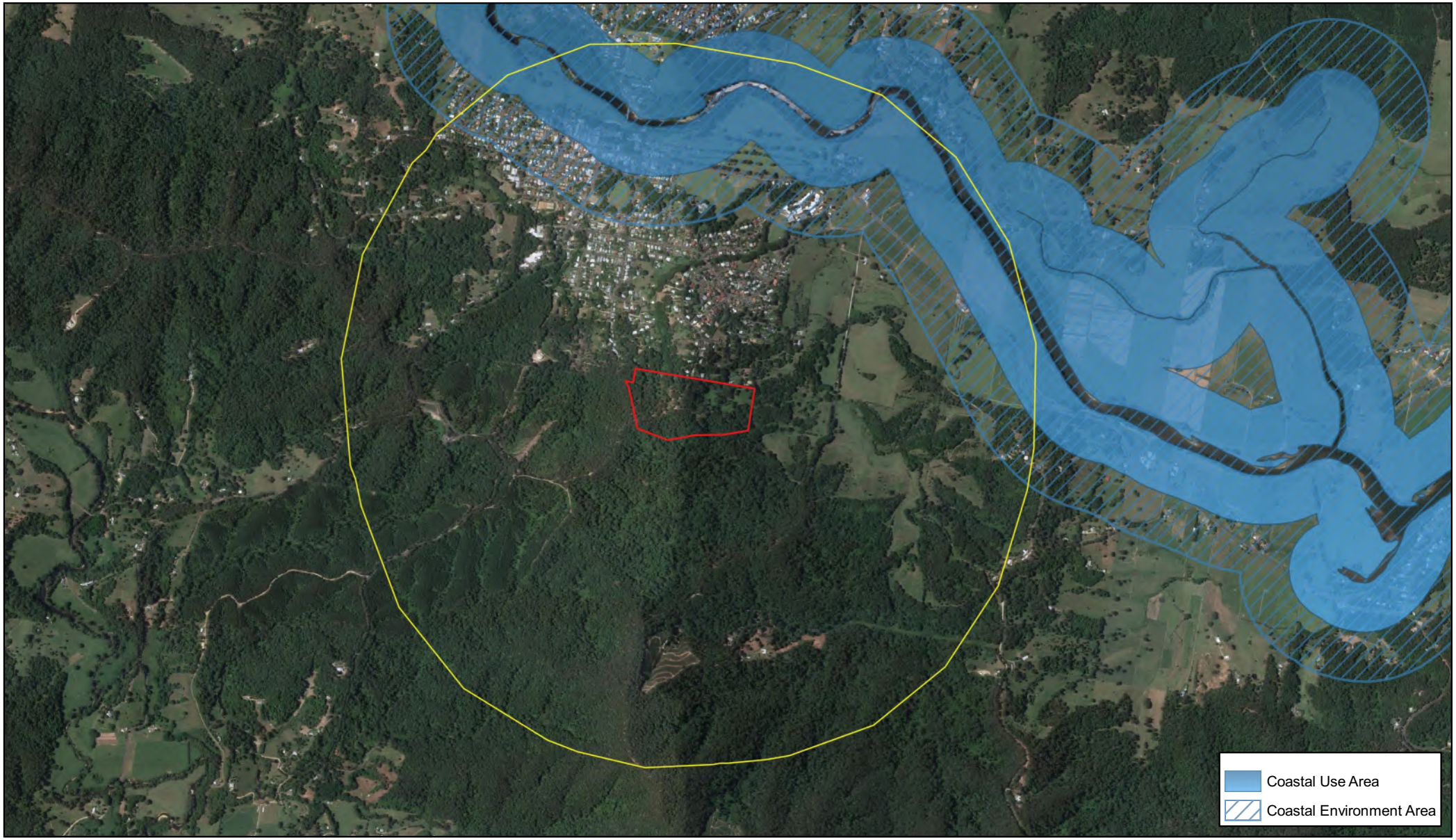

Figure 6: Wetlands

Steve and Jen Smith
BDAR Bellingen, NSW

BDAR boundary
1500m Buffer

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2019-05-02T14:04:10.451

0 0.5 1 1.5 2 km

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

Figure 7: Habitat Connectivity Features

Steve and Jen Smith
BDAR Bellingen, NSW

BDAR boundary
1500m Buffer

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2019-05-06T11:02:54.676

0 1 2 3 4 km

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

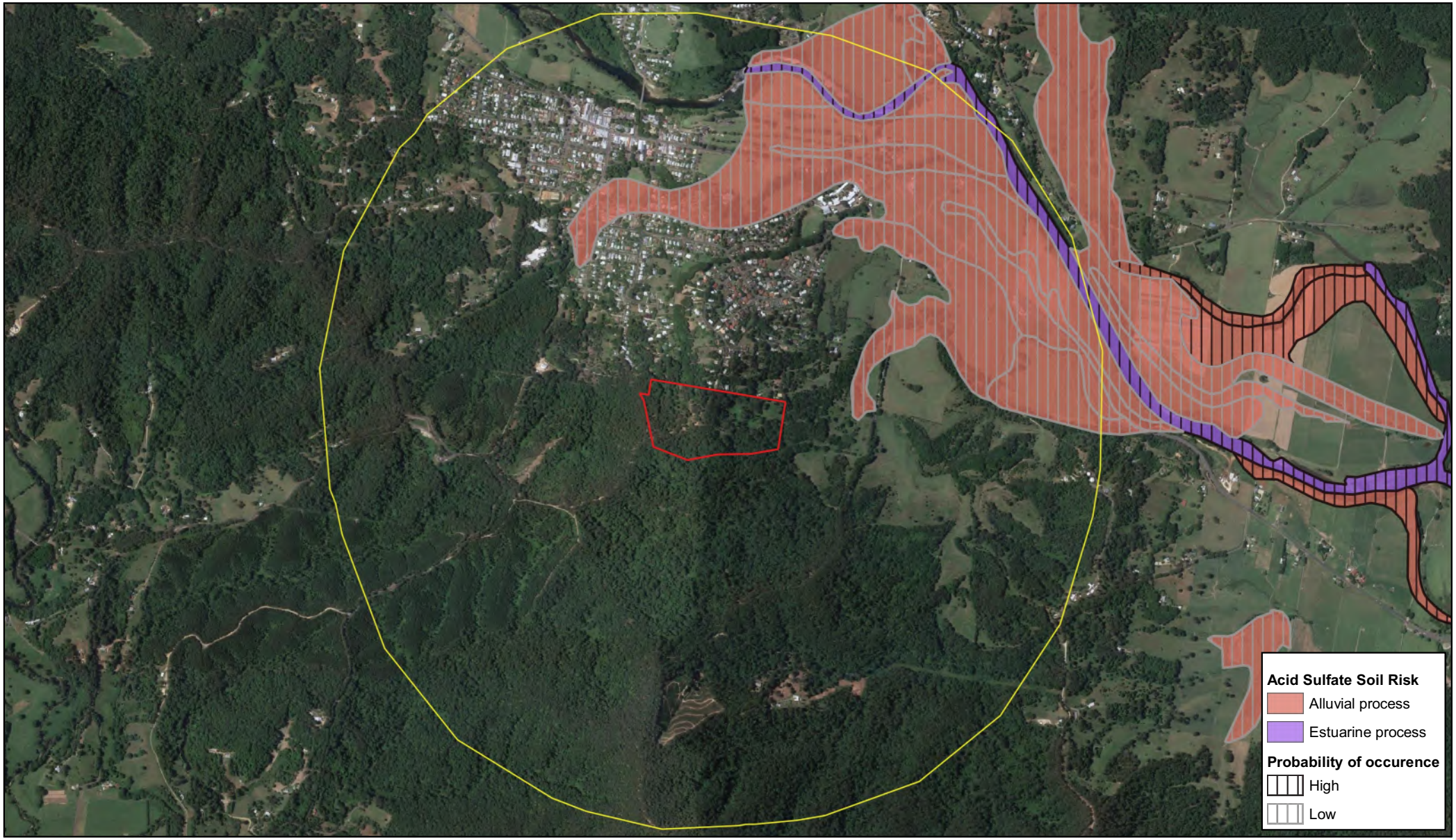

Figure 8: Soil Hazard Features

Steve and Jen Smith
BDAR Bellingen, NSW

BDAR boundary
1500m Buffer

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2019-05-06T12:01:24.858

0 0.4 0.8 1.2 1.6 km

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

2.3 Native vegetation

To address requirements set out in Section 5.2 of the BAM, identification and mapping of all Plant Community Types (PCT) and Threatened Ecological Communities (TEC) on the site have been categorised according to NSW PCT Classification as described in BioNet Vegetation Classification (OEH 2017).

2.3.1 Vegetation class and formation

Observations made during field surveys conducted by Ecosure were correlated with the NSW BioNet Vegetation Classification (OEH 2017). Within the standard operational hierarchy for native vegetation in NSW, the vegetation that occurs on the site falls within three broad vegetation classes: *Northern Hinterland Wet Sclerophyll Forest*, *Northern Escarpment Wet Sclerophyll Forest*, and *Northern Gorge Dry Sclerophyll Forest*. These classes are further categorised into three vegetation formations: *Wet Sclerophyll Forest (Grassy sub-formation), Wet Sclerophyll Forest (Shrubby sub-formation)* and *Dry Sclerophyll Forest (Shrub/grass sub-formation* (Table 1).

Table 1 Plant Community Types and Threatened Ecological Communities

Vegetation Class	Vegetation Formation	PCT Number	PCT Common Name	Associated Threatened Ecological Community	Percent Cleared
Northern Hinterland Wet Sclerophyll Forest	Wet Sclerophyll Forest (Grassy sub-formation)	1262	Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	No	30
Northern Escarpment Wet Sclerophyll Forest	Wet Sclerophyll Forest (Shrubby sub-formation)	747	Brush Box - Tallowwood tall moist forest in the Washpool area of the NSW North Coast	No	30
Northern Gorge Dry Sclerophyll Forest	Dry Sclerophyll Forest (Shrub/grass sub-formation)	872	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion	No	15

2.3.2 Identification of draft plant community types and draft vegetation zones

This section addresses the requirements set out in Section 5.2.1.1 to 5.2.1.8 (a) of the BAM, identifying native plant community types and ecological communities on the subject land as well as Section 5.3.1, mapping vegetation zones.

Preliminary assessment of the site for vegetation classification involved a review of existing maps, relevant ecological reports, and previous vegetation surveys where possible. A report and mapping dataset prepared by the Office of Environment and Heritage mapped native vegetation extent and PCTs located within the coast and lowland areas of Bellingen Local Government Area (LGA) (OEH 2014). The study focussed on vegetation located on private

and Crown land which was assessed and attributed to PCTs within the Northern Rivers Vegetation Classification (OEH 2012), and further identified for equivalency to listed TECs.

Drafting of vegetation zones was undertaken by selecting a series of points for rapid vegetation assessment within each identified PCT. Vegetation zone boundaries were determined based on major plant species occurring in the upper stratum. Data collected on draft vegetation zones was then digitised using a GIS application. Following drafting of preliminary vegetation maps, a field survey was designed with random pre-determined plot locations to strategically sample the range of identified plant communities and any unexpected environmental variation on the site (Section 2.3.3).

Data from BioNet Vegetation Classification was also used to allocate one or more PCTs to each vegetation class. A combination of techniques was applied, including use of the PCT Data and Plant Community Identification search function on the BioNet website and a download of the entire PCT spreadsheet as a csv file, which was manipulated via the Excel filter function. PCTs identified as potentially occurring on the site are presented in Figure 9 and detailed in Table 1. It should be noted that PCT numbers identified on the site were converted to parent PCTs using the Office of Environment and Heritage lineage table. There were no threatened ecological communities identified as potentially occurring at the BDAR site.

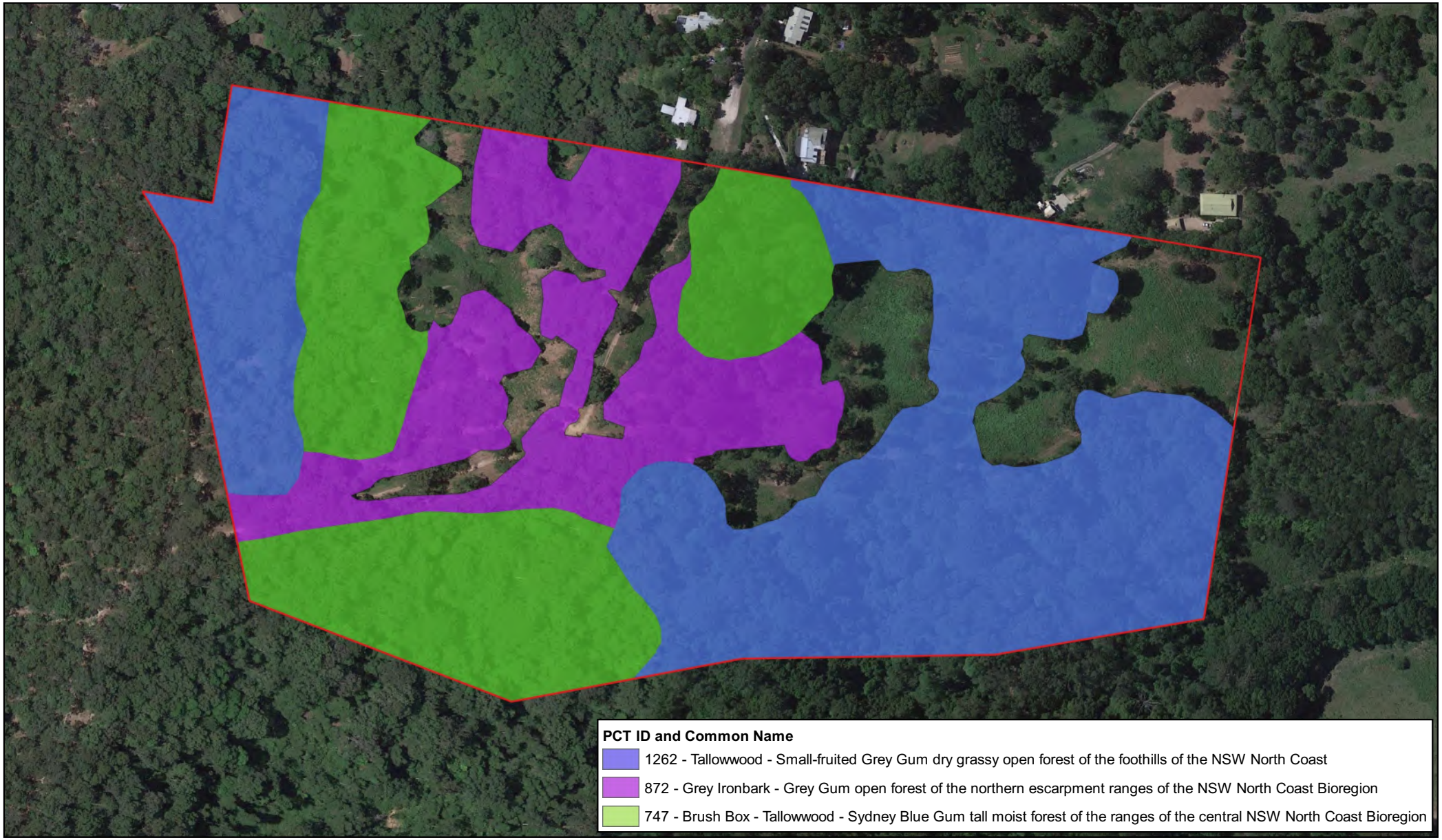

Figure 9: Plant Community Types (PCTs)

Steve and Jen Smith
BDAR Bellingen, NSW

BDAR boundary

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2019-05-09T12:50:51.106

0 50 100 150 200 m

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

2.3.3 Plot-based vegetation surveys

A systematic field-based vegetation survey using documented and repeatable methods was used to collect floristic data at the site in accordance with sections 5.2.1.8 (b) to 5.2.1.11 of the BAM. The vegetation survey was designed to identify environmental variation across the site, and to fill any potential gaps in existing mapping and site information. Survey effort was undertaken in accordance with the minimum number of plots required as specified in Table 4 of the BAM and detailed in Table 2 below.

Rapid assessments and plot-based floristic vegetation surveys were carried out to gather baseline data to confirm or revise the information. Vegetation integrity plots were not located in or near ecotones, vehicle tracks and their edges, or other disturbed areas that were readily distinguishable from the broad condition state of the vegetation zone. Data was recorded using the Fulcrum™ application loaded with GIS layers to enable plot locations, plot data and observations to be recorded in the field. Plot-based vegetation survey points are shown in Figure 10 with data provided in Appendix 2.

The following vegetation data was recorded in a 400 m² (standard 20 x 20 m) plot:

- Composition
  - Species richness (genus and species), status (native/exotic) and growth form
- Structure
  - Percent Foliage Cover and abundance.

Function attributes were assessed in a 1,000 m² (50 x 20 m) plot:

- Function
  - Number of large trees, plant regeneration, tree stem size class, length of fallen logs, litter cover, number of hollow-bearing trees and high threat exotic vegetation cover.

Most of the plant identification was undertaken in the field. For plant species requiring further assessment, specimens were collected, and identification confirmed at the Ecosure office. No plant species required outsourcing for identification purposes.

The plots were assessed using the linear traverse method. Drafting of vegetation zone boundaries was based on assessing the vegetation condition and level of disturbance in each stratum across the entire site. The condition class of Zones 1 and 3 were assessed to be in moderate condition due to retention of a canopy layer, and disturbed midstorey and ground layer. Zone 2 was assessed to be in a low condition class due to a largely absent canopy layer, disturbed midstorey layer, and a ground layer dominated by introduced grass species (Table 2). Data collected on draft vegetation zones was then digitised using a GIS application (Figure 10).

Table 2 Plant Community Types, Vegetation Zones and Number of BAM Plots

PCT	PCT Common Name	Vegetation Zone	Description	Condition Class	Area (ha)	No. Plots
1262	Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	1	Wet Sclerophyll Forests (Grassy sub-formation)	Moderate	5.98	3
872	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion	2	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Low	3.02	2
747	Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	3	Wet Sclerophyll Forests (Shrubby sub-formation)	Moderate	3.60	2

2.3.4 Confirmation of PCTs, vegetation zones and ecological communities

This section addresses the requirements set out in Sections 5.2.1.12 to 5.2.1.17, and Section 5.3.1 of the BAM. In order to confirm the identification of PCT's, a combination of reviewing quantitative data collected during plot-based vegetation surveys together with mapping data and results from the BioNet Vegetation Classification desktop review was used.

Plot data and field observations were used to amend the existing mapping where necessary and confirm the identification of PCTs. Once PCTs were confirmed across the site, it was determined that no further survey effort was required.

At this stage, any PCTs that were observed as having areas in different broad condition states were stratified to ensure the environmental variation on the site was properly assessed. Vegetation zones were based on existing PCT boundaries as changes in condition states were sporadic, small in area and were restricted to lower stratums. Generally, canopy layers were intact across the entire site.

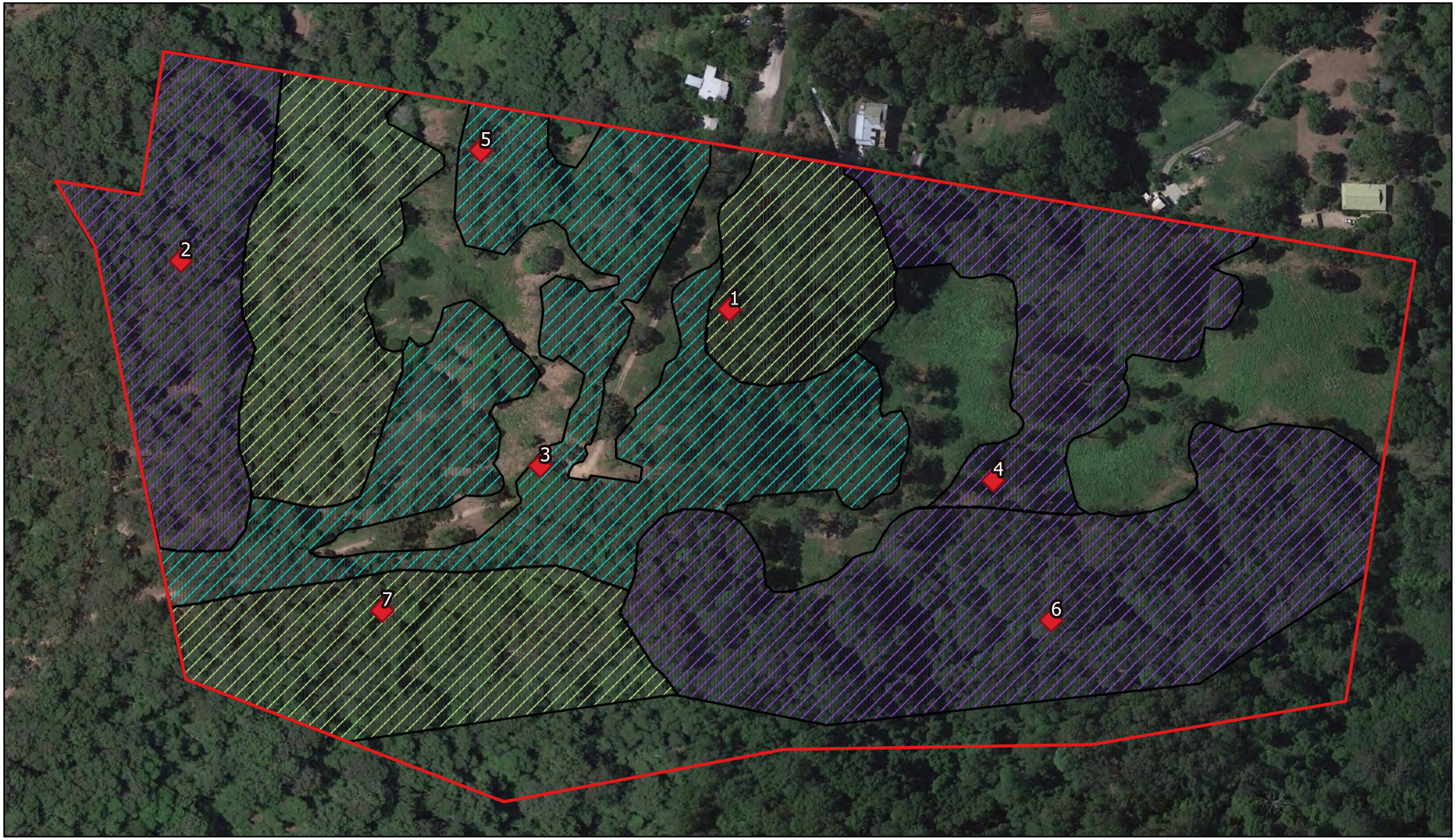

Figure 10: Vegetation zones and BAM plot locations on the site

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BDAR BAM plots
BDAR boundary
Vegetation Zones
Zone 2
Zone 1
Zone 3

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Revision: 0
Author: JLY
Date: 2020-01-06T15:46:01.105

0 50 100 m

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

2.3.5 Confirmation of native vegetation extent and patch size

This section addresses the requirements set out in Section 4.3.1 of the BAM to determine the site context of the subject land and assess both native vegetation cover and patch size. The percent cover of native vegetation on the site and within a 1,500 m buffer was mapped using GIS software. The patch size was assessed as the area of intact native vegetation that occurs on the site and potentially extends beyond the subject land. Woody native vegetation patches separated by <100 m and non-woody native vegetation patches separated by <30 m were considered to be part of the same patch.

Within a 1,500 m buffer area, the vegetation patch size was calculated as approximately 65 to 70 percent (Figure 11). Native vegetation extends beyond the boundaries of the land providing a high level of connectivity to the west, south-west and east of the site. This area is included as a component of the Key Habitats and Climate Change Corridors mapped by OEH and identified in Section 2.2.1.

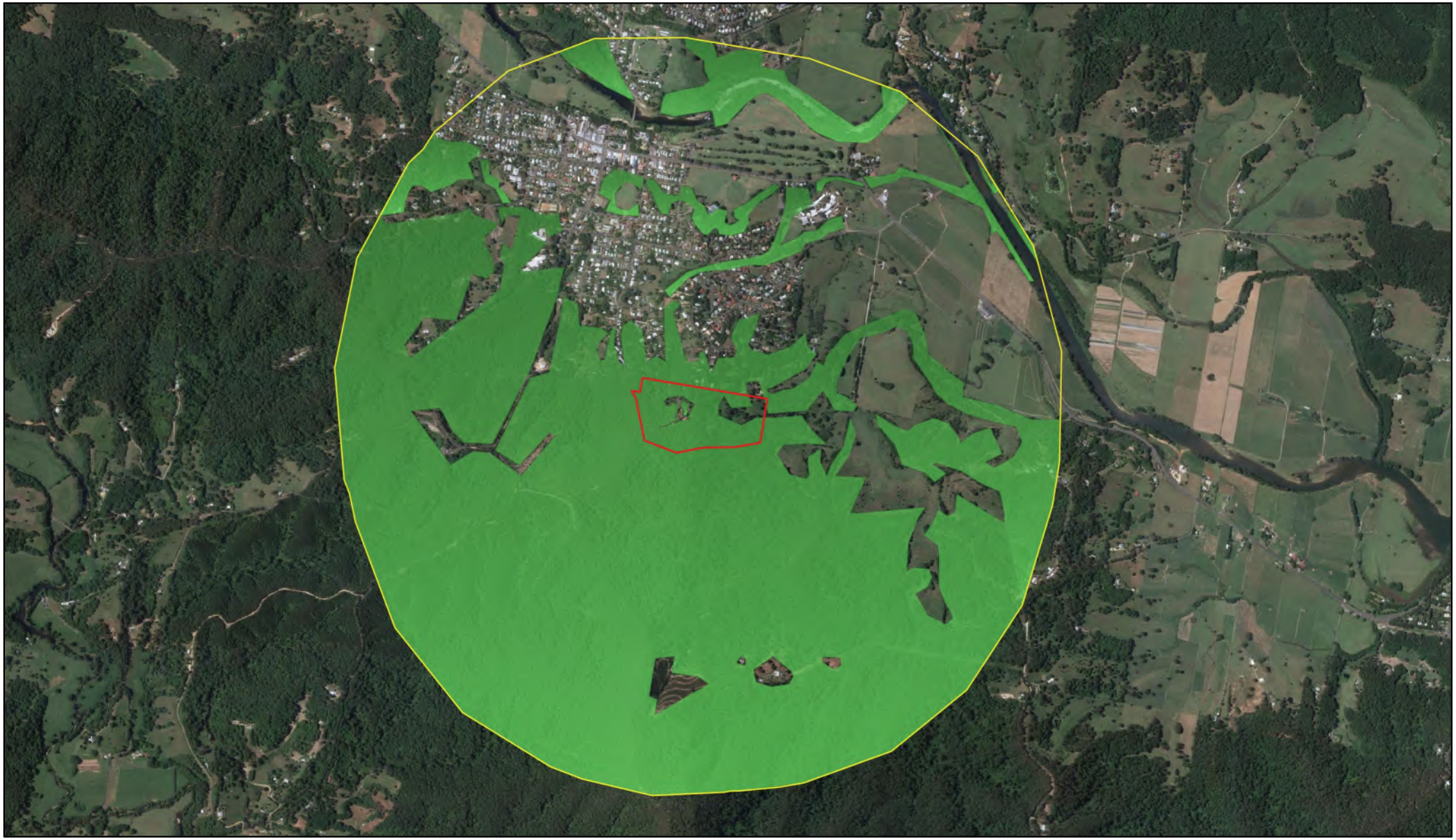

Figure 10: Native Vegetation Extent

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Revision: 0
Author: JLY
Date: 2019-05-06T16:05:39.616

0 0.4 0.8 1.2 1.6 km

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

2.3.6 Changes to the mapped native vegetation extent

This section addresses changes to native vegetation extent in accordance with Sections 5.1.1.6 and 5.1.1.7 of the BAM. Changes to the mapped native vegetation extent were undertaken based on field surveys and review of mapping data outlined in Section 2.3.2.

2.3.7 Calculation of current Vegetation Integrity

The plot-based vegetation survey data was entered into the BAM calculator as per the BAM method to produce the current Vegetation Integrity (VI) for each vegetation zone. Vegetation integrity scores including composition condition, structure condition and function condition for each vegetation zone are presented in Table 3.

Table 3 Vegetation Integrity Scores for each Vegetation Zone

Zone	PCT	PCT Common Name	Condition Class	Area (ha)	Threatened Ecological Community	Composition Condition Score	Structure Condition Score	Function Condition Score	VI Score
1	1262	Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	Moderate	5.98	No	59.5	55.4	75	62.8
2	872	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion	Low	3.02	No	46.3	58.4	56	53.3
3	747	Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	Moderate	3.60	No	80	75.4	85	80.1

2.4 BAM calculator results and habitat suitability for threatened species

2.4.1 Predicted and candidate threatened species

This section addresses requirements set out in Section 6 of the BAM. The BAM calculator generated 38 Predicted (ecosystem credit species) and 48 Candidate (species credit species) threatened species (Table 4). The full list of predicted and candidate species derived from the BAM calculator are presented in Appendices 3 and 4, respectively.

Table 4 Summary of predicted and candidate threatened species

Taxa	Predicted threatened species (ecosystem credits)	Candidate threatened species (species credits)
Amphibians	0	3
Bats	10	6
Birds	20	11
Marsupials	4	9
Plants	0	16
Reptile	0	3
Rodent	2	0
Total	**38**	**48**

2.4.2 Assessment of habitat suitability for predicted threatened species

This section addresses the requirements set out in Sections 6.4.1.10 and 6.4.1.17 of the BAM; steps for identifying habitat suitability for threatened species.

Predicted threatened species were assessed in conjunction with information collected about site context of the subject land, vegetation integrity attributes and data from the Threatened Biodiversity Data Collection (TBDC). Information on geographic limitations and habitat constraints were assessed in relation to the site to determine the likely presence of predicted threatened species (Table 5).

Thirty-three predicted threatened species were reliably assessed as likely to utilise the site. Three predicted threatened species were excluded due to geographic limitations; the diamond firetail (*Stagnopleura guttata*), and the Hastings River mouse (*Pseudomys oralis*).

Table 5 Habitat components, confirmation of PCTs and sensitivity classes for predicted threatened species

Type	Scientific name	Common name	PCT 747	PCT 872	PCT 1262	Sensitivity class
Bat	*Micronomus norfolkensis*	Eastern coastal free-tailed bat	Yes	Yes	Yes	High
Bat	*Falsistrellus tasmaniensis*	Eastern false pipistrelle	Yes	Yes	Yes	High
Bat	*Syconycteris australis*	Common blossom bat	Yes	-	Yes	High
Bat	*Phoniscus papuensis*	Golden-tipped bat	Yes	-	Yes	High
Bat	*Scoteanax rueppellii*	Greater broad-nosed bat	Yes	Yes	Yes	High
Bat	*Pteropus poliocephalus*	Grey-headed flying-fox	Yes	Yes	Yes	High
Bat	*Chalinolobus nigrogriseus*	Hoary wattled bat	-	Yes	Yes	High
Bat	*Miniopterus orianae oceanensis*	Large bent-winged bat	Yes	Yes	Yes	High
Bat	*Miniopterus australis*	Little bent-winged bat	Yes	-	Yes	High
Bat	*Saccolaimus flaviventris*	Yellow-bellied sheathtail-bat	Yes	Yes	Yes	High
Bird	*Ninox connivens*	Barking owl	-	Yes	Yes	High
Bird	*Coracina lineata*	Barred cuckoo-shrike	Yes	Yes	Yes	Moderate
Bird	*Climacteris picumnus victoriae*	Brown treecreeper (eastern subspecies)	-	Yes	Yes	High
Bird	*Artamus cyanopterus cyanopterus*	Dusky woodswallow	Yes	Yes	Yes	Moderate
Bird	*Calyptorhynchus lathami*	Glossy black-cockatoo	Yes	Yes	Yes	High
Bird	*Pomatostomus temporalis temporalis*	Grey-crowned babbler (eastern subspecies)	-	Yes	-	Moderate
Bird	*Hieraaetus morphnoides*	Little eagle	-	Yes	-	Moderate
Bird	*Glossopsitta pusilla*	Little lorikeet	Yes	Yes	Yes	High

Type	Scientific name	Common name	PCT 747	PCT 872	PCT 1262	Sensitivity class
Bird	*Tyto novaehollandiae*	Masked owl	Yes	Yes	Yes	High
Bird	*Amaurornis moluccana*	Pale-vented bush-hen	Yes	-	Yes	High
Bird	*Ninox strenua*	Powerful owl	Yes	Yes	Yes	High
Bird	*Anthochaera phrygia*	Regent honeyeater	Yes	Yes	Yes	High
Bird	*Ptilinopus regina*	Rose-crowned fruit-dove	Yes	-	-	Moderate
Bird	*Petroica boodang*	Scarlet robin	-	Yes	-	Moderate
Bird	*Lophoictinia isura*	Square-tailed kite	Yes	Yes	Yes	Moderate
Bird	*Ptilinopus superbus*	Superb fruit-dove	Yes	-	-	Moderate
Bird	*Lathamus discolour*	Swift parrot	No	Yes	Yes	Moderate
Bird	*Daphoensitta chrysoptera*	Varied sittella	Yes	Yes	Yes	Moderate
Bird	*Ptilinopus magnificus*	Wompoo fruit-dove	Yes	-	-	Moderate
Bird	*Stagonopleura guttata*	Diamond firetail	-	No	No	Moderate
Mammal	*Pseudomys gracilicaudatus*	Eastern chestnut mouse	Yes	Yes	Yes	High
Mammal	*Phascolarctos cinereus*	Koala	Yes	Yes	Yes	High
Mammal	*Potorous tridactylus*	Long-nosed potoroo	Yes	No	Yes	High
Mammal	*Thylogale stigmatica*	Red-legged pademelon	Yes	-	-	High
Mammal	*Dasyurus maculatus*	Spotted-tailed quoll	Yes	Yes	Yes	High
Mammal	*Petaurus australis*	Yellow-bellied glider	Yes	Yes	Yes	High
Mammal	*Pseudomys oralis*	Hastings River mouse	No	-	-	High

2.4.3 Habitat survey for candidate threatened species

Forty candidate threatened species required survey to confirm their presence (Table 6). Six candidate threatened species were excluded due to habitat constraints or geographic limitations; the Newry golden wattle (*Acacia chrysotricha*), white-crowned snake (*Cacophis harriettae*), brush-tailed wallaby (*Petrogale penicillata*), common planigale (*Planigale maculata*), parma wallaby (*Macropus parma*), and fragrant pepperbush (*Tasmannia glaucifolia*). Targeted fauna surveys were conducted by Ecosure personnel between January 2018 and August 2019. All survey effort was carried out in accordance with the relevant survey and assessment guidelines listed below:

- 'Species credit' threatened bats and their habitats - NSW survey guide for the Biodiversity Assessment Method (OEH 2018)
- NSW Guide to Surveying Threatened Plants (OEH 2016)
- Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians (2009)
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (2004).

Targeted surveys were conducted for all fauna species identified as candidate species. Survey effort to detect nocturnal arboreal marsupials including the eastern pygmy-possum (*Cercartetus nanus*), squirrel glider (*Petaurus norfolcensis*), and brush-tailed phascogale (*Phascogale tapoatafa*) involved spotlighting by two surveyors using hand-held spotlights to detect 'eye shine'. Surveyors traversed the subject land on foot for a period of at least one hour on three separate nights during calm weather in spring. No candidate arboreal marsupials were detected.

2.4.4 Assessment of habitat suitability for candidate threatened species

Candidate threatened species were excluded if the site lacked the appropriate habitat constraints, or species were surveyed with the required effort and not recorded during the targeted field surveys (Table 6). For each candidate threatened species recorded as a result of the survey effort, the habitat suitability of each vegetation zone was assessed. Information from the TBDC including associated vegetation types, habitat features, geographic limitations and habitat constraints were assessed to determine presence/absence of the species across the site.

Species polygons were prepared to represent the area and location assessed as suitable habitat for each candidate threatened species on the site (Figure 12). Area (m²) is the defined unit of measurement for all threatened fauna and flora present at the site. For the threatened flora species, a species polygon is used to show the location of measured suitable habitat on the site together with a 30 m buffer.

Table 6 Candidate threatened species presence status in each PCT (area ha/buffer) and biodiversity risk weighting

Type	Scientific name	Common name	Species presence	PCT 747	PCT 872	PCT 1262	Biodiversity risk weighting
Amphibian	*Litoria brevipalmata*	Green-thighed frog	No - surveyed	-	-	-	1.5
Amphibian	*Mixophyes balbus*	Stuttering frog	No – surveyed	-	-	-	3
Amphibian	*Mixophyes iteratus*	Giant barred frog	No – surveyed	-	-	-	2
Bat	*Chalinolobus dwyeri*	Large-eared pied bat	No – surveyed	-	-	-	3
Bat	*Myotis macropus*	Southern myotis	Yes – surveyed	3.5	3.02	5.98	2
Bat	*Miniopterus australis*	Little bent-winged bat	No – surveyed	-	-	-	3
Bat	*Miniopterus orianae oceanensis*	Large bent-winged bat	No – surveyed	-	-	-	3
Bat	*Pteropus poliocephalus*	Grey-headed flying-fox	No – surveyed	-	-	-	2
Bat	*Vespadelus troughtoni*	Eastern cave bat	No – surveyed	-	-	-	3
Bird	*Burhinus grallarius*	Bush stone-curlew	No – surveyed	-	-	-	2
Bird	*Calyptorhynchus lathami*	Glossy black-cockatoo	No – surveyed	-	-	-	2
Bird	*Erythrotriorchis radiatus*	Red goshawk	No – surveyed	-	-	-	3
Bird	*Ninox connivens*	Barking owl	No – surveyed	-	-	-	2
Bird	*Ninox strenua*	Powerful owl	No – surveyed	-	-	-	2
Bird	*Tyto novaehollandiae*	Masked owl	No – surveyed	-	-	-	2
Bird	*Lathamus discolor*	Swift parrot	No – surveyed	-	-	-	3
Bird	*Lophoictinia isura*	Square-tailed kite	No – surveyed	-	-	-	1.5
Bird	*Carterornis leucotis*	White-eared monarch	No – surveyed	-	-	-	2

Type	Scientific name	Common name	Species presence	PCT 747	PCT 872	PCT 1262	Biodiversity risk weighting
Bird	*Anthochaera phrygia*	Regent honeyeater	No – surveyed	-	-	-	3
Bird	*Hieraaetus morphnoides*	Little eagle	No – surveyed	-	-	-	1.5
Marsupial	*Aepyprymnus rufescens*	Rufous bettong	No – surveyed	-	-	-	2
Marsupial	*Cercartetus nanus*	Eastern pygmy-possum	No – surveyed	-	-	-	2
Marsupial	*Petaurus norfolcensis*	Squirrel glider	No – surveyed	-	-	-	2
Marsupial	*Phascogale tapoatafa*	Brush-tailed phascogale	No – surveyed	-	-	-	2
Marsupial	*Phascolarctos cinereus*	Koala	Yes - surveyed	3.5	3.02	5.98	2
Reptile	*Hoplocephalus bitorquatus*	Pale-headed snake	No – surveyed	-	-	-	2
Reptile	*Hoplocephalus stephensii*	Stephen's banded snake	No – surveyed	-	-	-	2
Plant	*Niemeyera whitei*	Rusty plum	No – surveyed	-	-	-	2
Plant	*Arthraxon hispidus*	Hairy jointgrass	No – surveyed	-	-	-	2
Plant	*Asperula asthenes*	Trailing woodruff	No – surveyed	-	-	-	2
Plant	*Parsonsia dorrigoensis*	Milky silkpod	No – surveyed	-	-	-	2
Plant	*Oberonia titania*	Red-flowered king of the fairies	No – surveyed	-	-	-	2
Plant	*Polygala linariifolia*	Native milkwort	No – surveyed	-	-	-	2
Plant	*Pomaderris queenslandica*	Scant pomaderris	No – surveyed	-	-	-	2
Plant	*Hicksbeachia pinnatifolia*	Red boppel nut	No – surveyed	-	-	-	2
Plant	*Marsenia longiloba*	Slender marsdenia	No – surveyed	-	-	-	2
Plant	*Rhodamnia rubescens*	Scrub turpentine	Yes - surveyed	30 m buffer	-	30 m buffer	3
Plant	*Senna acclinis*	Rainforest cassia	No – surveyed	-	-	-	2

Type	Scientific name	Common name	Species presence	PCT 747	PCT 872	PCT 1262	Biodiversity risk weighting
Plant	*Tinospora smilacina*	Tinospora vine	No – surveyed	-	-	-	2
Plant	*Tylophora woollsii*	Cryptic forest twiner	No – surveyed	-	-	-	2
Plant	*Typhonium sp. aff. brownii*	Stinky lily	No – surveyed	-	-	-	2

2.4.5 Targeted threatened flora surveys

This section addresses the requirements set out in Sections 6.5 of the BAM; undertaking a threatened species survey. Targeted threatened flora surveys were undertaken to detect all candidate threatened flora species using the random meander survey technique. This technique was suitable due to the undulating terrain at the site.

Rhodamnia rubescens (scrub turpentine), listed as critically endangered under the BC Act was identified during the random meander surveys and as a result of the plot-based vegetation surveys. This species has been recently listed (February 2019) as critically endangered. Four individuals were identified on the site with two located within the proposed Asset Protection Zone (APZ) and two located within the proposed clearing area. The position of each individual plant was recorded using a GPS. All plants displayed signs of infection by myrtle rust (*Austropuccinia psidii*) and on subsequent inspection, some individuals were unable to be located and presumed dead.

Two individuals of scrub turpentine remain within the area designated as an APZ and will be protected. The Biodiversity Assessor Update No. 28 distributed via email on 17 December 2019 provided some clarity as to the short-term management of this species which stated that surviving plants should be considered potentially viable and will be afforded protection. Two other individuals are located within the clearing area and will be offset via the BOS. Species polygons were developed to show the location of measured suitable habitat on the site (Figure 12).

2.4.6 Targeted koala survey

Preferred koala habitat (PKH) is identified by Bellingen Shire Council's Koala Plan of Management (KPoM) developed under State Environmental Planning Policy 44 – Koala habitat protection (now State Environmental Planning Policy – Koala Habitat Protection 2019). Approximately 9.09 ha of PKH is expected to be impacted by the proposed development.

A Spot Assessment Technique (SAT) survey was used to determine habitat use by koalas at the site and involved scat searches within a 1 m buffer area around the base of selected trees for two person minutes per tree. Tree selection was based on preferred KFT species identified in the KPoM and included tallowwood (*Eucalyptus microcorys*) and small-fruited grey gum (*E. propinqua*). A single koala scat was identified at the base of a single tallowwood, with the overall result of the SAT survey determining that koala activity levels were low (less than 6 percent) within the BDAR site (Phillips & Callaghan 2011).

A Koala Habitat Assessment Report has been prepared to address potential habitat and species impacts to koalas as per requirements in Chapter 16 – Koala Habitat Protection of Bellingen Shire Council's (BSC) Development Control Plan and is provided in Appendix 7.

2.4.7 Assessment for grey-headed flying-fox

Bellingen Island flying-fox camp is located north of Bellingen township and approximately 2 km from the site. The island is located along the northern bank of the Bellingen River, and is bounded by private properties along Dowle Street to the north and Hammond Street to the

east.

The Bellingen Island camp is recognised as a nationally important camp for grey-headed flying foxes (*Pteropus poliocephalus*) and is deemed to be roosting habitat critical to the survival of the species as specified in the Grey-headed Flying-fox (GHFF) Draft National Recovery Plan. It is primarily used by GHFFs with a small number of black flying-foxes (*Pteropus alecto*) also recorded during surveys (Ecosure 2017).

The usual camp extent on the island covers approximately 3.5 ha, and at peak occupancy extends into vegetation behind houses along Dowle Street. Regular quarterly monitoring as part of the National Flying-fox Monitoring Program (NFFMP) began in 2012, and the maximum total number of flying-foxes recorded at the camp was 42,932 in February 2013 (Ecosure 2017).

GHFF's feed on nectar and pollen from a range of plant species. Trees recorded on the site include species that comprise suitable foraging habitat, and it is highly likely that GHFF's would use these food resources when available. The GHFF was returned as both a predicted threatened species and a candidate threatened species (breeding). The site is not host to a camp and therefore the species was discounted from the candidate list.

2.4.8 Assessment for coastal raptors

The eastern osprey (*Pandion cristatus*) and white-bellied sea-eagle (*Haliaeetus leucogaster*) were not returned as predicted or candidate species by the BAM calculator. No observations for either species were made at the site during targeted bird surveys, and the site lacks appropriate nest trees consisting of large emergent trees with emergent dead branches as preferred by the white-bellied sea-eagle, and is located approximately 13 km away from coastline and river mouth habitat at the confluence of the Bellinger and Kalang Rivers preferred by the eastern osprey. There is potential that both species may utilise resources along the Bellinger River approximately 2 km from the site.

2.4.9 Other threatened species

A powerful owl (*Ninox strenua*) was recorded during call playback during nocturnal surveys conducted in November 2018. This species was returned as both a predicted threatened species and a candidate threatened species (breeding). Surveys were unable to identify a roost/nest tree on the site and therefore the species was discounted from the candidate species list.

A square-tailed kite (*Lophoictinia isura*) was recorded opportunistically during vegetation surveys on the site. This species was returned as both a predicted threatened species and a candidate threatened species (breeding). Surveys were unable to identify a nesting site and therefore the species was discounted from the candidate species list.

Additionally, the little bent-wing bat (*Miniopterus australis*) was confirmed using the site following deployment of an Anabat bat detector during August and October 2018. This species was returned as both a predicted threatened species and a candidate threatened species (breeding), however surveys were unable to determine roosting or breeding locations on the site and therefore the species was discounted from the candidate species list. Survey points for all fauna and flora surveys conducted on the BDAR site are presented in Figure 13.

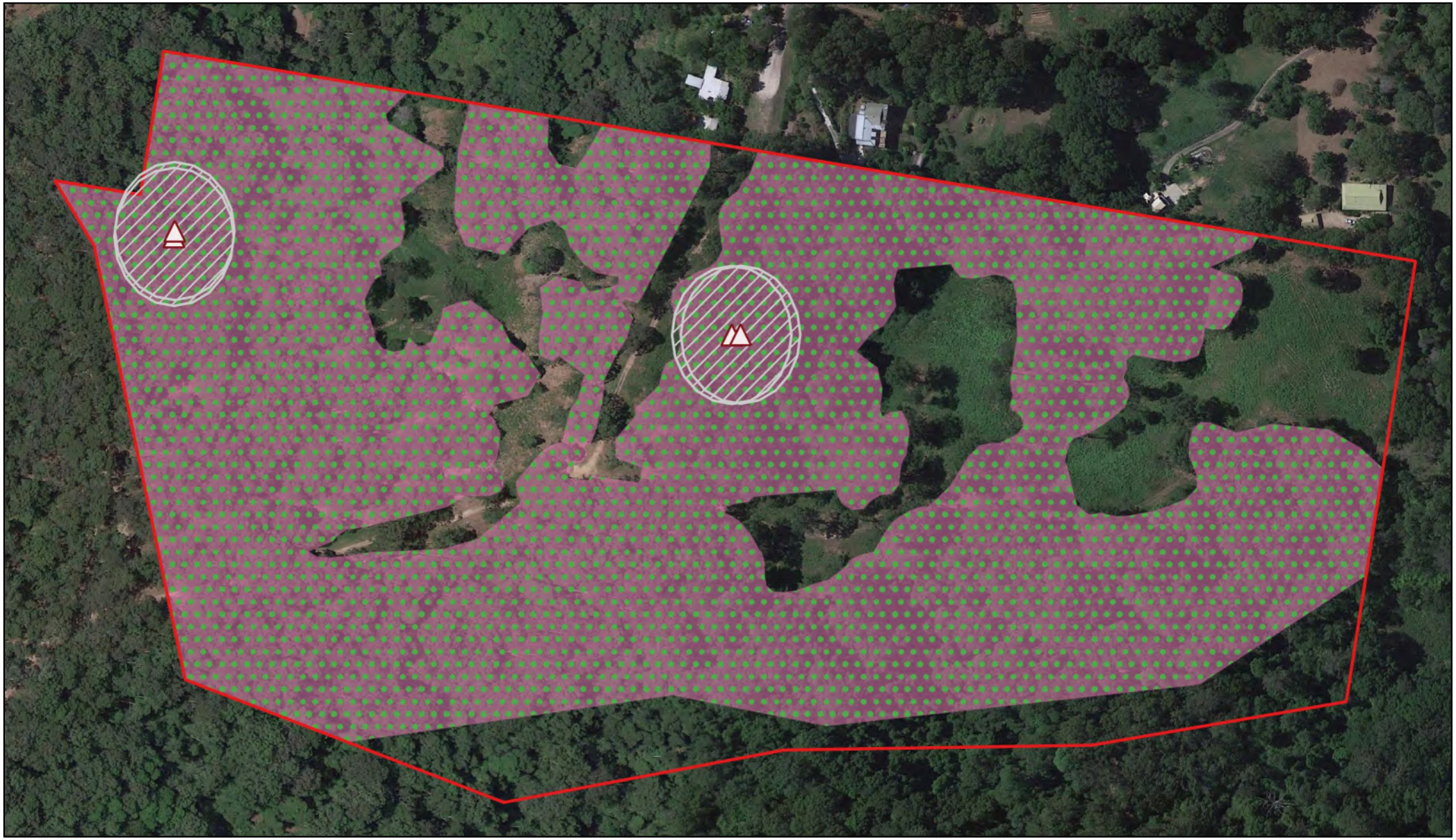

Figure 12: Species polygons for candidate threatened species (fauna and flora)

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Author: JLY
Date: 2020-01-06T14:57:06.907

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Units: Meter

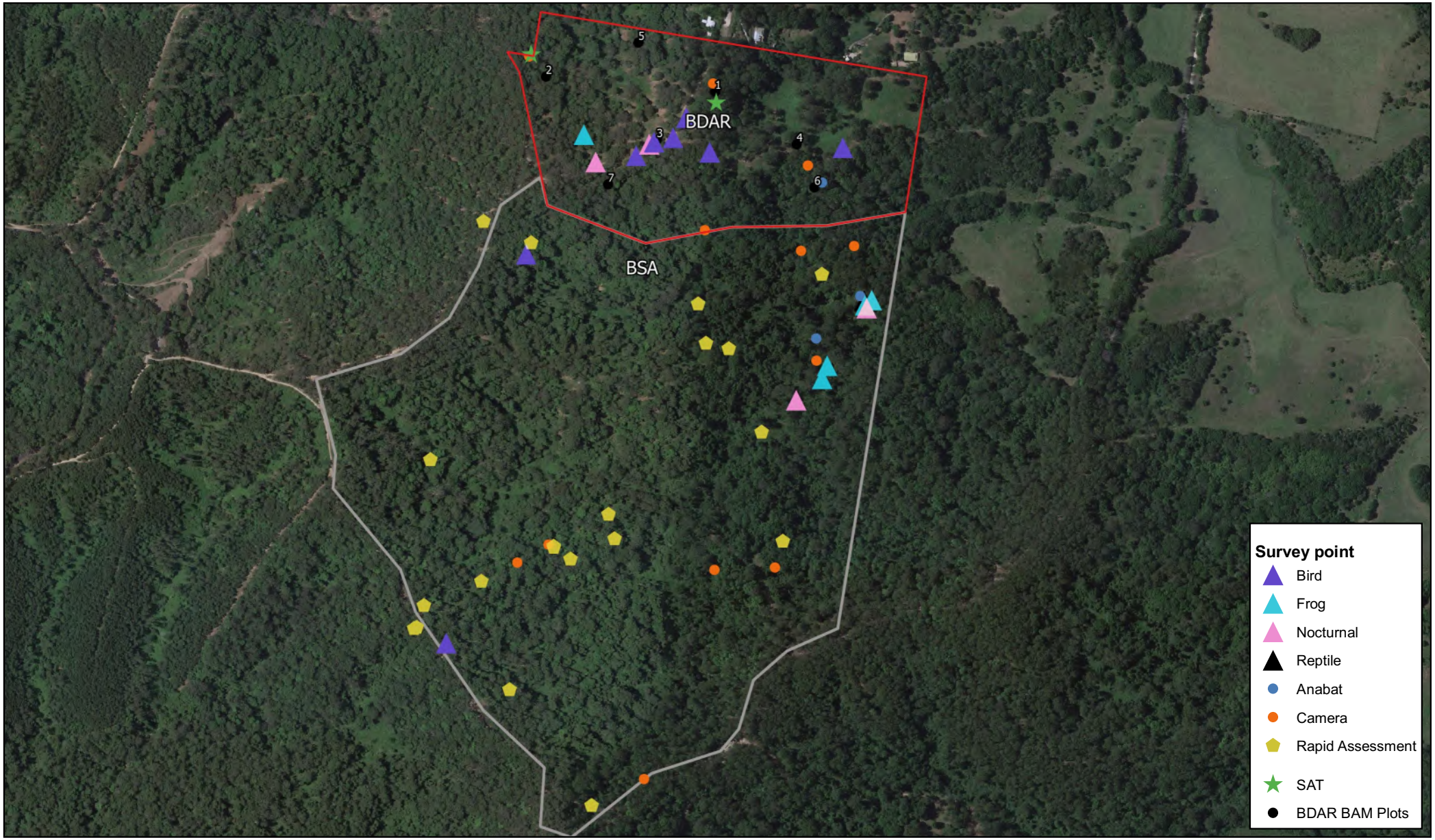

Figure 13: Survey points

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BDAR boundary
BSA boundary

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Revision: 0
Author: JLY
Date: 2019-05-07T15:09:34.487

0 0.1 0.2 0.3 0.4 km

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

3 Stage 2 – Impact assessment (biodiversity values)

Section 3 of this BDAR has been prepared as per the requirements of Stage 2 of the BAM.

3.1 Avoiding and minimising impacts on biodiversity values

This section addresses Section 8 of the BAM; avoiding and minimising impacts on native vegetation and habitat during project planning. The impacts of the proposed development have been avoided and minimised by using the following principles to situate the development footprint in areas where:

- native vegetation has a low integrity score
- there are no TECs
- on-site connectivity corridors for species movement are maintained
- large, hollow-bearing trees are avoided.

In addition, impacts of the proposed development are minimised through offsetting 58.07 ha of adjoining land under a proposed Biodiversity Stewardship Agreement (BSA).

Table 7 below addresses key points in Section 8 of the BAM relating to avoiding and minimising impacts.

Table 7 Avoiding and minimising impacts on native vegetation, habitat and biodiversity values

Method	Mitigation	Description
8.1 Locating the project to avoid and minimise impacts on native vegetation and habitat		
Locating the project in areas where there are no biodiversity values	The development is proposed to be located in an area where the biodiversity values are already reduced	Previous clearing has removed the majority of understorey on the site. The project intends to retain large trees within the development footprint and also takes advantage of retaining vegetation remaining on site for inclusion in fauna corridors
Locating the project in areas where the native vegetation is in the poorest condition	The majority of the proposed development will be located where current vegetation integrity scores are low	
Locating the project in areas that avoid habitat for species that have a high biodiversity risk rating or native vegetation that is a CEEC or an EEC	The proposed development will be located in an area where no threatened ecological communities or core threatened species habitat have been identified	Preferred Koala Habitat is mapped across a large portion of the site with 9.09 ha expected to be impacted. This will be offset in the adjacent BSA site. Preferred Koala Habitat will be retained in the area along the western boundary which will be managed as an APZ
Locating the project such that connectivity that enables movement of species and genetic material between areas of adjacent or nearby habitat is maintained	Connectivity corridors will be maintained within the proposed development	Two existing connectivity corridors are proposed along riparian zones within the development. Two fauna underpasses are proposed for the road network.
8.1.2 Designing a project to avoid and minimise impacts on native vegetation and habitat		
Reducing the clearing footprint of the project	Select mature trees are proposed to be retained within the development footprint.	All large DBH (>80 cm) and/or hollow-bearing trees mapped during the Environmental Assessment are recommended to be retained.
Locating ancillary facilities in areas where there are no biodiversity values	Ancillary facilities will be located on land where biodiversity values are already reduced	Previous clearing has removed the majority of understorey on the site. Ancillary facilities will be confined to these areas
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition	Ancillary facilities will be located on land where native vegetation integrity scores are low	
Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories	Ancillary facilities will be located in an area that will avoid threatened species and vegetation in high threat categories	Previous clearing has removed the majority of understorey on the site. Ancillary facilities will be confined to these areas
Providing structures to enable species and genetic material to move across barriers or hostile gaps	Structures will be provided to enable species movement	Two fauna underpass structures will be positioned where roads intersect the eastern fauna corridor

Method	Mitigation	Description
Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site	Remnant vegetation surrounding and within the development will be managed for both environmental and APZ purposes. The adjacent BSA site will employ a management plan to improve biodiversity values on the land	Thirty percent of canopy vegetation will be retained within the areas designated as APZs which will also function as habitat corridors
8.2 Avoiding and minimising prescribed biodiversity impacts during project planning		
Impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs or other geological features of significance	Habitat features such as these have not been identified on the site	The project design utilised land that was previously cleared to avoid and minimise development impacts on existing vegetation
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Site selection aimed to avoid impacting on connectivity	The development site was selected to minimise vegetation removal and utilise areas previously cleared
Impacts of development on movement of threatened species that maintains their life cycle	Site selection aimed to avoid vegetation removal as much as possible	The proposed development will allow movement of species through retention of native vegetation on the site and using dedicated fauna corridors
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	The proposed development will contain water run-off on the site during the construction phase	A construction sediment and erosion plan will be initiated prior to works being undertaken
Impacts of wind turbine strikes on protected animals	n/a	n/a
Impacts of vehicle strikes on threatened species or on animals that are part of a TEC	Reduced speed limits and warning signs will be utilised within the development	Speed limits will be restricted to 40 km hour. Speed limit and wildlife warning signs will be installed at two locations in the vicinity of the development entrance. Roadside street lighting will also improve visibility

3.2 Impact assessment and risk mitigation

This section of the BDAR addresses the requirements set out in Section 9 of the BAM.

3.2.1 Direct impacts

The total area of native vegetation proposed to be impacted is 12.60 ha, of which 5.62 ha is proposed to be removed and 6.98 ha is proposed to be managed as an asset protection zone where ground layer vegetation (grasses and forbs) and approximately 30 percent of canopy vegetation will be retained. Direct impacts associated with vegetation clearing include:

- loss of habitat and reduced opportunities for fauna nesting, breeding and foraging
- reduced habitat connectivity and increased habitat fragmentation
- changes to hydrology.

The extent of native vegetation to be removed is shown in Figure 14. It should be noted that habitat loss and decreased connectivity that affect threatened species, and changes to hydrology, are also listed as prescribed impacts (Section 3.2.4). Changes to hydrology is also an uncertain impact (Section 3.3).

3.2.2 Indirect impacts

Approximately 1 ha of native vegetation surrounding the site may be affected by indirect impacts associated with:

- noise and light spill
- changes to fire regimes including increased frequency and intensity
- weed incursion and damage to retained native vegetation
- predation on native animals by domestic and/or feral cats and dogs
- increased traffic risks to fauna resulting in injury or death.

Indirect impacts can occur during both the construction and operation phases. The type of impact, timing, extent, frequency and duration of direct and indirect impacts are provided in Table 8.

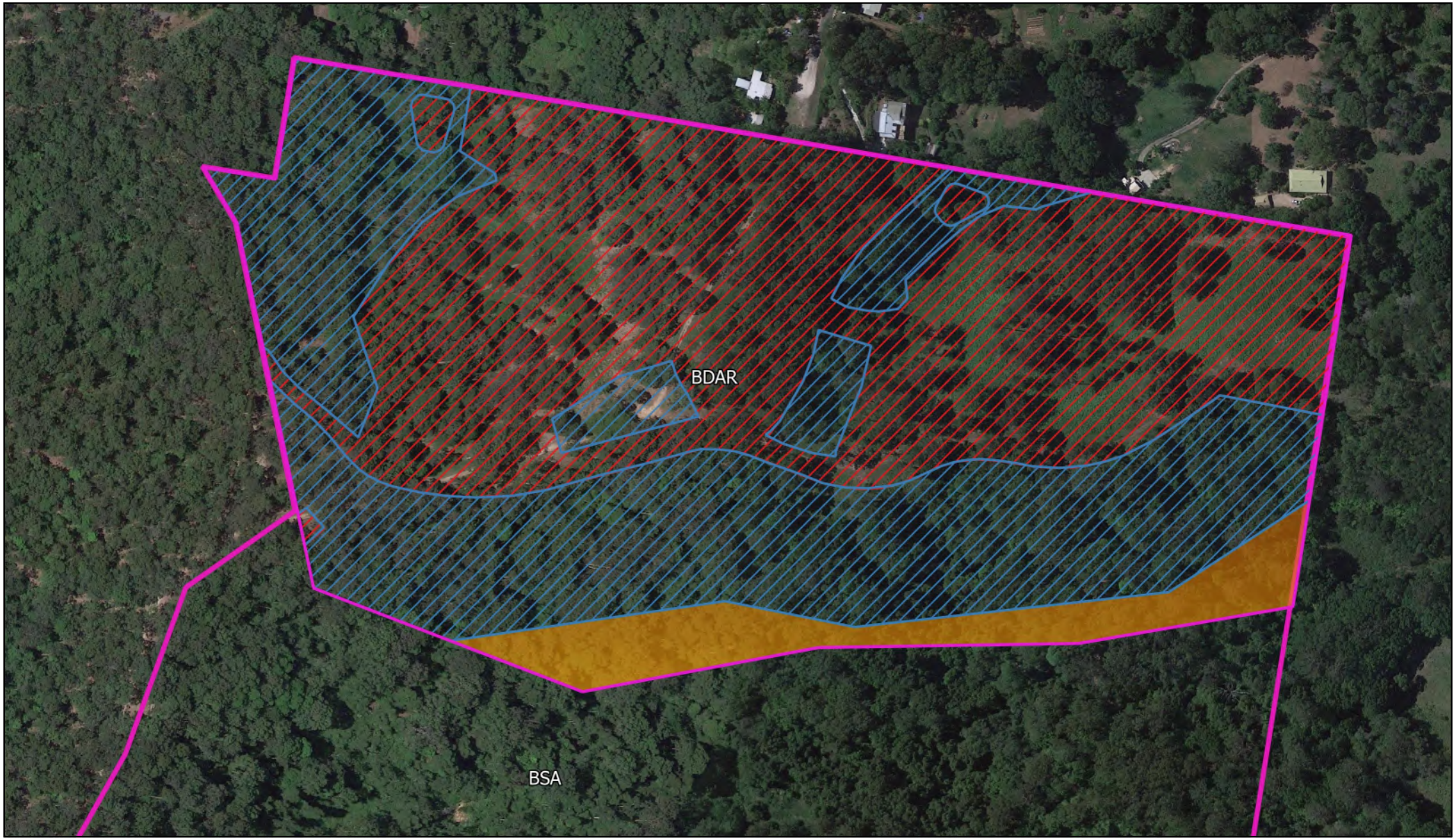

Figure 14: Native vegetation to be removed and retained on site

Steve and Jen Smith
BDAR Bellingen, NSW

Lot boundary
Clearing area
APZ clearing area
Native vegetation to be retained

ecosure

Job number: PR3563
Revision: 0
Author: JLY
Date: 2020-01-14T13:31:57.162

0 50 100 m

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

Table 8 Direct and indirect impacts associated with the proposed development

Type of impact	Timing	Extent	Frequency / duration	Mitigation
Direct impacts				
Habitat loss	Construction	Construction footprint	Single event	Habitat loss will be restricted to the area of the development footprint (15.88 ha). Staged clearing should occur to enable fauna to move away from the clearing area. Prior to vegetation removal, all trees in the vicinity of vegetation removal should be inspected for fauna by a suitably qualified fauna spotter catcher (FSC). Inspection should be conducted each day prior to clearing works. The FSC should be present during all vegetation removal, with a minimum of one person per machine. The FSC must not be involved in tree clearing operations and will be responsible only for identifying and rescuing fauna present on-site. Any uninjured fauna detected during tree removal should be relocated in an area of nearby suitable habitat, outside the development footprint. Injured fauna should be transferred to a veterinarian for treatment and/or rehabilitation with WIRES. In the event a koala is detected during pre-clearing or clearing of vegetation, works should be suspended within a 30 m radius to allow the animal to move away from the area. Work should not resume in the vicinity until the animal has moved of its own volition. An ecologist should also be present during any major earthworks that involve removal of bush rock or fallen logs. The loss of habitat will be offset under the Biodiversity Offsets Scheme (BOS).
Reduced connectivity	Construction	Construction footprint	Ongoing	Habitat links will be retained at two locations in the east and west of the proposed development to enable fauna to traverse in a north-south direction. The western habitat link will be retained for environmental management and will be excluded from the APZ. Fauna underpasses will be constructed at two locations where roads intersect the eastern habitat link (see Biodiversity Guidelines RTA 2011). Canopy vegetation will remain within the eastern habitat link but will be managed for APZ purposes. Within the broader area, a BSA site will provide connectivity to the broader landscape.
Changes to hydrology	Construction / operation	Downstream	Ongoing	All construction activities will be undertaken in accordance with a Council approved plan that outlines appropriate sediment controls. A stormwater drainage system will be constructed to convey stormwater runoff into existing stormwater system.

Type of impact	Timing	Extent	Frequency / duration	Mitigation
Indirect impacts				
Noise and light spill	Construction / operation	Broader area	Ongoing	Construction activities will be limited to daylight hours during the period Monday to Friday. Lighting used to illuminate the site once operational should be shielded, pointing downwards and of reduced brightness.
Increased frequency and intensity of fire	Operation	Broader area	Ongoing	APZ's will be established within the proposed development using mechanical means. Any bushfire management required to take place will be aligned with BSC's fire management objectives in the Koala Management Strategy and Plan.
Increased potential of weed incursion	Operation	Broader area	Ongoing	BSC weed management plan to include APZ area.
Predation of native wildlife by domestic / feral cats and dogs	Operation	Broader area	Ongoing	Recommend Bellingen Shire Council consider imposing a condition on cat and dog ownership that prohibits roaming animals (particularly at night) to reduce impacts of predation and disturbance within the surrounding environment particularly during known koala movement periods (September and October). Community awareness of impacts of dogs on koalas.
Increased traffic and potential vehicle strike resulting in death of fauna	Construction / operation	Proposed development road network	Ongoing	All construction activities will be undertaken in accordance with an approved Council Plan. Speed limits will be restricted to 40 km hour. Speed limit and wildlife warning signs will be installed at two locations in the vicinity of the development entrance. Roadside street lighting (as noted above) will also improve visibility.

3.2.3 Serious and irreversible impacts

The Credit Summary Report and Biodiversity Credit Report for this assessment identify whether candidate Serious and Irreversible Impact entities are present on the site (Appendix 5 and 6 respectively).

These reports indicate that there are no SAII entities associated with the proposed development.

3.2.4 Prescribed impacts

Prescribed biodiversity impacts are detailed in the BC Regulation, 6.1. These impacts relate specifically to threatened species and ecological communities, are listed below and summarised in Table 9:

1. the impacts of development on habitat of threatened species or ecological communities:
    a. karst, caves, crevices, cliffs and other geological features of significance
    b. rocks
    c. human-made structures
    d. non-native vegetation
2. the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
3. the impacts of development on movement of threatened species that maintains their lifecycle
4. the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development)
5. the impacts of wind turbine strikes on protected animals
6. the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

The prescribed impacts on biodiversity listed above that potentially relate to the proposed development include:

1. the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
2. the impacts of development on movement of threatened species that maintains their lifecycle
3. the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development)
4. the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

3.2.5 Prescribed impacts on water

Amphibian species returned as candidate species for the site were not detected during surveys. However, suitable storm water, sediment and erosion control management that complies with best practice management (Landcom 2004) is expected to be employed at the site and will be monitored as per BSC requirements.

As a result of the prescribed impact risk assessment, it was identified that the residual risk following the application of mitigation measures for stormwater management was low.

Table 9 Prescribed impacts and mitigation measures

Type of impact	Timing	Potential consequence	Mitigation	Responsibility	Risk before mitigation	Residual risk
Reduced connectivity across species range	Construction / operation	Inhibit movement of threatened species resulting in inability to obtain adequate resources for survival	Habitat links will be retained at two locations in the east and west of the proposed development to enable fauna to traverse in a north-south direction. The western habitat link will be retained for environmental management and will be excluded from the APZ. Fauna underpasses will be constructed at two locations where roads intersect the eastern habitat link. Canopy vegetation will remain within the eastern habitat link but will be managed for APZ purposes. The proposed BSA site will maintain connectivity to the broader landscape.	Proponent / Project Manager	Moderate	Low
Reduced connectivity that affects species lifecycle	Construction / operation	Further decline of threatened species unable to complete their lifecycle	Preliminary construction works that involve vegetation clearing should be programmed to avoid periods of known koala movement during September and October, and when trees are flowering to reduce any impacts on GHFF. Generally, the spring period should be avoided entirely.	Proponent / Project Manager	Moderate	Low
Changes to hydrology and hydrological processes including water quality	Construction / operation	Sediment run-off during construction resulting in negative impacts to water quality entering local waterways	All construction activities will be undertaken in accordance with an approved Council Plan that outlines appropriate sediment controls. A stormwater drainage system will be constructed to convey stormwater runoff into existing stormwater system.	Proponent / Project Manager	Moderate	Low
Impacts of vehicle strikes on threatened species	Construction / operation	Injury and mortality of threatened species resulting in local population decline	Fauna exclusion fencing will be installed at strategic locations to ensure animals are not directed into areas where they are at risk of vehicle strike. The proposed development will adopt appropriate road design standards including fauna warning signs, speed limit of 40 km/hr and roadside lighting to improve night-time visibility.	Proponent / Project Manager	Moderate	Low

3.3 Adaptive management for uncertain impacts

Uncertain impacts are deemed difficult to predict or assess and are generally associated with large developments where impacts may include subsidence from longwall mining, wind turbine or aircraft strike. Due to the nature of the proposed development, its design and proposed mitigation measures, uncertain impacts have been assessed to be very low and therefore a Biodiversity Management Plan under Section 9.4 of the BAM is not required.

3.4 Impact summary

3.4.1 Impacts requiring offsets

The direct impacts associated with clearing of vegetation and associated threatened species habitat (12.6 ha) will require offsetting under the Biodiversity Offsets Scheme (BOS).

3.4.2 Areas not requiring offsets

Areas expected to be impacted that were historically cleared with very low vegetation integrity (VI) will not require offsetting under the BOS. Additionally, retained areas of vegetation on the site, such as the linear strip along the southern boundary, will not be directly impacted by the proposed development and will not require offsetting.

3.4.3 Areas not requiring assessment

Vegetated areas across the site were assessed using the Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC 2004). Areas not vegetated were not assessed.

3.5 Summary of recommendations

The development should monitor and manage potential impacts associated with habitat loss and water quality through:

- Vegetation Management Plan that incorporates restoration and planting offsets
- monitoring of connectivity corridors to ensure species movement is not impeded
- Erosion and Sediment Control Plan that ensures storm water, sediment and erosion controls are effectively implemented.

3.6 Credit summary

3.6.1 Change in Vegetation Integrity (VI) score

The change in VI as a result of the project development is outlined in Table 10. The future VI score of zero for zones 1 and 3 is due to the clearing of native vegetation within the

development footprint. The calculation of VI for APZ areas considered partial clearing of the understorey and the retention of the ground layer and canopy trees. Condition scores for cover attributes, for grass and forb growth form groups, and functional attributes for large trees were calculated at approximately one third of the current VI condition score. Where maintenance work within APZ areas contributes to vegetation decline, ongoing management must include supplementary planting to maintain current VI.

Table 10 Change in Vegetation Integrity (VI) score

Zone	PCT ID	PCT Name	Condition Class	Total Area	Current VI	Management Zone	Future VI	Change in VI score	Total change in VI score
1	1262	Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	Moderate	5.98	62.8	Remove	0	-62.8	-55.8
						APZ	9.6	-53.2	
2	872	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion	Low	3.02	53.3	Remove	0	-53.3	-50.8
						APZ	11.9	-41.4	
3	747	Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	Moderate	3.6	80.1	Remove	0	-80.1	-71.3
						APZ	15.5	-64.6	

3.6.2 Required ecosystem credits

The Credit Summary Report (Appendix 5) details a total of 279 ecosystem credits were generated by the BAM calculator.

3.6.3 Required species credits

A Biodiversity Credit Report (Appendix 6) details a total of three candidate species requiring offset on the site generating a total of 750 species credits.

3.6.4 Conclusion

A total of 279 ecosystem credits and 750 species credits were generated by the BAM calculator. A decrease in vegetation integrity scores as a result of the proposed development is due to clearing of native vegetation and will require offsetting.

4 References

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Appendix 1 Master plan (development and construction footprint)

SEWER RISING MAIN OPTION 1B TO CONTINUE DOWN HILL STREET TO EXISTING PIT EX10-07 AT CORNER OF DUDLEY STREET

END OF EXIST 100mm UPVC MAIN
IL APPROX. 64.6
WATER PRESSURE UNKNOWN.

END OF EXIST 200mm UPVC MAIN
IL 61.24
CONTACTED BARRY FROM BSC
RE WATER PRESSURE AVAILABLE.
24.5 to 31m OF HEAD
240 to 305 kpa

HILL STREET

ENDEAVOUR DRIVE

SEWER PUMP STATION

WATER QUALITY CONTROL DEVICE

CONNELL CREEK

ACCESS

POSSIBLE FUTURE LOTS

ROAD RS01

ROAD RS02

ROAD RS03

PROPOSED WATER RETICULATION BALANCE TANK AND PUMP

REGRADE GRAVEL TO 5.5m WIDE

GRAVEL ROAD 5.5m WIDE

CONCRETE 5.5m WIDE TO APPROX CH889

PROVIDE TURNING AREA WIDENING AT WATER TANK

PROPOSED WATER RETICULATION TANK

FAUNA UNDERPASS HUMES BEBO(tm) ARCH BRIDGE TYPE 6210S

FAUNA UNDERPASS HUMES BEBO(tm) ARCH BRIDGE TYPE 6240S

FAUNA CORRIDOR

CONCRETE RD WITH EDGE STRIPS

RESERVE LOT FOR FUTURE ROAD

GRID NORTH

1. Grey Ironbark
2. Strangler Fig
3. Grey Ironbark
4. Small-fruited Grey Gum
5. Pink Bloodwood
6. Small-fruited Grey Gum
7. Tallowood
8. Small-fruited Grey Gum
9. Small-fruited Grey Gum
10. Pink Bloodwood
11. Tallowood
12. Tallowood

STAGE 1

STAGE 2

PROPOSED APZ AREAS SHOWN HATCHED

PROPOSED LOT 1
17.13 ha
BEFORE ROAD CONSTRUCTION AND LOTS CREATION

PROPOSED LOT 2
57.9 ha
PROPOSED BIODIVERSITY STEWARDSHIP AGREEMENT

PRELIMINARY

AMEND-MENT	DATE	AMENDMENT DETAILS	AUTHOR-ISED BY
3.C	01/09/20	LOT 69 & 70 ADDED	I.S.
3.D	18/09/20	AMEND LOTS 7,8,29,70 LOT 71–74 ADDED	I.S.

CLIENT: STEPHEN & JENNIFER SMITH

APPROVED ON BEHALF OF COFFS HARBOUR CITY COUNCIL

CITY ENGINEER ---------- DATE ----------

CONSULTING SURVEYORS | URBAN PLANNERS | PROJECT MANAGERS
Newnham Karl Weir
and Partners Pty Ltd
5 Murdock Street Coffs Harbour 2450
Phone: 02 6652 6630
Fax: 02 6652 3064
ABN 21 100 904 783
ACN 100 904 783

SCALE: 1:1000

SHEET SIZE A1
CAUTION DO NOT SCALE

DATE: 18/09/20

SURVEYED: S.A.

DRAWN: I.S.

DATUM: AHD

DESIGNED: A.H.

CHECKED:

PROJECT: HEARTWOOD COMMUNITY & FOREST

TITLE: DRAFT PROPOSED LOT LAYOUT WITH 1m CONTOURS
LOT 456 D.P. 755557 NOBLES LANE, BELLINGEN, NSW
OPTION 3 REVISION D

FILE No. 11875

SHEET 1 OF 2

COUNCIL DRAWING No.

PRELIMINARY

22
area 668.74 m2

21
area 950.59 m2

08
area 1102.05 m2

09
area 716.65 m2

10
area 724.37 m2

07
area 894.84m2

29
area 1019.37m2

28
area 731.00 m2

73
area 625.34 m2

72
area 605.59m2

71
area 605.49 m2

70
area 605.49 m2

74
area 644.81m2

56
area 723.41 m2

55
area 727.75 m2

54
area 735.42 m2

3. Grey Ironbark

2. Strangler Fig

7. Tallowood

6. Small-fruited Grey Gum

R-40.00

R-60.00

R50.00

ROAD RS02

PROPOSED APZ AREAS SHOWN HATCHED

STAGE 1 STAGE 2

GRID NORTH

AMEND-MENT	DATE	AMENDMENT DETAILS	AUTHORISED BY
3.C	01/09/20	LOT 69 & 70 ADDED	I.S.
3.D	18/09/20	AMEND LOTS 7,8,29,70 LOT 71–74 ADDED	I.S.

CLIENT: STEPHEN & JENNIFER SMITH

APPROVED ON BEHALF OF COFFS HARBOUR CITY COUNCIL

CITY ENGINEER DATE

CONSULTING SURVEYORS | URBAN PLANNERS | PROJECT MANAGERS
Newnham Karl Weir
and Partners Pty Ltd
5 Murdock Street Coffs Harbour 2450
Phone: 02 6652 6630
Fax: 02 6652 3064
ABN 21 100 904 783
ACN 100 904 783

SCALE: 1:200

SHEET SIZE A1 CAUTION DO NOT SCALE

DATE: 01/09/20

SURVEYED: S.A.

DRAWN: I.S.

DATUM: AHD

DESIGNED: A.H.

CHECKED:

PROJECT: HEARTWOOD COMMUNITY & FOREST

TITLE: DRAFT PROPOSED LOT LAYOUT WITH 1m CONTOURS
LOT 456 D.P. 755557 NOBLES LANE, BELLINGEN, NSW
LOT 70–74 DETAIL

FILE No. 11875

SHEET 2 OF 2

COUNCIL DRAWING No.

Appendix 2 Floristic and vegetation integrity plot survey summary of results

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4	
		cover	abundance	cover	abundance	cover	abundance	cover	abundance
Acacia melanoxylon	Blackwood					0.1	2		
Acacia spp.	Wattle					1	12		
Allocasuarina torulosa	Forest Oak	3	2						
Alphitonia excelsa	Red Ash	6		1	1	0.5	50	1	2
Alpinia caerulea	Native Ginger	0.2	1						
Ardisia bakeri				0.5	12				
Blechnum indicum	Swamp Water Fern	2	50	20					
Breynia oblongifolia	Coffee Bush			0.5	3	1	15		
Callicarpa pedunculata	Velvet Leaf	1	1						
Calochlaena dubia	Rainbow Fern	1	30						
Cinnamomum camphora		1	30	4	100	0.5	10	1	20
Cissus antarctica	Water Vine	0.5	10	1	20				
Cissus hypoglauca	Giant Water Vine	0.1	5	3	40				
Clematis spp.		0.1	1						
Clerodendrum floribundum var. floribundum	Lolly bush	0.1	1						
Clerodendrum tomentosum	Hairy Clerodendrum			0.1	1				
Corymbia intermedia	Pink Bloodwood	5				5			
Cryptocarya microneura	Murrogun	3	15	0.1	3				
Dianella caerulea var. caerulea				1	20				
Dioscorea transversa	Native Yam	0.5	30	0.5	2				
Doodia aspera	Prickly Rasp Fern	2	200						
Eucalyptus acmenoides	White Mahogany	6							

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4	
		cover	abundance	cover	abundance	cover	abundance	cover	abundance
Eucalyptus microcorys	Tallowwood			50				15	
Eucalyptus propinqua	Small-fruited Grey Gum	15		2	1				
Eucalyptus siderophloia	Grey Ironbark	4	1			40			
Eupomatia laurina	Bolwarra	1	2						
Eustrephus latifolius	Wombat Berry	0.5	40	0.5	6				
Ficus coronata	Creek Sandpaper Fig	0.5	5						
Glochidion ferdinandi	Cheese Tree			10					
Glochidion ferdinandi var. ferdinandi	Cheese Tree					0.5	3	1	3
Glycine clandestina	Twining glycine					0.5	20		
Glycine spp.								1	20
Guioa semiglauca		5							
Gymnostachys anceps	Settler's Twine	0.1	4						
Hibbertia scandens	Climbing Guinea Flower			0.5	5			2	20
Imperata cylindrica	Blady grass					20		5	
Jagera pseudorhus var. pseudorhus	Foambark Tree	1	5	0.5	3	1	10	2	3
Lantana camara		1		6		15		10	
Legnephora moorei	Round-leaf Vine	0.1	2						
Ligustrum sinense		0.5	12						
Lomandra filiformis	Wattle Matt-rush			0.5	2				
Lomandra longifolia	Spiny-headed Mat-rush	1	10						
Maclura cochinchinensis	Cockspur Thorn	0.5	2						
Marsdenia spp.	Milk vine	0.1	1						
Morinda jasminoides	Sweet Morinda	5		0.5	30				
Myrsine variabilis		0.5	4	0.5	6				
Notelaea longifolia	Large Mock-olive	1	5					0.5	2
Notelaea longifolia f. longifolia				1	2				
Ochna serrulata		0.5	1	1	20			0.5	2
Oplismenus aemulus	Creeping Beard Grass	0.1	1	0.5	20			1	10

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4	
		cover	abundance	cover	abundance	cover	abundance	cover	abundance
Ozothamnus bidwillii	Climbing Everlasting	0.1	1	2	6				
Ozothamnus diosmifolius	White Dogwood					0.5	3		
Paspalum wettsteinii		15				40		70	
Passiflora edulis	Edible passionflower			0.5	2				
Passiflora spp.	Corky pass	0.1	1						
Passiflora suberosa	Corky passion			0.5	4	1	30		
Passiflora subpeltata	White passion					2	50		
Persoonia silvatica	Forest Geebung			1	1				
Pittosporum revolutum	Rough Fruit Pittosporum	0.1	1						
Pittosporum undulatum	Sweet Pittosporum	1	10	3	4	0.1	2		
Pratia purpurascens	Whiteroot							0.5	10
Pseuderanthemum variabile	Pastel Flower			0.5	12				
Pteridium esculentum	Bracken			1	20	5		15	
Rhodamnia rubescens	Scrub Turpentine	0.5	5	2	5				
Ripogonum fawcettianum	Small Supplejack			4	20				
Rubus moorei	Silky Bramble								
Sarcopetalum harveyanum	Pearl Vine			2	6				
Senna pendula	Winter senna	2	20	2	15	1	15	0.5	5
Setaria spp.						6			
Sloanea australis	Maiden's Blush	0.5	2						
Smilax glyciphylla	Sweet Sarsparilla			1	20				
Solanum seaforthianum		0.1	2						
Stephania japonica	Snake vine			2	12	1	20		
Syncarpia glomulifera	Turpentine	1	1					5	
Synoum glandulosum subsp. glandulosum	Scentless Rosewood	1	10	1	20				
Syzygium luehmannii	Riberry	0.1	1	2	6			2	3
Syzygium oleosum	Blue Lilly Pilly			2	1				

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4	
		cover	abundance	cover	abundance	cover	abundance	cover	abundance
Tabernaemontana pandacaqui	Banana Bush	1	5	3	12			1	5
Tasmannia insipida	Brush Pepperwood								
Themeda triandra	Kangaroo Grass					15			
Tripladenia cunninghamii		0.5	10	1	10				
Wikstroemia indica				0.5	3				
Wilkiea austroqueenslandica	Smooth Wilkiea	0.5	3						

Scientific name	Common name	Plot 5		Plot 6		Plot 7	
		cover	abundance	cover	abundance	cover	abundance
Acacia spp.	Wattle	0.5	5			0.1	1
Allocasuarina torulosa	Forest Oak			2	1	15	
Alphitonia excelsa	Red Ash	10		0.2	20	2	6
Alpinia caerulea	Native Ginger			0.1	1	0.5	10
Bidens pilosa		0.1					
Blechnum indicum	Swamp Water Fern	5		30		30	
Cinnamomum camphora		8		2	20		
Cissus antarctica	Water Vine	0.2	12	0.1	10	1	20
Cissus hypoglauca	Giant Water Vine					5	
Clerodendrum floribundum var. floribundum	Lolly bush					1	5
Clerodendrum tomentosum	Hairy Clerodendrum						
Commelina cyanea	Native Wandering Jew	1	100				
Cordyline spp				0.1	1	0.2	6
Corymbia intermedia	Pink Bloodwood	10		10			
Cryptocarya glaucescens	Jackwood			3	12	10	
Cryptocarya obovata	Pepperberry			0.1	5		
Cryptocarya rigida	Forest Maple			5		2	20

Scientific name	Common name	Plot 5		Plot 6		Plot 7	
		cover	abundance	cover	abundance	cover	abundance
Cyathea australis	Rough Treefern					1	3
Cyperus spp.						1	50
Dianella caerulea	Blue Flax-lily	0.1	10	0.2	20		
Dioscorea transversa	Native Yam	0.1	5	0.2	20	0.1	10
Diploglottis australis	Native Tamarind			0.1	1	0.5	6
Embelia australiana						2	20
Eucalyptus microcorys	Tallowwood	10		60		70	
Eucalyptus saligna	Sydney Blue Gum					20	
Eucalyptus siderophloia	Grey Ironbark	15					
Eupomatia laurina	Bolwarra			1	2	10	
Eustrephus latifolius	Wombat Berry	0.1	2	0.1	20	0.1	20
Geitonoplesium cymosum	Scrambling Lily	0.1	2	0.1	10		
Glochidion ferdinandi	Cheese Tree	10		1	1	2	6
Glycine spp.				0.1	10		
Guioa semiglauca				1	5		
Hibbertia scandens	Climbing Guinea Flower	0.2	5	0.1	5		
Jagera pseudorhus var. pseudorhus	Foambark Tree	5		1	5	0.5	6
Lantana camara		0.5	4	0.1	10	0.5	6
Ligustrum sinense		0.2	5	0.1	1		
Lomandra filiformis	Wattle Matt-rush	0.2	20				
Lomandra longifolia	Spiny-headed Mat-rush	0.1	10	0.1	1	0.5	5
Macrozamia communis	Burrawang					1	4
Mallotus philippensis	Red Kamala					1	20
Melicope micrococca	White Euodia			0.1	1		
Morinda jasminoides	Sweet Morinda	0.2	2	1	50	3	50
Myrsine howittiana	Brush Muttonwood	0.1	1	0.2	20		
Notelaea longifolia	Large Mock-olive	0.1	2			1	5
Ochna serrulata		0.5	3				

Scientific name	Common name	Plot 5		Plot 6		Plot 7	
		cover	abundance	cover	abundance	cover	abundance
Oplismenus aemulus	Creeping Beard Grass	30		0.5	30	0.1	20
Palmeria scandens	Anchor Vine			0.1	3		
Pandorea pandorana	Wonga Wonga Vine			0.1	20		
Parsonsia straminea	Common Silkpod			3	10		
Paspalum dilatatum		50		0.1	1		
Passiflora spp.	Corky pass						
Passiflora suberosa	Corky passion	0.1	12				
Passiflora subpeltata	White passion	0.1	1				
Petermannia cirrosa				0.1	5	0.5	5
Pittosporum multiflorum	Orange Thorn					0.1	2
Pittosporum undulatum	Sweet Pittosporum	0.2	5			1	1
Pratia purpurascens	Whiteroot	0.5	50				
Pteridium esculentum	Bracken	3	30	1	10		
Rhodamnia rubescens	Scrub Turpentine					0.1	1
Ripogonum brevifolium	Small-leaved Supplejack			10			
Ripogonum discolor	Prickly Supplejack			0.1	1	2	5
Ripogonum elseyanum	Hairy Supplejack					1.1	6
Ripogonum fawcettianum	Small Supplejack					5	
Rubus moorei	Silky Bramble			0.1	5		
Sarcopteryx stipata	Steelwood					0.1	1
Senna pendula	Winter senna	2	20	0.1	5	0.1	10
Setaria spp.							
Sloanea australis	Maiden's Blush			2	20	2	20
Smilax glyciphylla	Sweet Sarsparilla			0.1	20	0.1	6
Solanum mauritianum	Wild tabbaco	0.1	2				
Stephania japonica	Snake vine	0.1	5				
Syncarpia glomulifera	Turpentine					10	
Synoum glandulosum subsp. glandulosum	Scentless Rosewood			5		5	

Scientific name	Common name	Plot 5		Plot 6		Plot 7	
		cover	abundance	cover	abundance	cover	abundance
Syzygium luehmannii	Riberry			0.1	3		
Syzygium moorei	Durobby					0.2	6
Syzygium spp.				0.5	5	0.1	1
Tabernaemontana pandacaqui	Banana Bush	0.5	5	5		0.2	6
Tasmannia insipida	Brush Pepperwood			1	12		
Tripladenia cunninghamii						0.2	20
Unknowin grass		0.1	2				
Wilkiea huegeliana	Veiny Wilkiea			1	20	5	
Zieria smithii	Sandfly Zieria			0.1	1		

Appendix 3 Predicted threatened species report

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00015264/BAAS18026/19/00015265	Heartwood	07/12/2020
Assessor Name	Report Created	BAM Data version *
Nigel A Cotsell	10/12/2020	34
Assessor Number	Assessment Type	BAM Case Status
BAAS18026	Part 4 Developments (General)	Open
Assessment Revision	BOS entry trigger	Date Finalised
1		To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
Barred Cuckoo-shrike	Coracina lineata	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
Common Blossom-bat	Syconycteris australis	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast

Dusky Woodswallow	Artamus cyanopterus cyanopterus	872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Golden-tipped Bat	Phoniscus papuensis	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Greater Broad-nosed Bat	Scoteanax rueppellii	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion

Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Hoary Wattled Bat	Chalinolobus nigrogriseus	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
Koala	Phascolarctos cinereus	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Little Bent-winged Bat	Miniopterus australis	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Little Eagle	Hieraaetus morphnoides	872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
Little Lorikeet	Glossopsitta pusilla	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Masked Owl	Tyto novaehollandiae	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast

Masked Owl	Tyto novaehollandiae	872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Powerful Owl	Ninox strenua	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Red-legged Pademelon	Thylogale stigmatica	747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Regent Honeyeater	Anthochaera phrygia	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Rose-crowned Fruit-Dove	Ptilinopus regina	747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Scarlet Robin	Petroica boodang	872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Square-tailed Kite	Lophoictinia isura	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Superb Fruit-Dove	Ptilinopus superbus	747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Swift Parrot	Lathamus discolor	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion

Varied Sittella	Daphoenositta chrysoptera	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Wompoo Fruit-Dove	Ptilinopus magnificus	747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Yellow-bellied Glider	Petaurus australis	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Diamond Firetail	Stagonopleura guttata	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
Hastings River Mouse	Pseudomys oralis	747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
Pale-vented Bush-hen	Amaurornis moluccana	1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast
		747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Diamond Firetail	Stagonopleura guttata	Geographic limitations
Hastings River Mouse	Pseudomys oralis	Geographic limitations

Pale-vented Bush-hen	Amaurornis moluccana	Habitat constraints

Appendix 4 Candidate threatened species report

BAM Candidate Species Report

Proposal Details

Assessment Id 00015264/BAAS18026/19/00015265	Proposal Name Heartwood	BAM data last updated * 07/12/2020
Assessor Name Nigel A Cotsell	Report Created 09/12/2020	BAM Data version * 34
Assessor Number BAAS18026	Assessment Type Part 4 Developments (General)	BAM Case Status Open
Assessment Revision 1	Date Finalised To be finalised	BOS entry trigger

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Aepyprymnus rufescens Rufous Bettong	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Anthochaera phrygia Regent Honeyeater	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Arthraxon hispidus Hairy Jointgrass	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Asperula asthenes Trailing Woodruff	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Carterornis leucotis White-eared Monarch	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?

Erythrotriorchis radiatus Red Goshawk	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hicksbeachia pinnatifolia Red Boppel Nut	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hoplocephalus bitorquatus Pale-headed Snake	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Hoplocephalus stephensii Stephens' Banded Snake	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Lathamus discolor Swift Parrot	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?

Litoria brevipalmata Green-thighed Frog	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Marsdenia longiloba Slender Marsdenia	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Miniopterus australis Little Bent-winged Bat	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Miniopterus orianae oceanensis Large Bent-winged Bat	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Mixophyes balbus Stuttering Frog	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Mixophyes iteratus Giant Barred Frog	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	Yes (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Niemeyera whitei Rusty Plum, Plum Boxwood	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox strenua Powerful Owl	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☑ Survey month outside the specified months?
Oberonia titania Red-flowered King of the Fairies	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Parsonsia dorrigoensis Milky Silkpod	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascogale tapoatafa Brush-tailed Phascogale	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	Yes (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Polygala linariifolia Native Milkwort	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Pomaderris queenslandica Scant Pomaderris	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Pteropus poliocephalus Grey-headed Flying-fox	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Senna acclinis Rainforest Cassia	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tinospora smilacina Tinospora Vine	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tylophora woollsii Cryptic Forest Twiner	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Typhonium sp. aff. brownii Stinky Lily	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Vespadelus troughtoni Eastern Cave Bat	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Brush-tailed Rock-wallaby	Petrogale penicillata	Refer to BAR
Common Planigale	Planigale maculata	Habitat degraded
Fragrant Pepperbush	Tasmannia glaucifolia	Refer to BAR
Long-nosed Potoroo	Potorous tridactylus	Habitat constraints
Newry Golden Wattle	Acacia chrysotricha	Geographic limitations
Parma Wallaby	Macropus parma	Geographic limitations
White-crowned Snake	Cacophis harriettae	Geographic limitations

Appendix 5 Credit Summary Report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00015264/BAAS18026/19/00015265	Heartwood	07/12/2020
Assessor Name	Report Created	BAM Data version *
Nigel A Cotsell	09/12/2020	34
Assessor Number	BAM Case Status	Date Finalised
BAAS18026	Open	To be finalised
Assessment Revision	Assessment Type	BOS entry trigger
1	Part 4 Developments (General)	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion											
3	747_Moderate	Not a TEC	80.1	71.3	3.6			High Sensitivity to Potential Gain	1.50		96
										Subtotal	**96**

Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion										
2	872_Low	Not a TEC	53.3	50.8	3			High Sensitivity to Potential Gain	1.50		58
										Subtotal	**58**
Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast										
1	1262_Moderate	Not a TEC	62.8	55.8	6			High Sensitivity to Potential Gain	1.50		125
										Subtotal	**125**
										Total	**279**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Myotis macropus / Southern Myotis (Fauna)								
1262_Moderate	55.8	55.8	6	Vulnerable	Not Listed	2	False	167
872_Low	50.8	50.8	3	Vulnerable	Not Listed	2	False	77
747_Moderate	71.3	71.3	3.6	Vulnerable	Not Listed	2	False	128
							Subtotal	**372**
Phascolarctos cinereus / Koala (Fauna)								
1262_Moderate	55.8	55.8	6	Vulnerable	Vulnerable	2	False	167
872_Low	50.8	50.8	3	Vulnerable	Vulnerable	2	False	77
747_Moderate	71.3	71.3	3.6	Vulnerable	Vulnerable	2	False	128
							Subtotal	**372**

Appendix 6 Biodiversity Credit Report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00015264/BAAS18026/19/00015265

Proposal Name
Heartwood

BAM data last updated *
07/12/2020

Assessor Name
Nigel A Cotsell

Assessor Number
BAAS18026

BAM Data version *
34

Proponent Names

Report Created
09/12/2020

BAM Case Status
Open

Assessment Revision
1

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

BOS entry trigger

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Pseudomys oralis / Hastings River Mouse
Stagonopleura guttata / Diamond Firetail

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	Not a TEC	6.0	125	0	125
872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion	Not a TEC	3.0	0	58	58
747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	Not a TEC	3.6	96	0	96

BAM Biodiversity Credit Report (Like for like)

747-Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
North Coast Wet Sclerophyll Forests This includes PCT's: 487, 613, 661, 684, 686, 692, 693, 694, 695, 699, 747, 748, 752, 812, 826, 827, 1073, 1208, 1217, 1222, 1237, 1244, 1245, 1257, 1259, 1260, 1261, 1265, 1266, 1282, 1284, 1285, 1504, 1561, 1562, 1563, 1566, 1567, 1568, 1569, 1572, 1573, 1575, 1579, 1841, 1843, 1915	North Coast Wet Sclerophyll Forests <50%	747_Moderate	Yes	96	Coffs Coast and Escarpment, Armidale Plateau, Chaelundi, Clarence Sandstones, Dalmorton, Ebor Basalts, Macleay Gorges, Macleay Hastings and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

872-Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Northern Gorge Dry Sclerophyll Forests This includes PCT's: 723, 735, 841, 842, 843, 855, 859, 868, 872, 983, 1162, 1219, 1273, 1583, 1595, 1599	Northern Gorge Dry Sclerophyll Forests <50%	872_Low	No	58	Coffs Coast and Escarpment, Armidale Plateau, Chaelundi, Clarence Sandstones, Dalmorton, Ebor Basalts, Macleay Gorges, Macleay Hastings and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Northern Hinterland Wet Sclerophyll Forests This includes PCT's: 690, 697, 698, 755, 1092, 1262, 1267, 1268, 1281, 1385, 1548, 1549, 1550, 1556, 1557, 1558, 1564, 1565, 1580, 1582, 1584, 1585, 1845, 1846, 1847, 1914	Northern Hinterland Wet Sclerophyll Forests <50%	1262_Moderate	Yes	125	Coffs Coast and Escarpment, Armidale Plateau, Chaelundi, Clarence Sandstones, Dalmorton, Ebor Basalts, Macleay Gorges, Macleay Hastings and Yuraygir. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast

Species Credit Summary

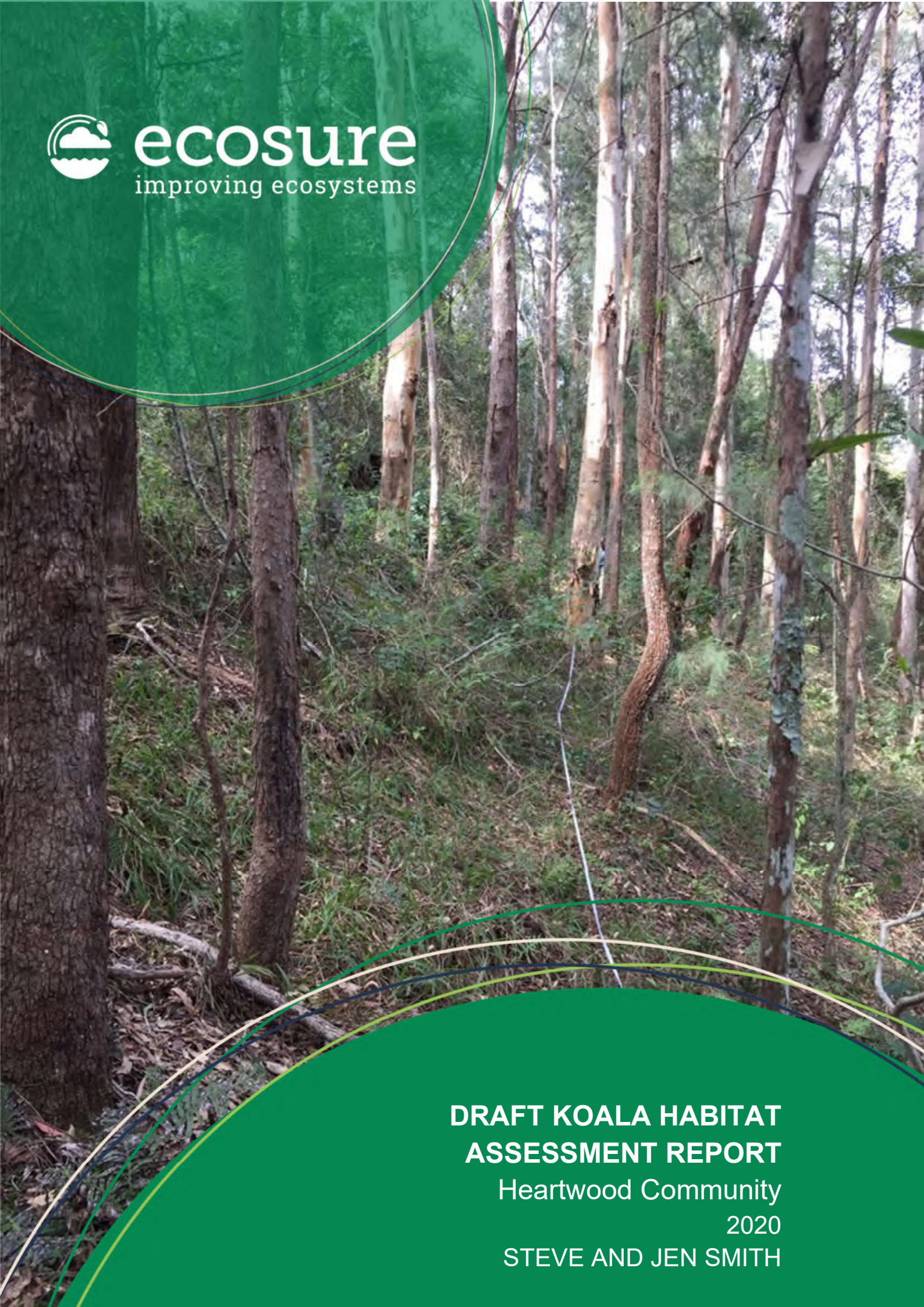
Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**1262_Moderate, 872_Low, 747_Moderate**	12.6	372.00
Phascolarctos cinereus / Koala	**1262_Moderate, 872_Low, 747_Moderate**	12.6	372.00

Credit Retirement Options

Like-for-like credit retirement options

Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW

Appendix 7 Koala Habitat Assessment Report



ecosure
improving ecosystems

DRAFT KOALA HABITAT ASSESSMENT REPORT

Heartwood Community

2020

STEVE AND JEN SMITH

Glossary, acronyms and abbreviations

BDAR	Biodiversity Development Assessment Report
BSA	Biodiversity Stewardship Agreement
BSS	Biodiversity Stewardship Site
BSSAR	Biodiversity Stewardship Site Assessment Report
BSC	Bellingen Shire Council
DA	Development Application
DBHOB	Diameter at Breast Height Over Bark
DCP	Development Control Plan
KHAR	Koala Habitat Assessment Report
KPA	Koala Planning Area
LGA	Local Government Area
PCT	Plant Community Type
PKH	Preferred Koala Habitat
SEPP 44	State Environmental Planning Policy – Koala Habitat Protection

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1 Introduction

Chapter 16 – Koala Habitat Protection of Bellingen Shire Council's Development Control Plan (2017) aims to provide consistent assessment criteria for development applications for land within the Bellingen Shire Council Coastal Koala Planning Area. The chapter also aims to manage the long-term sustainability and recovery of koalas and their habitat in the Shire by ensuring zero net loss of preferred koala habitat (PKH), maintaining and restoring koala habitat linkages, and minimising and managing threats affecting koalas and their habitat.

Under section 16.6.2 of the DCP, where a proposed development involves the removal of a tree or trees in an area mapped as PKH, a Koala Habitat Assessment Report (KHAR) is required. If the KHAR identifies that one or more koala feed trees greater than or equal to 100 mm diameter at breast height over bark (DBHOB) is to be removed or isolated, a Koala Activity Report must also be prepared to determine koala usage at the site.

Ecosure understands that Bellingen Shire Council (BSC) will consider variations to the required standards where the overall and specific aims of Chapter 16 in the DCP are achieved (as stated in section 16.5). Consequently, Ecosure undertook a modified version of the KHAR which involved surveying a number of plots (based on the Biodiversity Assessment Method [BAM] as set out by the Biodiversity Offset Scheme [BOS]) in vegetation communities containing KFTs and within the area mapped as PKH. While Ecosure acknowledges that BSC requirements to address koala habitat loss are distinct from requirements set out by the BOS, undertaking a modified KHAR provided the most cost-effective and practical method of identifying the full range of KFTs proposed to be impacted, and is also justified when coupled with previous koala and vegetation surveys undertaken at the site that have already determined koala activity levels. The modified process is detailed in Section 2.

1.1 Background

This report has been prepared to accompany a development application proposed to be lodged with Bellingen Shire Council (BSC) by George Stulle Planning on behalf of Steve and Jennifer Smith. The lot is currently identified as Lot 456 DP755557 with the entire site occupying an area of 75.2 hectares. The proposed development intends to subdivide the site into two portions. The northern portion of land is proposed as the Heartwood Community residential area (17.13 ha) and the southern portion is proposed as a Biodiversity Stewardship Site (BSS) (58.07 ha) to be conserved in perpetuity under a Biodiversity Stewardship Agreement (BSA) and requires a Biodiversity Stewardship Site Assessment Report (BSSAR) to be prepared.

A BSSAR assesses the biodiversity values of the land and requires a thorough assessment of native vegetation and suitability of habitat for threatened species via a rigorous survey process. A BSSAR also includes a management plan that details the range of management actions required to improve the conservation values at the site such as fire management, threatened species habitat management and enhancement, integrated feral pest control, weed management and monitoring.

The proposed Heartwood Community development will include 66 low density residential lots to be released in two stages. The development footprint encompasses an area of 12.6 ha, and Preferred Koala Habitat (PKH) classed as Secondary A is mapped across a large portion of the proposed development site (Bellingen Shire Council 2019). The area of PKH expected to be impacted totals 9.09 ha (Figure 1).

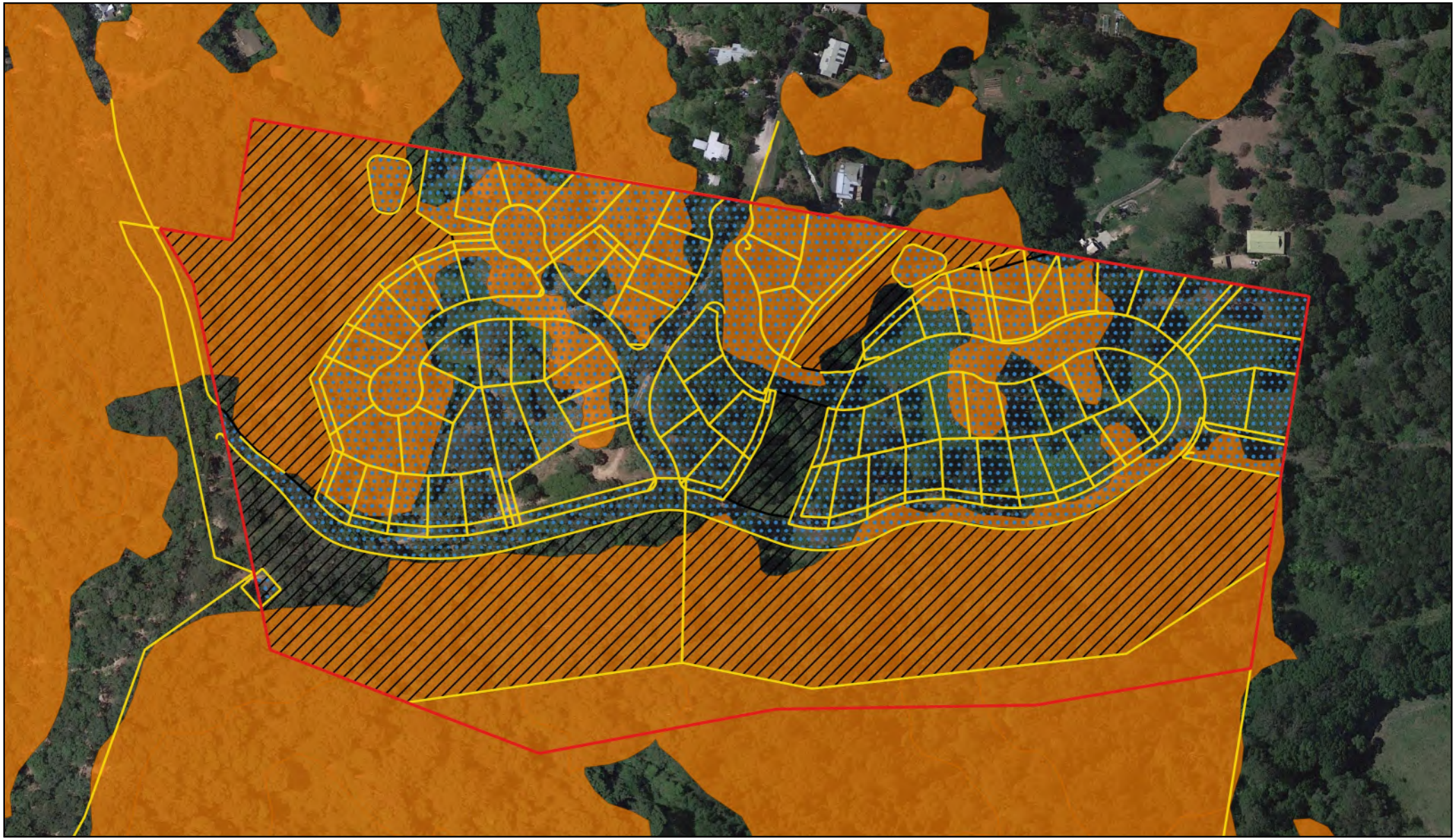

Figure 1: Development footprint and preferred koala habitat on site

Steve and Jen Smith
KHAR, Bellingen, NSW

ecosure

Job number: PR3045
Revision: 0
Author: JLY
Date: 2019-12-19T12:54:56.778

0 50 100 m

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

1.2 Previous surveys

Previous fauna surveys undertaken as part of the environmental assessment process at the proposed Heartwood development site include a Spot Assessment Technique (SAT) survey (Phillips and Callaghan 2011) to identify koala presence/absence and usage level, deployment of remote cameras, night-time spotlighting for arboreal fauna, and opportunistic surveys conducted whilst undertaking plot-based vegetation surveys. These surveys were undertaken as part of a Biodiversity Development Assessment Report in accordance with the Biodiversity Assessment Method Order 2017 (NSW Government 2017) and to address requirements set out in the *Biodiversity Conservation Act 2016*. Surveys were also used to inform the Biodiversity Stewardship Site Assessment Report for the proposed BSS on adjoining land.

The SAT survey involved scat searches within a one-meter buffer area around the base of selected trees for two person minutes per tree across the site. Tree selection was based on preferred KFT species identified in the BSC KPoM and included tallowwood (*Eucalyptus microcorys*), and small-fruited grey gum (*E. propinqua*). A single koala scat was identified at the base of a tallowwood, with the overall result of the survey determining that koala activity levels were low (less than 6 percent) within the proposed development site (Phillips and Callaghan 2011).

Nocturnal fauna surveys were conducted on three separate nights during calm weather in spring 2019. Nocturnal surveys involved traversing the subject land on foot for a period of at least one hour using hand-held spotlights to detect 'eye shine'. No arboreal marsupials were detected during nocturnal surveys on both the proposed development site and the BSS site (Figure 2 – note the start point only of the nocturnal traverse is indicated). Additionally, 12 remote cameras baited with truffle oil, peanut butter, oats and honey were deployed across the entire lot. Four cameras were positioned within the proposed Heartwood development area and eight within the adjacent BSS site. Koalas were recorded on three cameras utilising the BSS site (Figure 2).

On the proposed Heartwood development site, three Plant Community Types (PCTs) were identified via systematic field-based vegetation surveys to collect floristic data in accordance with the BAM. Seven vegetation plots were surveyed with composition (species richness) and structure (stratum) attributes recorded within a 400 m² (20 x 20 m) plot, together with function (hollow-bearing, stem size) attributes assessed within a 1000 m² (50 x 20 m) plot. Results of the field surveys were correlated with the NSW BioNet Vegetation Classification together with mapping available from the Office of Environment and Heritage (NSW Government 2014). It should be noted that PCT numbers identified on the site were converted to parent PCTs using the Office of Environment and Heritage lineage table. The dominant plant species associated with PCTs on the site are known KFTs, such as tallowwood, small-fruited grey gum and Sydney blue gum (*E. saligna*) (Table 1).

Table 1 Plant community types

PCT ID	PCT Common Name
747	Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion
872	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion
1262	Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast

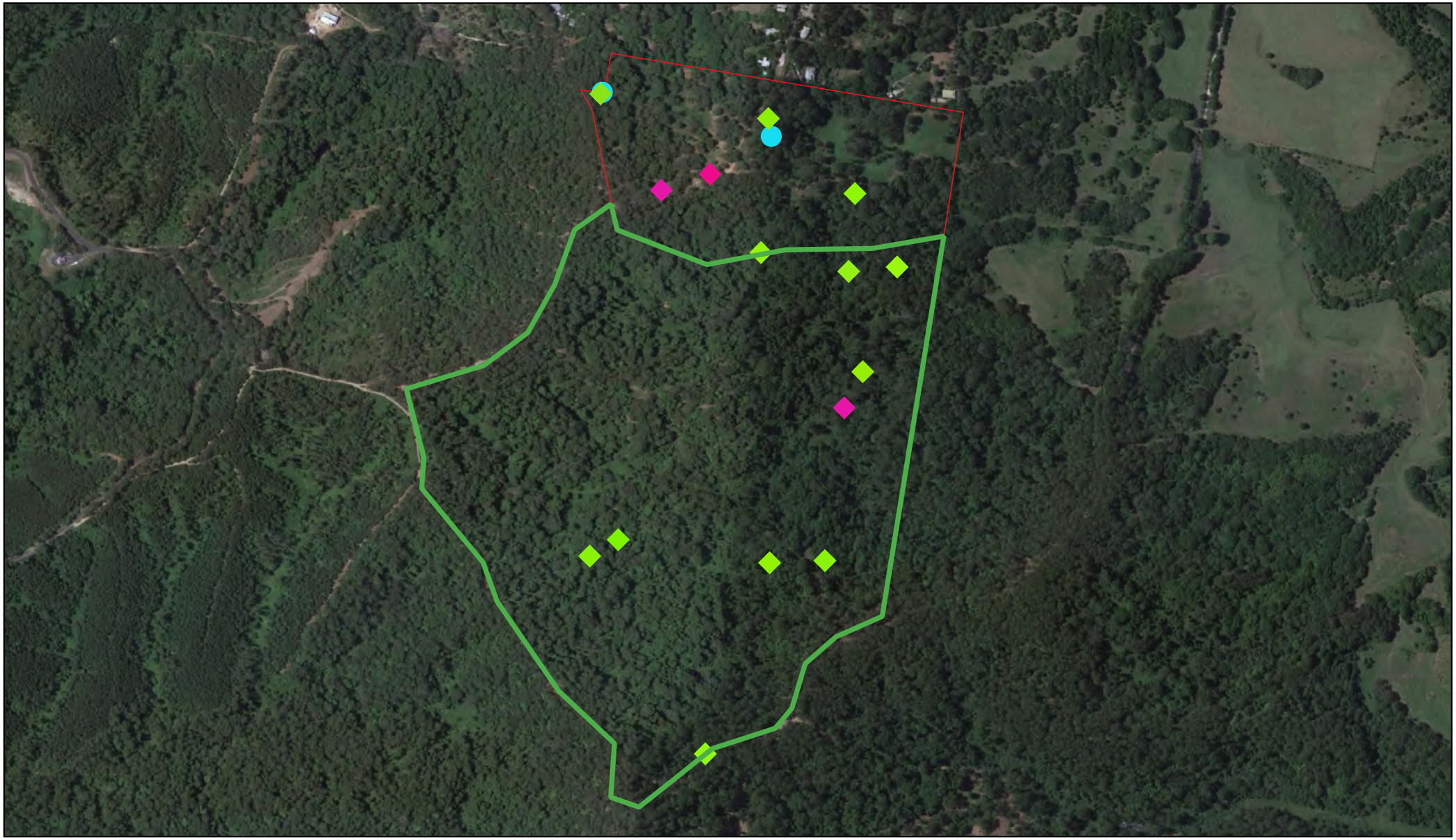

Figure 2: Previous koala survey effort at site

Steve and Jen Smith
KHAR, Bellingen, NSW

ecosure

Job number: PR3045
Revision: 0
Author: JLY
Date: 2019-12-19T14:15:08.737

0 50 100 150 200 m

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

2 Koala feed tree assessment

2.1 Impacted area

The total area of PKH expected to be impacted on the site is 9.09 ha, of which approximately 3.07 ha is proposed to be removed, and 6.02 ha is proposed to be managed as an Asset Protection Zone (APZ). While the APZ will retain approximately 30 percent of canopy trees, the impact calculations have been made based on complete vegetation removal for practicality reasons.

Table 2 Koala habitat class and area

Preferred koala habitat class	Area (ha)
Secondary A	9.09

In order to assess the number of KFTs likely to be impacted at the site, surveyors undertook a modified version of the KHAR which involved surveying a number of 50 x 20 metre plots in each PCT also categorised as PKH (Figure 3). The number of plots undertaken in each PCT is based on the minimum number of survey plots required when undertaking a BAM assessment (Table 3). Surveying the 50 x 20 m plot is designed to assess ecosystem function attributes including the number of large trees and stem class sizes within the plot area (see Section 1.2).

Table 3 Impacted plant community types within preferred koala habitat and number of plots surveyed

PCT ID	PCT Common Name	Total area (ha) of PCT within impacted PKH	No of plots
747	Brush Box - Tallowwood - Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	3.26	2
872	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion	0.78	1
1262	Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	5.05	3
	Total	**9.09**	**6**

Using mobile tablets loaded with PCT shapefiles and randomly assigned plot locations, surveyors identified all KFTs within the 50 x 20 m plots, recording the species and diameter at breast height over bark (DBHOB). The number of KFTs for all PCTs was averaged for each size class and multiplied by 10 to achieve a per hectare average. This figure was then applied across the entire area (9.09 ha) of impacted PKH (Table 4).

Table 4 Combined results of koala feed trees recorded in all plots including the per hectare average

Koala feed tree	Size class (DBHOB)		
	<100 mm	100-300 mm	>300 mm
Tallowwood (*E. microcorys*)	1	6	14
Small-fruited grey gum (*E. propinqua*)	0	3	13
Swamp mahogany (*E. robusta*)	0	0	1
Sydney blue gum (*E. saligna*)	0	0	4
Average	**0.25**	**2.25**	**8**
Average per hectare	**2.5**	**22.5**	**80**
Average for impacted area (9.09 ha)	**23**	**205**	**727**

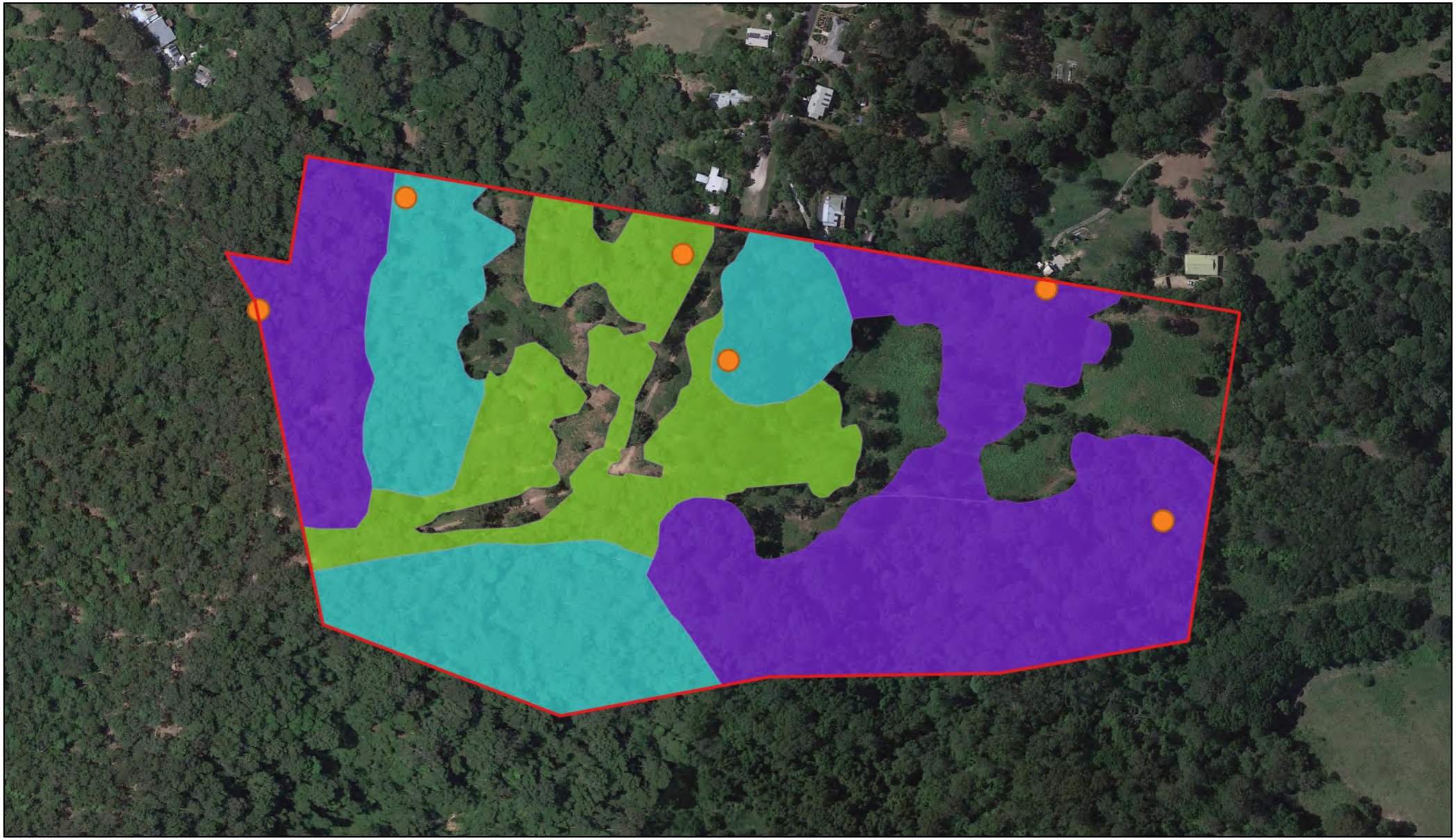

Figure 3: Plant Community Type (PCT) and Koala Feed Tree (KFT) survey points on site

Steve and Jen Smith
KHAR, Bellingen, NSW

ecosure

Job number: PR3045
Revision: 0
Author: JLY
Date: 2019-12-19T14:46:55.861

0 50 100 m

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

3 Impacts to koalas and koala habitat

Approximately 9.09 ha of PKH is expected to be directly impacted as a result of the proposed development. The direct impacts of vegetation removal at the site will result in a loss of habitat and reduced connectivity across the site.

The indirect impacts associated with loss of habitat at the site include:

- reduced availability of potential future koala feed trees
- reduction in the extent of PKH in the Bellingen Shire Local Government Area
- increased risk of human and domestic animal conflict as a result of future development, including:
  - drowning in swimming pools
  - dog attack
  - vehicle strike.

4 Measures to avoid and minimise

The impacts of the proposed Heartwood development have been avoided and minimised using the following principles to situate the majority of the development footprint in areas where:

- native vegetation has a low integrity score
- there are no threatened ecological communities
- local connectivity corridors for species movement are maintained
- large, hollow-bearing trees are avoided and retained.

The proposed development has been designed to include two fauna corridors which are located in the western and central areas of the lot. These corridors are included in asset protection zones and will retain 30 percent of existing canopy vegetation with priority to retain species that are known KFTs. A linear strip of vegetation categorised as PKH will also be retained along the southern boundary between the APZ and the adjoining proposed BSS site (refer to Figure 1).

The impacts of the development will also be minimised through offsetting 58.07 ha of land that adjoins the southern boundary of the site and contains 33.82 ha of Secondary A habitat and 6.25 ha of Secondary B habitat (Figure 4). Bellingen Shire Council's Habitat Compensation Policy requires that where protection of land is to be used as compensation for loss of PKH, Secondary A habitat must be replaced using a factor of three. This will result in a total offset area of 27.27 ha (from 9.09 ha to be impacted).

Section 3.1 of the accompanying Biodiversity Development Assessment Report provides a comprehensive overview of avoiding and minimising impacts on biodiversity values at the site, and Table 5 below addresses criteria set out in Section 16.7 of Chapter 16 of BSCs DCP to avoid or minimise direct impacts on koala habitat.

Table 5 Development criteria and mitigation measures proposed for the site

Development criteria	Mitigation
The development shall be located, designed, constructed and managed to avoid adverse impacts on koala food trees and/or preferred koala habitat. If adverse impacts cannot be avoided, it does not result in any overall net loss of koala food trees and/or preferred koala habitat	The development will utilise areas on the site where biodiversity values are reduced and vegetation integrity scores are low such as already cleared land and where vegetation communities have been disturbed. The development will retain 30 percent of canopy trees in areas designated as APZs and will prioritise retaining KFTs within these areas. A linear strip of PKH will also be retained as a buffer along the southern boundary of the site. The impacted area of PKH totalling 9.09 will be offset within the adjoining BSS. BSCs Habitat Compensation Policy requires that where protection of land is to be used as compensation for loss of PKH, Secondary A habitat must be replaced using a factor of three resulting in an area of 27.27 ha to be offset.

Development criteria	Mitigation
The development shall maintain existing linkages between areas of preferred koala habitat across the development area and between areas	The development has been designed to include two fauna habitat links, one of which will include two fauna underpasses for the road network. Vegetation in the habitat links will be managed for APZ purposes and will retain 30 percent of current native canopy and tall midstorey vegetation.
The development shall not contribute to fragmentation and/or isolation of preferred koala habitat across the development area	The development has been designed so that no PKH will be fragmented or isolated. The connectivity corridor proposed for the central area of the development will maintain connection to the APZ located south of the road and with habitat outside the development boundary to the north.
The development shall not impede safe koala movement across the development area	It is recommended that safe koala movement be facilitated via use of approved koala fencing along lot boundaries, fauna corridors and APZ areas. Fencing will prevent domestic dogs or cats entering areas designated for native fauna movement. Community awareness of the impact of dogs and cats should be conveyed through signage in the vicinity of these areas. Wildlife warning signs are also recommended in fauna corridor and APZ areas and along roadsides within and upon approach to the development.
The development shall consider the need and potential where appropriate to revegetate cleared land within koala movement corridors	Infill planting is recommended where appropriate to improve areas lacking in native vegetation cover while also adhering to APZ requirements. Ongoing weed control targeting invasive species such as lantana (*Lantana camara*) is recommended within all fauna corridor and APZ areas.
Proposed bushfire asset protection zone shall not result in the clearing of koala food trees and/or preferred koala habitat unless this clearing has been explicitly addressed and compensated for as part of the assessment of the application	All APZ areas will prioritise retention of known species of koala food trees

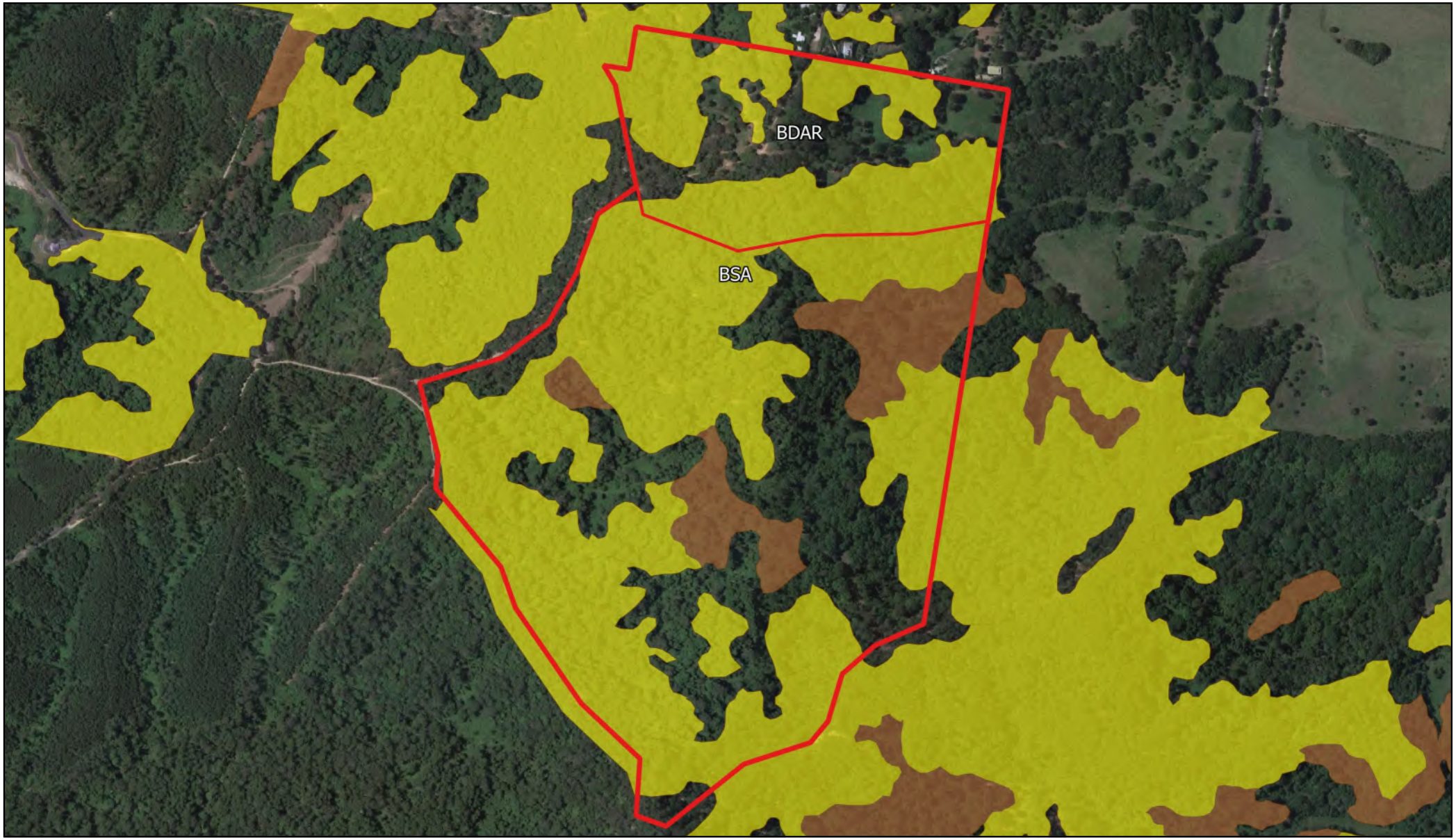

Figure 4: Preferred koala habitat located on proposed biodiversity stewardship site

Steve and Jen Smith
KHAR, Bellingen, NSW

BDAR boundary

Preferred koala habitat
Secondary A
Secondary B

ecosure

Job number: PR3045
Revision: 0
Author: JLY
Date: 2020-01-08T11:35:24.822

0 100 200 m

GDA 1994 MGA Zone 56
Projection: Tranverse Mercator
Datum: GDA 1994
Units: Meter

5 Conclusion

Targeted koala surveys determined that while suitable habitat exists on the site, the species use of the area is low. Surveys conducted as part of the environmental assessment of the site included a SAT survey, nocturnal spotlighting surveys, remote camera trap surveys and opportunistic fauna surveys conducted during vegetation assessments. Low koala use at the site could be due to a range of factors such as proximity to the urban area or greater suitability of surrounding habitat.

A total of 9.09 ha of Secondary A PKH is expected to be impacted by the proposed development. The impacted area will be offset within the proposed adjoining Biodiversity Stewardship Site which will be conserved under a Biodiversity Stewardship Agreement (BSA) and will be managed subject to the BSSAR Management Plan that will protect, conserve and enhance the biodiversity values on the site including PKH and KFTs on the site.

Koala habitat will be adequately offset under the BOS, however the offset outcome also aligns with BSCs Habitat Compensation Policy that aims to achieve zero net loss of KFTs and PKH. Offsetting under the BOS will satisfy BSC's Habitat Compensation Policy through mitigation options where possible, protection of the same category of PKH, threatened species habitat enhancement, feral pest and weed management, and monitoring of the site. The offset site will also be protected in perpetuity under the *Biodiversity Conservation Act 2016*.

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00	14/01/2020	Koala Habitat Assessment Report	Vanessa Cain Environmental Scientist	Nigel Cotsell Team Leader Coffs Harbour	James Davis Wildlife Team Manager
01	15/10/2020	Koala Habitat Assessment Report	Vanessa Cain Environmental Scientist	Nigel Cotsell Team leader Coffs Harbour	James Davis Wildlife Team Manager

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