Dulconghi Investments Pty Ltd

Dulconghi Heights Rezoning

Ecology Assessment

October 2016

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1. Introduction

1.1 Overview

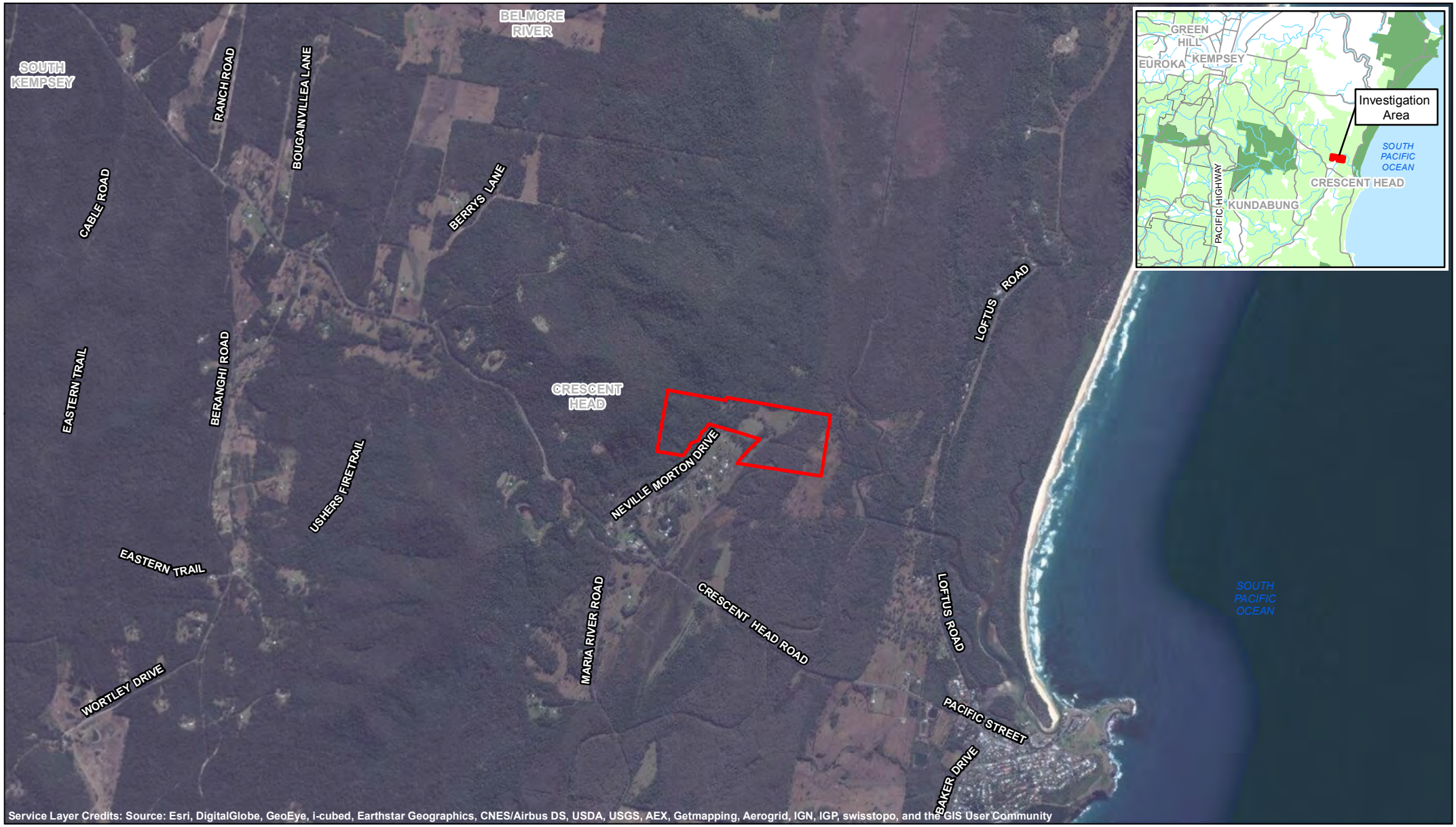
GHD Pty Ltd (GHD) has been engaged by Dulconghi Investments Pty Ltd to complete an ecology assessment to support a rezoning application for the proposed Dulconghi Heights rural residential subdivision. The rezoning application would be submitted to Council for approval under the NSW *Environment Protection and Assessment Act 1979* (EPA Act). This Ecology Assessment is a specialist appendix for inclusion in the rezoning application. It describes the ecological values at the site, with particular emphasis on threatened ecological communities, populations and species listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and *Fisheries Management Act 1994* (FM Act), and *Matters of National Environmental Significance* (MNES) listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 Proposal description

The subject site (Lot 3 DP 1164661 Neville Morton Drive, Crescent Head NSW (see Figure 1) has been included in the Rural Residential Land Strategy (Kempsey Shire Council 2014) as a Stage 1 site for future rezoning. The proponent is seeking approval for the rezoning of land within the indicative development footprint (see Figure 2) to R5 Large Lot Residential under the Kempsey Local Environmental Plan (LEP) 2013.

The exact location, size and nature of the proposal would be determined at the Development Application (DA) stage. A preliminary concept plan for the proposed subdivision has been developed which comprises 14 lots, with an approximate lot size of one hectare (ha) (see Figure 2). Access to the subdivision would be via Neville Morton Drive. Additional road and infrastructure services would also be constructed in accordance with relevant standards to service the proposed allotments. The retention of native vegetation located outside of the development footprint is also proposed to be rezoned E2 Environmental Conservation..

A final design layout that achieves an appropriate balance between development and conservation areas and ultimately improves or maintains the existing biodiversity values at the site would be included in a future Development Application (DA).



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

Investigation area

Dulconghi Investments Pty Ltd
Dulconghi Heights Rezoning
Ecology Assessment

Job Number	22-17672
Revision	B
Date	10 Mar 2016

Regional Locality

Figure 1

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Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DCDB / DTDB, 2012; ESRI: Aerial Imgaery, 2014; Geoscience Australia: 250k Topographic Data Series 3, 2006. Created by: fmackay, tmorton

Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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LEGEND

- Investigation area
- Cadastre
- Proposed subdivison

Dulconghi Investments Pty Ltd
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Proposed Subdivision

Figure 2

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Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DCDB / DTDB, 2012; ESRI: Aerial Imgaery, 2014. Created by: fmackay, tmorton

1.3 Terms and definitions

The following terms are used in this report:

The proposal	The proposed rezoning and residential subdivision at Neville Morton Drive, Crescent Head, NSW.
Indicative development footprint	The area to be directly impacted by the proposal (see Figure 2). In this case it comprises the preliminary construction footprint of the proposed residential subdivision and ancillary infrastructure.
Subject site	Lot 3 DP1164661 Neville Morton Drive, Crescent Head, NSW, as shown on Figure 1.
Locality	The area within a 10 km radius of the subject site boundary.
Threatened biota	Threatened species, populations and communities that are listed under the TSC Act, FM Act and/or the EPBC Act.
Biobanking agreement	An agreement entered into between the landowner and the Minister under Part 7A of the TSC Act for establishing a biobank site.
BioBanking Assessment Methodology (BBAM)	The rules of BioBanking established under the TSC Act that determine credits created, credits required and the circumstances that improve or maintain biodiversity values.
BioBanking	The biodiversity banking and offsets scheme established under Part 7A of the TSC Act.
Biobanking statement	Specifies the number and class of credits to be retired for a particular development in accordance with the BBAM. A biobanking statement can only be issued in circumstances that improve or maintain biodiversity values.

1.4 Scope of assessment

The aim of this ecology assessment report is to:

- Describe the existing environment of the subject site, including flora species, vegetation communities, fauna habitats and flora and fauna species known or likely to occur.
- Present the ecological assessment of the subject site to support the rezoning application.
- Assess the value and conservation significance of native vegetation and habitats within the subject site and the likelihood of occurrence of threatened biota based on habitats present.
- Compile a list of threatened biota previously recorded, or predicted to occur in the locality and an assessment of their potential to occur in the subject site and/or be affected by the proposal.
- Provide a preliminary assessment of likely impacts of the proposed development.
- Provide an analysis of the ecological constraints to development in the context of relevant environmental legislation.

1.5 Purpose of this report

To prepare an Ecology Assessment Report to support a Planning Proposal for a portion of Lot 3 DP 1164661 Neville Morton Drive, Crescent Head NSW. The report describes the site's biodiversity values as well as possible impacts associated with any future development of the land.

2. Legislative context

2.1 NSW legislation

2.1.1 Environmental Planning and Assessment Act 1979 (EPA Act)

The EPA Act forms the legal and policy platform for development proposal assessment and approval in NSW and aims to, inter alia, 'encourage the proper management, development and conservation of natural and artificial resources'. All development in NSW is assessed in accordance with the provisions of the EPA Act and EPA Regulation 2000. The rezoning application would be submitted to Council for approval under Part 4 of the NSW Environment Protection and Assessment Act 1979 (EPA Act).

Section 5A of the EPA Act lists seven factors that must be taken into account in the determination of the significance of potential impacts of a proposed activity on threatened species, populations or ecological communities (or their habitats) listed under the TSC Act and the FM Act. The '7-part test' is used to assist in the determination of whether a proposal is 'likely' to impose 'a significant effect' on threatened biota and thus whether a species impact statement (SIS) is required.

The future development application for the proposal would require assessment of impacts on threatened biota under Section 5A or an application for a biobanking statement (see TSC Act below).

2.1.2 Threatened Species Conservation Act 1995 (TSC Act)

The TSC Act provides legal status for biota of conservation significance in NSW. The Act aims to, inter alia, 'conserve biological diversity and promote ecologically sustainable proposal'. It contains schedules that list endangered, critically endangered and vulnerable species, populations, ecological communities, and key threatening processes in NSW. Potential impacts on any of these biota must be subject to an impact significance assessment ("7-part test) through the provisions of Section 5A of the EPA Act or a biobanking statement under Part 7A of the TSC Act.

Part 7A of the TSC Act establishes the biodiversity banking and offsets scheme (BioBanking). Under Part 7A a proponent may obtain a 'biobanking statement' for a development which means that Section 5A of the EPA Act does not apply to that development. A biobanking statement is issued under section 127ZL of the TSC Act and specifies the number and class of biodiversity credits to be retired for a particular development in accordance with the BBAM in order to achieve an 'improve or maintain' outcome for biodiversity values. The statement may include other conditions to minimise the impact of the development on biodiversity values. If provided to a consent or determining authority under the EPA Act, the statement must be included as a condition of development consent or approval.

2.1.3 National Parks and Wildlife Act 1979

The National Parks and Wildlife Act 1974 (NPW Act) provides the basis for the legal protection of native animals and plants in NSW. A wildlife licence is required under the NPW Act to harm or pick protected fauna and flora. All field surveys were carried out under a Section 132C scientific licence (SL100146).

2.1.4 Fisheries Management Act 1994 (FM Act)

The FM Act contains schedules that list endangered, critically endangered and vulnerable aquatic species, populations, ecological communities, and key threatening processes of relevance to aquatic environments. As for biota listed under the TSC Act, potential impacts on any of these species must be addressed through 7 part tests in accordance with section 5A of the EPA Act. If a significant impact is likely, an SIS must be completed and a licence obtained pursuant to Part 7a of the FM Act. The proposal does not involve any dredging or reclamation that would require specific consideration under the Act.

2.1.5 Noxious Weeds Act 1993 (NW Act)

The NW Act provides for the declaration of noxious weeds by the Minister for Primary Industries. Noxious weeds may be considered noxious on a National, State, Regional or Local scale. All private landowners, occupiers, public authorities and Councils are required to control noxious weeds on their land under Part 3 Division 1 of the NW Act. As such, if present, noxious weeds on the site should be assessed and controlled.

There are at least two noxious weed species present at the subject site, both of which would require management during construction of the proposal and control once the residential subdivision has been established.

2.2 NSW policies and guidelines

2.2.1 State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14)

This policy aims to preserve and protect areas identified and mapped as coastal wetlands in the environmental and economic interests of the State. Land on the eastern portion of the subject site is mapped as a coastal wetland under this policy. The Planning proposal does not include any change to the mapped boundary of the SEPP 14 wetland or the changing of the E2 zone to the east of this boundary. The proposed subdivision has been designed to ensure no dwellings, associated infrastructure or Assets Protection Zones (APZ's). As such, there would be no impacts to the mapped SEPP 14 area associated with the proposed rezoning. This approach also removes the need for Environmental Impact Assessments (EIS) to accompany future Development Applications.

2.2.2 State Environmental Planning Policy No. 44 – Koala Habitat (SEPP 44)

This policy aims to encourage the proper conservation and management of natural vegetation identified as providing habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline.

Kempsey Shire Council has developed a Comprehensive Koala Plan of Management (CKPoM) for the Eastern Portion of the Kempsey Shire Local Government Area (LGA). This plan satisfies the requirements of SEPP 44 and replaces the requirement for preparation of an individual KPoM in relation to development in areas of *core Koala* habitat. Further information regarding the Kempsey CKPoM and implications for the proposal is provided at Section 2.2.4.

2.2.3 Kempsey Local Environmental Plan (LEP) 2013

The Kempsey LEP outlines planning provisions for land within the Kempsey Shire LGA in accordance with the relevant standard environmental planning instrument under section 33A of the EPA Act.

Under the LEP, zoning for the subject site falls into the following two categories (see Figure 3):

- RU2 – Rural Landscape.
- E3 – Environmental Management.

The subject site has been included in the draft Rural Residential Land Strategy (Kempsey Shire Council 2013) as a Stage 1 site for future rezoning. Following approval and finalisation of the Strategy from the Department of Planning and Environment (DPE), rezoning of the site can occur, subject to approval from Kempsey Shire Council (KSC). The proponent is seeking approval for the rezoning of land within the indicative development footprint to R5 Large Lot Residential (see Figure 4).

2.2.4 Comprehensive Koala Plan of Management for the Eastern portion of the Kempsey LGA

The majority of subject site is mapped as Secondary (Class B) Preferred Koala Habitat with a small portion in the north east corner mapped as Secondary (Class A) under the Kempsey CKPoM. Vegetation that falls within the Class A category includes a Primary Feed Tree (PFT) growing in association with one or more Secondary Feed Trees (SFT). The Class B category is defined as vegetation communities and/or associations wherein primary food tree species are absent and secondary or supplementary food tree species are identified.

Assessments of the site indicated the presence of Tallowwood (*Eucalyptus microcorys*) and Grey Gum (*Eucalyptus propinqua*), which are listed as a PFTs, were recorded in scattered distribution within the western portion of the site. Consequently, despite the majority of the site being mapped as Secondary (Class B) Preferred Koala Habitat, this portion of the site is categorised as Secondary (Class A) and covers an area of 7.5 hectares. The small area of the site currently mapped as Secondary (Class A) habitat (approximately 0.4 hectares) was also visited and should be classified as ‘other vegetation’ as none of the listed PFTs or SFTs under the CKPoM occur in this location. The remainder of the site, covering an area of approximately 8.3 hectares, is considered ‘other vegetation’ as this portion of the site is cleared or contains only scattered trees which are not PFT’s or SFT’s.

Details of the possible impacts from the subdivision and associated compensation measures are include in Section 5.3.

2.3 Commonwealth legislation

2.3.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

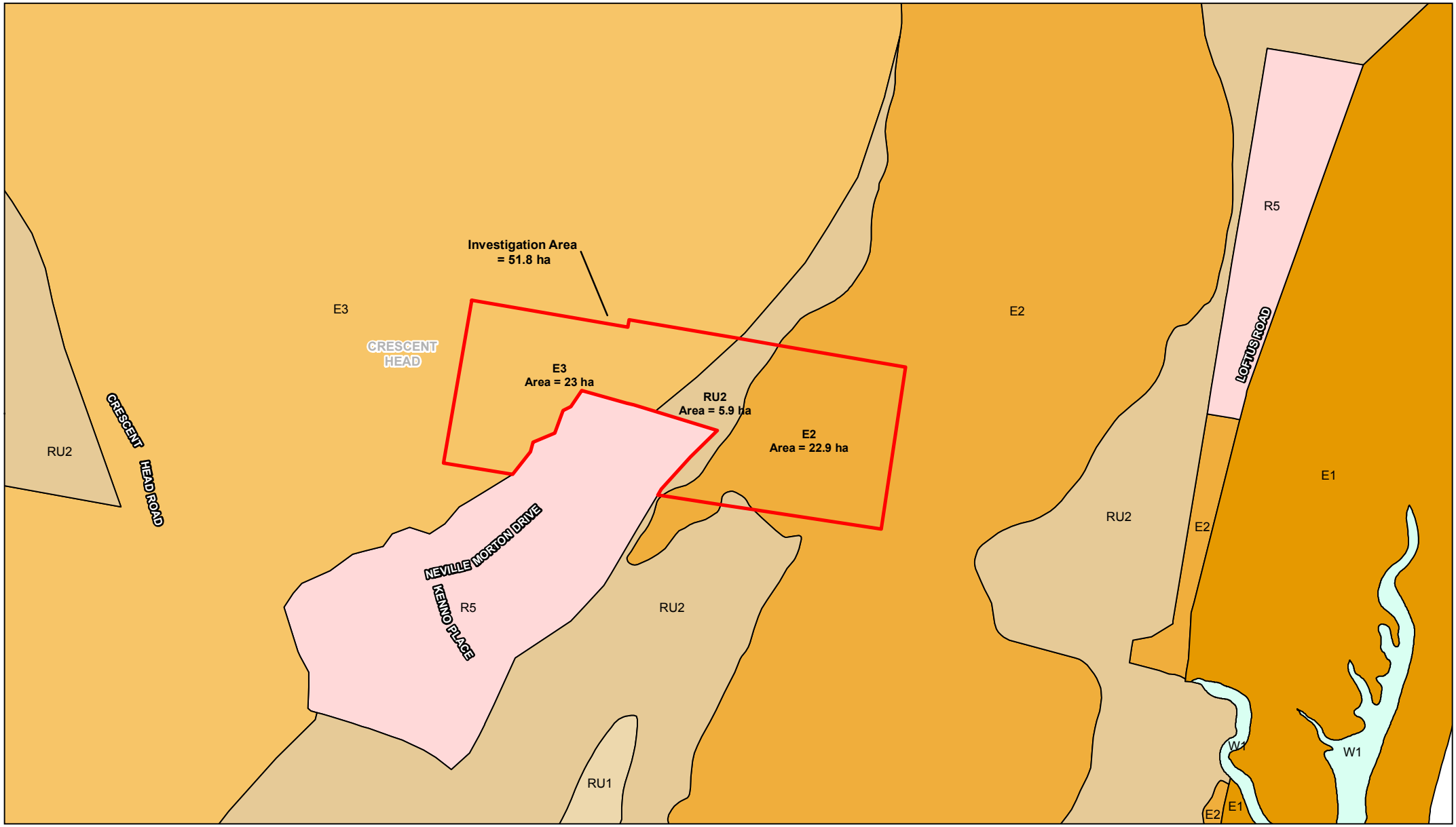
The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on Matters of National Environmental Significance (MNES) undergo an assessment and approval process. Under the EPBC Act, an action includes a proposal, undertaking or activity. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Government Minister for the Environment (the 'Minister').

The EPBC act identifies MNES as:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (Ramsar wetlands).
- Threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- Nuclear actions (including uranium mining).
- A water resource, in relation to coal seam gas development and large coal mining development.

Potential impacts on any MNES must be subject to assessments of significance pursuant to the Department of the Environment (DotE) *Significant Impact Guidelines* (DotE 2013). If a significant impact is considered likely, a referral under the EPBC Act must be submitted to the Commonwealth Environment Minister.

A number of threatened flora and fauna species listed under the EPBC Act have been identified as occurring (or potentially occurring based on known habitat requirements) within the subject site (see Section 4.3). Once the proposed subdivision design has been finalised, an assessment will be undertaken to determine whether the proposal is likely to impact on any listed threatened species and whether a referral is required under the provisions of the Act.



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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LEGEND

- Investigation area
- E1, National Parks and Nature Reserves
- E2, Environmental Conservation
- E3, Environmental Management
- R5, Large Lot Residential
- RU1, Primary Production
- RU2, Rural Landscape
- W1, Natural Waterway

Dulconghi Investments Pty Ltd
Dulconghi Heights Rezoning
Ecology Assessment

Job Number 22-17672
Revision B
Date 10 Mar 2016

Current Zoning

Figure 3

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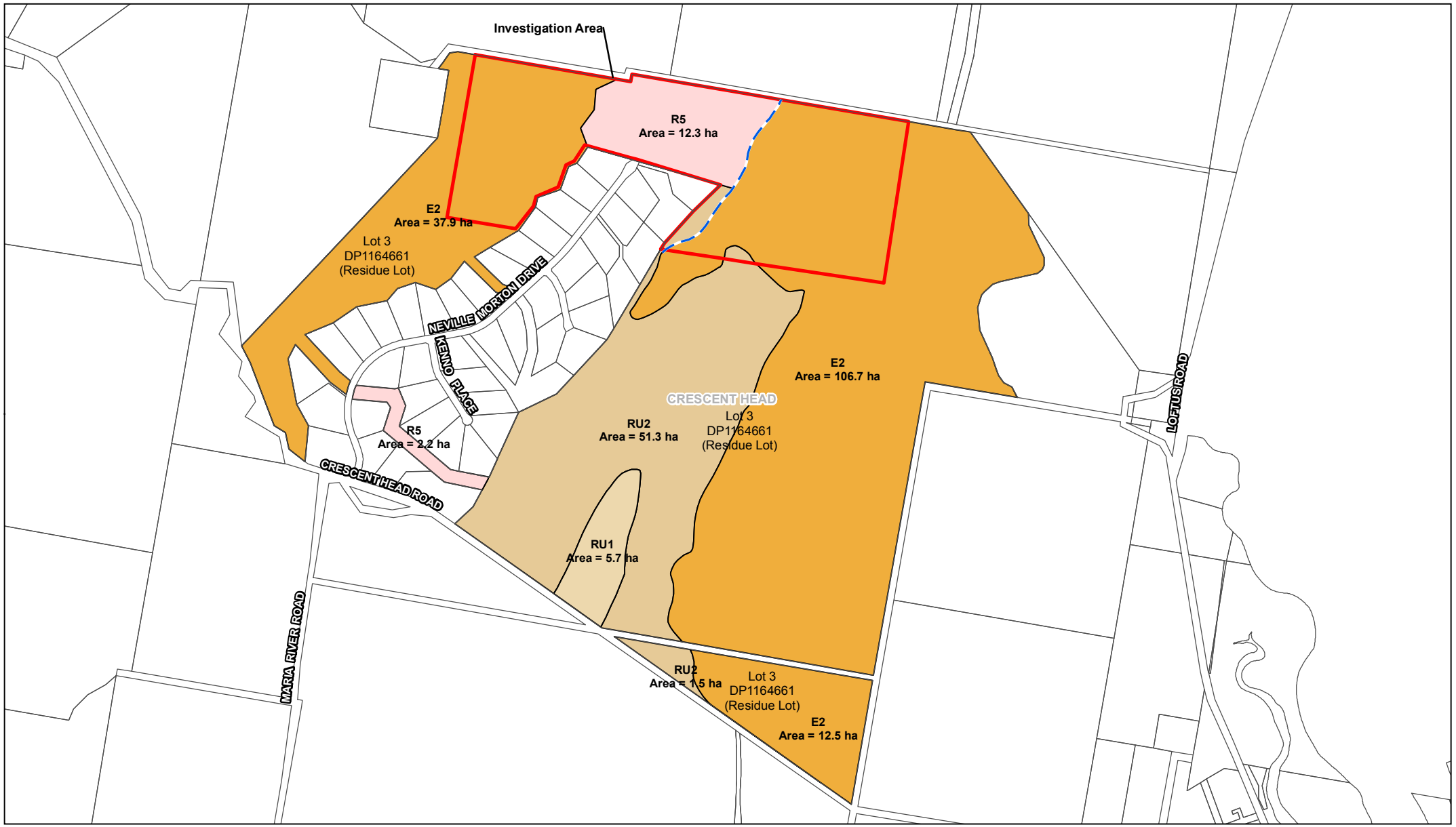
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DCDB / DTDB, 2012; DoP&I: LEP Zoning, 2014. Created by: fmackay, tmorton



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Investigation area
- Cadastre
- Existing zone boundary

Proposed zoning

- R5, Large Lot Residential
- RU1, Primary Production
- RU2, Rural Landscape
- E2, Environmental Conservation

Dulconghi Investments Pty Ltd
Dulconghi Heights Rezoning Application

Job Number 22-17672
Revision 0
Date 11 Aug 2016

Proposed Zoning

Figure 4

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Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data source: LPI: DCDB / DTDB, 2012; DoP&I: LEP Zoning, 2014. Created by: fmackay, tmorton, gmcdiarmid

3. Methods

3.1 Desktop assessment

A desktop assessment was undertaken to identify threatened flora and fauna species, populations and ecological communities listed under the TSC Act and FM Act, and MNES listed under the EPBC Act that may be affected by the proposal. Reports and database records pertaining to the subject site and locality (ie within a 10 km radius of the subject site) were reviewed and included:

- NSW Office of Environment and Heritage (OEH) Wildlife Atlas database for records of threatened species listed under the TSC act (OEH 2015a; data downloaded on 2 March 2015).
- Department of the Environment (DotE) Protected Matters Online Search Tool for MNES listed under the EPBC Act and predicted to occur in the locality (DotE 2015a; database queried on 3 March 2015).
- Department of Primary Industries (DPI) Threatened Species Records Viewer (DPI 2015; database queried on 3 March 2015).
- OEH (2015b) *NSW Vegetation Types Database* and DECC (2009) BioBanking operation manual to define vegetation types and condition classes within the subject site.
- Biolink Ecological Consultants (2011) Comprehensive Koala Plan of Management for Eastern Portion of Kempsey Shire LGA (Volume 1 - Working Provisions). Prepared for Kempsey Shire Council.
- Biolink Ecological Consultants (2009) Comprehensive Koala Plan of Management for Eastern Portion of Kempsey Shire LGA Volume 2 Resource Study. Prepared for Kempsey Shire Council. A review of the following ecological assessments previously undertaken on or within close proximity to the subject site was also undertaken:
- Kendall & Kendall (1996) *Assessment of Significance on Possibly Occurring Threatened Species, SEPP 44 Koala Habitat Assessment and SEPP 46 Native Vegetation Assessment of Proposed Subdivision of Part Lots 2 & 3 DP794159*.
- Kendall & Kendall (1999) *Flora and Fauna Assessment of the "Habitat Zone" – Dulconghi Heights Estate*.
- GHD (2013) *Crescent Head Rezoning Submission*.

The habitat resources present at the site (determined during the site inspection) were compared with the known habitat associations/requirements of the relevant threatened and migratory biota identified by the desktop review. This was used to determine the likelihood of each threatened ecological community, endangered population and threatened or migratory species occurring within the study area.

3.2 Field survey

Preliminary field surveys were undertaken on 11 September 2013 to assess vegetation types and flora species present. Further detailed surveys were completed on 22 October 2014 to accurately describe and map vegetation communities within the proposed development footprint. A total of four BioBanking survey transects/plots were undertaken at the site in accordance with the BBAM. Koala Spot Assessment Technique (SAT's) and Koala Feed Tree mapping was completed on 1 October 2015.

3.3 Survey limitations

Vegetation mapping at the site comprises preliminary mapping of vegetation types and condition only. This level of survey reflects the intent to undertake more extensive survey effort at the development application stage should the rezoning application be successful.

The desktop assessment provided an indication of the native flora and fauna and especially threatened biota that could potentially occur in the subject site or be affected by the proposal (including seasonal, transient or cryptic species). The habitat assessment conducted for the site allows for identification of habitat resources for such species. As such, the survey was not designed to detect all species, rather to provide an overall assessment of the ecological values on site in order to predict potential impacts of the proposal, with particular emphasis on endangered ecological communities, threatened species and their habitats.

Survey effort undertaken to date would be insufficient to inform a detailed Ecological Assessment or Biobanking statement to support a Development Application for the proposed subdivision. Rather, the survey effort is commensurate with a rezoning application. It is anticipated that further detailed surveys would be undertaken to meet the requirements of these assessment processes, and would include formal flora and fauna surveys as well as targeted searches for threatened species identified as having the potential to occur within the subject site.

3.4 Staff qualifications

This report was prepared by Amanda Ayres based on field surveys conducted by GHD ecologists and review of existing information. The assessment was peer reviewed by Daniel Williams. Staff qualifications are presented in Table 3-1.

Table 3-1 Staff qualifications

Name	Position/project role	Qualifications	Relevant experience
Daniel Williams	Principal Environmental Consultant/technical review Field assessments	B. App. Sc. BioBanking Assessor Accreditation [1]	15+ years
Amanda Ayres	Ecologist/reporting	BEnvSc (Env Mgt)	10+ years
Arien Quinn	Ecologist/field surveys	BSc, (B.A/BSc) BioBanking Assessor Accreditation [1]	8+ years
Leanne Gallagher	Ecologist/field surveys	BSc(EM)	10+ years
1 Refer to OEH (2015c) list of accredited assessors.			

4. Existing environment

4.1 Site context

4.1.1 Location and land uses

The subject site is known as Lot 3 DP 1164661, Neville Morton Drive, Crescent Head (see Figure 1) and is located on the north side of Crescent Head Road, less than 3 km to the north west of the Crescent Head town centre.

The site lies directly adjacent to and is accessed from an existing rural residential estate known as Dulconghi Heights. This estate currently has a central access road (Neville Morton Drive) and associated services which extend through to the boundary of the site. The rezoning of the site for rural residential development would simply lead to an extension of the existing subdivision.

As shown in Figure 3, the site is currently zoned RU2 – Rural Landscape, E2 – Environmental Conservation and E3 – Environmental Management under the Kempsey LEP 2013.

Land uses surrounding the site include the existing Dulconghi Heights rural residential estate to the south, agricultural lands to the east used for cattle grazing and vegetated lands to the north and west.

4.1.2 Climate

The climate is generally warm-temperate in nature. During summer, warm moist north-east to south-east winds prevail, bringing rain in the form of thunderstorms or depressions from subtropical cyclones moving south. In winter, the northern movement of the anticyclones leads to a dominance of usually dry west to south winds, often leading to fine sunny days and cool nights. Rainfall is usually associated with cold fronts and the coolest temperatures.

Annual rainfall is most influenced by distance from the coast and topographic position, with a general decrease from east to west. Annual rainfall in the Kempsey area (nearest station) is approximately 1,213 mm pa (BOM 2014), falling predominantly in summer and autumn.

The annual mean daily average temperature ranges from 29°C to 12°C (nearest recording location is Kempsey (BOM 2014). The coastal strip is usually several degrees cooler though in summer and is typically closer to an average of 24°C.

4.1.3 Landscape context

The site occurs within the ‘Manning – Macleay Barriers and Beach’ Mitchell Landscape (DECC, 2008). Mitchell (2002) describes this landscape as comprising beaches, dunes, swamps and lagoons on Quaternary coastal sands, with inner and outer barrier dune sequences. Elevation ranges between 0 to 160 m, increasing from east to west.

Based on interpretation of the 1:100 000 Kempsey Soil Landscapes map (DLWC 1999), the subject site appears to fall over four distinct soil landscapes (Atkinson 1999), these being:

- Beranghi Soil Landscape: Associated with undulating rises and low hills with broad crests and drainage depressions. Elevation ranges from 20-30m, rising to 50m. Soils on crests are shallow to deep (40-300cm); moderately deep (100-300cm) on footslopes and deep (>300cm) on flats. The soil has limitations of seasonal waterlogging, water erosion hazard, shallow and acidic soils and low permeability. The majority of the site (including the proposed development footprint) occurs on this soil landscape.

- Crescent Head Soil Landscape: Associated with isolated coastal headlands and rolling hills with elevation and relief up to 250m, on conglomerates and lithic sandstones of the Kempsey Beds. Comprises shallow (60-100cm) stony Lithosols on crests and sideslopes and limited by sodic, erodible, strong acidity soils with high aluminium toxicity potential and low available water holding capacity. Found within the steeper, western portion of the subject site.
- Connection Creek Soil Landscape: Associated with level, swamp, linear open-depressions and supratidal flats of low elevation and relief (<1m) with a narrow central channel and minor tidal influence. Soils are deep (>300cm) and very poorly drained and limited by waterlogging, low bearing wet strength, sodicity, acidity, salinity and aluminium toxicity. Mapped on the eastern section of the subject site, associated with a drainage line.

4.1.4 Hydrology

The site is traversed by one small ephemeral drainage line in the north western portion associated with the existing farm dam. In addition, there are two areas of 'low depressions' with one containing Paperbark Swamp Forest.

4.2 Vegetation and habitat

4.2.1 Vegetation zones

As mapped in Figure 5, the proposed development footprint includes three distinct vegetation types, these being:

- Blackbutt Tallowwood grassy open forest.
- Paperbark Swamp Forest.
- Cleared lands.

A summary of these vegetation zones is provided in Table 4-1 and more detailed information as follows. A complete list of flora species recorded during the surveys is provided at Appendix A.

Table 4-1 Vegetation zones within the proposed development footprint

Vegetation type (OEH 2014b)	Vegetation type ID	Condition	Area within the proposed development footprint	Conservation significance
Blackbutt Tallowwood dry grassy open forest of the central parts of the north coast	NR119	Moderate/Good -medium	7.5 ha	Not an EEC
Paperbark swamp forest of the coastal lowlands of the north coast	NR217	Moderate/Good - medium	0.6 ha	Not an EEC
Cleared lands	N/A		4.2	
Total area			**12.3 ha**	

Blackbutt Tallowwood dry grassy open forest of the central parts of the north coast (NR119)

This vegetation type is located throughout the western portion of the proposed development footprint and a small patch in the south eastern portion (covering approximately 45% of the footprint area) and is in a modified state with the mid storey largely removed and ground covers dominated in locations by introduced pastures. This portion of the site is subject to constant grazing from cattle.

The vegetation is primarily characterised by a tree canopy dominated by Blackbutt (*Eucalyptus pilularis*) and occasional scattered Tallowwood (*Eucalyptus microcorys*), Brush Box (*Lophostemon confertus*) and Pink Bloodwood (*Corymbia intermedia*). The mid storey has been largely removed through the impacts of grazing and regular slashing however species present included occasional occurrences of Cheese Tree (*Glochidion ferdinandi*), Blueberry Ash (*Elaeocarpus reticulatus*), Forest Sheoak (*Allocasuarina torulosa*), Geebung (*Persoonia stradbrokensis*) and Sweet Pittosporum (*Pittosporum undulatum*).

Groundcovers include a mix of introduced grasses/herbs as well as Blady Grass (*Imperata cylindrica*), Dusky Coral Pea (*Kennedia rubicunda*), Sword Sedge (*Lepidosperma laterale*), Spiny-headed Mat-rush (*Lomandra longifolia*), Many-flowered Mat-rush (*Lomandra multiflora*), Weeping Grass (*Microlaena stipoides*), Barbed Wire Grass (*Cymbopogon refractus*), Blue Flax-lily (*Dianella caerulea*) and Kangaroo Grass (*Themeda australis*).

Weed species present included introduced grasses Cobbler's Pegs (Bidens pilosa), Flaxleaf Fleabane (*Conyza bonariensis*), Lantana (*Lantana camara*) and Fireweed (*Senecio madagascariensis*).

Plate 1 Blackbutt Tallowwood in the western portion of the site

Paperbark swamp forest of the coastal lowlands of the north coast (NR217)

This forested wetland vegetation type is restricted to a small area of the proposed development footprint in the eastern portion of the site. This vegetation type is heavily degraded and is characteristically dominated by scattered Broad-leaved Paperbark (*Melaleuca quinquenervia*) with occasional regenerating Swamp Oak (*Casuarina glauca*) only.

The mid storey has been largely removed due to the impacts of previous clearing and active grazing and is represented by a small number of individuals only comprising Cheese Tree, Geebung and Bottlebrush (*Callistemon* spp.).

The groundcover stratum is generally dominated by introduced weeds/grasses and also Tall Sedge (*Carex appressa*) and occasional sedges such as Saw-sedge (*Gahnia* spp.). This small patch of vegetation is not considered to be indicative of Swamp Sclerophyll Forest on Coastal Floodplains, which is listed as an EEC under the TSC Act. The patch of vegetation is not associated with a coastal floodplain as described in Section 4.3.2.

Plate 2 Degraded Paperbark swamp forest in the centre of the site

Cleared Lands

This area dominates the eastern portion of the proposed development footprint and covers approximately 45% of the total area. This area has been subjected to intense stock grazing and is dominated by the introduced grasses such as Paspalum (*Paspalum dilatatum*) and Kikuyu (*Pennisetum clandestinum*) as well as Fireweed.

Plate 3 Cleared lands in the eastern portion of the site

The distribution of vegetation at the site is shown in Figure 5.

Paper Size A4

0 10 20 40 60 80

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

Mapped SEPP14 wetland

Vegetation

Blackbutt Tallowwood dry open forest (NR119)

Paperbark Swamp Forest (NR217)

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Dulconghi Heights Rezoning
Ecology Assessment

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Ecology Constraints

Figure 5

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Data source: LPI: DCDB / DTDB, 2012; ESRI: Aerial Imgaery, 2014; OEH: SEPP14, 2012. Created by: fmackay, tmorton

4.2.2 Noxious and environmental weeds

The *Noxious Weeds Act 1993* provides for the declaration of noxious weeds in local government areas. Landowners and occupiers must control noxious weeds according to the control category specified in the Act. Public authorities must control noxious weeds according to the control category to the extent necessary to prevent their spread to adjoining land.

The subject site contains two species declared as noxious weeds in the Kempsey LGA, as shown in Table 4-2. Lantana occurs as scattered individuals throughout the Blackbutt Tallowwood dry grassy open forest while Fireweed is prevalent throughout the cleared grazing areas.

Table 4-2 Declared noxious weeds recorded during the field survey

Scientific name	Common name	Control category	Legal requirements
Lantana camara	Lantana	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Senecio madagascariensis	Fireweed	4	The plant must not be sold, propagated or knowingly distributed

4.2.3 Fauna habitats

Targeted fauna surveys were not undertaken at the site, however broad habitat features identified include:

- Myrtaceous plant species – provides a foraging resource for a variety of nectivorous birds and mammals, including the Grey-headed Flying-fox.
- Modified grassland provides a potential foraging/nesting resource for insectivorous and grainivorous bird species and a sheltering resource for reptiles.
- The presence of Forest Oak – provides a potential foraging resource for the Glossy Black-cockatoo.
- The Koala food trees Tallowwood (*Eucalyptus microcorys*) and Grey Gum (*Eucalyptus propinqua*), potential foraging resource for the Koala.
- SEPP 14 wetland area to the east of the proposed subdivision provides a potential foraging/breeding resource for aquatic bird species, native frogs and other fauna.
- Small ephemeral drainage lines.

4.3 Conservation significance

4.3.1 Overview

Based on the desktop assessment the following threatened biota and MNES are known or predicted to occur in the locality:

- Nine threatened ecological communities (TECs).
- 11 threatened flora species.

- 37 threatened fauna species, comprising three frogs, 19 birds, 15 mammals and one reptile.
- 11 migratory species.

This list does not include marine threatened and migratory species or shorebirds which were identified during the database searches because the locality does not contain any marine or estuarine habitats.

The occurrence and potential occurrence of these threatened biota within the subject site is discussed in the following sections.

4.3.2 Threatened biota (TSC Act and FM Act)

The database searches identified 10 threatened flora species, 37 threatened fauna species and nine TECs listed under the TSC Act as having been previously recorded or predicted to occur in the locality. Each of the threatened biota are included in the likelihood of occurrence table included as Appendix B.

A search of the Department of Primary Industries Threatened Species Records Viewer (DPI 2015) showed that no threatened fish or invertebrate species listed under the FM Act have been previously recorded or are predicted to occur within the locality.

The potential for these threatened biota to occur within the subject site is discussed in the following sections and Appendix B.

Threatened ecological communities

A total of nine TECs were identified within the locality as a result of database searches. Details of these communities are provided in Table 4-3.

Table 4-3 Threatened ecological communities known within the locality

Naming under the TSC Act	Naming under the EPBC Act	TSC Act Status	EPBC Act Status
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Subtropical and Temperate Coastal Saltmarsh	E	V
Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions		E	-
Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	E	CE
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	Lowland Rainforest of Subtropical Australia	E	CE
Lowland Rainforest on Floodplain in the NSW North Coast Bioregion	Lowland Rainforest of Subtropical Australia	E	CE

Naming under the TSC Act	Naming under the EPBC Act	TSC Act Status	EPBC Act Status
Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion		E	-
Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions		E	-
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions		E	-
Themeda Grassland on Seacliffs and Coastal Headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions		E	-

No other TECs were identified on the site. The Paperbark Swamp Forest community (NR217) identified in the eastern portion of the site in association with the minor drainage line, is not considered to be indicative of the Swamp Sclerophyll Forest on Coastal Floodplains which is a listed as an EEC under the TSC Act. The community exists as a small patch of remnant *Melaleuca quinqinervia* trees only with no shrub layer present and groundcovers being limited to introduced pastures. The small patch is not associated with a floodplain and it appears that the remnant Paperbark trees have established on the site due to the establishment of a farm dam immediately downstream changing the local hydrology in this location or may be associated with a small discharge area from water draining from Dulconghi Mountain. GHD has analysed soil samples taken from within the small patch of Paperbark Swamp Forest with soil immediately to the west of the patch, taken from within the Blackbutt Tallowwood Forest, as well as samples from the floodplain associated with the vegetation to the east of the site. This analysis showed the soil from within the Paperbark Swamp Forest was similar to that contained within the Blackbutt Tallowwood Forest to the west of the patch of Paperbark Swamp Forest. It should also be noted that Blackbutt Tallowwood Forest also exists immediately below the farm dam which further supports the position the small patch of remnant Paperbarks does not constitute an example of the EEC. The area is also subjected to constant grazing.

SEPP 14 Wetlands

Lands in and to the east of the site are currently zoned E2. This zoning reflects the existing mapped boundary of the SEPP 14 wetlands. The proposed rezoning retains the existing E2 zone boundary within the proposed eastern lots. . The photo included as Plate 4, below, is taken from the north east corner of the site. The proposed subdivision will see the lots proposed in the eastern portion of the site include a portion of this land however no dwellings, associated infrastructure and APZ's would be included within the SEPP 14 boundary. This means there will be no impacts within the SEPP 14 boundary and future Development Applications would not require and EIS.

Plate 4 SEPP 14 Vegetation boundary

Threatened flora species

No threatened flora species have been recorded within the proposed development footprint to date. Based on the preliminary assessment of habitats, soil types and vegetation occurring within the site, a total of two threatened flora species have been identified as possibly occurring within the Paperbark Swamp Forest community on the eastern portion of the site. These species are listed in Table 4-4. Surveys of the site did not identify these species and details of potential habitat for these species are included in Appendix B. Areas identified as possible habitat for these species will be retained as part of the proposal.

Table 4-4 Threatened flora that may occur within the site

Scientific name	Common name	TSC Act status	EPBC Act status
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V
Maundia triglochinoides	-	V	-

Threatened fauna species

A total of 20 threatened fauna species have been assessed as having the potential to occur within the subject site based on the habitats present. These species are listed in Table 4-5 and comprise 10 threatened birds, seven threatened bats, two threatened mammals and one threatened frog species. The value of habitats within the subject site for these species is discussed in Section 4.2.3.

Table 4-5 Threatened fauna that may occur within the site

Scientific name	Common name	TSC Act status	EPBC Act status
Calyptorhynchus lathami	Glossy Black-cockatoo	V	-
Daphoenositta chrysoptera	Varied Sittella	V	-
Ephippiorhynchus asiaticus	Black-necked Stork	E	-
Glossopsitta pusilla	Little Lorikeet	V	-
Grus rubicunda	Brolga	V	-
Irediparra gallinacea	Comb-crested Jacana	V	-
Ixobrychus flavicollis	Black Bittern	V	-
Lophoictinia isura	Square-tailed Kite	V	-
Ninox strenua	Powerful Owl	V	-
Tyto novaehollandiae	Masked Owl	V	-
Dasyurus maculatus	Spotted-tailed Quoll	V	E
Miniopterus australis	Little Bentwing-bat	V	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-
Mormopterus norfolkensis	Eastern Freetail-bat	V	-
Phascolarctos cinereus	Koala	V	V
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-
Syconycteris australis	Common Blossom-bat	V	-
Litoria aurea	Green and Golden Bell Frog	E	V

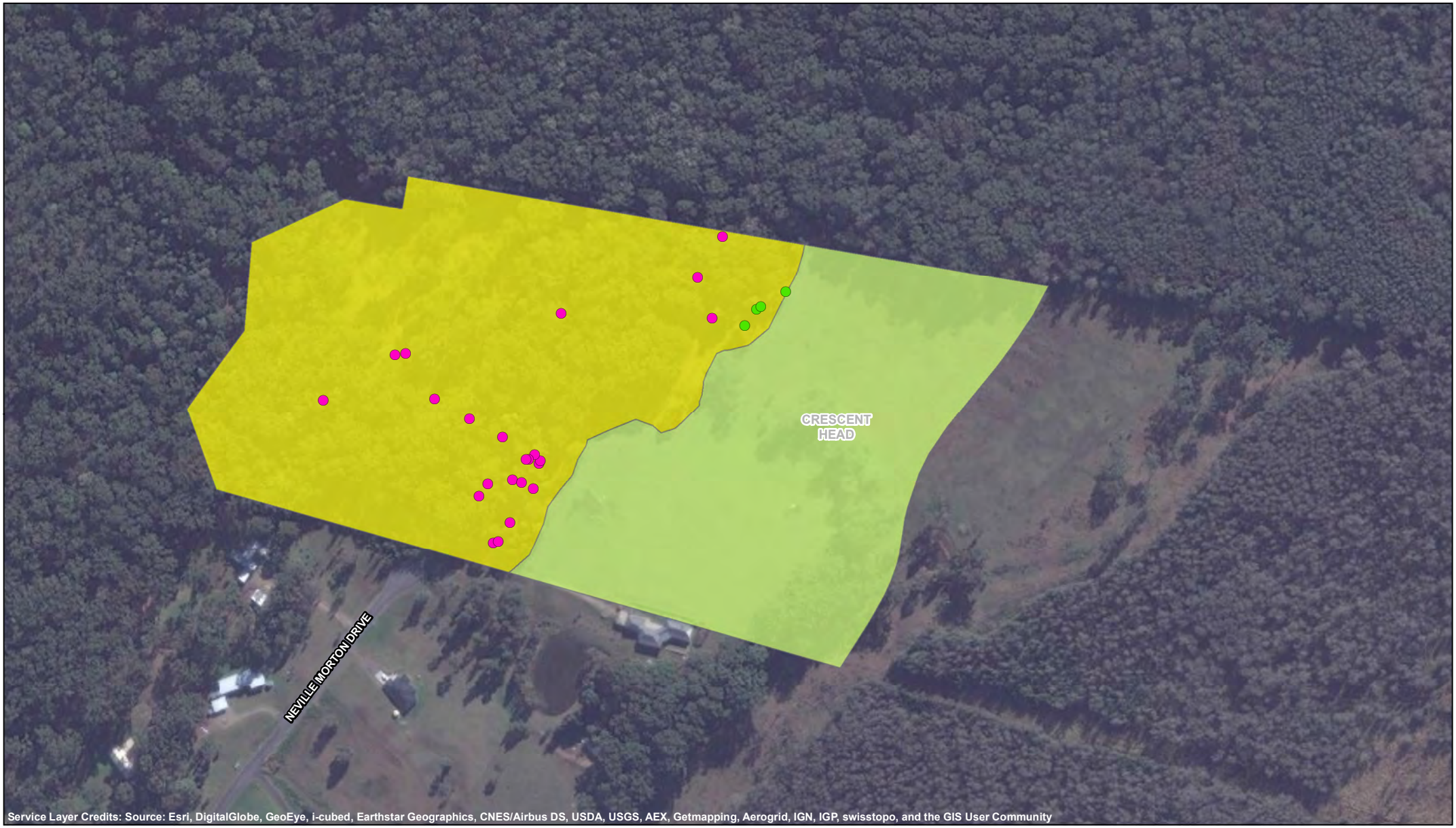
4.3.3 Koala

Kempsey Shire Council has developed a Comprehensive Koala Plan of Management (CKPoM) for the eastern portion of the Kempsey Local Government Area (LGA). This plan satisfies the requirements of SEPP 44 and replaces the requirement for preparation of an individual KPoM in relation to development in areas of core Koala habitat.

The majority of subject site is mapped as Secondary (Class B) Preferred Koala Habitat with a small portion in the north east corner mapped as Secondary (Class A) under the Kempsey CKPoM. Vegetation that falls within the Class A category includes a Primary Feed Tree (PFT) growing in association with one or more Secondary Feed Trees (SFT). The Class B category is defined as vegetation communities and/or associations wherein primary food tree species are absent and secondary or supplementary food tree species are identified.

Assessments of the site indicated that significant adjustments to this mapping were required to reflect the site's actual habitat value to the Koala. The presence of Tallowwood (*Eucalyptus microcorys*) and Grey Gum (*Eucalyptus propinqua*), which are listed as a PFT's, were recorded in a scattered distribution within the western portion of the site. Consequently, despite the majority of the site being mapped as Secondary (Class B) Preferred Koala Habitat under the CKPoM, this portion of the site should be categorised as Secondary (Class A) and covers an area of 7.5 hectares. The small area of the site currently mapped as Secondary (Class A) habitat (0.4 hectares) was also visited and should be classified as 'other vegetation' as none of the listed PFT's or SFT's under the CKPoM occur in this location. The remainder of the site, covering an area of approximately 4.8 hectares, is considered 'other vegetation' as this portion of the site is cleared lands (4.2 hectares) or contains only scattered trees (0.6 hectares) which are not PFT's or SFT's. The difference in the mapping is an inherent result of the CKPoM being a broad scale assessment of the landscape.

GHD's ecologists completed ten SAT assessments associated with PFTs. No Koala activity was detected at the site however there are confirmed sightings of the Koala in the locality and it is assumed the Koala may utilise the site on a transient basis only as part of a broader range. In addition, all Koala feed trees (both Primary and Secondary) were mapped on the site. As mentioned, two PFTs were present on site. The Koala habitat is mapped in Figure 5a.



Paper Size A4

0 10 20 40 60 80

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Other vegetation
- Secondary (Class A) Preferred Koala habitat
- Primary Food Tree (PFT) - Grey Gum
- Primary Food Tree (PFT) - Tallowwood

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Koala Habitat Features

Figure 5(a)

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Data source: LPI: DCDB / DTDB, 2012; ESRI: Aerial Imgaery, 2014. Created by: fmackay, tmorton

4.3.4 EPBC Act MNES

The database searches identified three threatened ecological communities, nine threatened flora species, 14 threatened fauna species and 11 migratory species listed under the EPBC Act as potentially occurring within the locality (see Appendix B).

Threatened ecological communities

As indicated in Table 4-3, the following three EPBC Act listed ecological communities, were identified during the database searches as occurring within the locality:

- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia.
- Lowlands Rainforest of Subtropical Australia.
- Subtropical and Temperate Coastal Saltmarsh.

Site surveys revealed that these communities do not occur within the subject site.

Threatened flora species

As discussed in Section 4.3.2, no threatened flora species have been recorded within the proposed development footprint to date. One EPBC listed threatened flora species, Leafless Tongue-orchid, was identified as possibly occurring within the Paperbark Swamp Forest community on the eastern portion of the site. Areas identified as possible habitat for this species will be retained as part of the proposal.

Threatened fauna species

As indicated in Table 4-5, a total of four EPBC Act listed threatened species were assessed as having the potential to occur within the site. Three of these species (Koala, Grey-headed Flying-fox and Green and Golden Bell Frog) were considered likely to occur, and the fourth species, Spotted-tailed Quoll, was considered as a possible occurrence.

The Koala, Grey-headed Flying-fox and Spotted-tailed Quoll were assessed as potentially utilising the site as a foraging resource as part of a much larger home range. Paperbark Swamp Forest associated with the SEPP 14 wetland on the eastern portion of the site was considered to provide potential habitat for the Green and Golden Bell Frog. This area would be retained as part of the proposal.

Migratory fauna

A total of seven migratory terrestrial bird species and four migratory wetland species were identified by the database searches as known or having the potential to occur within the locality, comprising:

- Migratory terrestrial species
  - Black-faced Monarch (*Monarcha melanopsis*)
  - Rainbow Bee-eater (*Merops ornatus*)
  - Rufous Fantail (*Rhipidura rufifrons*)
  - Satin Flycatcher (*Myiagra cyanoleuca*)
  - Spectacled Monarch (*Monarcha trivirgatus*)
  - White-bellied Sea-Eagle (*Haliaeetus leucogaster*)
  - White-throated Needletail (*Hirundapus caudacutus*)

- Migratory wetland species
  - Cattle Egret (*Ardea ibis*)
  - Great Egret (*Ardea alba*)
  - Latham's Snipe (*Gallinago hardwickii*)
  - Painted Snipe (*Rostratula benghalensis*)

5. Preliminary impact assessment

5.1 Overview

A preliminary assessment of impacts of the proposal is included below. This assessment is based on the proposal and indicative development footprint as described in Section 1.2 and is intended to provide an overview of the potential impacts associated with the proposal. It should be noted, however, that a more comprehensive impact assessment, based on the final development footprint and informed by more extensive survey effort and assessment, would be undertaken at the Development Application stage should this rezoning application be successful.

The exact location, size, lot layout and nature of the development would be determined using reference to the BBAM before the DA stage.

This approach will assist in determining a subdivision design that may not be considered to have a 'significant impact' on threatened biota. The intended amendments to the current zoning would not result in direct impacts within the entire indicative development footprint shown on Figure 2. Impacts are likely to be reduced through retention of vegetation and habitat resources within large lots and potentially also a reduction or reconfiguration of lots. This preliminary impact assessment should therefore be considered as an indication of the maximum impacts that could be associated with the proposal.

5.2 Direct impacts

The direct impacts of the proposal would be limited to areas within the indicative development footprint as shown on Figure 6. The indicative development footprint is contained within Lot 3 DP 1164661 although would not affect the entirety of the subject site. Areas outside of the indicative development footprint would be retained. Impacts within potential conservation areas would therefore be positive in terms of biodiversity outcomes.

5.2.1 Removal of vegetation and habitat

The proposal would result in the removal or modification of approximately 6.98 ha of Blackbutt Tallowwood dry grassy open forest within the indicative development footprint. This includes 2.3 ha that would be cleared for residential dwellings and their associated infrastructure (eg services, roads etc) and 4.68 ha that would be under scrubbed/thinned to accommodate bushfire protection areas. In addition, several remnant Paperbark trees would be removed to accommodate the main access road, dwellings and APZ's (approximately 0.36 ha).

As indicated on Figure 6, there is likely to be scope to retain native trees and some understorey vegetation within the residential lots and to retain native trees within the asset protection zones. In this regard, Preferred Koala Food Trees will be retained across the site where possible, as well as all large hollow-bearing trees within areas nominated as APZ's. Vegetation being impacted as part of the proposed subdivision has already been impacted by the effects of clearing and grazing of cattle meaning clearing of trees to accommodate the APZ's will be limited. This has enabled the project team to be able to retain most of the important habitat trees throughout the site.

No SEPP 14 wetland vegetation will be directly impacted by the proposal.

The extent of vegetation and habitats within the indicative development footprint is summarised in Table 5-1.

Table 5-1 Extent of vegetation within the proposed development footprint

Vegetation community	TSC Act Status	Area impacted by total clearing (hectares)	Area impacted by partial clearing (hectares)	Area to be retained (hectares)
Blackbutt Tallowwood dry grassy open forest of the central parts of the north coast Moderate/good - medium	-	2.3	4.68	0.52 (plus 37.9 within proposed new E2 zone)
Paperbark swamp forest of the coastal lowlands of the north coast Low		-0.06	0.3	0.24
Total Native Vegetation		**2.36**	**4.98**	**38.66**

Note:

1. Partial clearing calculations include Asset Protection Zones

2. Primary Koala feed trees (PFTs) will be retained in Asset Protection Zones and in areas proposed for dwelling construction through the use of Tree Preservation Order or Section 88b instruments.

The Planning Proposal also includes the rezoning of approx. 37.9 ha of Lot 3 DP 1164661 to offset impacts to native vegetation at the site. This approach was discussed with representatives of the DPE and OEH during the site visit on 3 February 2016 and it was agreed this would be a suitable offset activity for the proposals impacts. OEH indicated they were also supportive of the avoidance and mitigation measures proposed within the planning proposal however these actions alone were not considered adequate leading to the rezoning of the additional 37.9 ha as E2 Environmental Conservation.

5.2.2 Impacts on aquatic habitats

A drainage line bisects the proposed development footprint. This drainage line would be retained as part of the proposal. Impacts to water quality through increased runoff from hardstand areas and potential for contamination from surrounding residences may occur as a result of the proposal. However, the adoption of appropriate mitigation measures including appropriate sediment and erosion control measures would reduce the potential for impact.

5.2.3 Koala habitat impacts

Vegetation at the site is identified as Secondary (Class A) Preferred Koala habitat under the Kempsey CKPoM (see Section 2.2.4) and comprises scattered occurrences of the ‘primary food trees’, Tallowwood and Grey Gum (Biolink 2011) are present. It is considered likely that the Koala utilises the site as part of a much larger home range in a transient nature and consequently impacts to this species, in terms of habitat fragmentation would need to be addressed as part of the DA. Impacts to the Koala would be limited to the clearing of 2.3 hectares of Secondary (Class A) Koala habitat and the partial clearing (for APZ’s) of 4.68 hectares. This vegetation is in a degraded state with the canopy already ‘thinned’ in the majority of the western portion of the site due to previous tree clearing and the mid storey largely removed due to the impacts of constant grazing. Approximately four (4) PFTs will be impacted by the proposal through the construction of the access roads or dwellings. Those PFTs occurring within Asset Protection Zones will be protected by a Tree Preservation Order. PFTs proposed to be retained are shown on Figure 5a.

Fragmentation/isolation of habitat would also need to be considered for other species identified as potentially occurring within the subject site (see Table 4-4 and Table 4-5).

Construction activities may result in the injury or mortality of terrestrial fauna that may be sheltering amongst vegetation within the site. Pre-clearing fauna surveys would be recommended as part of the Construction Environmental Management Plan (CEMP) to reduce the risk of injury or mortality to native fauna, especially tree dwelling fauna. The CEMP would also include protocols for the felling of habitat trees and measures for the safe management of native fauna if detected during construction.

Other direct impacts that would need to be considered during the DA phase of the proposal include habitat fragmentation and isolation and fauna injury/mortality.

Offsetting impacts to Koala habitat

The CKPoM Working Provisions (April 2011) outlines the planning provisions associated with the Koala within the portion of the shire covered by the CKPoM. Section 4 sets out the requirements when a Development Application or Planning Proposal seeks to impact on native vegetation, in particular, vegetation mapped as Preferred Koala Habitat (PKH).

This proposal will impact on approximately 6.98 ha of Secondary (Class A) Preferred Koala Habitat with the breakdown of these impacts discussed above. In this case consideration of Section 4.6 of the CKPoM is required. As such, mapping of Koala feed trees and SAT assessments were completed. Under Section 4.7 the proposed rezoning is considered to be 'higher density'. In this case, if the proposal seeks to retain almost all PFTs over 250 mm at dbhob (diameter at breast height over bark), the provisions outlined in Section 4.10 apply. In addition, a habitat compensation package will be prepared in accordance of the provisions outlined in Section 4.12.

The details of this package will be included in the detailed ecological assessment to be completed as part of the future DA documentation. In general, it will include:

- Securing at least twice the area of the habitat being cleared under a conservation mechanism. This will require some consultation with council as the majority of the impact to Koala habitat is limited to 'thinning' of canopy tress for Asset Protection Zones (approximately 4.68 hectares). The area of total clearing is approximately 2.3 hectares. The lands required for the Koala offset would be located within the 37.9 ha of land proposed to be rezoned E2.
- The offset will be secured using the E2 zoning and another conservation mechanism if required by KSC.
- The offset will be located adjacent to the site in vegetation mapped as the same type though in better condition (the preferred area for conservation is not subject to grazing from cattle). Vegetation proposed for conservation is Secondary (Class A) Preferred Koala Habitat.
- The offset site would be subjected to a Vegetation Management Plan or similar (depends on the type of mechanism used to secure the offset) and managed for conservation purposes.

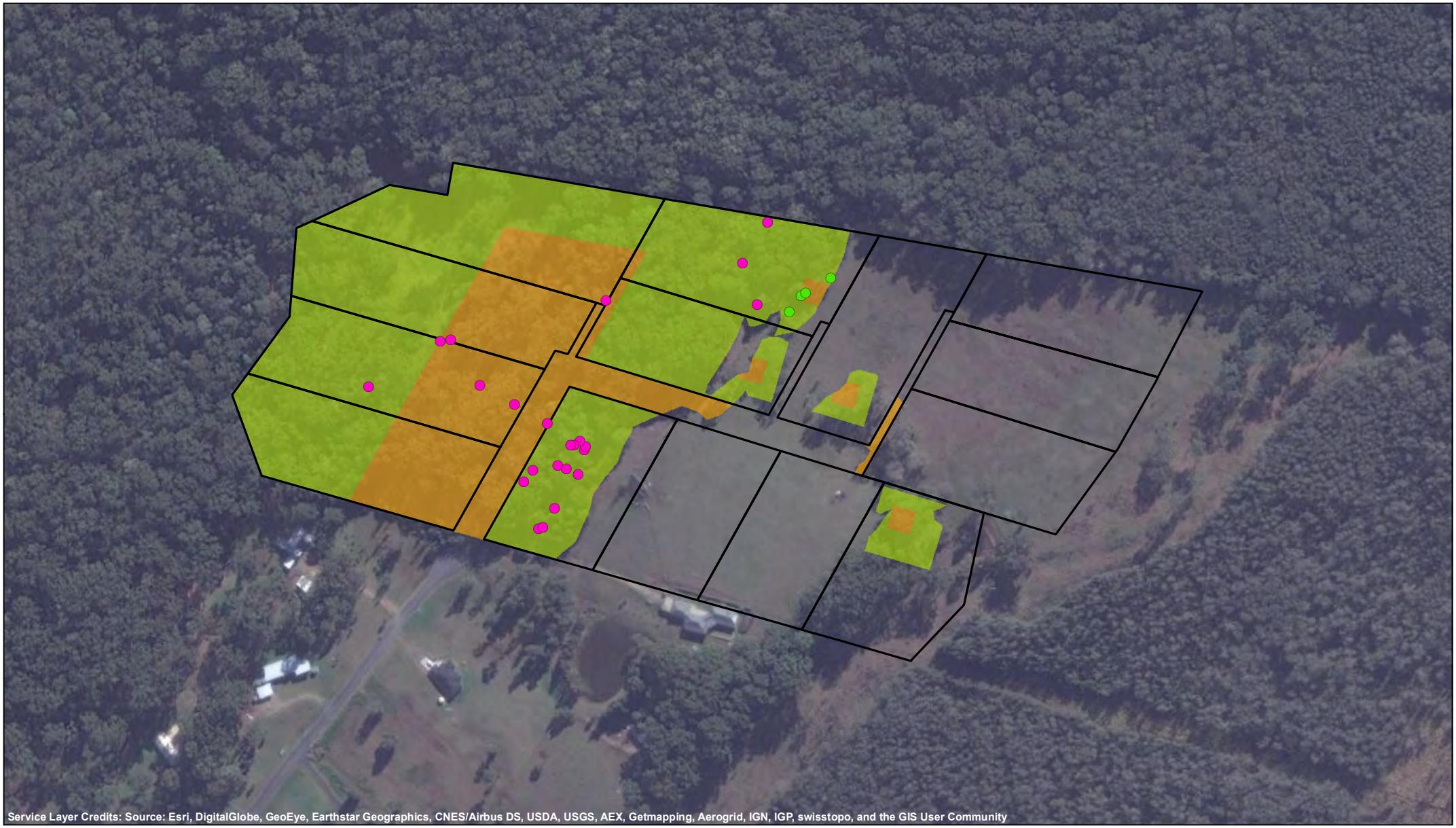
5.3 Indirect impacts

A number of indirect impacts are identified that could potentially affect surrounding native vegetation, native fauna populations and waterways (including SEPP 14 wetland) outside of the proposed development footprint. These impacts relate to:

- Erosion, sedimentation and contamination.
- Weed invasion and edge effects.
- Introduction of pests and pathogens.
- Increased light, noise and vibration.

These impacts would be addressed in greater detail throughout the DA process. It should be remembered that the subdivision plan presented in the planning proposal has been provided to show how a potential subdivision may apply to the land and the considerations associated with reducing impacts to biodiversity. This layout may be subject to change (either through the realignment of lot boundaries or repositioning/ reduction in dwellings) depending on decisions made by approval authorities and/or the applicant. In this regard it is not possible to complete a full ecological impact assessment. Furthermore, such a detailed assessment is not required until the Development Application (DA) process commences.

The results of this assessment show the site is suitable for the proposed subdivision and indicates that the subdivision will not have a 'significant impact' on any threatened biota. Issues associated with the Koala have been considered and addressed in accordance with the CKPoM and it is anticipated that the majority of these issues would be satisfactorily addressed through the adoption of appropriate mitigation measures, which would be incorporated into the CEMP, and outlined during the complete ecological impact assessment which will accompany any future DA.



Paper Size A4

0 10 20 40 60 80

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Proposed subdivison
- Canopy Trees Retained
- Clearing
- Primary Food Tree (PFT) - Grey Gum
- Primary Food Tree (PFT) - Tallowwood

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Revision	C
Date	11 Feb 2016

Ecology Impacts

Figure 6

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Data source: LPI: DCDB / DTDB, 2012; ESRI: Aerial Imgaery, 2014. Created by: fmackay, tmorton

6. Conclusion

A review of existing literature and site surveys indicate the main constraint to future development is the management of biodiversity, including Koala habitat. Constraints to be considered and how they would be managed during future approvals include:

- Impacts to approximately 6.98 ha of modified Blackbutt Tallowwood grassy open forest vegetation, comprising the removal of 2.3 ha of vegetation for residential dwellings and associated infrastructure and partial clearing of 4.68 ha to accommodate bushfire protection areas. This vegetation type is in a degraded state with the canopy already 'thinned' in the majority of the western portion of the site due to previous tree clearing and the mid storey largely removed due to the impacts of constant grazing. This vegetation type is not listed as an EEC in NSW and such an impact would likely not be considered a 'significant' impact.
- Removal of several remnant Paperbark trees to accommodate construction of the main access road, dwelling and APZ (approximately 0.36 hectares).
- Impacts to habitat for potential threatened fauna as listed in Table 4-2. These impacts are considered minor due to the following:
  - The existing condition of the vegetation being impacted
  - The limited total clearing of 2.36 ha required
  - Limited tree removal in Asset Protection Zones (large areas of the western portion of the site already have a discontinuous canopy and cleared understorey)
  - The retention of all PFTs for the Koala
  - The retention of the majority of hollow-bearing trees within Asset Protections Zones and via the sighting of dwelling locations
  - The protection of habitat trees via Tree Preservation Orders (or other agreed planning mechanism)
  - Preparation of a Construction Environmental Management Plan (CEMP), including appropriate avoidance and mitigation measures, associated with native biota.
- Presence of Secondary (Class A) Preferred Koala habitat (Blackbutt Tallowwood grassy open forest). This vegetation type at the site includes scattered individuals of the 'primary food trees (PCTs)', Tallowwood and Grey Gum (Biolink 2011). The proposed subdivision would remove approx. four PCTs with most PCTs being retained and protected via a planning instrument (such as Tree Preservation Order). Impacts have been minimised by retaining PCTs in APZ's, determining building footprints within lots to avoid PCTs and gazetting biodiversity offsets for conservation if required. Impacts to Koala habitat have been assessed in accordance with the Comprehensive Koala Plan of Management, as detailed in Section 5.2.3, and the EPBC Act.
- SEPP 44. As mentioned above, the development would also be subject to detailed ecological impact assessment, including assessments of significance (7-part test) through the provisions of Section 5A of the EPA Act or a biobanking statement under Part 7A of the TSC Act.
- The mapped SEPP 14 boundary in the east of the site will be the extent of the proposed rezoning to R5. There will be no dwellings, associated infrastructure and APZ's constructed within the mapped SEPP 14 area within the proposed eastern lots and, therefore, this area will not be subjected to any impacts associated with the proposal.

The Rural Residential Land Strategy (Kempsey Shire Council 2014) determined that biodiversity was a constraint to the development of rural residential subdivisions in the Crescent Head locality. In regards to lands that are the subject of this report, GHD have completed an analysis of biodiversity constraints and impacts associated with the proposed subdivision and conclude that the land subject to the planning proposal is suitable for rezoning to R5. Any impacts to threatened biota would be further addressed in greater detail at the DA stage. It should be noted that the subdivision plan presented in the planning proposal has been provided to show how a potential subdivision may apply to the land and the considerations associated with reducing impacts to biodiversity. This layout may be subject to change (either through the realignment of lot boundaries or repositioning/ reduction in dwellings) depending on decisions made by approval authorities and/or the applicant. In this regard it is not possible to complete a full ecological impact assessment.

7. Disclaimer

This report: has been prepared by GHD for Dulconghi Investments Pty Ltd and *may only be used and relied on by Dulconghi Investments Pty Ltd for the purpose agreed between GHD and the Dulconghi Investments Pty Ltd as set out in section 1.4 of this report.*

GHD otherwise disclaims responsibility to any person other than Dulconghi Investments Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described throughout this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Dulconghi Investments Pty Ltd and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

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Appendices

Appendix A – Field survey data

Vegetation plot/transect data

Veg zone	Veg type ID	Plot ID	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regeneration	Total length of fallen logs	Eastings	Northings	Zone
1	NR 119	1	36	56.5	7	36	0	18	2.3	0	1	3	495381	6551983	56
1	NR 119	2	35	24.4	5.4	12	0	12	40	0	1	6	495208	6552006	56
1	NR 119	3	23	49	8.5	20	0	32	9.3	1	1	27	495392	6552062	56
1	NR 119	4	30	62	2	28	0	6	3.7	1	1	11	495507	6552048	56

Flora species recorded within the subject site

Family	Exotic	Scientific name	Common name	TSC status	EPBC status
ADIANTACEAE		*Cheilanthes sieberi*	Rock Fern		
APIACEAE		*Daucus glochidiatus*	Native Carrot		
APIACEAE		*Hydrocotyle hirta*	Hairy Pennywort		
APOCYNACEAE	Yes	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush		
ASTERACEAE	Yes	*Ageratina adenophora*	Crofton Weed		
ASTERACEAE	Yes	*Bidens pilosa*	Cobbler's Pegs		
ASTERACEAE	Yes	*Cirsium vulgare*	Spear Thistle		
ASTERACEAE	Yes	*Conyza* spp.	Fleabane		
ASTERACEAE	Yes	*Gamochaeta americana*	Cudweed		
ASTERACEAE	Yes	*Hypochaeris radicata*	Catsear		
ASTERACEAE	Yes	*Senecio madagascariensis*	Fireweed		
ASTERACEAE	Yes	*Sonchus oleraceus*	Common Sowthistle		
BLECHNACEAE		*Blechnum* spp.			
CAMPANULACEAE		*Wahlenbergia gracilis*	Sprawling Bluebell		
CASUARINACEAE		*Allocasuarina torulosa*	Forest Oak		
CLUSIACEAE		*Hypericum japonicum*	-		
COMMELINACEAE		*Commelina cyanea*	Native Wandering Jew		
CONVOLVULACEAE		*Convolvulus erubescens*	Pink Bindweed		
CONVOLVULACEAE		*Dichondra repens*	Kidney Weed		
CYPERACEAE		*Carex appressa*	Tall Sedge		
CYPERACEAE		*Schoenus apogon*	Fluke Bogrush		
DENNSTAEDTIACEAE		*Pteridium esculentum*	Bracken		

Family	Exotic	Scientific name	Common name	TSC status	EPBC status
DILLENIACEAE		*Hibbertia obtusifolia*	Hoary Guinea Flower		
DILLENIACEAE		*Hibbertia* spp.			
ERICACEAE		*Lissanthe strigosa*	Peach Heath		
EUPHORBIACEAE		*Homalanthus populifolius*	Bleeding Heart		
FABACEAE (FABOIDEAE)		*Desmodium varians*	Slender Tick-trefoil		
FABACEAE (FABOIDEAE)		*Glycine clandestina*	Twining Glycine		
FABACEAE (FABOIDEAE)		*Kennedia rubicunda*	Dusky Coral Pea		
FABACEAE (MIMOSOIDEAE)	Yes	*Acacia saligna*	Golden Wreath Wattle		
GERANIACEAE		*Geranium solanderi*	Native Geranium		
GOODENIACEAE		*Goodenia* spp.			
HALORAGACEAE		*Gonocarpus teucrioides*	Germander Raspwort		
LOBELIACEAE		*Pratia purpurascens*	White Root		
LOMANDRACEAE		*Lomandra longifolia*	Spiny-headed Mat-rush		
LOMANDRACEAE		*Lomandra multiflora*	Many-flowered Mat-rush		
LUZURIAGACEAE		*Eustrephus latifolius*	Wombat Berry		
MALVACEAE	Yes	*Sida rhombifolia*	Paddy's Lucerne		
MYRSINACEAE	Yes	*Anagallis arvensis*	Scarlet Pimpernel		
MYRTACEAE		*Acmena smithii*	Lilly Pilly		
MYRTACEAE		*Corymbia intermedia*	Pink Bloodwood		
MYRTACEAE		*Eucalyptus microcorys*	Tallowwood		
MYRTACEAE		*Eucalyptus pilularis*	Blackbutt		

Family	Exotic	Scientific name	Common name	TSC status	EPBC status
MYRTACEAE		*Lophostemon confertus*	Brush Box		
MYRTACEAE		*Melaleuca quinquenervia*	Broad-leaved Paperbark		
ORCHIDACEAE		*Dipodium variegatum*	-		
OXALIDACEAE		*Oxalis perennans*			
PASSIFLORACEAE	Yes	*Passiflora spp.*			
PHORMIACEAE		*Dianella caerulea*	Blue Flax-lily		
PHYLLANTHACEAE		*Breynia oblongifolia*	Coffee Bush		
PHYLLANTHACEAE		*Poranthera microphylla*	Small Poranthera		
PITTOSPORACEAE		*Billardiera scandens*	Hairy Apple Berry		
PLANTAGINACEAE	Yes	*Plantago lanceolata*	Lamb's Tongues		
PLANTAGINACEAE		*Veronica plebeia*	Trailing Speedwell		
POACEAE	Yes	*Andropogon virginicus*	Whisky Grass		
POACEAE	Yes	*Axonopus fissifolius*	Narrow-leafed Carpet Grass		
POACEAE		*Cymbopogon refractus*	Barbed Wire Grass		
POACEAE		*Echinopogon ovatus*	Forest Hedgehog Grass		
POACEAE		*Entolasia stricta*	Wiry Panic		
POACEAE		*Imperata cylindrica*	Blady Grass		
POACEAE		*Microlaena stipoides*	Weeping Grass		
POACEAE		*Oplismenus aemulus*	Basket Grass		
POACEAE		*Oplismenus imbecillis*	Basket Grass		
POACEAE	Yes	*Setaria* spp.	Pigeon Grass		
POACEAE	Yes	*Sporobolus africanus.*	Parramatta Grass		

Family	Exotic	Scientific name	Common name	TSC status	EPBC status
POACEAE	Yes	*Stenotaphrum secundatum*	Buffalo Grass		
POACEAE		*Themeda australis*	Kangaroo Grass		
POLYGONACEAE	Yes	*Rumex crispus*	Curled Dock		
PROTEACEAE		*Persoonia stradbrokensis*	Geebung		
RHAMNACEAE		*Pomaderris* spp.			
ROSACEAE		*Rubus parvifolius*	Native Raspberry		
SMILACACEAE		*Smilax australis*	Lawyer Vine		
VERBENACEAE	Yes	*Lantana camara**	Lantana		
VERBENACEAE	Yes	*Verbena bonariensis*	Purpletop		
VIOLACEAE		*Viola hederacea*	Ivy-leaved Violet		

Appendix B – Threatened and migratory biota

Threatened biota habitat table

Databases searched

Office of Environment and Heritage (OEH) (2015d) Threatened species profiles- threatened ecological communities known or predicted to occur within the Northern Rivers CMA subregion.

Department of the Environment (DotE) (2015) EPBC PMST Online Search 3 March 2015 - 10 km buffer.

Department of Primary Industries (DPI) (2015) Records viewer search for threatened and protected aquatic species - Northern Rivers CMA.

Office of Environment and Heritage (OEH) (2015a) NSW Wildlife Atlas Search - threatened species results within a 10 km buffer

Likelihood of occurrence

Matters considered in determining the likelihood of occurrence include:

- Known natural distributions including prior records (database searches) and site survey results.
- Geological/ soil preferences.
- Specific habitat requirements (e.g. aquatic environs, seasonal nectar resources, tree hollows etc).
- Climatic considerations (e.g. wet summers; snow fall).
- Home range size and habitat dependence.
- Topographical preferences (e.g. coastal headlands, ridgetops, midslopes, gilgai, wetlands).
- The likelihood of occurrence scale is defined as follows:

Likelihood of occurrence scale

Scale	Description
Known	Species known to occur within the site (e.g. breeding and foraging habitat; foraging habitat; movement corridors). Detected on or immediately adjacent to the site.
Likely	Presence of high value suitable habitat (e.g. breeding and foraging habitat; important movement corridors). Not detected.
Possible	Presence of medium value suitable habitat (e.g. disturbed breeding conditions; constrained foraging habitat; movement corridors). Not detected.
Unlikely	Presence of low value suitable habitat (e.g. disturbed conditions; isolated small habitat area; fragmented movement corridors). Not detected.
Nil	No suitable habitat or corridors linking suitable habitat present. Not detected.

Note: Marine species which are restricted to marine environments only (such as whales, dolphins, sharks and seabirds) are excluded from the Likelihood of Occurrence Table as there is no marine habitat in the subject site.

Threatened flora known or predicted from the locality, habitat association and likelihood of occurring at the subject site

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Allocasuarina defungens	Dwarf Heath Casuarina	E	E	Grows mainly in tall heath on sand, but can also occur on clay soils and sandstone. The species also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains. Confined to the north coast region of NSW, between Raymond Terrace and Port Macquarie. There are 32 sites recorded from six general localities over a geographic range of about 40 km.	**Predicted** to occur within 10km (DotE 2015)	Unlikely. No suitable habitat present at site.
Arthraxon hispidus	Hairy-joint Grass	V	V	Moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps.	**Predicted** to occur within 10km (DotE 2015)	Unlikely. No suitable habitat present at the site. Not previously recorded within the locality.
Chamaesyce psammogeton	Sand Spurge	E	-	Sand Spurge is found sparsely along the coast from south of Jervis Bay to Queensland. Populations have been recorded in Wamberal Lagoon Nature Reserve, Myall Lakes National Park, Moonee Beach Nature Reserve and Bundjalung National Park. Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (*Spinifex sericeus*) and Prickly Couch (*Zoysia macrantha*)	**1 record** within 10km (OEH 2015a)	Unlikely. No suitable habitat present at the site.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	Occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences not well defined. Grows mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with *Cryptostylis subulata* and *Cryptostylis erecta*. Soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. Flowers November-February.	**Predicted** to occur within 10km (DotE 2015)	Possible. Potential habitat present within the eastern portion of the site. Not previously recorded within the locality.
Cynanchum elegans	White-flowered Wax Plant	E	E	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley. Usually occurs on the edge of dry rainforest vegetation. Flowering occurs between August and May, with a peak in November	**Predicted** to occur within 10km (DotE 2015)	Unlikely. No suitable habitat present at the site.
Euphrasia arguta	-	CE	CE	Recently rediscovered near Nundle on the north-western slopes and tablelands, once known from scattered locations between Sydney, Bathurst and Walcha. Known populations occur in eucalypt forest with a mixed grass/shrub understorey, while previous records are described as occurring	**Predicted** to occur within 10km (DotE 2015)	Unlikely. No habitat present at the site due to the disturbed understorey. Not previously recorded within the locality.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
				in open forest, grassy country and river meadows. Annual and dies back over winter. Dense stands observed in cleared firebreak areas, suggesting it may respond well to disturbance.		
Maundia triglochinoides	-	V	-	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients.	**1 record** within 10km (OEH 2015a)	Possible. Some potential habitat provided by the SEPP 14 wetland to the east of the site.
Melaleuca biconvexa	Biconvex Paperbark	V	V	Scattered, disjunct populations in coastal areas from Jervis Bay to Port Macquarie, with most populations in the Gosford-Wyong areas. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	**Predicted** to occur within 10km (DotE 2015)	Unlikely. The site is outside of the known distribution range. Not previously recorded within the locality.
Phaius australis	Lesser Swamp-orchid	E	E	Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Occurs in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	**Predicted** to occur within 10km (DotE 2015)	Unlikely. Some suitable vegetation association present in the eastern portion of the site (Paperbark Swamp Forest), however, the site is outside of the known geographic range. Not previously recorded within the locality.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Streblus pendulinus	Siah's Backbone	-	E	Siah's Backbone occurs from Cape York Peninsula to Milton, south-east New South Wales (NSW), as well as Norfolk Island (ATRP 2010; Jessup 2003; The Royal Botanic Gardens and Domain Trust 2011). Siah's Backbone is found in warmer rainforests, chiefly along watercourses. The species grows in well developed rainforest, gallery forest and drier, more seasonal rainforest (ATRP 2010).	**Predicted** to occur within 10km (DotE 2015)	Unlikely. No suitable habitat present at the site.
Thesium australe	Austral Toadflax	V	V	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	**2 records** within 10km (OEH 2015a) and **predicted** to occur within 10km (DotE 2015)	Unlikely. No suitable habitat present at the site.

All information in this table is taken from NSW OEH and Commonwealth DotE Threatened Species profiles (OEH, 2013a; DotE 2013a) unless otherwise stated. The codes used in this table are: CE – Critically Endangered; E – Endangered; V – Vulnerable; EP – Endangered Population; CEEC – Critically Endangered Ecological Community; EEC – Endangered Ecological Community.

Threatened fauna known or predicted from the locality, habitat association and likelihood of occurring at the subject site

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Birds						
Anthochaera phrygia	Regent Honeyeater	CE	E	In NSW confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks occasionally seen in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests, presumably in response to drought. Inhabits dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes.	**Predicted** to occur within 10km (DotE 2015)	Unlikely. Preferred vegetation associations not present at the site. Not previously recorded within the locality.
Botaurus poiciloptilus	Australasian Bittern	E	E	Widespread but uncommon over most of NSW except the northwest. Favours permanent freshwater wetlands with tall dense reedbeds particularly *Typha* spp.and *Eleocharis* spp., with adjacent shallow, open water for foraging. Roosts during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails. Scattered distribution across NSW. Inhabits lowland grassy woodland and open forest and, in coastal areas, Casuarina and Melaleuca woodlands, saltmarsh and mangroves.	**Predicted** to occur within 10km (DotE 2015)	Unlikely. Some potential habitat provided by the SEPP 14 wetland/Paperbark Swamp Forest community to the east of the site, however, not previously recorded within the locality.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
				Requires a low, sparse groundcover, some fallen timber and leaf litter, and a general lack of a shrubby understory.		
Calyptorhynchus lathami	Glossy Black-cockatoo	V	-	Widespread but uncommon from coast to southern tablelands and central western plains. Feeds almost exclusively on the seeds of *Allocasuarina* species. Prefers woodland and open forests, rarely away from *Allocasuarina*. Roost in leafy canopy trees, preferably eucalypts, usually <1km from feeding site. Nests in large (approx. 20cm) hollows in trees, stumps or limbs, usually in Eucalypts (Higgins 1999).	**12 records** within 10km (OEH 2015a)	Likely. Some potential foraging habitat present due to the presence of Forest Oak (*Allocasuarina torulosa*).
Carterornis leucotis	White-eared Monarch	V	-	In NSW, White-eared Monarchs are generally found from the Queensland border south to Iluka at the mouth of the Clarence River, and inland as far as the Richmond Range. There are occasional records south of the Clarence River, near Woolgoolga and around Port Macquarie. Occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest.	**1 record** within 10km (OEH 2015a)	Unlikely. Some suitable vegetation association present within the eastern portion of the site (Paperbark Swamp Forest), however, outside of the general distribution range.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Daphoenositta chrysoptera	Varied Sittella	V	-	Sedentary, occurs across NSW from the coast to the far west. Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Sensitive to habitat isolation and loss of structural complexity, and adversely affected by dominance of Noisy Miners. Cleared agricultural land is potentially a barrier to movement. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	**3 records** within 10km (OEH 2015a)	Possible. Some potential habitat present, however, the high level of disturbance and loss of structural complexity as a result of the agricultural practices reduces the likelihood.
Dasyornis brachypterus	Eastern Bristlebird	E	E	Occurs in southern Queensland/northern NSW, the Illawarra Region and near the NSW/Victorian border. Illawarra population comprises an estimated 1600 birds, mainly from Barren Grounds Nature Reserve, Budderoo National Park and the Jervis Bay area. Habitat characterised by dense, low vegetation including heath and open woodland with a heathy understorey. The fire history of habitat is important, and the Illawarra and southern populations reach maximum densities in habitat that have not been burnt for over 15 years.	**Predicted** to occur within 10km (DotE 2015)	Unlikely. No suitable understorey vegetation present at the site.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	In NSW, becomes increasingly uncommon south of the Northern Rivers region, and rarely occurs south of Sydney. Breeding recorded as far south as Buladelah, though most breeding in NSW occurs in the north-east. Primarily inhabits permanent freshwater wetlands and surrounding vegetation including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters. Will also forage in inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water. Breeds during summer, nesting in or near a freshwater swamp.	**25 records** within 10km (OEH 2015a)	Likely. Suitable foraging habitat identified on the very eastern portion of the site.
Glossopsitta pusilla	Little Lorikeet	V	-	Occurs from coast to western slopes of the Great Dividing Range. Inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Feed primarily on profusely-flowering eucalypts and a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands *Eucalyptus albens* and *E. melliodora* are particularly important food sources for pollen and nectar respectively.	**2 records** within 10km (OEH 2015a)	Possible. Suitable vegetation association identified, however, the lack of structural and habitat complexity reduces the likelihood.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
				Mostly nests in small (opening approx. 3cm) hollows in living, smooth-barked eucalypts, especially *Eucalyptus viminalis*, *E. blakelyi* and *E. dealbata*. Most breeding records are from the western slopes.		
Grus rubicunda	Brolga	V	-	The Brolga was formerly found across Australia, except for the south-east corner, Tasmania and the south-western third of the country. It is still abundant in the northern tropics, but very sparse across the southern part of its range. Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged.	**1 record** within 10km (OEH 2015a)	Possible. Some potential foraging habitat to the east of the site.
Haematopus fuliginosus	Sooty Oystercatcher	V	-	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	**2 records** within 10km (OEH 2015a)	Unlikely. No suitable habitat present at the site.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Haematopus longirostris	Pied Oystercatcher	E	-	In NSW the species is thinly scattered along the entire coast, with fewer than 200 breeding pairs estimated to occur in the State. It favours intertidal flats of inlets and bays, open beaches and sandbanks.	**2 records** within 10km (OEH 2015a)	Unlikely. No suitable habitat present at the site.
Irediparra gallinacea	Comb-crested Jacana	V	-	The Comb-crested Jacana occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW, with stragglers recorded in south-eastern NSW.	**1 record** within 10km (OEH 2015a)	Possible. SEPP 14 wetland to the east of the site potentially provides some habitat.
Ixobrychus flavicollis	Black Bittern	V	-	Occurs from southern NSW to Cape York and the Kimberley, and southwest WA. Inhabits terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. May occur in flooded grassland, forest, woodland, rainforest and mangroves as long as there is permanent water. Roosts by day in trees or within reeds on the ground. Nests in branches overhanging water and breeds from December to March.	**1 record** within 10km (OEH 2015a)	Possible. Paperbark Swamp Forest to the east of the site potentially provides suitable habitat.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Lathamus discolor	Swift Parrot	E	E	Migratory, travelling to the mainland from March to October. Breeds in Tasmania from September to January. On the mainland, it mostly occurs in the southeast foraging on winter flowering eucalypts and lerps, with records of the species between Adelaide and Brisbane. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. *Eucalyptus robusta*, *Corymbia maculata* and *C. gummifera* dominated coastal forests are also important habitat.	**1 record** within 10km (OEH 2015a) and **predicted** to occur within 10km (DotE 2015)	Unlikely. Preferred mainland coastal foraging habitat not present at the site.
Lophoictinia isura	Square-tailed Kite	V	-	Occurs across NSW, resident in North, northeast and along west-flowing rivers. Summer breeding migrant to southeast of state. Inhabits a variety of habitats including woodlands and open forests, with preference for timbered watercourses. Favours productive forests on the coastal plain, box-ironbark-gum woodlands on the inland slopes, and Coolibah/River Red Gum on the inland plains. In Sydney area nests in mature living trees within 100m of ephemeral/permanent watercourse. Large home range > 100 km2.	**1 record** within 10km (OEH 2015a)	Possible. May utilise the site as part of a larger foraging range, however, suitable nesting habitat not present at the site.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Ninox strenua	Powerful Owl	V	-	Occurs from the coast to the western slopes. Solitary and sedentary species. Inhabits a range of habitats from woodland and open sclerophyll forest to tall open wet forest and rainforest. Prefers large tracts of vegetation. Nests in large tree hollows (> 0.5 m deep), in large eucalypts (dbh 80-240 cm) that are at least 150 years old. Pairs have high fidelity to a small number of hollow-bearing nest trees and defend a large home range of 400 - 1,450 ha. Forages within open and closed woodlands as well as open areas.	**1 record** within 10km (OEH 2015a)	Possible. May occasionally utilise the site as part of a wider foraging range although prefers large tracts of vegetation. No suitable nesting habitat present at the site.
Pandion cristatus	Eastern Osprey	V	-	Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging.	**5 records** within 10km (OEH 2015a)	Possible. SEPP 14 wetland area to the east of the site may provide limited foraging habitat although the lack of open areas reduces the likelihood. Presence would be in a transient nature only.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Rostratula australis	Australian Painted Snipe	E	E	Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. Nests on the ground amongst tall reed-like vegetation near water. Feeds on mudflats and the water's edge taking insects, worm and seeds. Prefers fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber.	**Predicted** to occur within 10km (DotE 2015)	Unlikely. Some limited habitat identified within the SEPP 14 wetland area however to the east of the site, not previously recorded from the locality.
Tyto novaehollandiae	Masked Owl	V	-	Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt woodlands from sea level to 1100 m. Roosts and breeds in large (>40cm) hollows and sometime caves in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. Prey mostly terrestrial mammals but arboreal species may also be taken.	**4 records** within 10km (OEH 2015a)	Possible. May occasionally utilise the site as part of a wider foraging range. No suitable nesting habitat present at the site.
Mammals						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Occurs from the coast to the western slopes of the divide. Largest numbers of records from sandstone escarpment country in the Sydney Basin and Hunter Valley (Hoye and Schulz 2008). Roosts in caves and mines and most commonly recorded from dry sclerophyll forests and woodlands. An insectivorous species that	**Predicted** to occur within 10km (DotE 2015)	Unlikely. No suitable roosting habitat present at the site. Outside of general distribution range and not previously recorded within the locality.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
				flies over the canopy or along creek beds (Churchill 2008). In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys.		
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Inhabits a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den sites are in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, usually traversed along densely vegetated creek lines.	**4 records** within 10km (OEH 2015a) and **predicted** to occur within 10km (DotE 2015)	Possible. May utilise the site as part of a larger foraging habitat, however the high level of disturbance, limited understorey and lack of available den sites reduces the likelihood.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Occurs on southeast coast and ranges. Prefers tall (>20m) and wet forest with dense understorey. Absent from small remnants, preferring continuous forest but can move through cleared landscapes and may forage in open areas. Roosts in hollow trunks of Eucalypts, underneath bark or in buildings. Forages in gaps and spaces within forest, with large foraging range (12km foraging movements recorded) (Churchill 2008, Law et al 2008).	**2 records** within 10km (OEH 2015a)	Unlikely. Preferred habitat not present at the site. Few records known from northern coastal areas.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Miniopterus australis	Little Bentwing-bat	V	-	Occurs from Cape York to Sydney. Inhabits rainforests, wet and dry sclerophyll forests, paperbark swamps and vine thickets. Only one maternity cave known in NSW, shared with Eastern Bentwing-bats at Willi Willi, near Kempsey. Outside breeding season roosts in caves, tunnels and mines and has been recorded in a tree hollow on one occasion. Forages for insects beneath the canopy of well-timbered habitats (Churchill 2008, Hoye and Hall 2008).	**9 records** within 10km (OEH 2015a)	Likely. May utilise the site as part of a larger foraging range, however, previous disturbance and lack of suitable roosting habitat reduces the likelihood.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Generally occurs east of the Great Dividing Range along the NSW coast (Churchill 2008). Inhabits various habitats from open grasslands to woodlands, wet and dry sclerophyll forests and rainforest. Essentially a cave bat but may also roost in road culverts, stormwater tunnels and other man-made structures. Only 4 known maternity caves in NSW, near Wee Jasper, Bungonia, Kempsey and Texas. Females may travel hundreds of kilometres to the nearest maternal colony (Churchill 2008).	**4 records** within 10km (OEH 2015a)	Likely. May utilise the site as part of a larger foraging range, however, previous disturbance and lack of suitable roosting habitat reduces the likelihood.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Forages in natural and artificial openings in vegetation, typically within a few kilometres of its roost. Roosts primarily in tree hollows but also recorded from man-made structures or under bark (Churchill 2008).	**2 records** within 10km (OEH 2015a)	Possible. May utilise the site as part of a larger foraging range, however, previous disturbance and limited suitable roosting habitat reduces the likelihood.
Myotis macropus	Southern myotis	V	-	Mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in close proximity to water (Campbell 2011). Breeds November or December (Churchill 2008)	**1 record** within 10km (OEH 2015a)	Unlikely. Lack of preferred foraging and roosting habitat at the site.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Petaurus australis	Yellow-bellied Glider	V	-	Occurs along the east coast to the western slopes of the Great Dividing Range. Inhabits a variety of forest types but prefers tall mature eucalypt forest with high rainfall and rich soils. Relies on large hollow-bearing trees for shelter and nesting, with family groups of 2-6 typically denning together. In southern NSW its preferred habitat at low altitudes is moist gullies and creek flats in mature coastal forests. Mostly feeds on sap, nectar and honeydew.	**1 record** within 10km (OEH 2015a)	Unlikely. Preferred habitat not present at the site.
Phascolarctos cinereus	Koala	V	V	Occurs from coast to inland slopes and plains. Restricted to areas of preferred feed trees in eucalypt woodlands and forests. Home range varies depending on habitat quality, from < 2 to several hundred hectares.	**61 records** within 10km (OEH 2015a) and **predicted** to occur within 10km (DotE 2015)	Likely. Preferred feed trees identified at the site. Further surveys recommended.
Pseudomys novaehollandiae	New Holland Mouse		V	Occurs in disjunct, coastal populations from Tasmania to Queensland. In NSW inhabits a variety of coastal habitats including heathland, woodland, dry sclerophyll forest with a dense shrub layer and vegetated sand dunes (Wilson and Bradtke 1999). Populations may recolonise/ increase in size in regenerating native vegetation after wildfire, clearing and sandmining. Presence strongly correlated with understorey vegetation density, and high floristic	**Predicted** to occur within 10km (DotE 2015)	Unlikely. Lack of suitable understorey vegetation at the site. Not previously recorded within the locality.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
				diversity in regenerating heath (Lock and Wilson 1999).		
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Roosts in camps within 20 km of a regular food source, typically in gullies, close to water and in vegetation with a dense canopy. Forages in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, swamps and street trees, particularly in eucalypts, melaleucas and banksias. Highly mobile with movements largely determined by food availability (Eby and Law 2008). Will also forage in urban gardens and cultivated fruit crops.	**8 records** within 10km (OEH 2015a) and **predicted** to occur within 10km (DotE 2015)	Likely. Suitable foraging habitat identified as part of a wider foraging range. No suitable roosting habitat identified at the site.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. Forages in most habitats across its very wide range, with and without trees.	**1 record** within 10km (OEH 2015a)	Possible. May utilise the site as part of a wider ranging foraging resource.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Occurs on the east coast and Great Dividing Range. Inhabits a variety of habitats from woodland to wet and dry sclerophyll forests and rainforest, also remnant paddock trees and timber-lined creeks, typically below 500m asl. Forages in relatively uncluttered areas, using natural or man-made openings in denser habitats. Usually roosts in tree hollows or fissures but also under exfoliating bark or in the roofs of old buildings. Females congregate in maternal roosts in suitable hollow trees (Hoye and Richards 2008, Churchill 2008).	**6 records** within 10km (OEH 2015a)	Likely. Potential suitable habitat identified at the site.
Syconycteris australis	Common Blossom-bat	V	-	Coastal areas of eastern Australia from Hawks Nest in NSW to Cape York peninsula in Queensland. In areas, the distribution extends inland to coastal foothills. Common Blossom-bats often roost in littoral rainforest and feed on nectar and pollen from flowers in adjacent heathland and paperbark swamps. They have also been recorded in a range of other vegetation communities, such as subtropical rainforest, wet sclerophyll forest and other coastal forests.	**1 record** within 10km (OEH 2015a)	Possible. Some potential foraging habitat provided by the Paperbark Swamp Forest however no rainforest/roosting habitat identified at the site.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Vespadelus troughtoni	Eastern Cave Bat	V	-	The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	**1 record** within 10km (OEH 2015a)	Unlikely. Suitable roosting habitat not present at the site.
Frogs						
Litoria aurea	Green and Golden Bell Frog	E	V	Formerly occurred from Brunswick Heads to Victoria, but >80% populations now extinct. Inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and in stream wetlands. Prefers sites containing cumbungi (*Typha* spp.) or spike rushes (*Eleocharis* spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. *Gambusia holbrooki* is a key threat as they feed on green and Golden Bell Frog eggs and tadpoles.	**5 records** within 10km (OEH 2015a) and **predicted** to occur within 10km (DotE 2015)	Possible. Potential habitat provided by the Paperbark Swamp Forest. More likely to the east of the site associated with the SEPP 14 wetland.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
Mixophyes balbus	Stuttering Frog	E	V	Occurs along the east coast of Australia. Has undergone a massive range reduction particularly in the south of its range: within the Sydney Basin, White (2008a) located only 3 populations south of Sydney (Macquarie Pass and Mt Werong) and Daly et al. (2002, in White 2008a) found only 2 extant populations between Macquarie Pass and Victoria. Inhabits rainforest and wet, tall, open forest. Shelter in deep leaf litter and thick understorey vegetation on the forest floor. Feeds on insects and smaller frogs, breeding in streams during summer after heavy rain. The species does not occur in areas where the riparian vegetation has been disturbed or where there have been significant upstream human impacts (Mahony et al 1997).	**Predicted** to occur within 10km (DotE 2015)	Unlikely. No suitable habitat present at the site.
Mixophyes iteratus	Giant Barred Frog	E	E	Occurs on the coast and ranges from south-eastern QLD to the Hawkesbury River in NSW, particularly in Coffs Harbour - Dorrigo area. Forage and live amongst deep, damp leaf litter in rainforest, moist eucalypt forest and nearby dry eucalypt forest. Breed in shallow, flowing rocky streams. Within Sydney Basin, confined to small populations in tall, wet forest in the Watagan Mountains north of the Hawkesbury and the lower Blue Mountains	**Predicted** to occur within 10km (DotE 2015)	Possible. No suitable habitat present at the site.

Scientific name	Common name	TSC Act status	EPBC Act status	Habitat association	Nature of record	Likelihood of occurrence in subject site
				(White 2008b).		
Reptiles						
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	V	V	The Three-toed Snake-tooth Skink occurs on the coast and ranges from the Macleay valley in NSW to south-eastern Queensland. It is very uncommon south of Grafton. Inhabits rainforest and occasionally moist eucalypt forest, on loamy or sandy soils.	**Predicted** to occur within 10km (DotE 2015)	Unlikely. Suitable habitat not present at the site due to disturbed understorey.

Notes:
The codes used in this table are: CE – Critically Endangered; E – Endangered; V – Vulnerable; EP – Endangered Population; CEEC – Critically Endangered Ecological Community; EEC – Endangered Ecological Community.

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