

741 Cudgen Road, Cudgen NSW

Baseline Ecological Assessment Report

Planit Consulting

23 November 2023

Final



Report No. 22050RP2

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or commendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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Approved by:	
Position:	Senior Ecologist/Queensland Manager
Signed:	
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Glossary

Term / Abbreviation	Definition
AOBV	Areas of Outstanding Biodiversity Value
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BAM	Biodiversity Assessment Method
BC Regulation	NSW <i>Biodiversity Conservation Regulation 2017</i>
BEA	Baseline Ecology Assessment
BC SEPP 2021	State Environmental Planning Policy (Biodiversity and Conservation) 2021
BOS	Biodiversity Offsets Scheme
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
Council	Tweed Shire Council
DA	Development Application
Development footprint	Area likely to be impacted by the proposed Cudgen Connection project
DBH	Diameter at breast height
DPE	Department of Planning and Environment
ECA	Ecological Constraints Assessment
EEC	Endangered Ecological Community
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EES	Environment, Energy and Science group
GPS	Global Positioning System
Koala SEPP 2021	State Environmental Planning Policy (Koala Habitat Protection) 2021
Locality	5 km area surrounding the subject site
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
PCT	Plant Community Type
PKFT	Preferred Koala Food Tree
Planning Proposal	Proposed Rezoning of the subject site
Resilience and Hazards SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
SAII	Serious and Irreversible Impact
SSD	State Significant Development
Subject site	741 Cudgen Road, Cudgen NSW, also known as Lot 6 DP727425
Study area	The subject site and part of adjacent land to the north

Term / Abbreviation	Definition
TEC	Threatened Ecological Community
The Guidelines	Threatened Species Test of Significance Guidelines (NSW Government 2018)
Tweed Coast CKPoM	Tweed Coast Comprehensive Koala Plan of Management
Tweed Shire DCP	Tweed Shire Council Development Control Plan 2008



1. Introduction

Cudgen Health Precinct Pty Ltd are seeking to rezone land located at 741 Cudgen Road, Cudgen NSW, also known as Lot 6 DP727425 (hereafter referred to as the subject site). The rezoning is proposed to enable the development of a precinct to support the adjacent proposed Tweed Valley Hospital, and wider subregional community. This Baseline Ecological Assessment (BEA) has been prepared to provide an evidence-base for the rezoning of the site and the associated Planning Proposal application.

Ultimately, this BEA concludes:

- that the ecological constraints present do not prevent rezoning;
- the ecological attributes of the land do not qualify for an E2 or E3 zoning to be applied, as per the Northern Councils E Zone Review Final Recommendations Report (NSW Government Planning and Environment 2015); and
- it is considered that significant impacts on areas of high environmental value can be avoided through the implementation of the avoidance and mitigation measures detailed in this report.

1.1. Background

A Pre-lodgement meeting was held with Tweed Shire Council 24 March 2022, and Preliminary Advice for the Pre-lodgement Meeting was prepared.

Several fauna and flora items were identified within the Preliminary Advice for Pre-lodgement Meeting. These are reproduced below:

“A Coastal Wetland Area (CWA) as mapped under the SEPP (Coastal Management) occurs on the subject site to the north-east. The CWA extends further to the north across adjacent Lot 3 DP828298 (north) and Lot 11 DP1269398 (east). The site is affected by the mapped ‘Proximity Area for Coastal Wetlands’.

Any planning proposal would be expected to address Clause 10 and Clause 11 of the SEPP (Coastal Management) in order to demonstrate how impact upon the biophysical, hydrological or ecological integrity of the coastal wetland from future development is to be avoided and minimised.

In order to satisfy the above, a minimum 50 metre wide ecological buffer to the CWA should be established consistent with the provisions of Council’s Development Control Plan Section A5 Subdivision Manual and Development Control Plan Section A19 Biodiversity & Habitat Management (DCP A19). The CWA area on site and the associated ecological buffer should be assigned a C2 Environmental Conservation land use zone as part of the planning proposal.

Section 4.2 of Ministerial Directions dated 28/2/22 made under Section 9.1 of the Environmental Planning and Assessment Act 1979 related to development within Coastal Vulnerability areas and should be addressed.

The planning proposal is inconsistent with Far North Coast Regional Conservation Plan, particularly the second action of the first objective under Section 1.3; “Local environmental plans will not zone land within the Environmental Assets and Rural Land area to permit urban purposes, other than rural residential development”.

The site occurs within the Southern Tweed Coast Koala Management Area identified in the approved Tweed Coast Comprehensive Koala Plan of Management 2020 (TCCCKPoM). The planning proposal should address all relevant components of 'Part 6 Strategic Planning' of the TCCCKPoM to satisfy the SEPP (Koala Habitat Protection) and the Aims of the Tweed Local Environmental Plan 2014 (Section 1.2(j)).

The planning proposal should be accompanied by a Baseline Ecological Assessment to identify red flagged values both on and adjacent to the site, quantify the full extent of ecological direct and indirect impacts, demonstrate how ecological impacts are to be avoided and minimised.

Direct reference to the DCP A19 and adoption of red flagged value ecological setbacks and buffer is made in the Development Control Plan – B26 Kingscliff Locality Plan."

This report provides the requested Baseline Ecological Assessment (BEA). Revised concept plans have now been prepared following pre-lodgement advice. This BEA assesses these revised concept plans against relevant legislation and policy including those items mentioned above.

1.2. Previous Ecology Assessment

Cumberland Ecology undertook ecological surveys to support rezoning of the subject site in 2022 and prepared an Ecological Constraints Assessment (ECA) (Report 22050 RP1) for an earlier version of the concept plan. No additional ecology surveys have been undertaken for this BEA, which is reliant on the surveys undertaken for the previous ECA.

1.3. Subject Site and Study Area

The subject site is located at 741 Cudgen Road, Cudgen NSW, also known as Lot 6 DP727425. It is located at the corner of Cudgen Road and Tweed Coast Road adjacent to the Tweed Valley Hospital that is currently under construction on land located to the east. The study area includes the subject site as well as the southern portion of Lot 3 DP828298 to the north, which is owned by Gales and is proposed as parkland. This area is included in the study area due to adjacent biodiversity values that potentially create setbacks that extend into the subject site. The subject site and study area are shown in **Figure 1**.

The subject site consists of fertile red clay loam soils formed on basalt and slopes to the north towards artificial drainage lines located on Lot 3 DP828298 within the study area.

1.3.1. Site History

The subject site has been historically used for horticulture, with at least the eastern portion operating as a plant nursery and has been historically cleared of woody native vegetation. Parts of the eastern portion of the subject site has been levelled/terraced to support this land use, and artificial drainage lines have been created between the terraces. Several areas have been paved to create hardstands. The subject site does not currently operate as a nursery following purchase by developers. A number of tin sheds of varying sizes and shade houses remain within the subject site, as well as some nursery rubbish such as polypipe. A residential dwelling is located at the southeast corner of the subject site and remains occupied. The subject site contains amenity plantings of introduced species along property boundaries, in particular of palms. Since purchase by the current owners weedy regrowth has become established in some areas.

1.4. Proposed Development

The proposed development is known as Cudgen Connection. The Cudgen Connection concept is formulated around a health, education and community precinct that will work in collaboration with the neighbouring Tweed Valley Hospital. Cudgen Connection will deliver much needed essential worker housing and additional health services, create skilled, long-term jobs and attract high level education and research industries. Designed around a central public transport initiative, the concept will stimulate and improve public transport to the region connecting local villages, townships, and places of high employment.

Proposed facilities are anticipated to include;

- Essential worker units;
- Private hospital;
- University campus;
- Mental Health Hospital;
- Medical Hotel;
- Childcare Centre;
- Community and Retail Centre;
- Bus interchange;
- Road and pedestrian links to adjacent hospital; and
- Landscaping, boardwalks and parkland.

The concept plan for Cudgen Connection is shown as **Figure 2**.

As the subject site is proposed for rezoning in order to support the proposed development, this BEA has been prepared to support rezoning, and as such the proposed rezoning is referred to as the 'planning proposal' throughout this BEA.

The proposed development is likely to a State Significant Development (SSD), and as such development approval would be through the preparation of an Environmental Impact Assessment. Under the SSD approvals pathway, local planning provisions do not apply, however these are considered to guide the development layout, and are summarised below, together with other relevant legislation.

1.5. Relevant Environmental Legislation

1.5.1. Commonwealth Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) any action (which includes a development, project, or activity) that is considered likely to have a significant impact on Matters of National Environmental Significance (MNES) (including nationally threatened ecological communities and species and

listed migratory species) must be referred to the Commonwealth Minister for the Environment. The purpose of a referral is to allow a decision to be made about whether an action requires approval on a Commonwealth level. If an action is considered likely to have a significant impact on MNES, it is declared a “controlled action” and Commonwealth approval is required.

1.5.2. NSW Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the overarching planning legislation in NSW that provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the protection of the environment, including the protection and conservation of native animals and plants. This includes threatened species, populations and ecological communities, and their habitats, as listed under the *Biodiversity Conservation Act 2016* (BC Act) and the *Fisheries Management Act 1994*.

1.5.3. NSW Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The purpose of the BC Act is to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BC Act is supported by a number of regulations, including the *Biodiversity Conservation Regulation 2017* (BC Regulation).

The BC Act requires consideration of whether a development or an activity is likely to significantly affect threatened species. For Part 4 local developments, projects that significantly affect threatened species trigger the Biodiversity Offsets Scheme (BOS). The BOS is intended to simplify biodiversity assessment and improve biodiversity outcomes by creating consistent assessment requirements to measure the likely biodiversity loss of development proposals and gains in biodiversity value achieved at offset sites through active management. The BOS requires an assessment following the Biodiversity Assessment Methodology (BAM) by an accredited assessor and the preparation of a Biodiversity Development Assessment Report (BDAR). Consideration of whether the project is likely to trigger the BOS for a future Development Application (DA) is provided below in subsequent subsections.

1.5.3.1. Biodiversity Offset Scheme Triggers

The BOS is intended to simplify biodiversity assessment and improve biodiversity outcomes by creating consistent assessment requirements to measure the likely biodiversity loss of development proposals and gains in biodiversity value achieved at offset sites through active management.

The BOS applies to local development (assessed under Part 4 of the EP&A Act) that is likely to significantly affect threatened species or communities or that triggers threshold levels for when assessment via the BOS is required. If the BOS is triggered a DA must be accompanied by a BDAR prepared in accordance with the BAM. The threshold consists of the following:

- Whether the amount of native vegetation being cleared exceeds a threshold area;
- Whether the area being cleared is mapped on the Biodiversity Values map published by the Minister for the Environment;

- Whether the impact on threatened species or ecological communities is deemed significant; and
- Whether the proposal will impact on an Area of Outstanding Biodiversity Value (AOBV).

The subject site is currently zoned RU1 Primary Production under the Tweed Local Environment Plan 2014 and has a minimum lot size of 10 ha. The BOS native vegetation clearing thresholds are reproduced in **Table 1**. Based on these thresholds, up to 0.5 ha could be cleared before the BOS is triggered. The total area of native vegetation within the subject site is 0.3 ha and if all of this was cleared, it would not trigger the BOS.

Table 1 Native vegetation clearing thresholds

Minimum lot size of the land	Area of clearing
Less than 1 hectare	0.25 hectare or more
Less than 40 hectares but not less than 1 hectare	0.5 hectare or more
Less than 1,000 hectares but not less than 40 hectares	1 hectare or more
1,000 hectares or more	2 hectares or more

On viewing the Biodiversity Values Map, we have noted that areas mapped on the Biodiversity Values Map extend along the northern site boundary and directly about the subject site in the north-east corner. If the proposed development was to result in certain indirect impacts, known as 'prescribed impacts', on an area mapped on the Biodiversity Values Map, this would trigger entry into the BOS. Prescribed impacts are detailed in Section 6.1 of the *Biodiversity Conservation Regulation 2017* and include:

1. *The impacts on biodiversity values of the following actions are prescribed (subject to subclause (2)) as biodiversity impacts to be assessed under the biodiversity offsets scheme*
 - a. *the impacts of development on the following habitat of threatened species or ecological communities*
 - (i) *karst, caves, crevices, cliffs and other geological features of significance,*
 - (ii) *rocks,*
 - (iii) *human made structures,*
 - (iv) *non-native vegetation,*
 - a. *the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range,*
 - b. *the impacts of development on movement of threatened species that maintains their lifecycle,*
 - c. *the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development),*

- d. *the impacts of wind turbine strikes on protected animals,*
- e. *the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.*

2. *The additional biodiversity impacts prescribed by this clause:*

- a. *are prescribed for the purposes of assessment and biodiversity assessment reports under the Act, but are not additional biodiversity impacts for the purposes of calculating the number and class of biodiversity credits that are required under a biodiversity assessment report to be retired to offset the residual impact on biodiversity values of proposed development, proposed clearing of native vegetation or proposed biodiversity certification of land, and*
- b. *may be taken into account in the determination of the biodiversity credits required to be retired (or other conservation measures required to be taken) under a planning approval or vegetation clearing approval or under a biodiversity certification of land.*

Of these impacts, the potential impacts of the proposal on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities are particularly relevant to the project. This could occur if the project was to impact on adjacent vegetation on the Biodiversity Values Map, for example due to changes in stormwater run-off or quality. A draft Stormwater Management Plan (PlanIT Consulting 2023) indicates that a neutral or beneficial assessment of stormwater quality for discharge from the subject site can be achieved.

The third element of the threshold levels for entry into the BOS relates to potential impacts to threatened species and threatened ecological communities, i.e. whether impacts would be significant. A Test of significance for a threatened ecological community identified within the subject site, and for threatened microchiropteran bats (microbats) with the potential to be present, is provided in **Appendix C** and indicates that impacts are unlikely to be significant.

Lastly, the BC Act currently lists the following AOBVs:

- Gould’s Petrel habitat;
- Little Penguin population in Sydney’s North Harbour habitat;
- Mitchell’s Rainforest Snail in Stotts Island Nature Reserve; and
- Wollemi Pine habitat.

The project is not located within any of the above AOBVs (Stotts Island Nature reserve is located approximately 5.5 km to the west of the subject site) and therefore the BOS would not be triggered by this mechanism.

Although this assessment indicates that the BOS is unlikely to be triggered by the aforementioned thresholds, if the project is a SSD, based on capital expenditure, then a BDAR or BDAR waiver would be required independent of these triggers. The BDAR would need to be prepared according to the BAM.

1.5.4. State Environmental Planning Policy (Resilience and Hazards) 2021

State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) commenced on 1 March 2022 and includes coastal planning provisions. The Resilience and Hazards SEPP replaced the *State Environmental Planning Policy (Coastal Management) 2016*.

The following zones of the Resilience and Hazards SEPP occur within the study area:

- Coastal Wetlands;
- Proximity Area for Coastal Wetlands;

Resilience and Hazards SEPP mapping for the study area is mapped in **Figure 3**.

The consistency of the proposed development with the objectives of each zone is outlined below.

i. Coastal Wetland Zone

Under the Resilience and Hazards SEPP, development can be carried out in areas mapped as Coastal Wetlands (as Designated Development) if *the consent authority is satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland.*

The areas within the study area mapped as Coastal Wetland occur outside of the subject site (**Figure 3**). Therefore, no development will be carried out in areas mapped as Coastal Wetlands.

ii. Proximity to Coastal Wetland Zone

Under the Resilience and Hazards SEPP *Development consent must not be granted to development on land identified as "proximity area for coastal wetlands" or "proximity area for littoral rainforest" on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on:*

- (a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or*
- (b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.*

(2) This clause does not apply to land that is identified as "coastal wetlands" or "littoral rainforest" on the Coastal Wetlands and Littoral Rainforests Area Map .

The proximity area for Coastal Wetlands extends into the subject site and as such the project must not have a significant impact on adjacent Coastal Wetlands, in accordance with the above mentioned objective. Specific to any rezoning, the proximity area is not required to be zoned for environmental purposes, as per the Northern Councils E Zone Review Final Recommendations Report (Planning and Environment 2015). As stormwater, hydrological and groundwater studies have not yet been completed, it cannot at this stage be determined whether the proposed development would have a significant impact on Coastal Wetlands.

1.5.5. Tweed Shire Council Development Control Plan

i. Section A19 Biodiversity and Habitat Management

Section A19 of the Tweed Shire Council Development Control Plan 2008 (Tweed Shire DCP) deals with biodiversity and habitat management. The Tweed Shire DCP applies to developments on land that is:

- Privately owned land holdings with an area $\geq 2500\text{m}^2$ containing bushland;
- Privately owned land holdings with an area $\geq 2500\text{m}^2$ containing or adjoining waterways;
- Lots containing E2, E3, E4, RE1, RE2, W1, W2, W3, zones (or equivalent) under the applicable Local Environmental Plan;
- Lots within 100 m of a flying fox camp;
- Lots within 50 m of a raptor nest; and
- Public land.

As the subject site is greater than 2500m^2 the Tweed Shire DCP applies to future DAs. The Tweed Shire DCP also applies where the BOS is triggered. Section A19 however does not directly affect strategic and rezoning processes or apply to a SSD.

In defining the development envelope, the Tweed Shire DCP outlines ecological setbacks (referred to as 'red flags') for which a range of setbacks are required. Ecological setbacks required under the Tweed Shire DCP are discussed in **Section 4.2.7**.

Part D of Section A.19 also sets out assessment requirements in determining an application for development consent. It also sets out requirements for a Baseline Ecology Assessment (BEA) (i.e. this report) and where this is required. The BEA must include:

1. A signed statement from a qualified ecologist stating that the Biodiversity Offset Scheme does not apply to the proposed development including:
 - a. information to support the conclusion that the proposal does not exceed the BOS threshold; and
 - b. a response to the five part test of significance set out under cl 7.3(1) of the BC Act.
2. A Baseline Ecological Assessment prepared in accordance with the Baseline Ecological Assessment Guideline as updated from time to time ([http:// www. tweed.nsw.gov.au/PlanningPolicies](http://www.tweed.nsw.gov.au/PlanningPolicies)).

It is noted that as the planning proposal is at the rezoning stage only (i.e. not requiring development consent) assessment under the BOS is not yet required, although if it is a SSD the BOS will be triggered. As such a signed statement is not provided.

It is also noted that the Baseline Ecological Assessment Guideline could not be accessed at the above link.

ii. Section B.26 Kingscliff

Section B.26 of the Tweed Shire DCP aims to protect ecologically significant areas from development through land use planning. Ecologically significant areas are identified within the study area, but do not extend into the subject site. Controls in Section 2.3.3 (Section C.1.) indicate that a Habitat Restoration Plan must be prepared for buffer areas around ecologically significant areas. These buffers/setbacks are to be identified according to Section A.19 of the Tweed Shire DCP. A Habitat Restoration Plan is yet to be prepared as at this stage and would be required to support a DA.

Section B.26 of the Tweed Shire DCP contains a range of other controls not specifically relevant to biodiversity, which are not addressed in the BEA.

1.5.6. State Environmental Planning Policy (Biodiversity and Conservation) 2021

The State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala SEPP 2021) commenced on 17 March 2021 and has most recently has been incorporated into the State Environmental Planning Policy (Biodiversity and Conservation) 2021 (BC SEPP 2021). The Koala SEPP 2021 reinstates the policy framework of SEPP Koala Habitat Protection 2019 to 83 Local Government Areas (LGA) in NSW. The Koala SEPP 2021 does not apply to land zoned RU1 Primary Production, RU2 Rural Landscape or RU3 Forestry within the Tweed Shire Council LGA. As the subject site is currently zoned RU1 under the Tweed Local Environment Plan 2014 the Koala SEPP 2021 does not apply. However, the State Environmental Planning Policy (Koala Habitat Protection) 2020 also included in the BC Act SEPP 2021 would still apply. Note that if the land is rezoned, assessment under the Koala SEPP 2021 would be required in the future. If assessment under the Koala SEPP 2021 is required, where there is an approved Koala Plan of Management, Council's determination of a DA must be consistent with the Koala Plan of Management. The Tweed Coast Comprehensive Koala Plan of Management 2020 (Tweed Coast CKPoM) is a valid Koala Plan of Management and would apply in this situation. As the proposed development is public infrastructure, the Tweed Coast CKPoM would apply after rezoning.

Under the State Environmental Planning Policy (Koala Habitat Protection) 2021 before a council may grant consent to a DA to carry out development on land to which this Part applies, the council must be satisfied as to whether or not the land is potential koala habitat. The council may be satisfied as to whether or not land is potential koala habitat only on information obtained by it, or by the applicant, from a person who is qualified and experienced in tree identification.

1.5.7. Tweed Coast Comprehensive Koala Plan of Management 2020

The subject site occurs within the Southern Tweed Coast Koala Management Area identified in the Tweed Coast CKPoM. The Preliminary Advice for Pre-lodgement Meeting has specifically requested that the planning proposal be assessed under relevant components of Part 6 Strategic Planning of the Tweed Coast CKPoM. Part 6 relates to strategic planning and applies to planning proposals within the Tweed Coast.

Under Section 6.2.2 of the Tweed Coast CKPoM a planning proposal should consider to the extent that it is possible:

- Any Preferred Koala Habitat within a Koala Activity Precinct or Koala Linkage Precinct shall be included in an environmental protection zone; and

- Any known Core Koala Habitat that occurs over largely cleared areas (e.g. as scattered trees with Koalas present) may be included within an environmental protection zone

Where Koalas are present there is also a requirement to set aside 10% of the land for revegetation to create Koala habitat.

The subject site is not located within a Koala Activity Precinct or Koala Linkage Precinct and Core Koala Habitat and requirements to set aside land for conservation would only be present if Koalas were identified as being present. In order to determine if Core Koala Habitat is present, an assessment of Koala habitat within the study area has been undertaken.

1.5.8. Rezoning

The Northern Councils E Zone Review Final Recommendations Report (NSW Government Planning and Environment 2015) applies to the Local Government Areas (LGAs) of Ballina, Byron, Kyogle, Lismore and Tweed. The Northern Councils E Zone Review applies to proposed new zones E2 (Environmental Conservation) and E3 (Environmental Management) and does not apply to other rezoning, such as rezoning for the proposed development. However, the criteria for the new zones are considered to determine if they would apply to any areas within the subject site.

The former Department of Planning, Industry and Environment (DPIE) (now the Department of Planning and Environment (DPE)) has also released the Local Environment Plan Making Guideline (DPIE 2022) that outlines the information that is likely to be required to support a rezoning proposal. This includes a biodiversity assessment (i.e. this report). Details of where the information required is addressed in this report is detailed in **Table 2** below.

Table 2 Information required by DPIE (2022) for a Biodiversity Assessment Report for a Rezoning Proposal

Information Required	Where provided in this Report
Maps and describe the ecological features and biodiversity value of the site (including ground truthing if relying on existing mapping) including threatened ecological communities, threatened species and their habitat including linkages to corridors beyond the site	Figures provided including: Ground-truthed vegetation mapping (Figure 7) Threatened ecological communities (Figure 8) Koala habitat (Figure 11)
Discuss the implications of occurrences of native flora and fauna for future development of the site	Implications of threatened species for future development are discussed in Section 4.2.3 .
Demonstrate how the proposal has taken appropriate and sufficient steps, as a first step, to avoid or minimise impacts to native vegetation (if relevant)	Not relevant at this stage, however, avoidance and minimisation measures are recommended in Section 5 .
Make recommended mitigation of the ecological impacts of rezoning (if relevant)	Avoidance and minimisation measures are recommended in Section 5 .
Make recommendations for biodiversity offsets to address any loss of native vegetation (if relevant)	Recommendations are provided in Section 5.7 .

Information Required	Where provided in this Report
Proposed ownership and management arrangements for residual land such as environmental land, open space and riparian corridors	Not addressed as arrangements are yet to be determined

2. Methods

2.1. Literature Review and Database Searches

2.1.1. Literature Review

A literature review and database searches were undertaken, including review of documents prepared for adjacent properties. Key documents reviewed included:

- Stage 2 SSD: Biodiversity Development Assessment Report, Tweed Valley Hospital Health Infrastructure (Greencap 2019);
- Comparative assessment of the ecological value of vegetation on Gales southern holdings and its use for parklands and restoration (Idyll Spaces Environmental Consultants 2020a);
- Review of impacts of proposed development and parklands on SEPP Coastal Wetlands, Gales Southern Land holdings, Kingscliff (Idyll Spaces Environmental Consultants 2020b);
- Kingscliff Gales Holding Land and Associated Stormwater Flows (Australian Environmental Surveys 2021);
- The Tweed Shire Vegetation Management Strategy (Kingston et al. 2004); and
- The Tweed Coast Koala Habitat Study (Phillips 2011).

2.1.2. Database Searches

Database analysis was conducted for the locality using the BioNet Atlas (E&H 2023a) and the EPBC Protected Matters Search Tool (DEECCW 2023). The BioNet Atlas search facility was used to generate records of threatened flora and fauna species and populations listed under the BC Act and/or EPBC Act within the locality of the subject site. The locality is defined as the area within a 5 km radius of the subject site. The abundance, distribution and age of records generated within the search areas provided supplementary information for the assessment of occurrence of those threatened species within the subject site. The Protected Matters Search Tool generated a list of potentially occurring EPBC Act listed entities within the locality.

The following databases and mapping tools were also interrogated:

- BioNet Vegetation Classification database (E&H 2023b);
- NSW BioNet Threatened Biodiversity Data Collection;
- Biodiversity Values Map and Threshold Tool;
- Tweed Shire Council mapping; and
- NSW State Vegetation Type mapping available in the SEED Portal:

The information collected during the database analysis provided additional information on the biodiversity values associated with the subject site and study area.

2.2. Field Survey

A survey of the study area was undertaken on 21 June 2022 by Senior Ecologist Dr Trevor Meers of Cumberland Ecology. Details of survey components are detailed below. Survey effort (tracks and plot locations) are shown in **Figure 4**.

2.2.1. Vegetation Mapping

A general walk over the study area and subject site was undertaken to verify the Tweed Shire Council vegetation mapping. Where mapping was found to vary, changes were marked up on aerial imagery. A list of flora species present was recorded, including a list of species within each mapped vegetation community. Following mapping, communities were assigned to Plant Community Types (PCTs) and checked against descriptions of threatened ecological communities listed under the BC Act and the EPBC Act. Descriptions checked included PCT descriptions in the BioNet Vegetation Classification Database, Final Determinations (BC Act) and the EPBC Act Species Protection and Threats Profile Database (EPBC Act).

2.2.2. Vegetation Integrity Plots

Three plots were surveyed using the BAM.

Sampling of the BAM plots included the survey of a 20 m x 50 m plot within which data was collected to assess the vegetation integrity and habitat suitability. This survey included collection of the following data:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20m plot;
- Cover of High Threat Exotic weed species;
- Assessment of function attributes within a 20 m x 50 m plot, including:
 - Count of number of large trees;
 - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
 - Regeneration based on the presence of living trees with stems <5cm DBH; and
 - The total length in metres of fallen logs over 10 cm in diameter.
 - Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 20 m x 50 m plot; and
 - Number of trees with hollows that are visible from the ground within the 20 m x 50 m plot.

For two of the BAM plots, the internal plot was 40 x 10 m rather than 20 x 20 m due to the narrow linear distribution of some vegetation communities located on the property boundary.

The location of the BAM plots is shown in **Figure 4**. Species composition data from the BAM plots is included in **Appendix A**.

2.2.3. Threatened Flora Searches

A random meander search was undertaken for threatened flora species identified in database searches as occurring in the locality. In particular, this search focussed on *Cryptocarya foetida* which was identified from the adjacent Tweed Valley Hospital site along Cudgen Road (Greencap 2019). This search focussed primarily on areas of native vegetation and planted exotic vegetation, with meanders undertaken more sparsely in areas of exotic grassland.

2.2.4. Fauna Habitat Assessment

A general fauna habitat assessment was undertaken within the study area during the site inspection. This assessment included consideration of important indicators of habitat conditions and complexity, as well as the occurrence of micro-habitats. Notes were taken on specific habitat features that may be utilised by threatened fauna species known to occur in the locality which included hollow bearing trees, logs, branches, and structures that could be used by microbats for roosting.

2.2.5. Incidental Observations

Any incidental fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded and listed in the total species list for the study area.

2.2.6. Koala Habitat Assessment

2.2.6.1. Desktop Assessment

Existing information relating to Koalas and Koala habitat within the study area were reviewed.

Koala records that are held in databases were reviewed within the broader locality (5 km of the subject site including:

- E&H BioNet Atlas (E&H 2023a); and
- Atlas of Living Australia.

Existing mapping was reviewed including:

- Tweed Vegetation Management Strategy (Kingston et al. 2004), prepared for Tweed Shire Council and associated Tweed LGA vegetation mapping; and
- Tweed Shire Council Preferred Koala Habitat mapping;

Vegetation mapping within the Tweed Vegetation Management Strategy was also cross-referenced to the description of PCTs held within the E&H (2023b) BioNet VIS Classification.

2.2.6.2. Mapping of Preferred Koala Food Trees

The GPS location, size (measured as diameter at a height of 1.4 m above ground) and species of all Preferred Koala Food Trees (PKFTs) within the study area were recorded (if present) during the field survey. Preferred Koala Food Trees are defined in The Tweed Coast Koala Habitat Study (Phillips et al. 2011) as:

- *Eucalyptus tereticornis* (Forest Red Gum);
- *Eucalyptus microcorys* (Tallowwood);
- *Eucalyptus propinqua* (Grey Gum); and
- *Eucalyptus robusta* (Swamp Mahogany).

The presence of any secondary or supplementary species was also noted.

2.2.6.3. Mapping of Koala Habitat

Each vegetation community within the study area was assigned to a Koala habitat type based on the definitions in The Tweed Coast Koala Habitat Study (Phillips et al. 2011) and alignment with vegetation communities in the Tweed Vegetation Management Strategy (Kingston et al. 2004).

2.2.6.4. Koala Habitat Assessment

A Koala activity assessment was not undertaken as the areas of Koala habitat identified were primarily growing outside the subject site. The Koala activity assessment method specified in the Tweed Coast CKPoM using the SPOT Assessment Technique (SAT) of Phillips and Callaghan (2011) requires sampling a minimum of 30 trees on a 75 m grid, including searching the base of trees for scats and searching the trunks of trees for scratch marks. The areas of Koala habitat identified were all small, isolated fragments and as such it was not practical to apply this method. Further to this, the base of a row of overhanging *Eucalyptus grandis* growing on the property to the east could not be accessed in order to search around the base of trees. Instead a more general search of trees for Koalas, and for scratch marks where the trunks of overhanging trees was visible was undertaken.

2.3. Survey Limitations

The study area was easily accessible, and a general walkover covered the entire area. Despite this, it is unlikely that all flora species present within the subject site have been recorded. However, it is probable that the vast majority of species, and the majority of the endemic, native flora species present at the time of the survey were recorded, and that issues including conservation significance of the flora, and ecological constraints of native vegetation on development have been satisfactorily assessed.

Limited fauna surveys were undertaken for this assessment, which mainly relied on database analysis of species recorded within a 5 km radius of the subject site, and a fauna habitat assessment. The data produced by the database analysis and fauna habitat assessment is intended to be indicative of the types of species that could occur within the subject site.

3. Results

3.1. Geology, Soils and Landform

The Tweed Heads 1:100 000 Coastal Quaternary Geology Map indicates that the subject site consists of Tertiary volcanic rocks, which are associated with the Mount Warning/Wollumbin Caldera. This formation includes basalt, rhyolite, trachyte and gabbro. Outcropping rocks observed on the northern boundary of the subject site are basalt.

Part of the study area to the north of the subject site are mapped on the Tweed Heads 1:100 000 Coastal Quaternary Geology Map as Holocene tidal delta flats including marine sand, silt, clay, shell and gravel.

The soils formed on Tertiary volcanic rocks within the subject site are fertile deep red clay loams.

The subject site slopes gently from Cudgen Road to the north adjacent to artificial drainage lines that drain into the Tweed River through an artificial wetland.

Surface rock appears to have been removed from the subject site to support horticultural land use. However, an area of exposed basalt rock is present on the northern boundary of the subject site where the level drops to a floodplain adjacent to artificial drainage lines on the adjacent property within the study area.

Parts of the subject site have been terraced to create level areas that were used as a nursery.

3.2. Vegetation Mapping

3.2.1. Existing Mapping

3.2.1.1. Tweed Shire Council Vegetation Mapping

Tweed Shire Council vegetation mapping indicates the following mapping units are present in the subject site:

- Substantially Cleared of Native Vegetation; and
- Early Regrowth Rainforest (restricted to the northern boundary).

Other vegetation units within the study area include:

- Sub-tropical/Warm Temperate Rainforest on Bedrock Substrates;
- Broad-leaved Paperbark Closed Forest to Woodland;
- Broad-leaved Paperbark /Swamp She-oak Closed Forest to Woodland and
- Sedgeland and Rushland.

Tweed Shire Council Vegetation mapping is shown in **Figure 5**.

3.2.1.2. NSW State Vegetation Map

The NSW State Vegetation Type mapping available within the SEED Portal (shown as **Figure 6**) indicates the following Plant Community Types (PCTs) are present in the subject site:

- PCT 3004 Far North Bangalow Palm Swamp Forest; and

- PCT 3961 Coast Sands Lepironia Sedgeland.

Other PCTs mapped in the study area include:

- PCT 4004 Northern *Melaleuca quinquenervia* Swamp Forest; and
- PCT 3148 Far North Brush Box-Walnut Wet Forest.

3.2.2. Ground-truthed Vegetation Mapping

A summary of vegetation communities ground-truthed in the study area is provided in **Table 3** below, with detailed descriptions provided in subsequent sections. Ground-truthed vegetation mapping is shown in **Figure 7**. Plant communities have been assigned to a PCT number and name as per the BioNet VIS database, with cross reference to communities in the Tweed Shire Vegetation Strategy (Kingston et al. 2004).

Table 3 Plant Community Types and other vegetation communities within the study area

PCT Number	PCT Name	Tweed Shire mapping unit	Area subject site (ha)	Area study area (ha)
3172	Northern Ranges Brush Box-Flooded Gum Wet Forest	206 Flooded Gum Open Forest/ Native Plantations	0.08	0.08
3004	Far North Bangalow Palm Swamp Forest (Regrowth)	1002 Early Regrowth Rainforest	0.16	0.56
3004	Far North Bangalow Palm Swamp Forest (Slashed)	104 Lowland Rainforest on Floodplain	0.00	0.70
4004	Northern <i>Melaleuca quinquenervia</i> Swamp Forest	401 Broad-leaved Paperbark Closed Forest to Woodland	0.00	0.30
3987	Far North Floodplain Swamp Oak Paperbark Forest	601 Swamp She-oak Closed Forest to Woodland	0.05	0.05
NA	Planted Exotic	Substantially Cleared of Native Vegetation	0.92	0.97
NA	Exotic Grassland	Substantially Cleared of Native Vegetation	4.48	5.83
NA	Cleared	Substantially Cleared of Native Vegetation	0.10	0.10
Total			5.89	8.45

3.2.2.1. PCT 3172 Northern Ranges Brush Box-Flooded Gum Wet Forest

Vegetation Formation: Wet Sclerophyll Forests (shrubby formation).

Vegetation Class: North Coast Wet Sclerophyll Forests.

Percent Cleared Value: 14.63

BC Act Status of PCT within study area: n/a.

EPBC Act Status of PCT within study area: n/a.

i. General Description

The BioNet VIS Classification (E&H 2023b) describes this PCT as an extremely tall sclerophyll open forest which occurs predominantly in the Border Ranges and adjacent ranges and foothills in the Murwillumbah-Woodenbong-Lismore district, with scattered and disjunct occurrences south to the ranges west of Coffs Harbour. The canopy is typically comprised of one or more of the trees *Lophostemon confertus*, which is very frequent and usually has the highest cover and *Eucalyptus grandis* or *Eucalyptus microcorys*, which are both occasionally present. Where these two species do occur, they often also have high cover. Other species such as *Eucalyptus saligna* may occasionally be locally common. The mid-stratum is typically a highly diverse mix of mesic trees and vines, some of which may be locally abundant. *Cryptocarya microneura* is almost always present, and very frequently *Synoum glandulosum*, *Guioa semiglaucua*, *Eupomatia laurina*, *Neolitsea dealbata* and the vine *Cissus antarctica*. The palm *Archontophoenix cunninghamiana* is commonly present and may have locally high cover. The epiphytic fern *Asplenium australasicum* is commonly present however rarely abundant. The ground layer commonly includes ferns, most frequently *Blechnum neohollandicum* and *Blechnum cartilagineum*. The large herb *Alpinia caerulea* is very frequently present and may be locally abundant and the small herb *Pseuderanthemum variabile* is commonly present with low cover. This PCT occurs mainly in warm, wet locations receiving 1130-1750 mm mean annual rainfall, at moderate elevations of 210-590 metres asl. In the north-east part of its range it occurs on high fertility soils derived from Kyogle or Lismore basalt, while occurrences elsewhere are on other volcanic substrates or on clay-rich sedimentary lithology.

Within the subject site it occurs as a row of *Eucalyptus grandis* (Flooded Gum) located on the adjacent Tweed Valley Hospital site that overhang the subject site. Given that these trees occur in a row on the property boundary it is assumed they have been planted, and do not represent a naturally occurring example of this PCT. These trees occur over a subcanopy of *Macaranga tanarius* (Blush Macaranga) and on the subject site also overhang Planted Exotic vegetation. This community in its natural state aligns with Tweed Shire Vegetation community 206 Flooded Gum Open Forest. This community (Kingston et al. 2004) in its natural state is a tall open to open, wet sclerophyll forest on moderate to fertile soils, often in sheltered moist locations such as valley floors along watercourses. *Eucalyptus grandis* is generally the clear dominant species, but this species often occurs with one or two associates. However, as a planted community, assumed to be planted to create a windbreak, it would align better with Tweed Shire Vegetation community 1005 Native Plantations. This community is described in the Tweed Shire Vegetation Strategy (Kingston et al. 2004) as including areas deliberately planted out to native species for the production of timber resources. Species employed include *Araucaria cunninghamii*, *Eucalyptus saligna*, *E. grandis*, *E. pilularis* and *E. cloeziana*.

It is noted that Appendix D of the BAM 2020 includes a Streamlined assessment module-planted native vegetation, that can be used to assess planted native vegetation provided certain criteria are met. If the planted native vegetation occurs in an area that contains a mosaic of planted and remnant vegetation and which can

be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal, it must be assigned to a PCT and cannot be assessed under the Streamlined assessment module-planted native vegetation when preparing a BDAR. As this community contains some native regrowth of *Macranga tanarius*, it would need to be assigned to the best fit PCT.

Within the subject site this PCT occurs in one condition state as overhanging vegetation.

An example of this PCT is shown in **Photograph 1**.

Photograph 1 PCT 3172 overhanging the subject site



ii. Alignment with Threatened Ecological Communities

PCT 3172 is not aligned with any PCTs listed under the BC Act or EPBC Act. Further, it is not located on a coastal floodplain and as such does not align with any TECs occurring on coastal floodplains.

3.2.2.2. PCT 3004 Far North Bangalow Palm Swamp Forest

Vegetation Formation: Rainforests

Vegetation Class: Subtropical Rainforests.

Percent Cleared Value: 96.64

BC Act Status of PCT: Lowland Rainforest of the NSW North Coast and Sydney Basin Bioregions EEC and Lowland Rainforest on Floodplain in the NSW North Coast Bioregion EEC.

EPBC Act Status of PCT: Lowland Subtropical Rainforest of Eastern Australia CEEC (does not meet listing criteria)

i. General Description

This community is described in the BioNet VIS Classification (E&H 2023b) as a tall to very tall dense palm forest or rainforest, or rarely, extremely tall sclerophyll open forest with a dense sub-canopy, restricted to poorly-drained sites along a narrow strip of coastal lowlands north from Woodburn, North Coast. The palm *Archontophoenix cunninghamiana* is almost always present and has the highest foliage cover, very frequently accompanied by *Ficus coronata* and *Melaleuca quinquenervia*, with *Ficus obliqua* occasionally present. Other tree species such as *Araucaria cunninghamii* or *Syzygium francisii* may be locally common and the vine *Flagellaria indica* is very frequent. The mid-stratum and ground layer are commonly highly diverse, although it may have low species richness where the palm canopy cover is very high. This PCT occurs only at very warm, very wet locations receiving 1710-1830 mm mean annual rainfall, in poorly-drained and seasonally swampy gullies and depressions, usually on alluvium, at low elevations of up to 40 metres asl, within 15 km of the coast. It occurs as part of a complex, small-scale mosaic involving a range of other lowland PCTs.

PCT 3004 vegetation in the study area shares similarities with Tweed Shire Vegetation communities 1002 Early Regrowth Rainforest and intergrades with Tweed Shire Vegetation community 104 Lowland Rainforest on Floodplains (Kingston et al. 2004) where it extends onto floodplains.

Within the subject site this PCT occurs in two condition states as detailed further below.

A photograph of each condition state of this PCT is shown in **Photograph 2** and **Photograph 3**.

ii. Condition State 1 Regrowth

The Regrowth condition state of PCT 3004 occurs along the northern boundary of the subject site on a sloping area where the ground layer is dominated by basalt rocks that are likely to have been placed in the area. It marginally extends into the subject site. A small area dominated by *Cupaniopsis anacardioides* (Tuckeroo) is also located on the eastern boundary of the subject site. The dominant canopy species is *Macaranga tanarius* and the introduced species *Cinnamomum camphora* (Camphor Laurel). Native species in the subcanopy/mid layer include *Guioa semiglaucula*, *Glochidion ferdinandi*, *Cryptocarya triplinervis*, *Mallotus philippensis*, *Syzygium australe* and *Syzygium oleosum*. Vines are present including *Smilax australe*, *Eustrephus latifolius*, *Parsonsia straminea*, *Trophis scandens* and *Stephania japonica*. The mid-layer is dominated by introduced species including *Ligustrum sinense*, *Lantana camara*, *Cestrum parqui*, *Ochna serrulata*, *Senna pendula* var. *glabrata*, *Schinus terebinthifolius*, *Solanum mauritianum* and *Urena lobata*. On the fringes the ground layer is dominated by the introduced grass *Megathyrsus maximus* var. *pubiglumis* and the reed *Arundo donax*.

iii. Condition State 2 Slashed

The Slashed state of PCT 3004 is located on red clay loams formed from basalt adjacent to artificial drainage channels where it occurs on a coastal floodplain. It consists mostly of a canopy of fig trees including *Ficus obliqua* (Small-leaved Fig) *Ficus virens* (White Fig), and the non-native *Ficus benjamina* (Weeping Fig). The mid layer and ground layer has been removed and is maintained through slashing and is dominated by introduced grasses including *Megathyrsus maximus* var. *pubiglumis*, *Chloris gayana* and *Seteria sphacelata*. Other native trees occasionally present include *Glochidion ferdinandi*, *Archontophoenix cunninghamii*, *Melaleuca quinquenervia*, *Casuarina glauca* and *Macaranga tanarius*. The introduced species *Cinnamomum camphora* is

also present in the canopy. Scattered ferns are present including *Cyathea cooperi*, *Asplenium australasicum* and *Platycterium superbum*. This condition state is not present in the subject site.

iv. Alignment with Threatened Ecological Communities

PCT 3004 is aligned with the following BC Act listed TECs:

- Lowland Rainforest of the NSW North Coast and Sydney Basin Bioregions; and
- Lowland Rainforest on Floodplain in the NSW North Coast Bioregion.

The area of PCT 3004 Slashed condition state is located on a floodplain. Viewing of Tweed Shire Council flood mapping indicates that this condition state within areas with a design flood depth of < 2 m and as such it is located on a coastal floodplain. As such, this condition state aligns with the TEC Lowland Rainforest on Floodplain in the NSW North Coast Bioregion rather than Lowland Rainforest on Floodplain in the NSW North Coast Bioregion. The patches of PCT 3004 Regrowth condition state occur above the floodplain on basalt. The Final Determination for Lowland Rainforest TEC (NSW Scientific Committee 2011a) indicates this TEC may be associated with a range of high-nutrient geological substrates, notably basalts and fine-grained sedimentary rocks, on coastal plains and plateaux, footslopes and foothills. Lowland Rainforest, in a relatively undisturbed state, has a closed canopy, characterised by a high diversity of trees whose leaves may be mesophyllous and encompass a wide variety of shapes and sizes. (NSW Scientific Committee 2011a). Although highly disturbed and weed infested, the Regrowth condition state retains a closed canopy with a low diversity of mesic species and as such confirms to the BC Act listed TEC.

Lowland Subtropical Rainforest of Eastern Australia is also listed as a Critically Endangered Ecological Community (CEEC) under the EPBC Act. However, the patches of PCT 3004 within the study area does not align with this CEEC as it does not meet minimum requirements detailed in the listing advice (TSSC 2011) including for dominant canopy species and species richness.

Photograph 2 PCT 3004 Regrowth Condition State



Photograph 3 PCT 3004 Slashed condition state



3.2.2.3. PCT 4004: Northern *Melaleuca quinquenervia* Swamp Forest

Vegetation Formation: Forested Wetlands

Vegetation Class: Coastal Swamp Forests

Percent Cleared Status: 32.84%

BC Act Status of PCT: Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC

EPBC Act Status of PCT: NSW Coastal Swamp Sclerophyll Forest of New South Wales and South-East Queensland EEC

a. General Description

PCT 4004 is described in the BioNet VIS Classification (E&H 2023b) as a tall to very tall, or rarely low to mid-high, mid-dense to dense forest of *Melaleuca quinquenervia*, occasionally with eucalypts, which occurs in coastal lowland swamps on seasonally inundated alluvium or in drainage depressions. The canopy almost always includes *Melaleuca quinquenervia*, commonly with *Casuarina glauca* which sometimes has a high foliage cover. Eucalypts are occasionally present as part of the canopy or as emergents, by far the most frequent species being *Eucalyptus robusta*. The vine *Parsonsia straminea* is commonly present in the canopy however rarely with high cover. There is a mid-dense to dense ground layer of ferns, sedges and grasses that very frequently includes *Telmatoblechnum indicum*, commonly *Gahnia clarkei* and *Baumea articulata*, occasionally with *Baumea rubiginosa* and *Phragmites australis*, the latter forming dense stands in local depressions which are inundated for a longer duration. This PCT has a wide latitudinal range and occupies a range of warm, mostly wet climates at locations receiving 1070-1570 mm mean annual rainfall at low elevations of up to 10 metres asl within 20 km of the coast.

Within the study area this PCT is present in several small patches or scattered trees located adjacent to artificial drainage lines in red clay loam soils. This PCT is present in a single condition state and does not extend into the subject site. This PCT consists of mature trees of *Melaleuca quinquenervia* that form an open forest or woodland structure or exist as scattered trees. Other trees extending into the canopy include *Glochidion ferdinandi* (Cheese Tree). These canopy trees occur over exotic grassland, that at the time of survey had been slashed. Vines are present extending to the canopy including the native *Parsonsia straminea* (Monkey Rope) and the introduced *Ipomoea cairica* (Coastal Morning Glory). Isolated patches of *Phragmites australis* are present along the drainage line. An example of this PCT in the study area is provided as **Photograph 4**.

PCT 4004 corresponds with Vegetation Unit 401, Broad-leaved Paperbark Closed Forest to Woodland defined in the Tweed Vegetation Management Strategy (Kingston et al. 2004).

Photograph 4 PCT 4004 to artificial drainage line within the study area



b. Alignment with Threatened Ecological Communities

Within the BioNet Vegetation Classification, this PCT is associated with the following TEC:

- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.

PCT 4004 is consistent with the Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions threatened ecological community (Swamp Sclerophyll Forest TEC) under the BC Act where adjacent to the subject site. It has a canopy dominated by *Melaleuca quinquenervia* with infrequent occurrence of *Casuarina glauca* (Swamp Oak) and the presence of rainforest elements as subcanopy trees (TSSC 2011b). Swamp Sclerophyll Forest TEC occurs on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. (TSSC 2011b). Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (TSSC 2011b). Viewing of Tweed Shire Council flood mapping indicates that areas of PCT 4004 occur within areas with a design flood depth of < 2 m and as such it is located on a coastal floodplain.

NSW Coastal Swamp Sclerophyll Forest of New South Wales and South-East Queensland was listed as an EEC under the EPBC Act on 8 December 2021. The EPBC Act listed community has key diagnostics and minimum condition thresholds detailed in the Approved Conservation Advice (DAWE 2021). Within the Study Area PCT

4004 is unlikely to align with the EPBC Act community due to the small patch size and exotic dominated ground layer.

3.2.2.4. PCT 3987 Far North Paperbark-Swamp Oak Forest

Vegetation Formation: Forested Wetlands.

Vegetation Class: Coastal Swamp Forests

Percent Cleared Value: 75.84

BC Act Status of PCT: Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions EEC

EPBC Act Status of PCT: Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and Southeast Queensland EEC

a. General Description

PCT 3987 is described in the BioNet VIS Classification (E&H 2023b) as a mid-high to very tall, mid-dense to dense forest of *Casuarina glauca* and *Melaleuca quinquenervia*, rarely with eucalypts in the canopy or as emergents, which occurs on coastal lowland alluvium or estuarine deposits, north from Maclean, North Coast. The vine *Parsonsia straminea* is almost always present, often forming part of the canopy and sometimes locally abundant. The mid-stratum commonly includes scattered to mid-dense mesic small trees or vines, however no single species is frequent. Species occasionally include *Callistemon salignus*, and rarely *Glochidion ferdinandi* and *Cupaniopsis anacardioides*. The sparse to dense ground layer is comprised of grasses and forbs, occasionally including high cover of the grass *Ottochloa gracillima*. This PCT occurs mainly in very warm, wet locations receiving 1140-1730 mean annual rainfall, at low elevations of up to 10 metres asl.

Within the subject site it is restricted to a narrow fringe adjacent to an artificial drainage channel on red soils derived from basalt where *Casuarina glauca* dominates the canopy. The understorey is dominated by introduced species including *Lantana camara*, *Cinnamomum camphora*, *Ochna serrulata*, *Urena lobata*, *Solanum madagascarensis* and *Senna pendula* var. *glabrata*. The introduced climber *Ipomoea cairica* extends into the subcanopy. The few native species present in the mid layer include *Macaranga tanarius* and *Eustrephus latifolius* (Wombat Berry). The ground layer is dominated by the introduced grasses *Megathyrsus maximus* var. *pubiglumis* and *Urochloa decumbens*. This community is consistent with Tweed Shire Vegetation mapping community 601, Swamp She-oak Closed Forest to Woodland.

Within the subject site, PCT 3987 exists as one broad condition state.

An example of this PCT is shown in **Photograph 5**.

Photograph 5 PCT 3987 within the subject site



ii. Alignment with Threatened Ecological Communities

PCT 3987 is aligned with the BC Act listed EEC Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions (Swamp Oak Floodplain Forest) and the EPBC Act listed EEC Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and Southeast Queensland.

BC Act listed Swamp Oak Floodplain Forest EEC is associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (TSSC 2011c). Within the subject site PCT 3987 is located adjacent to a minor artificial drainage channel located on red clay loams formed on basalt on sloping land that is not located on the coastal floodplain. The area sits above areas mapped on Tweed Shire Council flood mapping. As such the patch of PCT 3987 within the subject site is not located on soils or landforms associated with the EEC and does not align with the EEC.

Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and Southeast Queensland is listed and as EEC under the EPBC Act. Within the subject site PCT 3987 does not have key diagnostics for the EPBC Act EEC (DoEE 2018) based on soils and landform. Further to this it occurs as a small patch with a predominantly exotic understorey and therefore also does not meet condition thresholds for listing (DoEE 2018).

3.2.2.5. Planted Exotic Vegetation

Planted exotic vegetation is present along much of the boundary of the subject site including a row of *Syagrus romanzoffiana* (Cocos Palm) along the Cudgen Road and Tweed Valley Road frontage. It also includes a stand of *Pinus elliottii* (Slash Pine) and areas dominated by tall weedy grasses such as *Arundo donax* (Giant Reed) and *Cenchrus purpureus* (Elephant Grass). Along the eastern boundary and adjacent to the residential dwelling the planted exotic vegetation includes a greater diversity of species including plantings that form an overgrown unmanaged hedge/screen planting including *Duranta erecta* and *Murraya paniculata*. It includes a range of planted palms including *Hyophorbe verschaffeltii* (Spindle Palm), *Dypsis lutescens* (Golden Cane Palm), *Livistona chinensis* (Chinese Fan Palm) and *Strelitzia nicolai* (Giant Bird of Paradise). Scattered regrowth of the native species *Macaranga tanarius* is scattered throughout areas of planted exotic vegetation. Woody environmental weeds are abundant including *Lantana camara* (Lantana), *Ochna serrulata* (Mickey Mouse Plant), *Cinnamomum camphora* (Camphor Laurel), *Solanum mauritianum* (Wild Tobacco) and *Solanum chrysotrichum* (Giant Devils Fig). The ground layer is dominated by exotic grasses.

Planted exotic vegetation does not align with any PCTs and does not align with TECs listed under the BC Act or EPBC Act. In the long term in the absence of further disturbance, it is possible that some colonising rainforest species such as *Macaranga tanarius* will invade and that this vegetation could ultimately develop into a highly degraded form of Lowland Rainforest EEC. However, given the abundance of weed species in the area including stands of *Pinus elliottii* that are spreading and other environmental weed species, this occurrence would be low quality vegetation that would take many years to potentially develop into Lowland Rainforest EEC. As such it is not considered to align with this EEC.

A photograph of the planted exotic vegetation within the subject site is provided as **Photograph 6**.

Photograph 6 Planted Exotic Vegetation (Cocos Palms) near the boundary of the subject site



3.2.2.6. Exotic Grassland

The majority of the subject site is exotic grassland, which also extends north into adjacent parts of the study area where exotic grassland had recently been slashed. Such areas are mapped by Tweed Shire mapping as sedgeland and rushland but are exotic grassland. Introduced grasses include *Chloris gayana* (Rhodes Grass), *Setaria sphacelata* (South African Pigeon Grass), *Urochloa decumbens* (Signal Grass), *Megathyrsus maximus* var. *pubiglumis* (Green Panic), *Melinis repens* (Red Natal Grass), *Melinis minutiflora* (Molasses Grass), *Andropogon virginicus* (Whiskey Grass) and *Paspalum* species (*P. conjugatum* and *P. urvillei*). Introduced forbs interspersed include *Ageratum houstonianum* (Billygoat Weed), *Ambrosia artemisioides* (Annual Ragweed), *Conyza sumatrensis* (Fleabane) and *Sphagneticola trilobata* (Singapore Daisy). In some areas legumes are abundant including *Neonotonia wightii* (Glycine) and *Desmodium uncinatum* (Silver-leaf Desmodium). In areas close to stands of *Pinus elliottii* scattered pine wildings are present within exotic grassland. No native species were detected within the single BAM plot located in exotic grassland.

Exotic grassland does not align with any PCTs and does not align with TECs listed under the BC Act or EPBC Act. In the long term in the absence of further disturbance including slashing, it is possible that some colonising rainforest species such as *Macaranga tanarius* will invade and that this vegetation could ultimately develop into a highly degraded form of Lowland Rainforest EEC or Lowland Rainforest on Floodplain EEC depending on the landform. The dense grass cover is however likely to prevent woody species from invading. Further, given the abundance of weed species in the surrounding area including stands of *Pinus elliottii* that are

invading, and other environmental weed species in the surrounding areas, this would be low quality vegetation that would take many years to potentially develop into an TEC. As such it is not considered to align with a TEC.

A photograph of the exotic grassland within the subject site is provided as **Photograph 7**.

Photograph 7 Exotic grassland within the subject site



3.2.3. Cleared Land

Areas mapped as cleared land include areas devoid of vegetation such as hardstands, driveways, sheds and the residential dwelling.

Cleared land does not align with any PCTs and does not align with TECs listed under the BC Act or EPBC Act.

3.2.4. Threatened Ecological Communities

No areas of vegetation that meet listing criteria for EPBC Act listed TECs are present in the study area and subject site. While several BC Act listed are present in the study area, only Lowland Rainforest EEC extends onto the subject site. **Table 4** below provides a summary of the TECs present in the study area and subject site. The distribution of TECs mapped under the BC Act is shown in **Figure 8**.

Table 4 BC Act listed TECs within the study area and subject site

Vegetation Community	Threatened Ecological Community	Area Study Area (ha)	Area (Subject Site)
PCT 3004 Regrowth	Lowland Rainforest EEC	0.56	0.16
PCT 3004 Slashed	Lowland Rainforest on Floodplain EEC	0.55	0.00
PCT 4004	Swamp Sclerophyll Forest EEC	0.30	0.00

3.3. Flora

3.3.1. General Flora

A total of 114 species were recorded during field surveys of the study area including within the three BAM plots, including 36 native species and 78 introduced species. The introduced species included a mix of planted ornamentals, garden escapes, common pasture grasses and forbs, and environmental weeds. The native species detected included species characteristic of Lowland Rainforest. The full of list species detected is provided in **Appendix B**.

3.3.2. Threatened Flora

No threatened flora species were detected within the study area. *Cryptocarya foetida* detected on the adjacent Tweed Hospital site (Greencap 2019) was not detected within surveys. Given that the rainforest regrowth within the subject site is highly degraded and that these areas were extensively searched it is considered unlikely that this species is present within the subject site. No other threatened flora species are considered likely to be present within the subject site due to the highly degraded nature of the site.

3.3.3. Introduced Species

A total of 78 introduced species are present within the study area. Of these, many species have been recognised as having a management requirement as per **Table 5**. Several species are listed as a Priority weed under the NSW *Biosecurity Act 2015* through the North Coast Regional Weed Management Plan (North Coast LLS 2017). The North Coast Regional Weed Management Plan (North Coast LLS 2017) also contains weed watch species, which are emerging weed species that may require additional management. It also contains additional species of management concern for which asset protection is a high priority. All State Priority weeds are also listed as Weeds of National Significance under the National Weed Strategy. Many other garden escapes and introduced pasture species with the study area have potential to be environmental weeds even though they are not listed as Priority weeds.

Table 5 Priority weeds listed under the *Biosecurity Act 2015* detected within the study area

Species Name	Common Name	Priority Weed	Weed of National Significance
<i>Ageratina adenophora</i>	Crofton Weed	Asset protection	
<i>Anredera cordifolia</i>	Madeira Vine	SP Asset Protection	Yes
<i>Arundo donax</i>	Giant Reed	SP Containment	

Species Name	Common Name	Priority Weed	Weed of National Significance
<i>Baccharis halimifolia</i>	Groundsel Bush	SP Containment	
<i>Cestrum parqui</i>	Green Cestrum	SP Containment	
<i>Cinnamomum camphora</i>	Camphor Laurel	Asset protection	
<i>Desmodium uncinatum</i>	Silver-leaf Desmodium	Asset protection	
<i>Duranta erecta</i>	Duranta	Asset protection	
<i>Lantana camara</i>	Lantana	SP Asset Protection	Yes
<i>Ligustrum lucidum</i>	Broad-leaved Privet	Asset protection	
<i>Ligustrum sinense</i>	Small-leaved Privet	Asset protection	
<i>Murraya paniculata</i>	Murraya	Asset protection	
<i>Ochna serrulata</i>	Ochna	Asset protection	
<i>Passiflora suberosa</i>	Corky Passionflower	Weed watch	
<i>Passiflora subpeltata</i>	White Passionflower	Asset protection	
<i>Pinus elliottii</i>	Slash Pine	Asset protection	
<i>Schefflera actinophylla</i>	Umbrella Tree	Asset protection	
<i>Schinus terebinthifolius</i>	Broad-leaved Pepper Tree	SP Containment	
<i>Senecio madagascariensis</i>	Fire Weed	SP Asset Protection	Yes
<i>Senna glabrata</i> var. <i>pendula</i>	Winter Cassia	Weed watch	
<i>Solanum chrysotrichum</i>	Giant Devil's Fig	SP Containment	
<i>Solanum seaforthianum</i>	Climbing Nightshade	RP Asset Protection	
<i>Spathodea campanulata</i>	African Tulip Tree	Weed watch	
<i>Sporobolus africanus</i>	Paramatta Grass	Asset protection	
<i>Strelitzia nicholii</i>	Giant Bird of Paradise	Weed watch	
<i>Syagrus romanzoffiana</i>	Cocos Palm	Asset protection	

Notes: SP: State Priority, RP: Regional Priority

3.4. Fauna

3.4.1. General Fauna

A total of 25 fauna species were observed in the study area during the field survey including 23 birds and two reptiles. These were predominantly common bird species and some rainforest species observed or heard that were foraging within areas of rainforest to the north of the study area or seen flying overhead. The species detected are listed in **Table 6** below. None of these species are listed as threatened species under the BC Act or EPBC Act.

Table 6 Fauna species detected from within the study area.

Class	Scientific Name	Common Name	Observation Type
Aves	<i>Acridotheres tristis</i>	Common Myna	Seen
Aves	<i>Alectura lathami</i>	Australian Brush-turkey	Mound
Aves	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	Seen
Aves	<i>Centropus phasianinus</i>	Pheasant Coucal	Seen
Aves	<i>Columba leucomela</i>	White-headed Pigeon	Seen
Aves	<i>Corvus orru</i>	Torresian Crow	Heard / Seen
Aves	<i>Coturnix ypsilophora</i>	Brown Quail	Seen
Aves	<i>Cracticus nigrogularis</i>	Pied Butcherbird	Heard
Aves	<i>Cracticus torquatus</i>	Grey Butcherbird	Heard
Aves	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	Heard
Aves	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	Seen
Aves	<i>Geopelia humeralis</i>	Bar-shouldered Dove	Heard
Aves	<i>Manorina melanocephala</i>	Noisy Miner	Seen
Aves	<i>Meliphaga lewinii</i>	Lewin's Honeyeater	Heard
Aves	<i>Ocyphaps lophotes</i>	Crested Pigeon	Seen
Aves	<i>Psophodes olivaceus</i>	Eastern Whipbird	Heard
Aves	<i>Ptilonorhynchus violaceus</i>	Satin Bowerbird	Seen
Aves	<i>Rhipidura albiscapa</i>	Grey Fantail	Seen
Aves	<i>Rhipidura leucophrys</i>	Willie Wagtail	Seen
Aves	<i>Strepera graculina</i>	Pied Currawong	Heard
Aves	<i>Threskiornis molucca</i>	Australian White Ibis	Seen
Aves	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	Heard
Aves	<i>Vanellus miles</i>	Masked Lapwing	Heard
Reptilia	<i>Intellagama lesueurii</i>	Australian Water Dragon	Seen
Reptilia	<i>Lampropholis guichenoti</i>	Common Garden Skink	Seen

3.4.1.1. Fauna Habitat

The subject site contains several tin sheds that could provide marginal roosting habitat for threatened microchiropteran bat (microbat) species. These do not contain enclosed ceiling cavities and would likely provide only marginal roosting habitat. Note that the residential dwelling was not able to be accessed for ceiling cavities as it was occupied at the time of survey.

A row of rocks located on the northern boundary of the subject site could provide potential shelter habitat for reptile species.

No hollow bearing trees were detected within the study area. However, it is likely that the *Eucalyptus grandis* on the adjacent Tweed Valley Hospital site contain small hollows that were not detected.

More broadly the vegetation within the study area provides foraging resources such as nectar and fruit for bird and bat species including fig trees within PCT 3004 Slashed. The subject site includes mature *Pinus elliottii* that provide seed for cockatoo species.

3.4.2. Threatened Fauna

No threatened fauna species were observed during surveys. The subject site is likely to provide foraging habitat for several threatened fauna species, but for most species breeding habitat is likely to be limited. Specific groups of threatened species for which the subject site could provide foraging habitat are discussed further below. In addition to these species a wider range of bird species including migratory birds listed under the EPBC Act are likely to pass over and forage above the subject site. This is likely given the close proximity to the coast. Note that if a BDAR is required for a future DA there are likely to be additional threatened fauna species for which targeted surveys may be required under the BAM, additional to the species discussed below.

3.4.2.1. Microbats

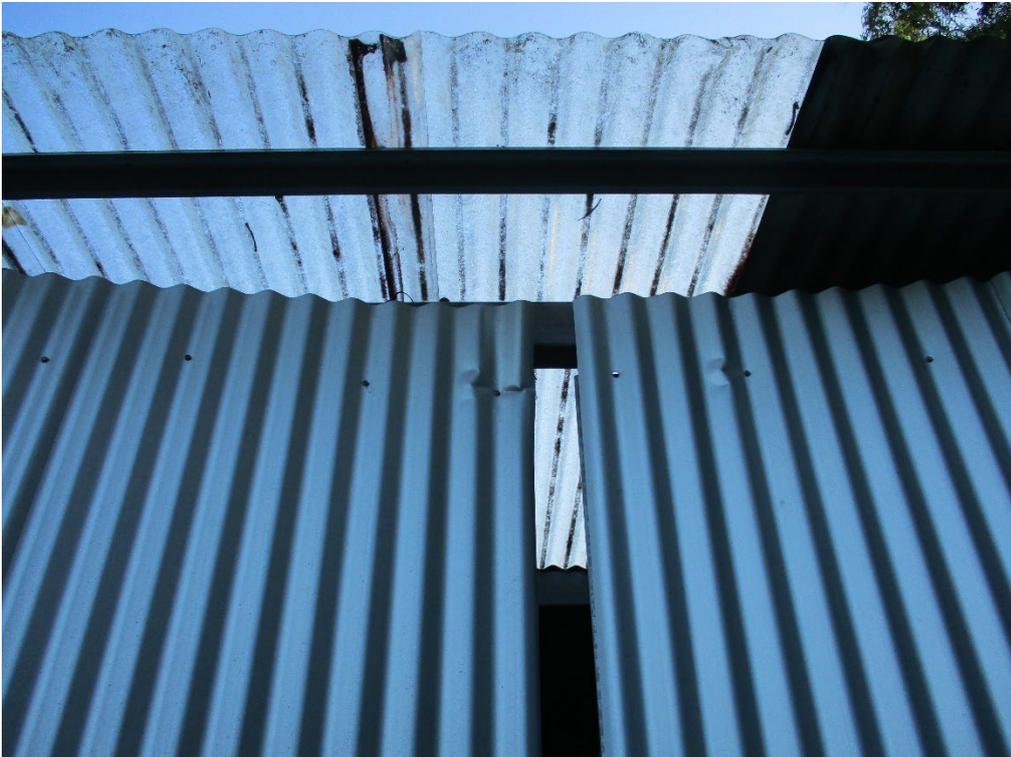
The following threatened microbat species could utilise old sheds and buildings as marginal roosting habitat including:

- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*);
- Little Bent-wing Bat (*Miniopterus australis*);
- Large Bent-wing Bat (*Miniopterus orianae oceanensis*); and
- Southern Myotis (*Myotis macropus*).

These species are all listed as vulnerable under the BC Act.

Example photographs of these sheds are provided as **Photograph 8** and **Photograph 9**.

Photograph 8 Wall and roof of a corrugated iron shed with noticeable gaps



Photograph 9 Disused nursery building



3.4.2.2. Rainforest Birds and Bats

Rainforest species, in particular figs within the study area are likely to provide foraging resources to rainforest bird and bat species. Planted exotic species and weeds would also provide foraging resources such as fruit and nectar. Threatened species for which foraging resources are present include:

- Wompoo Fruit Dove (*Ptilinopus magnificus*);
- Rose-crowned Fruit Dove (*Ptilinopus regina*);
- Common Blossom Bat (*Syconycteris australis*); and
- Grey-headed Flying Fox *Pteropus poliocephalus*.

These species are all listed as vulnerable under the BC Act, while the Grey-headed Flying Fox is also listed as vulnerable under the EPBC Act.

For the Grey-headed Flying Fox, two camps are known to be located approximately 1.4 km to the north and northwest of the subject site (based on Tweed Shire environmental mapping). Given this proximity it is considered likely that vegetation with the study area and subject site would be used for foraging only.

3.4.2.3. Threatened Species in Adjacent Areas

A number of threatened species have been detected in adjacent areas including the Tweed Valley Hospital site (Greencap 2019). These species include:

- Mitchells Rainforest Snail (*Thersites mitchellae*) recorded to the northeast of the site in *Melaleuca quinquenervia* open forest;
- Three-toed Snake-Tooth Skink (*Coeranoscincus reticulatus*) and Powerful Owl (*Ninox strenua*) both assumed to be present;
- Pale-vented Bush-hen (*Amaurornis moluccana*), Bush Stone-curlew (*Burhinus grallarius*), Common Blossom-bat (*Syconycteris australis*) and Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*) all detected within 1500 m of the Tweed Valley Hospital Site (Ecosure 2018);
- Grey-headed Flying Fox (*Pteropus poliocephalus*) known from existing camps at Kingscliff and Chinderah (Ecosure 2018); and
- Two Eastern Osprey (*Pandion cristatus*) nests are known from within a 1500 m radius of the Tweed Valley Hospital site (Greencap 2019).

In addition to the above species, the Wallum Froglet (*Crinia tinnula*) was detected in past surveys but not in surveys in December 2020 of Gales land holdings to the north of the subject site (Australian Environmental Surveys 2021).

An assessment of the potential that these species would occur in the subject site is provided in **Table 7** below.

Table 7 Assessment of potential of threatened fauna recorded in adjacent areas being present in the subject site.

Species			Habitat requirement	Likely occurrence in subject site
Mitchells Rainforest (<i>Thersites mitchellae</i>)	Snail	Remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. Slightly higher ground around the edges of wetlands with palms and fig trees are particularly favoured habitat. Typically found amongst leaf litter on the forest floor, and occasionally under bark in trees.	Possible. Regrowth rainforest on the northern edge of the subject site provides marginal degraded habitat for his species. There is little litter cover due to slashing in adjacent areas.	
Three-toed Snake-Tooth (<i>Coeranoscincus reticulatus</i>)	Skink	Occurs in rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. The Three-toed Snake-tooth Skink lives in loose soil, leaf litter and rotting logs, and feeds on earthworms and beetle grubs. Can also occur in garden beds and urban yards under leaf litter on alluvial soils.	Unlikely. Areas with suitable litter cover and rotting logs are very limited. Unlikely to occur, but targeted surveys required to confirm this.	
Powerful Owl (<i>Ninox strenua</i>)		The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. It breeds and hunts in open or closed sclerophyll forests or woodlands and occasionally hunts in open habitats. Roosting during the daytime occurs in dense vegetation of Eucalypts and species such as <i>Syncarpia glomulifera</i> (Turpentine), <i>Angophora floribunda</i> (Rough-barked Apple), and other species. Prey species are medium-sized arboreal mammals such as the Greater Glider, Common Ringtail Possum, and Sugar Glider. As most prey species require hollows and a shrub layer these are important habitat components also of the Powerful Owl. Nests are in large tree hollows (at least 0.5 m deep), in large eucalypts	Unlikely. No trees suitable for nesting are present in the subject site. The species could more broadly forage above the subject site.	

Species		Habitat requirement	Likely occurrence in subject site
		(diameter at breast height of 80-240 cm) that are at least 150 years old.	
Pale-vented Bush-hen (<i>Amaurornis moluccana</i>)		The Pale-vented Bush-hen inhabits tall dense understorey or ground-layer vegetation on the margins of freshwater streams and natural or artificial wetlands, usually within or bordering rainforest, rainforest remnants or forests. Also occur in secondary forest growth, rank grass or reeds, thickets of weeds, such as Lantana (<i>Lantana camara</i>), and pastures, crops or other farmland, such as crops of sugar cane, and grassy or weedy fields, or urban gardens where they border forest and streams or wetlands, such as farm dams. Can also occur in and around mangroves, though rarely do so, if at all, in NSW.	Possible. Rainforest regrowth to the north of the subject site and other vegetation adjacent to artificial drainage lines represents suitable habitat for this species
Bush Stone-curlew (<i>Burhinus grallarius</i>)		The Bush Stone-curlew inhabits open forests and grassy woodlands.	Unlikely. Suitable habitat is limited, although the species could pass through the subject site to forage on occasion
Common Blossom-bat (<i>Syconycteris australis</i>)		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.	Possible. Roosting habitat is limited, however, the species is likely to use rainforest regrowth within the subject site for foraging
Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>)		Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without	Possible. Old sheds or buildings could provide marginal roosting habitat. Species is likely to forage across the subject site. Targeted surveys recommended to confirm if the subject site is used for roosting

Species	Habitat requirement	Likely occurrence in subject site
Eastern Osprey (<i>Pandion cristatus</i>)	trees; appears to defend an aerial territory. Found in littoral and coastal habitats and terrestrial wetlands. They generally are found in coastal areas though will travel inland along major water courses. They visit a wide range of wetland habitats including inshore waters, reefs, bays, coastal cliffs, estuaries, mangrove swamps, broad rivers, reservoirs, large lakes, and water holes. They feed on fish over clear, open water, and nest in trees or dead trees, generally within one kilometre of the ocean.	Unlikely. While the species may fly over the subject site no nests are present, and no foraging habitat is present within the subject site.
Wallum Froglet (<i>Crinia tinnula</i>)	Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgeland and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests.	Unlikely. No habitat is present within the subject site. Habitat to the north in the study area is degraded due to artificial drainage lines in the area.

3.5. Koala Habitat

3.5.1. Koala Records

The NSW BioNet database indicates that there are 365 post 1990 records of Koala within the locality. The location of these is shown in **Figure 9**. The majority of these records are from the Kings Forest area to the south. There are no Koala records from the study area.

3.5.2. Koala Habitat Mapping

Mapping within the Tweed Vegetation Management Strategy 2004, (Kingston et al. 2004) indicates that a small slither of Preferred Koala Habitat occurs within the study area and does not extend into the subject site. This area is associated with an area of PCT 4004.

Koala habitat mapping is shown in **Figure 10**.

3.5.3. Preferred Koala Food Trees

No PKFTs defined under the Tweed Coast CKPoM were detected from within the study area.

3.5.4. Koala Habitat Mapping

The Tweed Coast Koala Habitat Study (Phillips et al. 2011) defines the following classes of Preferred Koala habitat:

- **Primary Habitat** – areas of forest and/or woodland wherein primary food tree species comprise the dominant or co-dominant (i.e. $\geq 50\%$) overstorey tree species;
- **Secondary (Class A) Habitat** – areas of forest and/or woodland wherein primary food tree species are present but not dominant or co-dominant and usually (but not always) growing in association with one or more secondary food tree species.
- **Secondary (Class B) Habitat** – areas of forest and/or woodland wherein primary food tree species are absent, habitat containing secondary and/or supplementary food tree species only.
- **Other habitat** - communities within which Koala food trees are absent.

Based on the above, the area of PCT 4004 would be Secondary (Class B) Habitat as it only contains *Melaleuca quinquenervia* which is a supplementary food species (Phillips et al. 2011). Any rainforest areas (PCT 3003) that contain *Melaleuca quinquenervia* would also be Secondary (Class B) Koala habitat. This applies to PCT 3004 Slashed that is located to the north outside the subject site.

Casuarina glauca which dominates PCT 3987, is rarely used by Koalas on the Tweed Coast (Phillips et al. 2011). This PCT does not contain the Preferred Koala Food Trees *Eucalyptus robusta* or *E. tereticornis* and as such would also meet the definition of Secondary (Class B) Habitat.

Eucalyptus grandis, which overhangs the subject site from the adjacent Tweed Valley Hospital site is a Koala use tree defined under the Koala (*Phascolarctos cinereus*) BAM Survey Guide (DPE 2022) but is not defined as a primary or secondary food species under the Tweed Coast Koala Habitat Study (Phillips et al. 2011). In its natural state this vegetation would align to Tweed Shire vegetation unit 206 Flooded Gum Open Forest and would be Secondary Class B Koala habitat due to the presence of *Eucalyptus propinqua* and *E. microcorys*. However, as a planted row of trees, it does not contain these species. and if assigned to the Tweed Shire mapping unit Native Plantation, then this area would be considered 'Other' Koala habitat.

Given that the subject site is not Koala Activity Precinct or Koala Linkage Precinct, the absence of PKFTs and the absence of Koala records, no vegetation within the subject site is Core Koala Habitat as defined by the Tweed Coast KPoM.

Table 8 below details the Koala habitat types assigned to each vegetation community with Koala habitat mapping shown in **Figure 11**.

Table 8 Koala habitat type for each PCT and condition state

PCT No and Name	Condition relevant)	State (if	Tweed Council Unit	Shire Vegetation	Koala Habitat Type
3172 Northern Ranges Brush Box-Flooded Gum Wet Forest			1005 Plantation	Native	Other
3004 Far North Bangalow Palm Swamp Forest	Regrowth		1002 Rainforest	Early Regrowth	Other
3004 Far North Bangalow Palm Swamp Forest	Slashed		104 Rainforest Floodplain	Lowland on	Secondary (Class B)
3987 Far North Floodplain Swamp Oak Paperbark Forest			601 Swamp Closed Woodland	She-oak Forest to	Secondary (Class B)
4004 Northern <i>Melaleuca quinquenervia</i> Swamp Forest			401 Paperbark Forest to Woodland	Broad-leaved Closed	Secondary (Class B)
NA	Planted Native Vegetation		1099 Cleared of Native Vegetation	Substantially	Unknown
NA	Exotic Grassland		1099 Cleared of Native Vegetation	Substantially	Unknown

3.5.4.1. Koala Activity

Although a Koala activity assessment using the SAT survey method (Phillips et al. 2011) has not been undertaken, no Koalas or signs of Koala activity were detected from the study area. However, *Eucalyptus grandis*, which overhangs the subject site from the adjacent Tweed Valley Hospital site is a Koala use tree defined under the Koala (*Phascolarctos cinereus*) BAM Survey Guide (DPE 2022). This row of *Eucalyptus grandis* has no connectivity to other Eucalypt dominated vegetation and is considered unlikely to support a population of the species. Koalas were not detected within surveys of the adjacent Tweed Valley Hospital site (Greencap 2019). Another Koala use species defined in the Koala (*Phascolarctos cinereus*) BAM Survey Guide (DPE 2022), *Melaleuca quinquenervia* is present within the study area north of the subject site.

Should these trees require removal, a Koala survey following the Koala (*Phascolarctos cinereus*) BAM Survey Guide (DPE 2022) will be required. This will require a SAT survey and survey by another method such as spotlighting.

4. Ecological Impact Assessment and Rezoning Requirements

4.1. Introduction

This chapter outlines the potential ecological impacts of the planning proposal, including direct and indirect impacts, as well as detailing suitability for rezoning. The likely approvals pathway for biodiversity matters for a future DA is also detailed.

4.2. Ecological Impact Assessment

4.2.1. Threatened Ecological Communities

The subject site contains Lowland Rainforest which is listed as an EEC under the BC Act. This EEC occurs as a small patch on the eastern boundary of the subject site, as well as on the northern boundary of the subject site where it intergrades with areas of Lowland Rainforest on Floodplains listed as EEC under the BC Act. These patches of rainforest are degraded and weedy. Direct impacts to these patches of rainforest can largely be avoided if the provided avoidance and mitigation measures in **Chapter 5** are applied to the proposed development. However, based on the development footprint determined from the conceptual layout, a total of 0.003 ha of Lowland Rainforest EEC in the form of part of the canopy of a *Cupaniopsis anacardioides* (Tuckeroo) that would require removal. It is noted that depending on the findings of an arborist's assessment, this tree may be able to be saved, with impacts limited to trimming of the canopy. A Test of Significance of impacts to this TEC is provided in **Appendix C**, and does not predict a significant impact to occur,

Other TECs are present in the study area north of the subject site. These will not be impacted although they are considered in applying setbacks under the Tweed DCP as discussed in **Section 4.2.6**.

4.2.2. Other Vegetation

The exact areas of vegetation requiring removal will not be known until the final development footprint is defined and additional requirements for asset protection zones have been determined. Nonetheless, preliminary calculations based on the conceptual development footprint in **Figure 2** have been provided in **Table 9**. The area calculations provided are based on an earlier version of the concept masterplan, however the impacts on vegetation would be similar. It is assumed that for areas proposed as parkland, existing trees can be retained, although this would need to be assessed by an arborist. The total area of vegetation likely to be impacted by the Cudgen Connection project is detailed in **Table 9** below.

Table 9 Areas of vegetation likely to be directly impacted

PCT Number	PCT Name	Tweed Shire mapping unit	Area to be Removed (ha)
3172	Northern Ranges Brush Box-Flooded Gum Wet Forest	206 Flooded Gum Open Forest/ 1005 Native Plantations	0.02
3004	Far North Bangalow Palm Swamp Forest (Regrowth)	1002 Early Regrowth Rainforest	0.003
3004	Far North Bangalow Palm Swamp Forest (Slashed)	104 Lowland Rainforest on Floodplain	0.00

PCT Number	PCT Name	Tweed Shire mapping unit	Area to be Removed (ha)
4004	Northern <i>Melaleuca quinquenervia</i> Swamp Forest	401 Broad-leaved Paperbark Closed Forest to Woodland	0.00
3987	Far North Floodplain Swamp Oak Paperbark Forest	601 Swamp She-oak Closed Forest to Woodland	0.05
NA	Planted Exotic	Substantially Cleared of Native Vegetation	0.30
NA	Exotic Grassland	Substantially Cleared of Native Vegetation	3.63
NA	Cleared	Substantially Cleared of Native Vegetation	0.05
Total			4.06

4.2.3. Threatened Fauna and Habitat

Targeted surveys of all fauna species with the potential to be present are yet to be undertaken and would need to be undertaken following the survey requirements of the BAM, for a future DA. This includes undertaking surveys during the specific survey periods for each species. Should species credit species observed to be present, or be assumed to be present, it will be necessary to include avoidance and mitigation measures for impact to habitat, and offset credits may be required for residual impacts that cannot be avoided. The old sheds and buildings present could provide roosting habitat for threatened microbat species. According to the Species credit threatened bats and their habitats – NSW survey guide for the Biodiversity Assessment Method for Threatened Bats (OEH 2018) surveys must be undertaken when the species are likely to be active, which is typically between November and February depending on the species.

Appendix C includes a Test of Significance for threatened microbat species that could be present due to the presence of structures that could provide roosting habitat. These species are:

- Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*);
- Little Bent-winged Bat (*Miniopterus australis*);
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*); and
- Southern Myotis (*Myotis macropus*).

This assessment concludes that impacts of the planning proposal on these species are not predicted to be significant.

4.2.4. Threatened Flora

No threatened flora species were detected during surveys. There are a small number of threatened flora species that have specific seasonal survey requirements under the BAM, for which additional surveys beyond those undertaken in June 2022 are required. However, given the weedy, degraded nature of the subject site it is

considered unlikely that any such species would be present. As such, while further surveys are required it is considered unlikely that the planning proposal would impact on any threatened flora species.

4.2.5. Coastal Wetlands

As shown in **Figure 3** much of the land to the immediate north of the subject site within the study area is mapped as Coastal Wetland under the SEPP Resilience and Hazards 2021, with the Proximity Area extending to cover much of the northern extent of the subject site. Much of the land mapped as Coastal Wetlands within the study area is currently exotic grassland maintained through slashing that is mapped in the Tweed Shire Council vegetation mapping as Sedgeland and Rushland.

Idyll Consultants (2020b) have undertaken a review of proposed impacts of development and parkland on SEPP Coastal Wetlands on Gales southern landholdings in Kingscliff, which include the area of Coastal Wetlands in the north of the study area. In regard to drainage Idyll Consultants (2020b) stated that:

“Gales southern lands are a back-swamp to the Tweed River floodplain, located in an area that was an estuarine lagoon infilled by Holocene marine sand. Prior to construction of drains, back-swamp areas typically remained inundated for much of the year. During early settlement, these back-swamps were valued for grazing as drought refuges. The government encouraged development of coastal floodplains for agriculture and as crops generally require floodwaters to be removed within five days, drainage unions were set up to empower local groups of farmers to drain floodplains cooperatively. The major re-engineering of back-swamps through flood mitigation and drainage works have dramatically changed residence time for water in the floodplain from around 100 days under natural conditions to around 5 days under drained and flood mitigated conditions. A network of drainage infrastructure was visible in Gales southern lands by the time of the earliest aerial photographic record in 1947.

The post-1947 drainage regeneration in Gales southern lands is dominated by Paperbark forests with high to very high stem densities, which has resulted in smaller trees with low growth rates. Consequently the features of more natural paperbark forests such as old trees, large trees, tree hollows, structural complexity and diversity are absent or rare in these areas.

Subsequently, until about 2006, the Gales site became wetter due to declining drain maintenance, blocking or filling of drains, closing of the main north-south drain for a period, increased stormwater flows from increasing urban development on elevated land surrounding the site and filling of low-lying land for further urban development. This increase in wetness was associated with some recovery of the wetland flora, particularly for species of the forest understorey and herbaceous open wetlands, as well as suppression of native and exotic flora that were not adapted to inundation.

After 2006, repair and re-instatement of the drainage system led to a drying out of Gales southern lands in most areas. This was accompanied by a decline in native herbaceous wetland flora and, together with nutrient inputs from stormwater and deposition of fertile soil from the basalt plateau upslope, has exacerbated invasion by robust exotic pasture grasses adapted to seasonally wet conditions and fertile soils.”

These artificial drains mentioned by Idyll Consultants (2020b) include the artificial drains within the northern part of the study area.

For areas previously mapped as sedgeland/rushland, Idyll Consultants (2020b) has noted that maintenance of drains after 2006 resulted in land drying out and sedgeland/rushland was replaced with exotic pasture grasses. This includes the exotic grassland within the north of the study area. As such, the only remaining areas that would conform to Coastal Wetlands within the study area are several small patches of PCT 4004 where *Melaleuca quinquenervia* forms woodland/scattered trees over exotic grassland. If the Proximity area for Coastal Wetlands was determined based on these areas, it would still extend onto the subject site, but with a lesser extent. The consent authority must be satisfied that the proposed development will not significantly impact on:

- the biophysical, hydrological or ecological integrity of the adjacent coastal wetland; or
- the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland.

To demonstrate the above, the proposed development must not substantially alter surface or groundwater flows or result in pollution including from surface run-off.

Under current conditions there are high levels of sediment inputs into artificial drainage lines within the north of the study area following heavy rainfall, such that water flows as a red slurry (Australian Environmental Surveys 2021). Following heavy rain, water sampling has shown analytically measured suspended sediment levels more than 7-10 times above maximum acceptable range of water quality parameters for turbidity (Australian Environmental Surveys 2021). This would include sediment inputs from the subject site, other agricultural properties and residential areas in the catchment. Development of the subject site would likely reduce the areas of exposed soil that would contribute sediment laden run-off into these artificial drains. However, a range of erosion and sediment control and possibly water treatment measures are likely to be required to improve the water quality of run-off. At this stage a range of other indirect impacts are possible and require further assessment. These include, but are not limited to:

- Changes to groundwater flows that could impact on the health of *Melaleuca quinquenervia* trees;
- Increased flow velocities from paved areas; and
- Reduced flow due to capture of water in water tanks or retention basins.

The Draft Stormwater Management Plan (PlantIT Consulting 2023) proposes that to achieve desirable outcomes, the overarching stormwater strategy is to collect stormwater in an internal pit/pipe network and discharge stormwater to a centralised treatment/detention system prior to release. The centralised treatment/detention system is anticipated to include an underground detention tank, Gross Pollutant Trap and Stormwater Filter. Hydrological and hydraulic modelling has been completed with MUSIC and DRAINS software to size these structures and provide an appropriate outlet configuration. The Legal Point of Discharge for the subject site is identified as the boundary adjacent to the coastal wetland to the north of the subject site. The stormwater strategy considered Tweed Shire Council's stormwater retention requirements, as expressed through its Design and Construction Specifications and Neutral or Beneficial assessment of the water quality has been completed and achieved. As such a negative impact of water quality to wetlands is not anticipated.

As per the scope identified in the Local Environmental Plan Making Guideline, August 2023 – Attachment C, Supporting Technical Information investigations into groundwater impacts are yet to commence. Post Gateway determination, should significant impacts be predicted, there are options to consider the siting of buildings, and redesign to avoid below ground basement carparking that could impact on groundwater. These impacts are not yet known, but it is considered that such impacts would be manageable.

4.2.6. Koala Habitat

A total of 0.05 ha of PCT 3987 that is Secondary (Class B) Koala habitat is proposed for removal. This vegetation does not contain PKFTs and contains supplementary food trees only. This area is not Core Koala Habitat, and as there is no evidence of Koala use, there is no requirement to set revegetate areas to create additional Koala habitat.

4.2.7. Tweed Shire DCP

In defining the development envelope, Section A.19 of the Tweed Shire DCP outlines ecological setbacks (referred to as 'red flags') as reproduced in **Table 10** below. As an SSD the Tweed Shire DCP does not apply, and setbacks are a guidance, rather than a planning control.

Table 10 Ecological setbacks for Red Flags identified in the Tweed Shire DCP

Red Flag*	Ecological Setback (m)
Bushland	
Threatened Ecological Communities	30
Over-cleared vegetation types	20
Over-cleared landscapes	20
Old growth	30
Important wetlands	50
Other wetlands	20
Other bushland on a slope greater than 18 degrees	20
Pre-existing protected habitat	20 m or as above, whichever is greater
Wildlife Corridors	
Land within a defined wildlife corridor	20
Koala Habitat (not applicable to development under the Tweed Coast CKPoM)	
Core Koala Habitat	20
Primary or Secondary (Class A) Koala habitat	20
Isolated or scattered primary Koala food trees with evidence of koala activity	20
Other areas where Koalas are present	20
Waterways and Riparian Areas	
First order stream	10

Red Flag*	Ecological Setback (m)
Threatened and Significant Species	
Areas within a species polygon for threatened fauna or other significant fauna that are known or predicted to occur at the site	20
Areas within a species polygon for threatened flora or other significant flora that are known to occur at the site	10
Other habitat features	
Very large native trees	10
Stags and hollow bearing trees	10
Raptor nests	50

*Some Red flags not relevant to the proposed development have not been reproduced. Setback distances in bold are relevant to the subject site (including based on ecological values in the study area).

The definition of bushland under Section A.19 of the Tweed Shire DCP is areas of vegetation dominated by woody native vegetation (e.g. forests, woodlands, shrublands, heathland etc.), native wetland vegetation or naturalised exotic tree species (e.g. camphor laurel). Bushland does not include overgrown gardens, orchards, tree plantations (native or otherwise) or native grasslands. The row of planted *Eucalyptus grandis* on the western boundary would not meet the definition of bushland, although setbacks should be considered, should individual trees containing hollows or meet the definition of very large trees, defined as locally indigenous trees that have a trunk diameter of greater than or equal to 0.8 metres measured at 1.4 metres above the natural ground. For the purpose of mapping the setbacks that may be required, a 10 m setback has been assumed from the edge of the canopy of these trees.

The following red flags are known to be present adjacent to the subject site (set-backs included in brackets):

- Threatened Ecological Communities (30 m);
- Important Wetlands (50 m);
- Over-cleared vegetation, i.e. PCT 3004 and PCT 3987 (20 m);
- Some possible hollow bearing trees of *Eucalyptus grandis* which overhang the subject site (10 m).

A wildlife corridor covers the study area, and as such a 20 m set back would apply to native vegetation where a larger buffer does not apply.

Important wetlands are those mapped under the SEPP Resilience and Hazards 2021. As noted, in **Section 4.2,3** there is limited coastal wetland values within the area mapped as Coastal Wetland, and much of the area is no longer native vegetation. As such, setbacks should be considered from the actual boundary of areas of PCT 4004 within the study area.

Setbacks required under the Tweed Shire DCP are shown in **Figure 13**.

Section C6 to C8 of the Tweed Shire DCP outline where variations to red flagged areas may be permitted. These are detailed below:

C.6 Minor variations to the red flagged areas may be considered to achieve practical outcomes. Some examples include:

- minor incursions into the ecological setbacks;
- ecological setbacks arising from adjoining land not in the same ownership;
- ecological setbacks that necessarily overlap with access roads or other linear infrastructure (e.g.) a narrow access road that does not require clearing with bushland on both sides);
- isolated patches of bushland with an area less than 1000m²;
- strips of bushland less than 10m wide;
- areas in low condition with an area less than 5000m²;
- bushland dominated by exotic species;
- Threatened or other significant fauna that are considered vagrant, highly nomadic or are not closely associated with habitat on the site;
- Threatened or other significant flora that occur as seedlings or saplings outside of bushland habitat;
- Secondary (class B) koala habitat without evidence of koala activity;
- Sreas subject to a controlled activity approval under the *Water Management Act 2000*; and
- Stags and raptor nests where it is possible and feasible to relocate them nearby (note, this has only been proved successful for osprey).

C7. A minor variation referred to in C6 above must not:

- trigger a red flag in another biodiversity theme unless it also represents a variation for that theme; or
- conflict with any statutory consideration that would require the retention of the area.

C8. A development application seeking a variation referred to in C6 above must:

- Clearly identify the variation sought;
- Demonstrate that alternative layouts have been considered and that the impacts cannot reasonably be avoided; and
- Show how the variation impact is consistent with the relevant planning principles and objectives of the DCP.

A number of these potential variations apply to vegetation within the subject site with many of the setbacks created from vegetation on adjacent properties not in the same ownership. Specific grounds for variations in setbacks include:

- Bushland dominated by exotic species – applies to PCT 3004 regrowth and PCT3987;
- Isolated areas of bushland with an area less than 1000m² – applies to PCT 3987 and one small area of PCT 3004 regrowth on the western edge of the subject site;
- ecological setbacks arising from adjoining land not in the same ownership – applies to PCT 3004 Slashed and PCT 4004 within Gales owned land, which includes areas mapped as Coastal Wetlands.

The setbacks prescribed within Section A19 of the Tweed DCP are not identified as being of specific relevance to any rezoning proposal or to a SSD. However, future concept and masterplanning is encouraged to incorporate buffers and develop a vegetation management plan outlining how retained vegetation and setbacks will be managed to ensure positive environmental outcomes.

4.3. Rezoning

This section provides an assessment against the E zone criteria detailed in the Northern Councils E Zone Review Final Recommendations Report (NSW Government Planning and Environment 2015). E2 and E3 zones will only be applied if the primary use of the land is considered to be environmental conservation (E2) or environmental management (E3) and the land contains attributes which meet one or more of the criteria for an E2 or E3 zone.

4.3.1. Land Use

The primary use of the land is the main use for which the land has been used for the last two (2) years. This may mean that land which is currently zoned rural will continue to have a rural zone, but it may have parts of that land that have attributes that meet the criteria for an E2 or E3 zone being included in a mapped planning control. The primary use of the land may vary across a particular property depending on the characteristics of the land. This may result in more than one zone being applied to the land.

While the primary land use of the subject site has been horticulture, since purchase by the current owner the land has been used a rural residential property. No land appears to have been used specifically for conservation purposes or environmental management in the past.

4.3.2. Assessment Against E Zone Criteria

4.3.2.1. E2 Zone Criteria

An assessment of E2 zone criteria detailed in the Northern Councils E Zone Review Final Recommendations Report (NSW Government Planning and Environment 2015) is provided in **Table 11** below. To be eligible for zoning more than one the criteria must apply where the primary land use is conservation or environmental management.

Table 11 Assessment of E2 Zone Criteria

Criteria	Applicability to the subject site
SEPP 26 Littoral rainforests (replaced by SEPP Resilience and Hazards 2021)	No Littoral rainforests mapped under the SEPP Resilience and Hazards 2021 are present on the subject site.

Criteria	Applicability to the subject site
SEPP 14 Coastal Wetlands (replaced by SEPP Resilience and Hazards 2021)	Areas mapped as Wetlands under the SEPP Resilience and Hazards 2021) are present in the study area and the Proximity area extend into the subject site. No Coastal Wetlands are present in the subject site.
Endangered Ecological Communities under the <i>Threatened Species Conservation Act 1995</i> (replaced by the <i>Biodiversity Conservation Act 2016</i>) and the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	TECs listed under the BC Act only are present within the subject site being a degraded/regrowth form of Lowland Rainforest TEC.
Key Threatened Species Habitat	<p>No old growth forests are present within the subject site with Lowland Rainforest present as regrowth. Overhanging vegetation is likely to be planted and would not be old growth forest. Some old growth fig trees are present to the north in the study area.</p> <p>No threatened fauna species are known to be present within the subject site, although this would need to be confirmed through targeted surveys.</p> <p>For species that cannot withstand further loss (i.e. Koala), the species is unlikely to be present. The species has not been detected in surveys (Greencap 2019) and habitat is limited to small patches of Secondary (Class B) Koala habitat.</p>
Over cleared communities and landscapes	<p>PCT 3004 and PCT 3987 within the subject site are more than 70% cleared. Rainforests and Forested Wetlands (which are the vegetation formations for these PCTs) are considered to be over cleared vegetation communities.</p> <p>The subject site is within the Lamington Volcanics NSW (Mitchell) Landscape which is 57% cleared and is not an over cleared NSW (Mitchell) Landscape.</p>
Culturally significant lands	Not covered in this assessment

Based on the above criteria only small areas of PCT 3004 and 3987 meet more than one criteria for E2 zoning. Given that these areas are of small extent within the subject site and are generally degraded through weed infestation, it is unlikely to be worth rezoning such small areas as E2 zone. Section 10 of the Northern Councils E Zone Review Final Recommendations report states that as a general principle, the use of multiple zones on a property should be minimised as far as possible. In addition to the areas being small, isolated and degraded, the primary use is not identified as conservation and as such does not satisfy the criteria established in the Northern Councils E Zone Review Final Recommendations report (as per Section 10 – Application of multiple zones to a single property). These findings are reinforced through Council’s draft Conservation Zone Mapping,

as exhibited in February – August 2022, which did not identify any zone changes (<https://www.yoursaytweed.com.au/czones>).

4.3.1. E3 Zone Criteria

An assessment of E3 zone criteria detailed in the Northern Councils E Zone Review Final Recommendations Report (NSW Government Planning and Environment 2015) is provided in **Table 12** below. To be eligible for zoning more than one the criteria must apply where the primary land use is conservation or environmental management. As only one criteria is met within the subject site, land within the subject site would not be eligible for E3 zoning.

Table 12 Assessment of E3 Zone Criteria

Criteria	Applicability to the subject site
Riparian vegetation and wetlands	Waterfront land includes the bed of any river, lake or estuary and any land within 40 m of its mean high water mark as defined by the <i>Water Management Act 2000</i> . No waterfront land is present in the subject site.
Rare, vulnerable and endangered ecosystems	The following rare, vulnerable and endangered ecosystems are present in the subject site: Lowland Rainforest (PCT 3004 regrowth)
Native vegetation on coastal foreshores	No areas are present

4.4. Future Biodiversity Assessment Pathway

4.4.1. Requirement for a BDAR

Under the *Biodiversity Conservation Act 2016* (BC Act), all SSD projects automatically enter the BOS and require the preparation of a BDAR, unless the Secretary and the Chief of the Environment and Heritage of DPE determines that the project is not likely to have a significant impact on biodiversity values.

The Secretary (or delegate) of DPE has the power to waive the requirement for a BDAR when proponents of SSD can clearly demonstrate that the proposed development is not likely to have a significant impact on biodiversity values.

Biodiversity values are defined as follows:

- Under Section 1.5 of the BC Act, Biodiversity Values are defined as;

“For the purposes of this Act, biodiversity values are the following biodiversity values:

- *vegetation integrity—being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state,*
- *habitat suitability—being the degree to which the habitat needs of threatened species are present at a particular site,*

- *biodiversity values, or biodiversity-related values, prescribed by the regulations.”*
- Under Section 1.4 of the *Biodiversity Conservation Regulation 2017*, the following are prescribed as additional biodiversity values:
 - *threatened species abundance—being the occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site,*
 - *vegetation abundance—being the occurrence and abundance of vegetation at a particular site,*
 - *habitat connectivity—being the degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range,*
 - *threatened species movement—being the degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle,*
 - *flight path integrity—being the degree to which the flight paths of protected animals over a particular site are free from interference,*
 - *water sustainability—being the degree to which water quality, water bodies and hydrological processes sustain threatened species.*

For the purpose of deciding whether the requirement for a BDAR can be waived, a proposed development could be considered as unlikely to have any significant impact on biodiversity values if it:

- Will not clear or remove native vegetation other than:
 - a few single trees with no native understorey in an urban context; or
 - planted native vegetation that is not consistent with a Plant Community Type (PCT) known to occur in the same Interim Biogeographic Regionalisation of Australia (IBRA) subregion (e.g. street trees, trees in carparks, landscaping).
- Will have negligible adverse impacts on threatened species or ecological communities, considering habitat suitability, abundance and occurrence, habitat connectivity, movement and water sustainability including consideration of any non-natural features, non-native vegetation, and human-built structures; and
- Will have negligible adverse impacts on protected animals because of impacts to flight path integrity.

Where there is reasonable doubt regarding potential impacts, or where information is not made available to DPE, a BDAR will be required. If a BDAR waiver is not granted, there is no appeal mechanism and a BDAR must be submitted with the SSD.

The extent to which the project would have a significant impact on biodiversity values would depend on the extent of native vegetation other than occasional planted native or regrowth trees within Planted Exotic vegetation requires removal. If no native vegetation requires removal, then a BDAR Waiver is likely to be approved.

Note that BDAR waivers require additional information in relation to bats and man-made structures. The BDAR Waiver must contain descriptions or photographs of the nature (structure, age, etc.) of the buildings to be demolished. DPE requires this information be provided otherwise DPE is unable to decide that the development is not likely to have a significant impact on biodiversity values. Microbats may require only very small entry points and may change roost sites from day to day. If any potential roosting habitat for microbat species is identified, the assessment needs to include descriptions and results of searches and surveys as indicated in the Species credit threatened bats and their habitats, NSW Guide for the Biodiversity Assessment Method (OEH 2018). Alternatively, the proponent can elect to prepare a BDAR that includes this information. A Test of Significance on threatened microbat species is provided in **Appendix C**, which indicates that impacts on these species are unlikely to be significant.

4.4.2. Prescribed Impacts

In the event that a BDAR is required, the BDAR must consider Prescribed Impacts to biodiversity values for land on the Biodiversity Values map. The area on the Biodiversity Values map includes the following biodiversity values:

- Lowland Rainforest TEC;
- Lowland Rainforest on Floodplains TEC;
- Swamp Sclerophyll Forest TEC; and
- Associated threatened fauna habitat.

The following Prescribed Impacts could be relevant to the proposed development:

- Impacts on:
 - Rocks that provide threatened species habitat (such as the rocks on the northern boundary of the subject site);
 - Human made structures such as old sheds and buildings that provide potential roosting habitat to threatened microbats;
- Removal of non-native vegetation including weeds and planted exotic vegetation that provides foraging resources;
- Impacts on habitat connectivity and fauna movement if the proposed development resulted in habitat fragmentation; and
- the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and TEC.

For the latter, an assessment of changes to water quality, water flow, groundwater and other hydrological processes of adjacent Lowland Rainforest and other adjacent TECs would be required for a future DA.

4.4.3. Recommended Assessment Pathway

Cumberland Ecology recommends that a BDAR should be prepared for a future DA due to the potential for the proposed development to impact on threatened species habitat. The BDAR would require targeted surveys for threatened species including flora and fauna species. The surveys undertaken for this BEA cover off on most threatened flora species. However, targeted surveys would be required for fauna species that are species credit species. The exact requirements for surveys are yet to be determined but would likely include the following species as a minimum.

- Coxen's Fig Parrot (*Cyclopsitta diophthalma coxeni*);
- Three-toed Snake-Tooth Skink (*Coeranoscincus reticulatus*);
- Mitchells Rainforest Snail (*Thersites mitchellae*);
- Little Bent-wing Bat (*Miniopterus australis*); and
- Large Bent-wing Bat (*Miniopterus orianae oceanensis*).

Surveys targeting the Koala (*Phascolarctos cinereus*) would only be required if areas of overhanging *Eucalyptus grandis* require removal or if areas containing *Melaleuca quinquenervia* were impacted.

Note that other species are likely to be identified as requiring survey during preparation of the BDAR, depending on the PCTs that require clearing. For the microbat species, surveys must be completed between December and February.

5. Avoidance and Mitigation Measures

5.1. Introduction

This section outlines avoidance and mitigation measures that should be considered for the proposed development in order to avoid and minimise impacts to biodiversity values during a future development.

5.2. Avoidance

5.2.1. Native Vegetation

The following is recommended for avoidance of clearing of native vegetation:

- Areas of Lowland Rainforest TEC should be retained and incorporated within open space, although removal of introduced weeds on the edges and within Lowland Rainforest could be undertaken;
- Areas of Secondary (Class B) Koala habitat should be retained including PCT 3987 where practical;
- Overhanging trees of *Eucalyptus grandis* should be retained where possible, although the understorey of introduced species could be removed;
- Where native vegetation does require removal, it should be restricted to small, isolated and weed infested fragments, while retaining the connectivity of larger patches of vegetation along the northern and eastern boundaries; and
- Engage an arborist to assess individual trees to determine impacts to the structural root zone and tree protection zone and determine where impacts can be limited to pruning. All tree protection measures recommended should be implemented.

5.2.2. Exotic Vegetation

Planted exotic vegetation has some habitat value for foraging and could be retained within landscaping where practical. However, much of the planted exotic vegetation is dominated by environmental weeds including weed species declared under the NSW *Biosecurity Act 2015*. This includes the species that dominate this vegetation: *Syagrus romanzoffiana*, *Pinus elliottii*, *Duranta erecta*, and *Arundo donax*. As such there is little value in retaining most of this vegetation. For individual trees that can be retained, an arborist should be engaged to determine that the tree protection zone of individual trees will not be impacted.

5.2.3. Habitat Features

While demolition of sheds and other buildings is unlikely to be avoidable, the removal of other habitat features such as bush rock should be avoided. Bush rock is located within Lowland Rainforest EEC on the northern boundary of the subject site.

5.3. Mitigation Measures

5.3.1. Clearing Protocols

5.3.1.1. Preclearance Survey

Any trees and buildings that require removal should be inspected for roosting microbats, hollows, nests and other habitat features prior to removal through a preclearance survey by a qualified ecologist.

5.3.1.2. Clearance Supervision

For the duration of tree removal, a qualified ecologist should be present at all times to actively seek, capture and release any microbats or other native fauna species that may be disturbed and flee from felled trees to limit the impacts to native fauna caused by clearing.

Any trees with hollows should be initially isolated by clearing all other non-habitat trees around them, then left *in-situ* for a 24-hour period prior to clearance under ecologist supervision. During clearance works standard clearance supervision protocols will be observed. This will involve the ecologist inspecting habitat features immediately prior to disturbance for occupying fauna. Following the initial inspection, each habitat tree should be agitated prior to felling in the presence of an ecologist and then inspected by an ecologist once felled. Inspections consist of a thorough examination of hollows, nests and decorticating bark to find any remaining resident fauna. A torch should be used to facilitate the inspection of deeper parts of hollows for fauna such as microbats. For each species captured and identified after felling, an experienced ecologist would place the animal in an appropriate container/calico bag and relocate it to an appropriate area outside the subject site.

5.3.1.3. Weed Disposal

Exotic plant material should not be mulched on site due to the risk of weed spread through seed or vegetative propagules. Instead, all material should be taken to an approved green-waste disposal facility. All loads should be securely covered to prevent spread of weed material during transport.

5.3.2. Erosion and Sediment Control

Erosion and sediment control measures must be put in place to prevent the movement of soil, sediment, weed seeds and nutrients to adjacent areas on the Biodiversity Values map. Erosion and sediment control structures should be constructed following the guidelines stated in Managing Urban Stormwater, Soils and Construction (Landcom 2004) (The Blue Book).

Recommended measures include:

- Clearly visible barrier fencing shall be installed at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work and they shall enter the subject site only through the designated access points;
- A suitably qualified person will be required to oversee the installation and maintenance of all soil and water management works on the subject site;

- Additional erosion and/or sediment control works will be constructed as necessary to ensure the desired protection is given to down slope lands and waterways;
- Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site stabilised;
- All soil stockpiled on site should be covered;
- All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event;
- During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in sufficient quantities, soil binders and/or dust retardants will be used, or the surface will be left in a cloddy state that resists removal by wind;
- Soil stockpiles will not be located within 5 metres of hazard areas, including likely areas of high velocity flows such as paved areas and driveways;
- No vegetation clearing or earthworks should take place during periods of heavy rainfall; and
- Temporary soil and water management structures will be removed only after the lands they are protecting are stabilised.

5.3.3. Weed Management

5.3.3.1. Weed Management during Clearing

During vegetation clearing all weed material should be disposed of in a manner that will not result in the spread of weeds. No exotic material should be retained on site or mulched and left on site. During removal all loads should be covered to prevent spread of weed material during transit.

5.3.3.2. Weed Management in Retained Vegetation

Weed control is likely to be required within retained vegetation, in particular areas of Lowland Rainforest EEC. This weed control should be undertaken following the requirements of a Vegetation Management Plan or a Koala Habitat Restoration Plan that should be prepared to guide the management of any vegetation retained on site and any restoration plantings. This weed management should seek to reduce the cover of Priority weeds within areas of Lowland Rainforest EEC over time, while promoting regeneration of rainforest species. Any exotic species including former garden plantings with Areas of Planted Exotic vegetation should be removed, before replanting with native species typical of Lowland Rainforest EEC.

5.3.4. Landscaping

Landscaping within the subject site should include local rainforest species and/or PKFTs to the maximum extent possible. In addition to landscaping plantings may be possible to interplant native species within retained areas of Lowland Rainforest including planting around the fringes to increase the extent of Lowland Rainforest EEC.

5.4. Compensation Measures

5.4.1. Offset Credits

The retiring of offset credits is likely be required for a future DA for native vegetation requiring removal, as determined through the preparation of a BDAR. The exact number of offset credits required will not be known until the area requiring clearing is known and BAM plot surveys are completed in all vegetation communities.

5.4.2. Nest Boxes

Council may request other compensation measures such as the installation of nest boxes within trees to be retained. The replacement ratio and type/size of nest box would be determined by Council. Typically, nest boxes are installed by a qualified tree climber/arborist under supervision of an ecologist.

6. Conclusion

Cumberland Ecology was engaged by Cudgen Health Precinct Pty Ltd to prepare an BEA to support the rezoning at 741 Cudgen Road, Cudgen (the subject site). A site inspection was undertaken in order to identify the ecological constraints associated with the subject site. The site inspection included vegetation mapping, habitat assessment and survey of three BAM plots. The study area was extended to include adjacent land to the north, due to the presence of biodiversity values that could create setback requirements. The subject site is proposed to be developed to deliver health services to support the adjacent Tweed Valley Hospital that is currently under construction.

The subject site is located on fertile red brown loams formed on basalt and has been subject to horticultural land use in the past. As such, much of the subject site has been cleared and currently contains exotic grassland and areas of planted exotic vegetation. However, a strip of weedy regrowth lowland rainforest is located on the northern boundary of the subject site, with other areas of rainforest managed through slashing located to the north within the study area. The rainforest on the subject site conforms to Lowland Rainforest EEC listed under the BC Act. Other vegetation within the subject site includes a small patch dominated by *Casuarina glauca* and a row of *Eucalyptus grandis* on the adjacent Tweed Valley Hospital site that is likely to have been planted. These areas do not align with TECs listed under the BC Act.

No threatened flora and fauna species were detected within the subject site during surveys. However, the subject site contains a number of old sheds and a residential dwelling that are likely to provide marginal roosting habitat for threatened microbat species.

A small patch of vegetation (0.05 ha) dominated by *Casuarina glauca* which is a supplementary Koala food species was assigned to Secondary (Class B) Koala habitat as per the requirements of the Tweed Coast CKPoM. However, as this is a small, isolated fragment it is considered unlikely to support Koalas. As this is not core Koala habitat and there is no evidence of Koala use, there is no requirement to set aside land for revegetation to create additional Koala habitat.

The proposed development is likely to be declared a State Significant Development and would automatically trigger the requirement to prepare a BDAR, unless a BDAR waiver is approved. Given the potential for impacts to native vegetation including a TEC, to adjacent areas on the Biodiversity Values Map and to habitat features that could support threatened species, it is recommended that a BDAR be prepared to support a future DA for the proposed development.

Given that the majority of the subject site is dominated by exotic vegetation as the result of past land use, the ecological constraints present would not prevent rezoning to support the proposed development.

Apart from some small, degraded and isolated fragments of vegetation the subject site does not meet criteria for E2 or E3 zoning under the Northern Councils E Zone Review Final Recommendations report. In addition to the areas being small, isolated and degraded, the primary use is not identified as conservation and as such does not satisfy the criteria established in the Northern Councils E Zone Review Final Recommendations report. Further, given that the small, and degraded areas of threatened ecological communities are largely able to be avoided, it is considered unlikely that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected because of the proposal.

Suggested measures to mitigate ecological impacts associated with the proposed development are provided in **Chapter 5** of this report.

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APPENDIX A :

BAM Plot Data

Table 13 BAM Plot data for species cover and abundance

Scientific Name	Common Name	P1 Cover	P1 Abundance	P2 Cover	P2 Abundance	P3 Cover	P3 Abundance
<i>Ageratum houstonianum</i>						0.1	10
<i>Andropogon virginicus</i>	Whisky Grass	0.1	2				
<i>Archontophoenix alexandrae</i>	Alexandra Palm					0.1	2
<i>Arundo donax</i>	Giant Reed					2.0	100
<i>Bidens pilosa</i>	Cobbler's Pegs			0.2	500	0.2	100
<i>Cenchrus clandestinus</i>	Kikuyu Grass			0.2	200		
<i>Cestrum parqui</i>	Green Cestrum					1.0	200
<i>Chloris gayana</i>	Rhodes Grass	1.0	200	0.5	200	0.2	100
<i>Cinnamomum camphora</i>	Camphor Laurel					4.0	10
<i>Commelina benghalensis</i>						2.0	200
<i>Conyza sumatrensis</i>	Tall fleabane	0.1	50				
<i>Crassocephalum crepidioides</i>	Thickhead			0.1	20	0.1	100
<i>Cupaniopsis anacardioides</i>	Tuckeroo					0.1	5
<i>Cyclosporum leptophyllum</i>	Slender Celery					0.1	50
<i>Cyperus brevifolius</i>				0.1	100		
<i>Cyperus polystachyos</i>							
<i>Desmodium uncinatum</i>	Silver-leaved Desmodium	1.0	100	1.0	500		
<i>Emilia sonchifolia</i>				0.1	5		

Scientific Name	Common Name	P1 Cover	P1 Abundance	P2 Cover	P2 Abundance	P3 Cover	P3 Abundance
<i>Eustrephus latifolius</i>	Wombat Berry					0.1	10
<i>Glochidion ferdinandi</i>	Cheese Tree					0.2	10
<i>Gomphocarpus physocarpus</i>	Balloon Cotton Bush	0.1	10	0.2	100		
<i>Guioa semiglauca</i>	Guioa					0.1	2
<i>Hypolepis muelleri</i>	Harsh Ground Fern						
<i>Ipomoea cairica</i>						1.0	20
<i>Lantana camara</i>	Lantana					2.0	100
<i>Ligustrum sinense</i>	Small-leaved Privet					50.0	1,000
<i>Macaranga tanarius</i>	Blush Macaranga			1.0	5	60.0	15
<i>Maclura cochinchinensis</i>	Cockspur Thorn					0.1	5
<i>Maclura cochinchinensis</i>	Cockspur Thorn					1.0	20
<i>Megathyrsus maximus</i> var. <i>pubiglumis</i>	Green panic			60.0	2,000	60.0	2,000
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark					4.0	1
<i>Melinis repens</i>	Red Natal Grass	0.1	100	2.0	500		
<i>Neonotonia wightii</i>	Perennial Soybean			10.0	1,000	0.5	200
<i>Nephrolepis cordifolia</i>	Fishbone Fern			0.1	1		
<i>Ochna serrulata</i>	Mickey Mouse Plant					0.2	20
<i>Oplismenus aemulus</i>						0.1	10

Scientific Name	Common Name	P1 Cover	P1 Abundance	P2 Cover	P2 Abundance	P3 Cover	P3 Abundance
<i>Parsonia straminea</i>	Common Silkpod					0.2	2
<i>Paspalum conjugatum</i>	Johnston River Grass	70.0	2,000				
<i>Paspalum dilatatum</i>	Paspalum	0.1	5				
<i>Paspalum urvillei</i>	Vasey Grass	5.0	50				
<i>Passiflora suberosa</i>	Cork Passionfruit					0.5	50
<i>Passiflora subpeltata</i>	White Passionflower					0.1	2
<i>Psidium guajava</i>	Common Guava			0.1	2		
<i>Senecio madagascariensis</i>	Fireweed	0.1	100				
<i>Senna pendula</i> var. <i>glabrata</i>						2.0	200
<i>Setaria sphacelata</i>	South African Pigeon Grass			10.0			
<i>Sida acuta</i>	Spinyhead Sida	0.1	2				
<i>Smilax australis</i>	Lawyer Vine					1.0	50
<i>Solanum chrysotrichum</i>	Devil's Fig			1.0	5	1.0	50
<i>Solanum mauritianum</i>	Wild Tobacco Bush			2.0	10	1.0	20
<i>Solanum nigrum</i>	Black-berry Nightshade			0.1	10	0.1	10
<i>Solanum seaforthianum</i>	Climbing Nightshade					0.1	5
<i>Sorghum halepense</i>	Johnson Grass			1.0	100		
<i>Sporobolus africanus</i>	Parramatta Grass	10.0	500				

Scientific Name	Common Name	P1 Cover	P1 Abundance	P2 Cover	P2 Abundance	P3 Cover	P3 Abundance
<i>Syagrus romanzoffiana</i>	Cocos Palm			30.0	10	0.5	3
<i>Syngonium podophyllum</i>	Arrowhead vine			0.1	1		
<i>Syzygium australe</i>	Brush Cherry					0.2	3
<i>Tradescantia fluminensis</i>	Wandering Jew					1.0	500
<i>Urena lobata</i>	Conga Jute					1.0	500
<i>Urochloa decumbens</i>	Signal Grass			20.0	1,000		
<i>Verbena bonariensis</i>	Purpletop			0.1	10		
<i>Vicia sativa</i>	Common vetch	0.1	200				
<i>Abutilon x hybridum</i>						0.5	20

APPENDIX B :

Flora Species List

Table 14 List of flora species detected from within the study area

Family	Scientific Name	Common Name	Introduced
Anacardiaceae	<i>Schinus terebinthifolius</i>	Brazilian Pepper Tree	*
Apiaceae	<i>Centella asiatica</i>	Indian Pennywort	
Apiaceae	<i>Cyclospermum leptophyllum</i>	Slender Celery	*
Apocynaceae	<i>Gomphocarpus physocarpus</i>	Balloon Cotton Bush	*
Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod	
Apocynaceae	<i>Trachelospermum jasminoides</i>	Star Jasmine	*
Araceae	<i>Pothos longipes</i>		
Araceae	<i>Syngonium podolobium</i>	Arrowhead Vine	*
Araliaceae	<i>Schefflera actinophylla</i>	Umbrella Tree	*
Arecaceae	<i>Archontophoenix alexandrae</i>	Alexandra Palm	*
Arecaceae	<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	
Arecaceae	<i>Bismarkia nobilis</i>	Bismark Palm	*
Arecaceae	<i>Dypsis decaryi</i>	Triangle Palm	*
Arecaceae	<i>Dypsis lutescens</i>	Yellow Butterfly Palm	*
Arecaceae	<i>Hyophorbe verschaffeltii</i>	Spindle Palm	*
Arecaceae	<i>Livistona chinensis</i>	Chinese Fan Palm	*
Arecaceae	<i>Syagrus romanzoffiana</i>	Cocos Palm	*
Aspleniaceae	<i>Asplenium australasicum</i>	Bird's Nest Fern	
Asteliaceae	<i>Cordyline stricta</i>	Narrow-leaved Palm Lily	
Asteraceae	<i>Ageratum houstonianum</i>		*
Asteraceae	<i>Baccharis halimifolia</i>	Groundsel Bush	*
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	*
Asteraceae	<i>Conyza sumatrensis</i>	Tall fleabane	*
Asteraceae	<i>Crassocephalum crepidioides</i>	Thickhead	*
Asteraceae	<i>Emelia sonchifolia</i>		*
Asteraceae	<i>Montanoa hibiscifolia</i>	Montanoa	*
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	*
Asteraceae	<i>Sphagnetocola trilobata</i>	Singapore Daisy	*
Asteraceae	<i>Tagetes minuta</i>	Stinking Roger	*
Basellaceae	<i>Anredera cordifolia</i>	Madeira Vine	*
Bignoniaceae	<i>Spathodea campanulata</i>	African tuliptree	*
Cannaceae	<i>Canna indica</i>	Arrowroot	*
Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak	
Commelinaceae	<i>Commelina benghalensis</i>		*

Family	Scientific Name	Common Name	Introduced
Commelinaceae	<i>Tradescantia fluminensis</i>	Wandering Jew	*
Convolvulaceae	<i>Ipomoea cairica</i>	Coastal Morning Glory	*
Crassulaceae	<i>Bryophyllum delagoense</i>	Mother of millions	*
Cyatheaceae	<i>Cyathea cooperi</i>	Straw Treefern	
Cyperaceae	<i>Cyperus brevifolius</i>	Mullumbimby Couch	*
Cyperaceae	<i>Cyperus polystachyos</i>		
Dennstaedtiaceae	<i>Hypolepis muelleri</i>	Harsh Ground Fern	
Euphorbiaceae	<i>Macaranga tanarius</i>	Blush Macaranga	
Euphorbiaceae	<i>Mallotus philippensis</i>	Red Kamala	
Fabaceae (Caesalpinioideae)	<i>Schizolobium parahyba</i>	Mexican Tree Fern	*
Fabaceae (Caesalpinioideae)	<i>Senna pendula</i> var. <i>glabrata</i>		*
Fabaceae (Faboideae)	<i>Desmodium uncinatum</i>	Silver-leaved Desmodium	*
Fabaceae (Faboideae)	<i>Neonotonia wightii</i>	Perennial Soybean	*
Fabaceae (Faboideae)	<i>Vicia sativa</i>	Vetch	*
Lauraceae	<i>Cinnamomum camphora</i>	Camphor Laurel	*
Lauraceae	<i>Cryptocarya triplinervis</i>	Three-veined Cryptocarya	
Lauraceae	<i>Endiandra globosa</i>	Black Walnut	
Luzuriagaceae	<i>Eustrephus latifolius</i>	Wombat Berry	
Lythraceae	<i>Cuphea carthagenensis</i>		*
Malvaceae	<i>Abutilon x hybridum</i>		*
Malvaceae	<i>Commersonia bartramia</i>	Brown Kurrajong	
Malvaceae	<i>Sida acuta</i>	Paddys Lucerne	*
Malvaceae	<i>Urena lobata</i>	Conga Jute	*
Menispermaceae	<i>Legnephora moorei</i>	Round-leaf Vine	
Menispermaceae	<i>Stephania japonica</i>	Snake vine	
Moraceae	<i>Ficus benjamina</i>	Weeping Fig	*
Moraceae	<i>Ficus obliqua</i>	Small-leaved Fig	
Moraceae	<i>Ficus virens</i>	White Fig	
Moraceae	<i>Maclura cochinchinensis</i>	Cockspur Thorn	
Myrtaceae	<i>Eucalyptus grandis</i>	Flooded Gum	
Myrtaceae	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	
Myrtaceae	<i>Psidium guajava</i>	Common Guava	*

Family	Scientific Name	Common Name	Introduced
Myrtaceae	<i>Syzygium australe</i>	Brush Cherry	
Myrtaceae	<i>Syzygium oleosum</i>	Blue Lilly Pilly	
Myrtaceae	<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	
Ochnaceae	<i>Ochna serrulata</i>	Mickey Mouse Plant	*
Oleaceae	<i>Ligustrum sinense</i>	Small-leaved Privet	*
Passifloraceae	<i>Passiflora suberosa</i>	Corky Passionflower	*
Passifloraceae	<i>Passiflora subpeltata</i>	White Passionflower	8
Phyllanthaceae	<i>Glochidion ferdinandi</i>	Cheese Tree	
Phyllanthaceae	<i>Glochidion sumatranum</i>	Umbrella Cheese Tree	
Pinaceae	<i>Pinus elliottii</i>	Slash Pine	*
Poaceae	<i>Andropogon virginicus</i>	Whisky Grass	*
Poaceae	<i>Arundo donax</i>	Giant Reed	*
Poaceae	<i>Axonopus fissifolius</i>	Narrow-leaved Grass	Carpet *
Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass	*
Poaceae	<i>Cenchrus purpurascens</i>	Elephant Grass	*
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	*
Poaceae	<i>Eragrostis tenuifolia</i>	Elastic Grass	*
Poaceae	<i>Hyparrhenia rufa</i>	Thatch Grass	*
Poaceae	<i>Megathyrsus maximum</i> var. <i>pubiglumis</i>	Green panic	*
Poaceae	<i>Megathyrsus maximus</i> var. <i>maximus</i>	Guinea Grass	*
Poaceae	<i>Melinis minutiflora</i>	Molasses Grass	*
Poaceae	<i>Melinis repens</i>	Red Natal Grass	*
Poaceae	<i>Oplismenus aemulus</i>		
Poaceae	<i>Paspalum conjugatum</i>	Johnston River Grass	*
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	*
Poaceae	<i>Paspalum urvillei</i>	Vasey Grass	*
Poaceae	<i>Phragmites australis</i>	Common Reed	
Poaceae	<i>Setaria sphacelata</i>	South African Pigeon Grass	*
Poaceae	<i>Sorghum halepense</i>	Johnston River Grass	*
Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass	*
Polypodiaceae	<i>Platynerium superbum</i>	Staghorn	
Polypodiaceae	<i>Pyrrosia confluens</i>	Horseshoe Felt Fern	

Family	Scientific Name	Common Name	Introduced
Ripogonaceae	<i>Ripogonum album</i>	White Supplejack	
Rutaceae	<i>Murraya paniculata</i>		*
Sapindaceae	<i>Cupaniopsis anacardioides</i>	Tuckeroo	
Sapindaceae	<i>Guioa semiglauca</i>	Guioa	
Smilacaceae	<i>Smilax australis</i>	Lawyer Vine	
Solanaceae	<i>Cestrum parqui</i>	Green Cestrum	*
Solanaceae	<i>Solanum chrysotrichum</i>	Devil's Fig	*
Solanaceae	<i>Solanum mauritianum</i>	Wild Tobacco Bush	*
Solanaceae	<i>Solanum nigrum</i>	Blackberry Nightshade	*
Solanaceae	<i>Solanum seafortianum</i>	Climbing Nightshade	*
Strelitziaceae	<i>Strelitzia nicolai</i>	Giant Bird of Paradise	*
Thelypteridaceae	<i>Christella dentata</i>	Binung	
Verbenaceae	<i>Duranta erecta</i>	Sky Flower	*
Verbenaceae	<i>Lantana camara</i>	Lantana	*
Verbenaceae	<i>Verbena bonariensis</i>	Purple-top	*
Vitaceae	<i>Cayratia clematidea</i>	Native Grape	

APPENDIX C :

Tests of Significance

C.1. Introduction

This appendix presents formal Tests of Significance required under Section 7.3 of the NSW *Biodiversity Conservation Act 2016* (BC Act) that have been prepared in accordance with the *Threatened Species Test of Significance Guidelines* (ToS Guidelines) (NSW Government 2018). The Test of Significance provides a means by which to gauge the significance of predicted impacts to threatened species and communities listed under the BC Act.

Both direct and indirect impacts are taken into account within these assessments. Direct impacts have been quantified within the assessments and are represented by the subject site boundary. Whilst it is acknowledged that indirect impacts can potentially be significant for a variety of species, such impacts cannot be mapped or accurately calculated in advance.

Each component of the test of significance is provided in italicised text below, and a response supplied beneath in plain text.

This Test of Significance as been prepared on the assumption that all TECs and threatened species habitat within the development footprint will require removal.

C.2. Threatened Entities

Threatened ecological communities and species present within the subject site, or with the potential to be impacted directly or indirectly by the project include:

- Threatened Ecological Communities:
 - Lowland Rainforest
- Roosting and foraging habitat for threatened microbat species:
 - Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*);
 - Little Bent-winged Bat (*Miniopterus australis*);
 - Large Bent-winged Bat (*Miniopterus orianae oceanensis*); and
 - Southern Myotis (*Myotis macropus*).

Threatened microbats are assessed collectively due to their similar habitat requirements.

Tests of Significance for these entities are provided below.

C.3. Lowland Rainforest

- a) *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

The local occurrence of Lowland Rainforest is considered to comprise vegetation within and beyond the study area extending into land owned by Gales for which 1.11 ha has been mapped in the study area. The NSW State Vegetation Type mapping includes other patches of rainforest to the east near Cudgen Creek and to the west near Cudgen. A further 0.72 of Lowland Rainforest TEC was mapped in the study area for the Tweed Valley Hospital BDAR (Greencap 2019) prior to clearing. Some of this rainforest is likely to be located on floodplains and as such would conform to Lowland Rainforest on Floodplains TEC rather than Lowland Rainforest TEC. As such it is difficult to accurately identify the local extent of this TEC.

Based on the development footprint, approximately 0.003 ha of Lowland Rainforest TEC will require removal, or 0.16% of the known extent in the locality. Given that the land to the north in the study area is to be retained as a reserve, the remainder in the study area would be conserved. However, the majority of the rainforest within the subject site is proposed to be retained. This Lowland Rainforest is already degraded and subject to weed invasion and other edge effects and the proposed development is not expected to contribute to these effects further. A total of 0.65 of Lowland Rainforest TEC was removed for the Tweed Valley Hospital (Greencap 2019) and is no longer part of the local extent, and any clearing impacts would be cumulative.

The potential modification of vegetation through direct and indirect impacts is not considered to place the local occurrence of the community at risk of extinction.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

The total area of Lowland Rainforest to be removed would be 0.003 ha. The potential changes to the adjoining extent of Lowland Rainforest resulting from indirect impacts are expected to be localised and overall are not considered to cause a substantial change in the extent of the community.

The vegetation to be removed from the subject site is part of a small, isolated patch consisting of trees of *Cupaniopsis anacardioides*. The removal of Lowland Rainforest on the subject site would reduce the size of this patch of rainforest but would not fragment it further. This small, isolated patch is located on the boundary of

the Tweed Valley Hospital site, where other small patches have already been removed. The proposed is not considered to significantly increase fragmentation of this community.

The proposed development will not significantly affect the dispersal function of any mapped sub-regional or regional terrestrial corridors or key habitats.

As Lowland Rainforest within the subject site is weedy regrowth of low quality, and as such the habitat to be removed is not important for the long-term survival of the community in the locality.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The BC Act currently lists the following AOBVs:

- Gould's Petrel habitat;
- Little Penguin population in Sydney's North Harbour habitat;
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and
- Wollemi Pine habitat.

The project is not located within or in proximity to the aforementioned AOBVs and is therefore not likely to have an adverse effect on any AOBVs.

e) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The following key threatening processes are relevant to Littoral Rainforest occurring within the study area:

- Invasion and establishment of exotic vines and scramblers

The proposed development has the potential to result in the spread of exotic weeds including vines and scramblers, with some species such as Madeira Vine already present. Further weeds could be introduced through the proposed development, although the removal of exotic vegetation within the subject site would reduce this risk. In order to mitigate this key threatening process mitigation measures will be implemented during clearing works to further minimise the risk of weeds spreading during the proposed development. Landscaping should include local native species only to ensure no introduced weed species are introduced.

- Invasion establishment and spread of Lantana, *Lantana camara* L. sens. lat.)

Lantana camara (Lantana) is already established within Lowland Rainforest TEC, and it is not expected that the project would increase the abundance of this weed beyond current conditions. The removal of exotic vegetation within the subject site would help reduce the risk that this weed would establish further.

- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Garden escapes are already established within Lowland Rainforest TEC, and it is not expected that the project would increase the abundance of garden escapes beyond current conditions. The removal of exotic vegetation within the subject site would help reduce the risk that garden escapes would establish further.

In order to mitigate this key threatening process mitigation measures will be implemented during clearing works to further minimise the risk of weeds spreading during the proposed development. Landscaping will should local native species only to ensure no introduced weed species are introduced.

Conclusion

Approximately 0.03ha of Lowland Rainforest will be removed by the proposed development. While some minor direct impacts are predicted, such as weed invasion, these impacts are similar to current conditions. Given the modified nature of the vegetation, the small scale of direct impacts, and presence of existing indirect impacts, the proposed development is not considered to result in a significant impact to Lowland Rainforest.

C.4. Threatened Microbats

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The potentially occurring local populations of the Yellow-bellied Sheath-tail Bat, Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis are considered to extend beyond the subject site. The number of records in BioNet for these species in the locality (i.e. 5 km radius) is as follows:

- Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*): 3;
- Little Bent-winged Bat (*Miniopterus australis*): 6;
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*): 4; and
- Southern Myotis (*Myotis macropus*): 8.

Potential marginal roosting habitat in the form of old sheds and buildings are present within the subject site. The assessed species would also utilise vegetation for foraging as they move between more intact patches of woody vegetation.

The removal of a sheds and buildings that provides potential marginal roosting habitat is not considered likely to have an adverse impact on the life cycle of the assessed species such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

The project is not considered to significantly increase fragmentation of potential habitat for the assessed species within the study area as the vegetation to be impacted is already highly fragmented, consisting of small patches of native vegetation and planted exotic vegetation in an area dominated by exotic grassland. Some fragmentation already exists as a result of historical clearing associated with horticultural use of the property. The proposed development includes some multistorey buildings that could restrict movement for some species and result in a reduction in overall foraging habitat. The assessed aerial species are highly mobile and will readily move between areas of suitable habitat.

Previous land uses have resulted in the modification of the composition of the potential habitat within the subject site. The potential habitat comprises native and planted exotic trees over an understorey of exotic vegetation considered too degraded to constitute preferred habitat for any of the assessed species. The area of the potential habitat directly and indirectly impacted by the project is not considered important for the long-term survival of the assessed species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

The BC Act currently lists the following AOBVs:

- Gould's Petrel habitat;
- Little Penguin population in Sydney's North Harbour habitat;
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and
- Wollemi Pine habitat.

The project is not located within or in proximity to the aforementioned AOBVs and is therefore not likely to have an adverse effect on any AOBVs.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process

The project will result in the following key threatening process:

- 'Clearing of native vegetation', as this reduces the area of habitat available for threatened species and communities.

The project may result in the following key threatening processes:

- 'Invasion and establishment of exotic vines and scramblers' as they can dominate and suppress native flora species.
- 'Invasion, establishment and spread of *Lantana camara*' as they can dominate and suppress native flora species.
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Whilst the project may result in the aforementioned key threatening processes, the increase in impacts of these processes are considered to be minor. All these key threatened processes are already occurring within and adjacent to the subject site. These threatening processes will be reduced due to the removal of exotic vegetation. No significant impacts resulting from key threatened processes are considered to occur as a result of the project.

Conclusion

The subject site represents marginal roosting foraging habitat for threatened fauna species. The habitat to be removed is in the form of native and introduced trees and planted native vegetation that represents foraging habitat. More extensive suitable habitat is present within adjacent areas including Gales land to the north. As such, the removal of this habitat would not represent the loss of critical habitat for any threatened species and is not expected to result in the local extinction of any species. The proposed development is not expected to contribute to threatening processes more than current conditions. As such impacts of the proposed development are not predicted to be significant.

FIGURES



Legend

- Subject Site
- Study Area
- Cadastre

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2022
Dated: 7/6/2022

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Tweed LGA



Figure 1. Location of the study area and subject site





Figure 2. Conceptual layout for the proposed development



Legend

- | | | |
|--|--------------|--|
|  | Subject Site | State Environment Planning Policy (Resilience and Hazards) |
|  | Study Area |  Coastal Wetlands |
| | |  Proximity Area to Coastal Wetlands |

Coordinate System: MGA Zone 56 (GDA 94)
 Image Source:
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Data Source:
 NSW Government Spatial Services
 SIX Maps 'Clip and Ship'
 Tweed LGA

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 Department of Planning and Environment 2022
 State Environmental Planning Policy
 (Resilience and Hazards) 2021



Figure 3. Mapping under the Resilience and Hazards SEPP





Legend

- Subject Site
- Study Area
- BAM Plot Locations
- Random Meander

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2022
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Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Tweed LGA



Figure 4. Survey effort including location of BAM Plots

0 50 m





Legend

- | | | |
|--|--------------|--|
|  | Subject Site | Vegetation Community (Tweed 2012) |
|  | Study Area |  Broad-leaved Paperbark / Swamp She-oak Closed Forest to Woodland |
| | |  Broad-leaved Paperbark Closed Forest to Woodland |
| | |  Early Regrowth Rainforest |
| | |  Sedgeland / Rushland (Murray & James Yes998 Study Area Only) |
| | |  Substantially Cleared of Native Vegetation |

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2022
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Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Tweed Shire Council

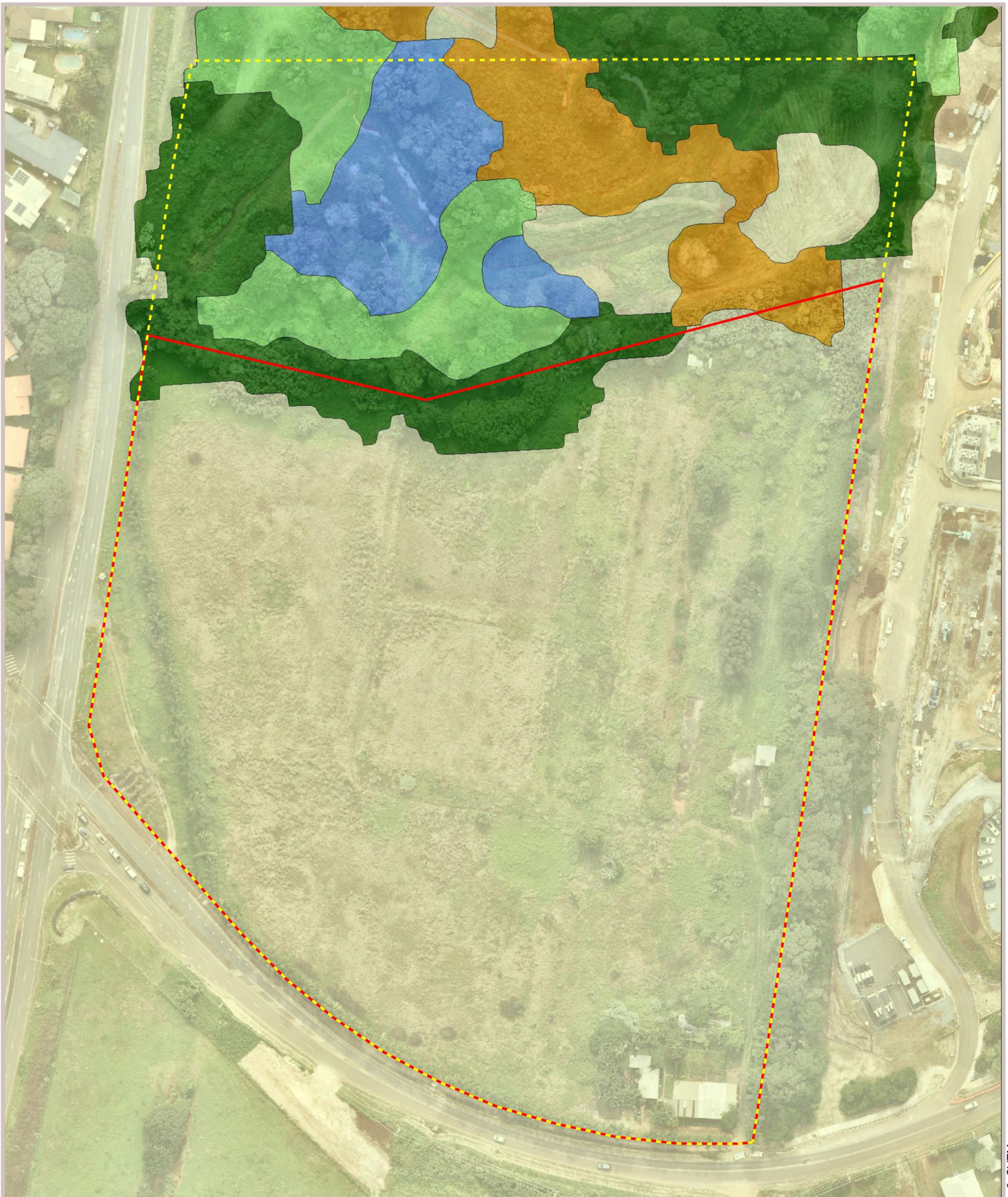
Kingston, M. and Hall, P (2011)
Update of Tweed Shire Council Vegetation Mapping



Figure 5. Tweed Shire Council vegetation mapping for the study area

0 50 m





Legend

- | | |
|--|--|
| <ul style="list-style-type: none"> Subject Site Study Area | <p>Plant Community Type</p> <ul style="list-style-type: none"> PCT 3004: Far North Bangalow Palm Swamp Forest PCT 3148: Far North Brush Box-Walnut Wet Forest PCT 3961: Coast Sands Lepironia Sedgeland PCT 4004: Northern Melaleuca quinquenervia Swamp Forest Not classified |
|--|--|

Coordinate System: MGA Zone 56 (GDA 94)
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Data Source:
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 NSW State Vegetation Type Map
 Release C1.1.M1



Figure 6. NSW Statewide Plant Community Type mapping for the study area

0 50 m



Legend

- Subject Site
- Study Area

Plant Community Type

- | | |
|---|--|
| <ul style="list-style-type: none"> PCT 3004: Far North Bangalow Palm Swamp Forest (Regrowth) PCT 3004: Far North Bangalow Palm Swamp Forest (Slashed) PCT 3172: Northern Ranges Brush Box-Flooded Gum Wet Forest (Overhanging) | <ul style="list-style-type: none"> PCT 3987: Far North Floodplain Swamp Oak Paperbark Forest PCT 4004: Northern Melaleuca quinquenervia Swamp Forest Planted Exotic Exotic Grassland Cleared |
|---|--|

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2022
Dated: 7/6/2022

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Tweed LGA



Figure 7. Ground-truthed vegetation mapping for the study area

0 50 m



Legend

- | | | |
|--|--------------|--|
|  | Subject Site | Threatened Ecological Community |
|  | Study Area |  Lowland Rainforest |
| | |  Lowland Rainforest on Floodplain |
| | |  Swamp Sclerophyll Forest |

Coordinate System: MGA Zone 56 (GDA 94)



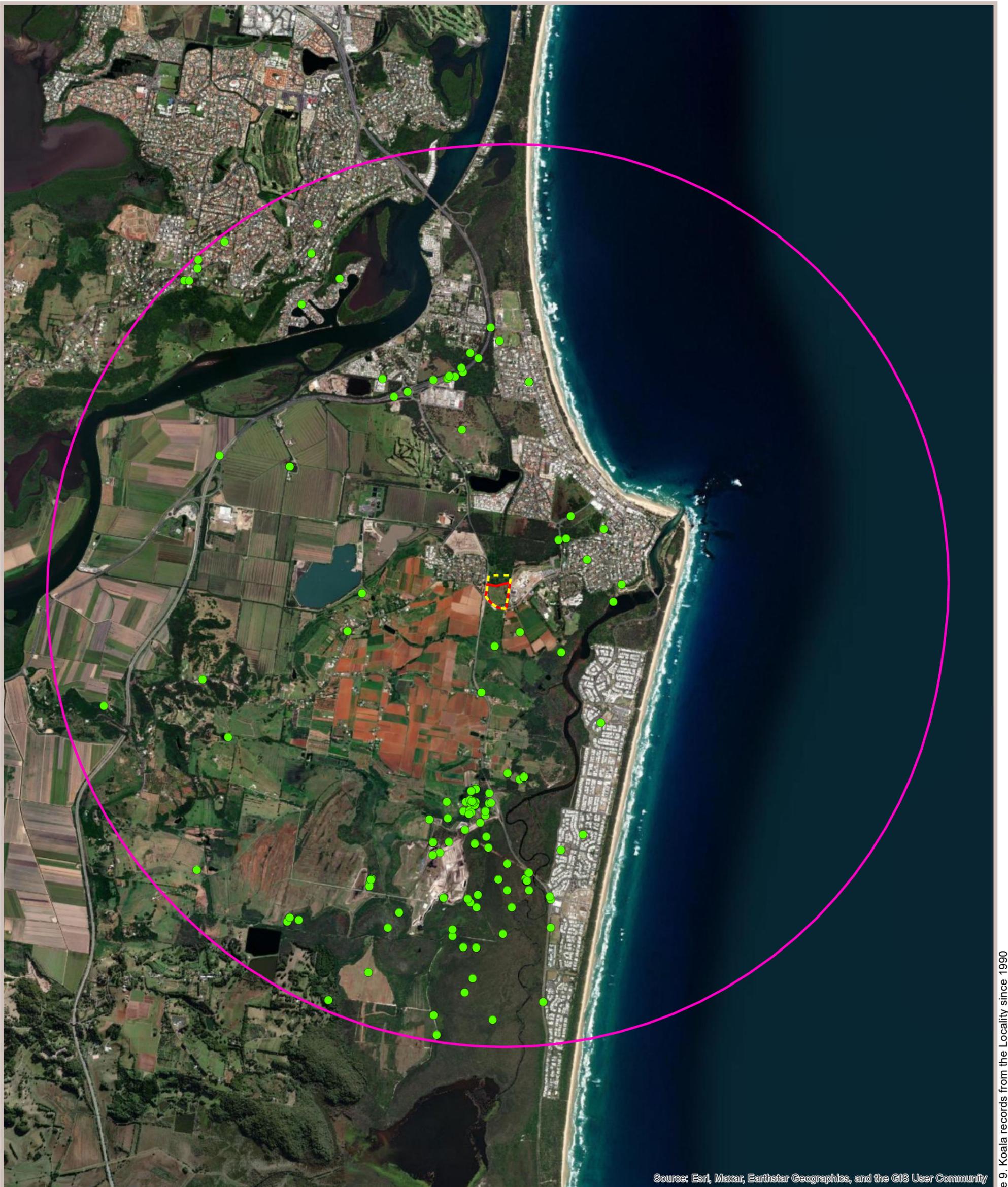
Image Source:
Image © NearMap 2022
Dated: 7/6/2022

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Tweed LGA



Figure 8. Threatened Ecological Communities listed under the NSW Biodiversity Conservation Act 2016

0  50 m



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- Legend**
- Subject Site
 - Study Area
 - Locality (5 km)
 - Koala Records

Coordinate System: MGA Zone 56 (GDA 94)

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Tweed LGA

BioNet Atlas of NSW Wildlife
© NSW Office of Environment and Heritage
dated 9/10/2023



Figure 9. Koala records from the Locality since 1990



I:\... \22050\Figures\RP2\2023\1009\Figure 9. Koala records from the Locality since 1990



Legend

- Subject Site
- Study Area
- Tweed Shire Council Koala Habitat Mapping

Coordinate System: MGA Zone 56 (GDA 94)
 Image Source:
 Image © NearMap 2022
 Dated: 7/6/2022

Data Source:
 NSW Government Spatial Services
 SIX Maps 'Clip and Ship'
 Tweed Shire Council

Koala habitat restoration mapping
 Tweed Shire Council 2023



Figure 10. Tweed Shire Council Koala Habitat Mapping

0 50 m



Legend

- | | | |
|--|--------------|---|
|  | Subject Site | Koala Habitat Type |
|  | Study Area |  Secondary (Class B) |
| | |  Other |
| | |  Unknown |

Coordinate System: MGA Zone 56 (GDA 94) 

Image Source:
Image © NearMap 2022
Dated: 7/6/2022

Data Source:
NSW Government Spatial Services
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Tweed LGA



Figure 11. Ground-truthed Koala Habitat Mapping

0  50 m



Legend

- Subject Site
- Study Area
- Development Footprint

Plant Community Type

- PCT 3004: Far North Bangalow Palm Swamp Forest (Regrowth)
- PCT 3004: Far North Bangalow Palm Swamp Forest (Slashed)
- PCT 3172: Northern Ranges Brush Box-Flooded Gum Wet Forest (Overhanging)

- PCT 3987: Far North Floodplain Swamp Oak Paperbark Forest
- PCT 4004: Northern Melaleuca quinquenervia Swamp Forest
- Planted Exotic
- Exotic Grassland
- Cleared

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
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Data Source:
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SIX Maps 'Clip and Ship'
Tweed LGA



Figure 12. Indicative areas of vegetation requiring removal

0 50 m



Legend

- Subject Site
- Study Area
- Required Setbacks

Plant Community Type

- PCT 3004: Far North Bangalow Palm Swamp Forest (Regrowth)
- PCT 3004: Far North Bangalow Palm Swamp Forest (Slashed)
- PCT 3172: Northern Ranges Brush Box-Flooded Gum Wet Forest (Overhanging)

- PCT 3987: Far North Floodplain Swamp Oak Paperbark Forest
- PCT 4004: Northern Melaleuca quinquenervia Swamp Forest
- Planted Exotic
- Exotic Grassland
- Cleared

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2022
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Figure 13. Setbacks required under Section A.19 of the Tweed Shire DCP

0 50 m