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Stage One Streamlined Biodiversity Development Assessment Report

Planning Proposal

205, 207, 209 Wallarah Road, Kanwal, NSW 2259

755-757 Pacific Highway, Kanwal, NSW 2259

Prepared for: Vivacity Property

28 August 2023

BOAMS: 00042630/BAAS18147/23/00042631 Revision: 0

AEP Ref: 2642.01

Revision: 02

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Document Control

Document Name	Stage One Streamlined Biodiversity Development Assessment Report – Planning Proposal at 205,207, 209 Wallarah Rd and 755-757 Pacific Highway, Kanwal, NSW 2259
Project Number	2642.01
Client Name	Vivacity Property
Accredited Assessor	Ian Benson (BAAS 18147)
AEP Project Team	Natalie Black Frances O'Brien Edouard Loisance Kelly Drysdale Stephen Curry Darcy Kilvert Samuel Rayfield Stevie Kay Jeremy Burrill Chris Wark Warwick Mui Alana Guest Chris Wark

Revision

Revision	Date	Author	Reviewed	Approved
Draft	16/08/2023	Edouard Loisance Frances O'Brien	Ian Benson	Ian Benson
01	17/08/2023	Edouard Loisance Frances O'Brien	Ian Benson	Ian Benson
02	28/08/2023	Edouard Loisance Frances O'Brien	Ian Benson	Ian Benson

Distribution

Revision	Date	Name	Organisation
Draft	16/08/2023	Tom Copping	Vivacity Property
01	17/08/2023	Tom Copping	Vivacity Property
02	28/08/2023	Tom Copping	Vivacity Property

EXECUTIVE SUMMARY

Anderson Environment & Planning (AEP) was commissioned by Vivacity Property (the Proponent) to undertake a Streamlined Biodiversity Development Assessment Report (SBDAR) over land identified as Lot 1 DP 518378, Lot 1223 DP 1004170 and Lots 14 and 15 DP 23235 (the Study Area of 5.49ha), located at 205-209 Wallarah Road and 755-757 Pacific Highway, Kanwal NSW in the Central Coast Local Government Area.

This report has been prepared to meet the requirements of the Biodiversity Assessment Method (BAM) 2020 established under Section 6.7 of the *NSW Biodiversity Conservation Act 2016*. This assessment utilises methods detailed within the BAM 2020 to identify biodiversity values inherent within the site, including known and potentially occurring threatened species and ecological communities, and quantifies impacts of the proposal upon these values in accordance with the streamlined assessment module for small area development of the BAM. In particular, considering the proposal is for a rezoning, consultation with the NSW Department of Planning and Environment (DPE) confirmed that an adjusted BDAR, including a Stage One Biodiversity Assessment, recommendations on strategies to avoid and minimise impacts to biodiversity, and calculations of biodiversity offsets credits likely to require retirement in order to offset residual impacts, would suffice to inform the Planning Proposal.

The Study Area totals 5.49ha in area and includes Lot 1 DP 518378, Lot 1223 DP 1004170 and Lots 14 & 15 DP 23235. The Study Area is currently zoned R1 – 'General Residential' and R2 – 'Low Density Residential'. Proposed future zoning was not determined at time of writing of the present report. However, the proposed rezoning would allow for the establishment of a mixed-use precinct.

Native vegetation proposed to be removed as part of this development totals 0.66ha and consists of:

- Approximately 0.2ha (Highly degraded) of PCT 3583 – *Hunter Coast Lowland Scribbly Gum Forest*. No associated threatened ecological Community (TEC)*;*
- Approximately 0.46ha (Highly to severely degraded) of PCT 4006 – *Northern Paperbark-Swamp Mahogany Saw-sedge Forest*. This community has an associated NSW-listed Endangered Ecological Community, being *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*. Furthermore, PCT 4006 was found not to be associated with Commonwealth-listed *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland*.

The remainder of the Study Area totals 4.83ha and consists of Exotic / Cleared / Existing Infrastructure.

Fauna species recorded were typical of those expected in this locality and in this type of degraded habitat with some existing connection to larger patches of habitat offsite. The clearing of land mapped as Important Habitat for threatened species Swift Parrot will incur biodiversity offsets credits under the Biodiversity Offset Scheme. Impacts to these areas required a Serious and Irreversible Impact (SAII) Assessment. Due to the proportionally small area of mapped Swift Parrot Important Habitat to be removed by the proposed rezoning and subsequent development (0.17ha), and the poor condition therein, combined with retention of land to the north, it is considered unlikely that the proposed development and associated removal of mapped habitat would place this species at risk of SAIIs.

Considerations of Avoid & Minimise confirmed that an iterative design process undertaken with bushfire consultants and project ecologists sought to locate the development on lands with lowest biodiversity values. Impacts to native vegetation were deemed to be of minimal consequences due to the very low Vegetation Integrity Score for all PCTs present onsite. Further impact avoidance and mitigation measures in the form of fencing in the north and tree retention in the north and along the western boundary are proposed.

To offset residual impacts of the proposal upon identified biodiversity values, the proposal would require retirement of a total of:

- 2 x PCT 4006 Ecosystem Credits
- 2 x Swift Parrot Species Credits

Assessment of the proposal under other relevant environmental policy instruments including *State Environmental Planning Policy Biodiversity and Conservation) 2021 – Chapter 4 Koala Habitat Protection 2021*; *State Environmental Planning Policy (Resilience and Hazards) 2021 – Chapter 2 Coastal Management,* and the *Environment Protection and Biodiversity Conservation Act 1999* was undertaken. Given the overall low biodiversity values of the site and the small impact to native vegetation, referral under the EPBC Act is not likely to be necessary for the Planning Proposal or any future DA.

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Tables

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Study Certification and Licensing

The fieldwork was undertaken by staff identified in the table below. This report was written by Edouard Loisance MMgt and DipCons&LandMgmt and Frances O'Brien BEnv LLB GDLP MEL (BAAS: 20013), and reviewed and certified by Ian Benson BEng(Civil) and GradDipSc(Ecology) (BAAS:18147) of Anderson Environment & Planning.

Staff	Title/Qualification	Tasks
Ian Benson	Director and Principal Ecologist BEng(Civil); GradDipSc(Ecology) BAAS 18147	Review and Certification Scientific advice
Frances O'Brien	Senior Ecologist BEnv LLB GDLP MEL BAAS 20013	Habitat assessment, Koala SAT survey, BAM plots, PCT determination
Natalie Black	Senior Environmental Manager BSc (Hons), Master Planning, BAAS: 19076	Report review and contribution Council liaison
Edouard Loisance	Lead Ecology Works Manager MMgt, Dip CALM	Project management Report writing, GIS
Stevie Kay	BSc (Marine Science)	Flora survey
Chris Wark	Senior Ecologist BSc (Hons) (Ecology and Zoology) Dip CALM	Habitat assessment, BAM plot
Jeremy Burrill	Ecologist BEnvSc (Environmental Management and Sustainability)	HBT survey, Arborist and Riparian reports, habitat assessment
Warwick Muir	Ecologist BSc (Biology); DipArb (AQF5)	Tree assessment
Darcy Kilvert	Ecologist BSc.(Biology)	Flora survey
Alana Guest	BSc (Biology), BA (History / Ancient History)	Flora survey
Stephen Curry	BEvnSc & Mmgt, Dip CALM, Cert III CALM, B.Ed.	Flora survey
Samuel Rayfield	Dip CALM, BComm	Flora survey

Research was conducted under the following licences:

- NSW DPE Scientific Investigation Licence SL101313;
- Animal Research Authority (Trim File No: 14/600(2)) issued by NSW Agriculture; and
- Animal Research Establishment Accreditation Number 53724.

Conflict of Interest:

The BAM assessment and this BDAR have been undertaken in line with the Accredited Assessors Conflict of Interest and professional behaviour code. There are no known conflicts of interest between AEP staff or Directors and the proponent of the development. AEP have received payment from Vivacity Property for the provision of professional ecological consulting services.

Certification:

As the Accredited Assessor, I, Ian Benson, make the following certification:

This report has been written to comply with the requirements of the BAM 2020 and obligations outlined within the BAM Assessor Code of Conduct and includes, in the opinion of the writer, a true and accurate account of the species recorded, or considered likely to occur within the Survey Area, and inferences of such for biodiversity credit calculations;

BAM Assessment methodology, as well as Commonwealth, state and local government policies and guidelines, formed the basis of project surveying methodology, unless specified departures from industry standard guidelines are justified for scientific and/or animal ethics reasons;

All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the Animal Research Act 1995, Biodiversity Conservation Act 2016 and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Certifier:

Ian Benson

Director and Principal Ecologist

Anderson Environment & Planning

BAAS no. 18147

Calculator Ref: 00042630/BAAS18147/23/00042631 Revision: 0

28 August 2023

Glossary of Terms

APZ	Asset Protection Zone
Assessment Area	Area covering a 1500-metre buffer around the Study Area, as defined in Section 3.1.2 item 1. (b) of the BAM.
BAM	*Biodiversity Assessment Method Order* (2020) that determines: Methodology applicable to quantifying biodiversity values inherent within a development site; Avoid and mitigation efforts required to be employed as part of any development proposal; and Number and class of credits required to offset residual impacts of the proposal upon the biodiversity values therein.
BAM Calculator (BAM-C)	The online tool used to interpret site survey data and regional location information to quantify ecosystem and species credits required / generated at a development / stewardship site.
BC Act	The NSW *Biodiversity Conservation Act 2016.*
Biodiversity Credit Report	Specifies the number and type of biodiversity credits required to offset the impacts of a development.
Biodiversity credits	Ecosystem or Species Credits required to offset the loss of biodiversity values on a development site.
Biodiversity offsets	Specific measures that are put in place to compensate for impacts on biodiversity values.
Biodiversity values	The composition, structure and function of ecosystems, and threatened species, populations and ecological communities, and their habitats.
BOS	The NSW Biodiversity Offsets Scheme
BV Map	The NSW DPE Biodiversity Values Map
Council	Central Coast
DAWE	The former Commonwealth Department of Agriculture, Water and the Environment.
DCCEEW	The Commonwealth Department of Climate Change, Energy, the Environment and Water
DPI	The NSW Department of Primary Industries.
DPIE	The former NSW Department of Planning, Industry and Environment.
DPE	The NSW Department of Planning and Environment. Formally known as DPIE.
Ecosystem credit	The class of biodiversity credits created or required for the impact on EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur within a vegetation type.
EEC	Endangered Ecological Community (under BC Act).
EPBC Act	The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
HBT	Hollow-bearing tree as defined in the *Private Native Forestry Code of Practice for Northern NSW* (LLS, 2022)
BC SEPP	State Environmental Planning Policy (Biodiversity and Conservation) 2021 Chapter 4 Koala Habitat Protection 2021.
HR SEPP	State Environmental Planning Policy (Hazard and Resilience) 2021 Chapter 2 Coastal Management.
OEH	The former NSW Office of Environment and Heritage.

PFC	Percentage Foliage Cover
Proposal	The proposal is for the rezoning of lands located at 205-209 Wallarah Road, Kanwal, NSW, 2259 (Lot 1 DP518378 and Lot 1223 DP1004170) and 755-757 Pacific Highway, Kanwal, NSW, 2259 (Lots 14 & 15 DP23235) to enable future high-density mixed-use development.
Study Area	Consists of Lot 1 DP518378, Lot 1223 DP 1004170 and Lots 14 & 15 DP 23235 and totals 5.49ha of which 2.88ha consists of the current caravan park. The area is predominantly cleared (4.83ha) with remnant patches of native vegetation (0.66ha) (refer **Figures 1** and **3**).
Species credit	Class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area based on habitat surrogates.
TBDC	Threatened Biodiversity Data Collection.
TEC	Threatened Ecological Community.
VIS	Vegetation Integrity Score.

1.0 Stage 1 – Biodiversity Assessment

1.1 Introduction

At the request of Vivacity Property (the proponent), Anderson Environment & Planning (AEP) have undertaken the necessary investigations to inform the production of a Streamlined Biodiversity Development Assessment Report (SBDAR) addressing the proposed development, specifically under Stage One of the BAM, to inform the lodgement of a Planning Proposal.

This SBDAR undertaken adheres to the approach outlined in the BAM (DPIE 2020a) and the Biodiversity Assessment Method Calculator User Guide (DPIE 2020b).

1.1.1 Biodiversity Offset Scheme Threshold Trigger

The Study Area is BV Mapped and as such, the proposal automatically triggers entry into the BOS through impacting BV Mapped Land.

This proposal will also incur the clearing of 0.66ha of native vegetation which is above the applicable area clearing threshold for the site (0.25ha). Exceeding the threshold triggers entry into the BOS.

A BDAR is therefore a requirement under Clause 7.1 *Biodiversity Conservation Regulation 2017* by the following threshold:

- (1)(a) the clearing of native vegetation of an area declared by clause 7.2 as exceeding the threshold (which is 0.25ha).
- (1) (b) the clearing of native vegetation, or other action prescribed by clause 6.1, on land included on the *Biodiversity Values Map* published under clause 7.3.

An assessment under Appendix C, Table 12 of the BAM Order, shows that the proposal can be assessed under the Streamlined Assessment Module for Small Area Development, as the Minimum Lot size associated with the Study Area is 450m^2 and the proposed clearing of native vegetation is 0.66ha, hence being under the applicable area clearing limits for an SBDAR (small area) of 1ha.

1.1.2 Assessment Scope

The SBDAR presented herewith aims to quantify impacts of the proposal upon biodiversity values based on the methods described within the BAM Order, including threatened entities listed under the BC Act.

The proposed development has been assessed under the Streamlined Assessment Module for Small Area Development of the BAM due to the clearing threshold of 1ha being met.

Site layout allowed for the landscape values to be determined based upon a site-based method, rather than a linear method.

For the purposes of the Planning Proposal, the report includes a Stage 1 – Biodiversity Assessment – including area limits, mapping of remnant vegetation communities within the location of previously identified threatened species and their habitats, and a list of threatened species, populations and communities with a likelihood of occurrence; and

1.1.3 The Proposal

The Study Area occurs within the Central Coast LGA (refer **Figure 1 & 2**). The proposal is for the rezoning of the Study Area to a mixed-use precinct comprising apartments, retail services and public parkland (refer **Appendix A** – Rezoning plan). Subsequent development post-rezoning would incur the clearing of the majority of native vegetation within the Study Area. Minimal native canopy or shrub species are present within the site and have been assessed as being in a highly degraded condition.

1.1.4 Site Particulars

Table 1 provides site context details to assist with the assessment of landscape features and to establish context of the Study Area in the surrounding landscape.

Table 1 – Site Particulars

Detail	Comments
Client	Vivacity Property
Address	205--209 Wallarah Road and 755-757 Pacific Highway, Kanwal, NSW 2259
Title(s)	Lot 1 DP 518378, Lot 1223 DP 1004170, Lots 14 & 15 DP 23235
Study Area	Consists of the entirety of Lot 1 DP 518378, Lot 1223 DP 1004170 and Lots 14 & 15 DP 23235. The Study Area consists of lands proposed to be rezoned to enable a mixed-use precinct (including apartments, retail services and public parklands). The site is currently used as a caravan park which includes onsite permanent accommodation, site office, swimming pool and bathroom facilities. The Study Area totals 5.49ha and comprises predominantly of infrastructure relevant to the caravan park and areas of vegetation connected to the adjacent allotment of the north. (Refer to **Figure 1**).
LGA	Central Coast
Current Zoning	Under the Central Coast Local Environment Plan 2022 (the LEP pub.24-6-2022), Lot 1 DP 518378 and Lot 1223 DP 1004170 are zoned R1 – General Residential and Lots 14 & 15 DP 23235 are zoned R2 – Low Density Residential (refer **Figure 1**).
Proposed Zoning	Mixed-use precinct
Biodiversity values Map	The Study Area comprises areas of BV mapped land, specifically described as Important Habitat for Swift Parrot (refer **Appendix E** and Error! Reference source not found.).
Minimum Lot Size	450m^2
Clearing Threshold	0.25ha
Current Land Use	The land is currently utilised as a caravan park which takes up almost 40% of the Study Area. The site is highly managed with a few patches of native vegetation in the west and north in a highly degraded condition.
Surrounding Land Use	To the north of the Study Area is a nature reserve zoned RE1 – Public Recreation and C2 – Environmental Management. To the east, residential lots zoned R2 – Low Density Residential are present. The site is bounded to the site by Wallarah Road and lands zoned R1 – General Residential, R2 – Low Density Residential and B1 – Neighbourhood Centre. To the east, a sporting field attached to the Wyong Ruby League Club and zoned RE2 – Private Recreation is present.

Figure 1 depicts the extent of the lot boundary; **Figure 2** defines the Assessment Area and depicts the location of the site within the landscape.

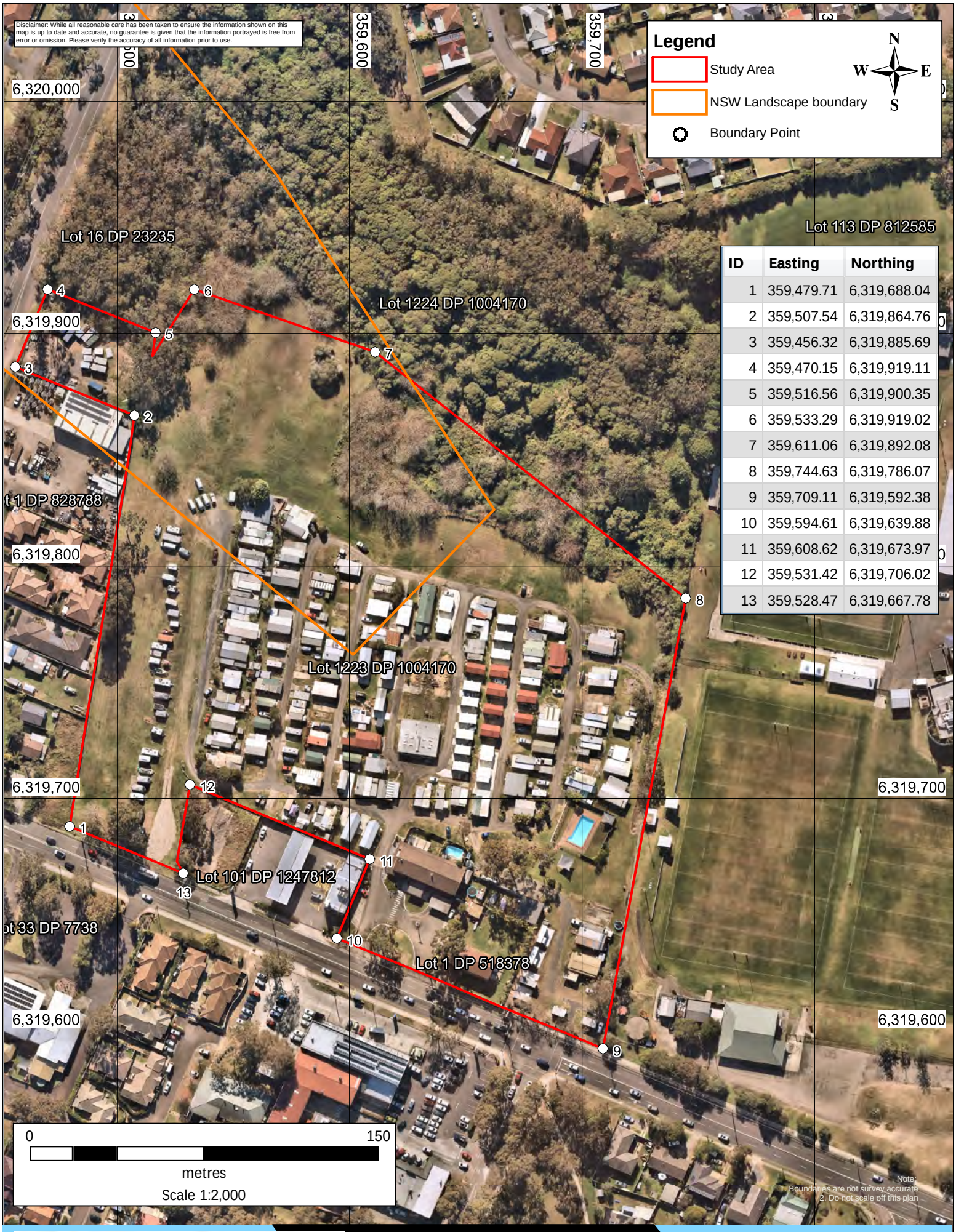
1.1.5 Information Sources

Information and spatial data provided within this SBDAR has been compiled from various sources including:

- Aerial Photograph Interpretation (API) of the site and surrounding locality (Google 2020; Nearmap 2022);
- DPE State Vegetation Type Map (SVTM) (DPE, 2022c);
- Applicable State survey guidelines: DEC 2004, DPIE 2020c, DPIE 2020d, DPE 2022b, DPE 2022b, OEH 2018;
- DPE Threatened Biodiversity Profiles (https://www.environment.nsw.gov.au/threatenedSpeciesApp/);
- PlantNET NSW (http://plantnet.rbgsyd.nsw.gov.au/);
- Collective knowledge gained from previous ecological survey and assessment; and
- Anecdotal records.

In addition, database searches were carried out, namely:

- Review of flora and fauna records held by DPE Atlas of NSW Wildlife within a 10km x 10km square polygon with the Subject Site as the centroid of the polygon (August 2023);
- Review of flora and fauna records held by the DCCEEW Protected Matters Search within a 5km radius of the site (August 2023); and
- Review of Important Area Maps (DPE August 2023).



ID	Easting	Northing
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2	359,507.54	6,319,864.76
3	359,456.32	6,319,885.69
4	359,470.15	6,319,919.11
5	359,516.56	6,319,900.35
6	359,533.29	6,319,919.02
7	359,611.06	6,319,892.08
8	359,744.63	6,319,786.07
9	359,709.11	6,319,592.38
10	359,594.61	6,319,639.88
11	359,608.62	6,319,673.97
12	359,531.42	6,319,706.02
13	359,528.47	6,319,667.78

AEP

Figure 1 - Site Map

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

BOAMs Ref: 42630

Client: Vivacity Property

AEP Ref: 2642.01

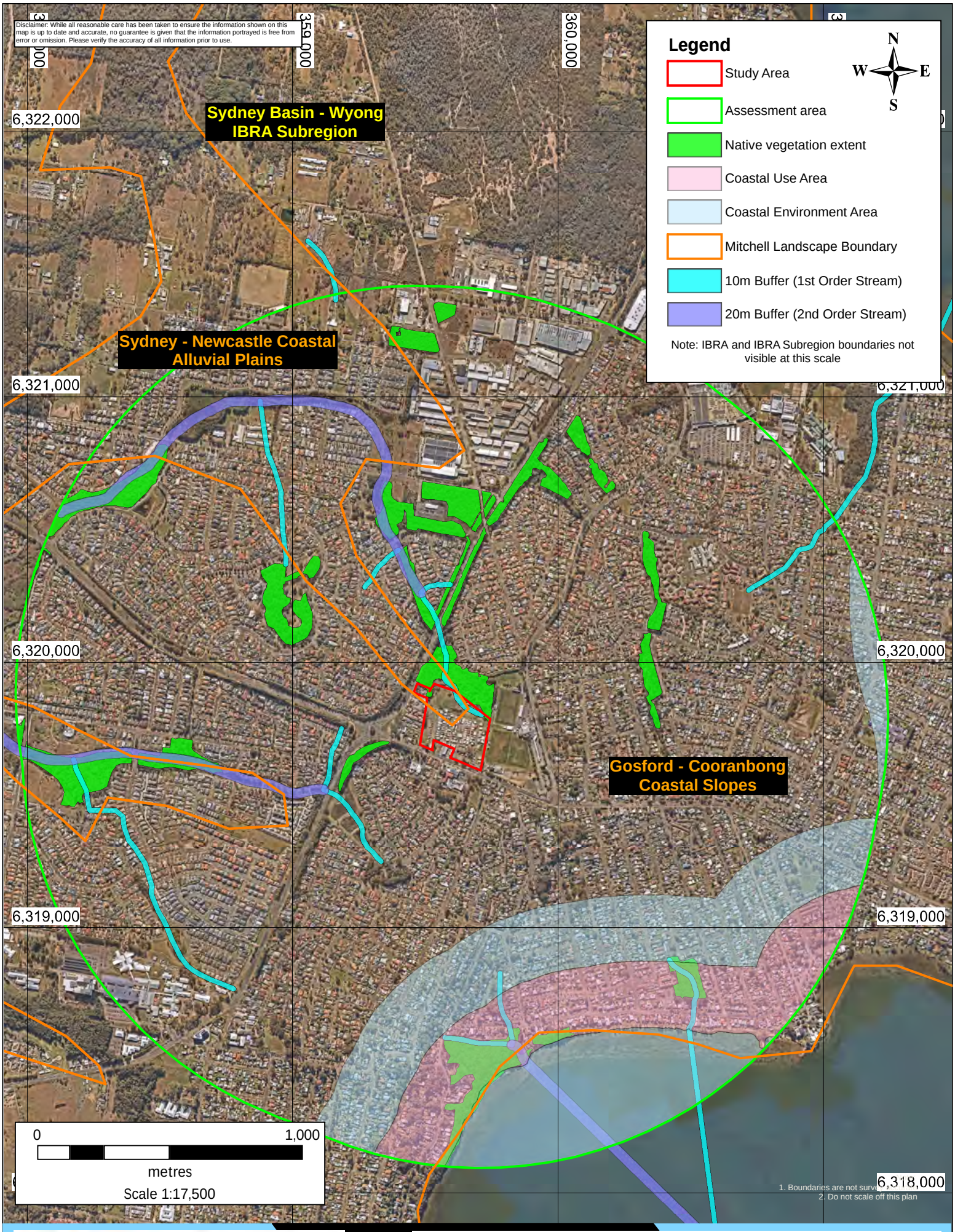

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Figure 2 - Location Map

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

BOAMs Ref: 42630

Client: Vivacity Property

AEP Ref: 2642.01

1.2 Landscape Features

1.2.1 Regional Landscapes

The Study Area was identified as occurring within the following landscape areas:

- *IBRA Bioregion* – Sydney Basin.
- *IBRA Subregion* – Wyong.
- *NSW Landscape* – Gosford-Cooranbong Coastal Slopes and Sydney-Newcastle Coastal Alluvial Plains.

Delineation of NSW Landscape areas are shown in the Location Map (**Figure 2**).

1.2.2 Identified Landscape Features

The BAM Calculator identifies nine (9) landscape features that require assessment for their relevance to the Study Area. These features are outlined in **Table 2**.

Table 2 – Landscape Feature Assessment

Landscape Feature	Assessment
Rivers and Streams	An unnamed 1st order stream is mapped within the Study Area and starts to the north of the Study Area (refer to **Appendix I** and **Figure 2**). The Riparian Assessment Report (AEP, August 2023) revealed that; "*The field investigations showed that Survey ID # 1 - 6 did not show key features of a watercourse. The area is not recognised as a wetland due to the absence of a number of key features. A low level of water within the surveyed area suggests the area is not frequently wet and the abundance of overgrown exotic vegetation is not commensurate with a typical wetland environment, where a distinct change in vegetation type can indicate a wetland area. As there was no watercourse present on site in accordance with the former DPIE Natural Resource Access Regulator Waterfront Land Tool; there is no requirement for Riparian Corridors (RC) or Vegetation Riparian Zones (VRZ).*"
Wetlands	The Study Area is not mapped as containing Coastal Management Areas in accordance with the Resilience and Hazards SEPP, with the nearest Coastal Environment Area mapped approx. 560m south of the Study Area (refer **Figure 2**).
Native Vegetation Extent	Approximately 0.66ha of native vegetation occurs in the Study Area, of which all will be impacted. Plant Community Types within the Study Area include: • Approximately 0.2ha (Highly degraded) PCT 3583 – *Hunter Coast Lowland Scribbly Gum Forest.* No associated threatened ecological Community (TEC); • Approximately 0.46ha (Highly to severely degraded) PCT 4006 – *Northern Paperbark-Swamp Mahogany Saw-sedge Forest*. This community has an associated BC Act-listed Endangered Ecological Community - Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;

Landscape Feature	Assessment
	PCT 4006 has potential to be associated with EPBC Act-listed *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland*. However, vegetation on site is not commensurate with the EPBC Act-listed EEC, as assessed further in the present report. Further assessment undertaken in **Section 1.5.7** determined that PCT 4006 on site was associated with the State TEC identified above.
Connectivity Features	The site is connected to larger tracts of bushland to the north and to some degree along the riparian area as the hydroline becomes a second order stream. The Pacific Highway is located further to the north representing a significant barrier and limit connectivity for terrestrial and arboreal mammals. Development of the site will not significantly impact connectivity through the locality as there is minimal native vegetation within the Study Area and the BV mapped lands adjacent to the Study Area in the north will form part of a broader corridor to allow for movement of local fauna and flora in the area to some degree.
Karst, Caves, Crevices, Cliffs, Rock and other Geological Features of Significance	There are no identified karst, caves, crevices, cliffs, rock and other geological features of significance within the Study Area.
NSW Landscape	The site is defined as *Gosford – Cooranbong Coastal Slopes* and *Sydney – Newcastle Coastal Alluvial Plains* and delineation of NSW Landscape areas are shown in the Site Map (**Figure** 1) and the Location Map (**Figure 2**).
Soil hazard features	None known on site.
Features identified in SEARs for major projects	Proposal is not a major project.
Areas of Outstanding Biodiversity Value (AOBV) under the BC Act:	No AOBV are present on the Study Area and the adjacent lands.

1.3 Site Context Components

1.3.1 Landscape Native Vegetation Cover

In accordance with Section 3.1.2, item 1.(b) of the BAM, a 1500m buffer was placed around the site, totalling approx. 862.4ha. Of this, approximately 41.89ha comprises native vegetation as per Section 3.2 of the BAM (**Figure 2**). This equates to approximately 4.86% native vegetation cover and was entered as such within the Calculator.

1.4 Biodiversity Mapped Land

The Biodiversity Values Map (BV Map) tool identifies land with high biodiversity value, as defined by the Biodiversity Conservation Act Regulations (BCR). The Biodiversity Offsets Scheme (BOS) applies to all local developments, major projects or the clearing of native vegetation where the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 applies. Any of these will require entry into the BOS if they occur on land mapped on the Biodiversity Values Map (refer **Appendix E**). The BOSET report does include BV mapped land mapped as *Biodiversity Values "mapped for more than 90 days"* nor *"added within the last 90 days"* within or adjacent to the Study Area.

BV mapped land is present within the Study Area. Specific values are '*threatened species or communities with potential for serious and irreversible impacts*'.

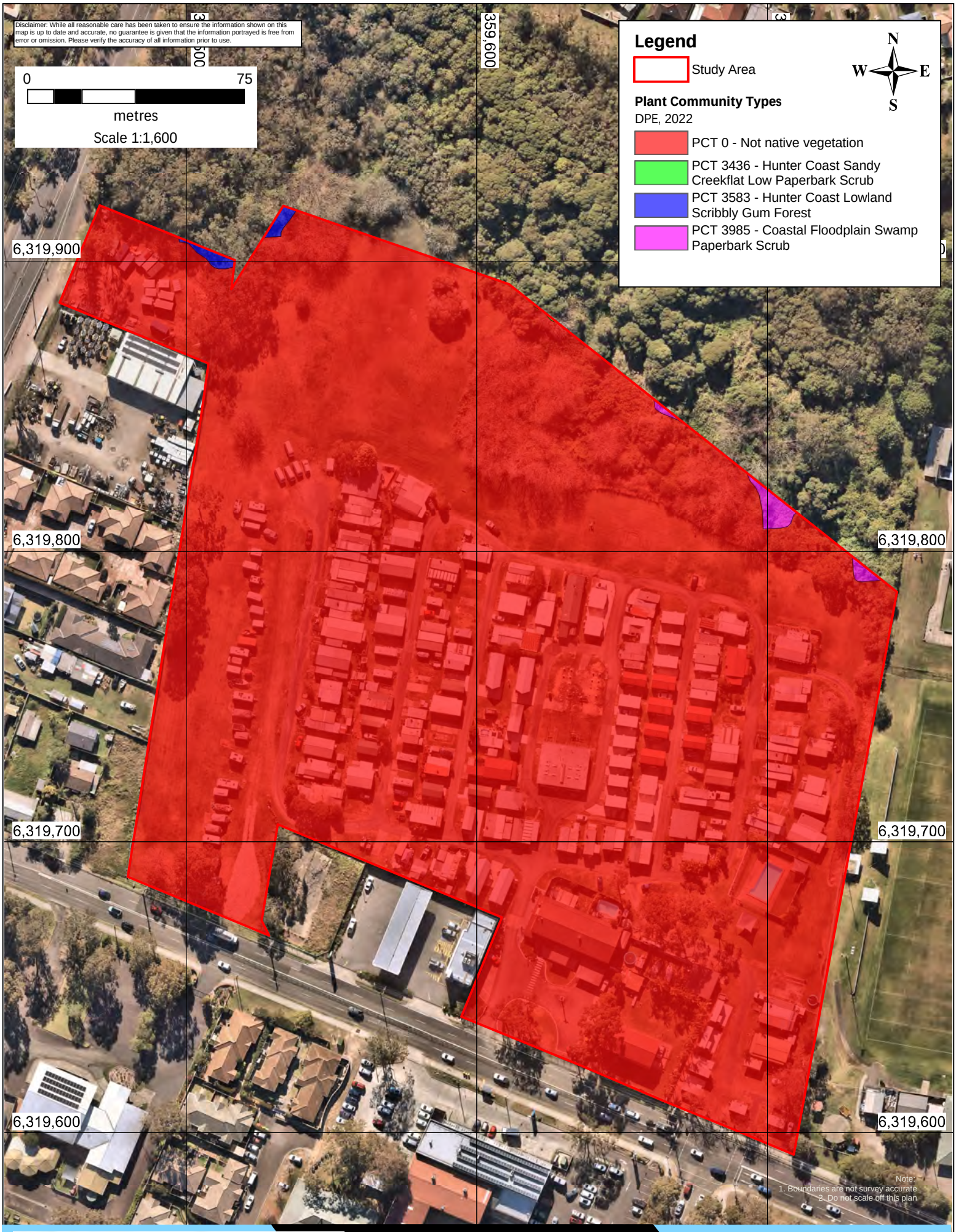
1.5 Native Vegetation

1.5.1 State Mapping

The State Vegetation Type Map dataset (DPE, 2022c) was consulted to inform preliminary vegetation mapping. The vegetation communities mapped by DPE and their extent within the Study Area are provided in **Table 3** and **Figure 3**.

Table 3 – State Vegetation Mapping Results (DPE 2022)

Vegetation Community	Study Area (ha)
PCT 3583 - Hunter Coast Lowland Scribbly Gum Forest	0.011
PCT 3985 - Coastal Floodplain Swamp Paperbark Scrub	0.019
Not native vegetation	5.461
Total	**5.49**



AEP

Figure 3 - State Vegetation Type Map

Location: 205-209 Wallarah Road, Kanwal

Client: Vivacity Property

Date: Aug 2023

BOAMs Ref: 42630

AEP Ref: 2642.01

1.5.2 Plot Based Floristic Surveys

Plot Based Floristic surveys were undertaken by AEP in July 2022 to identify the most likely Plant Community Type/s within the Study Area. The surveys are stratified and targeted to assess the expected environmental variation and address any areas with gaps in existing mapping and information. Surveys included:

- Ground-truthing of regional vegetation mapping to identify all vegetation communities present onsite as well as segregate vegetation zones according to condition and current management practices.
- Identification of all vascular plant species encountered during fieldwork. Study Area coverage was both systematic to ensure all key points of the site were checked, and therein the Random Meander Technique (Cropper 1993) was utilised to maximise species encountered.
- The plot-based floristic vegetation survey is based on a 20m × 20m plot (or 400m^2 equivalent for linear areas). The assessor must assess the plot for the information contained in Table 1 of BAM 2020 and record the data in the BAR.
    - Note that a non-standard plot was used for an area of PCT 4006 given the presence of a small waterbody at this location.
- Three (3) BAM plots were undertaken within the remnant native vegetation present within the Study Area with a fourth placed in non-native vegetation. Plots were located within the most typical parts of the vegetation zones as the zones on site allowed. Minor modifications to plot locations were made on site due to factors such as ecotones and proximity to disturbed edges.
- Field sheets are provided in **Appendix D**. Survey effort including plot location is depicted in **Figures 4** and **6**. A summary of the plot data and a list of all flora species identified on site is provided in **Appendix B**.

1.5.3 Plant Community Types (PCTs) and Vegetation Zones

The BAM's Streamlined Assessment Module for Small Area requires the identification of the dominant PCT or the most likely PCT, and all TECs, on the Subject Land. The identification must be in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. The identification of TECs must be consistent with the NSW Threatened Species Scientific Committee Final Determination for the TEC.

Diagnostic species recorded on site during field work within the Study Area and adjoining patches of vegetation that support the determination of PCTs are shown in **Tables 4** to **6.** The vegetation zones across the Study Area are detailed in **Tables 7** and **8**. This is further supported by vegetation mapping community designation (refer **Figure 4**).

Table 4 – Species Data for Potential PCT Determination

Search Item	Plot 1	Plot 2	Plot 3	Plot 4
Dominant Species	None	*Angophora costata; Corymbia gummifera; Eucalyptus capitellata;*	*Melaleuca nodosa, Glochidion ferdinandi*	*Baumea articulata, Typha orientalis*
Diagnostic species present	**Upper stratum:** None present	**Upper stratum:** *Angophora costata; Corymbia gummifera; Eucalyptus capitellata*	**Upper stratum:** *Glochidion ferdinandi*	**Upper stratum:** *Glochidion ferdinandi*
	Mid stratum: None present.	**Mid stratum**: *Hakea dactyloides, Acacia falcata*	**Mid stratum**: *Melaleuca nodosa, Pittosporum undulatum*	**Mid-Stratum:** None present.
	Ground stratum: No diagnostic species	**Ground stratum**: *Themeda triandra, Parsonsia straminea*	**Ground-Stratum:** *Themeda triandra, Parsonsia straminea, Calochlaena dubia*	**Ground-Stratum:** *Baumea articulata, Typha orientalis, Parsonsia straminea, Pteridium esculentum*
Potential PCTs	**Not applicable as almost entirely non-native and therefore a PCT could not be attributed to this plot**	**3244, 3432, 3581, 3582, 3583, 3998**	**3436, 3983, 3985, 4006, 4028, 4044**	**3436, 3983, 3985, 4006, 4028, 4044**

Table 5 – PCT Determination for Plot 2

Potential PCTs	3244	3432	3581	3582	3583	3998
Regional Vegetation	Not mapped on site	Not mapped on site	Not mapped on site	Not mapped on site	Mapped on site by State Vegetation Type Map (DPE 2022c).	Not mapped on site
IBRA Region	Sydney Basin					
IBRA Subregion	Wyong					
NSW Landscape	Gosford-Cooranbong Coastal Slopes / Sydney – Newcastle Coastal Alluvial Plains					
Present Key Diagnostic Species within Study Area	**Upper stratum:** *Angophora costata; Corymbia gummifera; Eucalyptus capitellata, Cupaniopsis anacardioides, Glochidion ferdinandi* **Mid stratum**: *Hakea dactyloides, Acacia falcata, Acacia longifolia, Melaleuca nodosa* **Ground stratum**: *Themeda triandra, Parsonsia straminea, Echinopogon caespitosus, Calochlaena dubia, Gonocarpus teucrioides, Cassytha pubescens, Aristida vagans*	**Upper stratum:** *Angophora costata; Corymbia gummifera; Eucalyptus capitellata, Glochidion ferdinandi* **Mid stratum**: *Hakea dactyloides, Acacia falcata, Acacia longifolia, Melaleuca nodosa* **Ground stratum**: *Themeda triandra, Parsonsia straminea, Echinopogon caespitosus, Calochlaena dubia, Gonocarpus teucrioides, Cassytha pubescens, Aristida vagans*	**Upper stratum:** *Angophora costata; Corymbia gummifera; Eucalyptus capitellata, Glochidion ferdinandi* **Mid stratum**: *Hakea dactyloides, Acacia falcata, Acacia longifolia, Melaleuca nodosa* **Ground stratum**: *Themeda triandra, Parsonsia straminea, Echinopogon caespitosus, Calochlaena dubia, Gonocarpus teucrioides, Cassytha pubescens, Aristida vagans*	**Upper stratum:** *Angophora costata; Corymbia gummifera; Eucalyptus capitellata, Glochidion ferdinandi* **Mid stratum**: *Hakea dactyloides, Acacia falcata, Acacia longifolia, Melaleuca nodosa* **Ground stratum**: *Themeda triandra, Parsonsia straminea, Echinopogon caespitosus, Calochlaena dubia, Gonocarpus teucrioides, Cassytha pubescens, Aristida vagans*	**Upper stratum:** *Angophora costata; Corymbia gummifera; Eucalyptus capitellata, Glochidion ferdinandi* **Mid stratum**: *Hakea dactyloides, Acacia longifolia, Melaleuca nodosa* **Ground stratum**: *Themeda triandra, Parsonsia straminea, Echinopogon caespitosus, Gonocarpus teucrioides, Cassytha pubescens, Aristida vagans*	**Upper stratum:** *Angophora costata; Corymbia gummifera; Eucalyptus capitellata, Glochidion ferdinandi* **Mid stratum**: *Hakea dactyloides, Acacia falcata, Melaleuca nodosa* **Ground stratum**: *Themeda triandra, Parsonsia straminea, Echinopogon caespitosus, Calochlaena dubia, Gonocarpus teucrioides, Cassytha pubescens, Aristida vagans*
PCT Description	A tall to very tall sclerophyll open forest with a mid-stratum of dry and soft-leaved shrubs or small trees and a ground cover of grasses and graminoids. The canopy includes a diverse mix of trees, which very frequently includes *Corymbia maculata*, and a suite of other eucalypts which individually occur occasionally or	A tall to very tall sclerophyll open forest with a sparse dry shrub layer and grassy ground cover. The tree canopy is diverse however collectively can be summarised into combinations of smooth-barked apple, bloodwood, ironbark, spotted gum, white mahoganies and stringybarks. A high cover of Angophora costata is very	A tall to very tall sclerophyll open forest with dry shrub layer and a grassy ground cover. The tree canopy almost always includes a high cover of Angophora costata, very frequently with *Corymbia gummifera* and commonly *Eucalyptus piperita*. Occasionally other eucalypts may be associated with or replace these	A tall to very tall dry shrubby sclerophyll open forest. The tree canopy almost always includes a high cover of *Angophora costata* and *Corymbia gummifera*, commonly with one or more species of stringybark eucalypts of which *Eucalyptus capitellata*	A mid-high to tall, rarely very tall, heathy sclerophyll woodland or open forest. The tree canopy very frequently includes a high cover of *Eucalyptus haemastoma* and *Corymbia gummifera* with less frequent *Eucalyptus* capitellata. On minor depressions local	A tall to very tall sclerophyll open forest or woodland with a sub-canopy of Melaleuca trees and a ground layer of sedges. The tree canopy has a variable composition, however commonly includes a high cover of *Eucalyptus resinifera* and/or

Potential PCTs	3244	3432	3581	3582	3583	3998
	rarely. Collectively, mahoganies and ironbarks are almost always present and grey gums are common. The more frequent mahoganies, ironbarks and grey gums are *Eucalyptus siderophloia, Eucalyptus acmenoides, Eucalyptus umbra* and *Eucalyptus punctata*, with *Eucalyptus propinqua*, *Eucalyptus carnea*, *Eucalyptus paniculata* and *Eucalyptus canaliculata* less regularly present. The mid-stratum is layered and almost always includes one or more Acacia species of varying stature, of which the most frequent are *Acacia implexa* and *Acacia ulicifolia*. Taller species in the mid-stratum very frequently include *Allocasuarina torulosa*, while shorter species very frequently include *Persoonia linearis*, commonly with *Breynia oblongifolia* and a Leucopogon (*Leucopogon juniperinus* or *Leucopogon lanceolatus*). The mid-dense ground layer typically includes graminoids, twiners, forbs and a hardy fern. *Imperata cylindrica* is almost always present and very frequent species include *Lobelia purpurascens*, *Dianella caerulea*, *Desmodium rhytidophyllum*, *Entolasia stricta*, *Lomandra longifolia*, *Themeda triandra* and *Hardenbergia violacea*.	frequently recorded, commonly in association with *Corymbia gummifera*, *Corymbia maculata* or occasionally *Eucalyptus umbra*. Five species of ironbark have been recorded although only *Eucalyptus fibrosa* is common. Collectively stringybarks are also common, however no single species occurs more than occasionally. The mid-stratum occasionally includes a tall sparse cover of *Allocasuarina littoralis* with a lower dry shrub layer commonly including *Persoonia linearis*, *Dillwynia retorta* or *Acacia ulicifolia*. The ground layer is a mid-dense to dense cover of grasses that almost always include *Themeda triandra* and *Entolasia stricta*, very frequently with *Rytidosperma pallidum*, *Aristida vagans* and *Microlaena stipoides*. The grass tree *Xanthorrhoea latifolia* is also common along with the sedge *Ptilothrix deusta*.	species including *Eucalyptus umbra* or *Eucalyptus pilularis*. The mid-stratum is layered with a very frequent tall sparse layer of *Allocasuarina littoralis* or *Allocasuarina torulosa.* Lower dry shrubs are also typically sparse with Persoonia linearis, *Podolobium ilicifolium* commonly recorded, occasionally with *Persoonia levis, Breynia oblongifolia, Leptospermum polygalifolium* or a range of *Acacia* spp. The ground layer is mid-dense to dense and is comprised of grasses of which *Entolasia stricta*, *Themeda australis* and *Imperata cylindrica* are the most frequently recorded. Graminoid species are also very frequent and add to the grass like appearance of the ground layer. *Dianella caerulea*, *Lepidosperma laterale* and *Lomandra longifolia* are the most common examples. The fern Pteridium esculentum is almost always present however generally a low cover.	and *Eucalyptus globoidea* are most frequent. These may be occasionally accompanied or replaced by *Eucalyptus piperita* and rarely *Eucalyptus racemosa* in the Kincumber area near Gosford. The mid-stratum consists of a sparse cover of small trees that commonly includes *Allocasuarina littoralis*. The sparse to mid-dense shrub layer very frequently includes *Banksia spinulosa*, *Persoonia levis, Xanthorrhoea latifolia* and less frequently *Leptospermum trinervium*. The ground layer is composed of a variable cover of grasses that almost always includes *Entolasia stricta* and *Themeda triandra*. Other common species are graminoids and climbers including *Dianella caerulea, Xanthorrhoea latifolia* and *Billardiera scandens*.	stands may occasionally be accompanied or replaced by a high cover of *Angophora inopina*. A dense shrub layer is almost always present, very frequently with a high cover of *Banksia oblongifolia* together with *Leptospermum trinervium*, *Lambertia formosa, Isopogon anemonifolius, Persoonia levis* and *Hakea dactyloides*. The ground layer is comprised of grasses and graminoids that very frequently includes a patchy cover of *Entolasia stricta* and *Ptilothrix deusta* with a sparser cover of *Themeda triandra* and *Cyathochaeta diandra*.	Eucalyptus robusta, commonly with a sparse cover of Angophora costata. Other eucalypt species such as Eucalyptus tereticornis, Eucalyptus pilularis or Eucalyptus parramattensis are rarely recorded however may have a high foliage cover at some sites. The mid-stratum includes a low to mid-high, sparse to mid-dense sub-canopy that almost always includes a high cover of *Melaleuca sieberi* as the tallest species, commonly with *Melaleuca linariifolia* and *Leptospermum juniperinum*. Lower growing woody shrubs very frequently include *Leptospermum juniperinum*, *Leptospermum polygalifolium* and *Melaleuca thymifolia*. The ground layer consists of a mid-dense to dense cover of sedges, grasses and graminoids. *Gahnia* sieberiana is almost always present, *Empodisma minus* is common and abundant, with very frequently a low cover of *Entolasia stricta* and *Themeda triandra* amongst clumps of *Lomandra longifolia*.
Vegetation Formation	Wet Sclerophyll Forests (Grassy sub-formation)	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Dry Sclerophyll Forests (Shrubby sub-formation)	Dry Sclerophyll Forests (Shrubby sub-formation)	Dry Sclerophyll Forests (Shrubby sub-formation)	Forested Wetlands
Vegetation Class	Northern Hinterland Wet Sclerophyll Forests	Hunter-Macleay Dry Sclerophyll Forests	Sydney Coastal Dry Sclerophyll Forests	Sydney Coastal Dry Sclerophyll Forests	Sydney Coastal Dry Sclerophyll Forests	Coastal Swamp Forests
Geographical Restrictions	Lower North Coast. This PCT primarily occurs between the Watagan Ranges and Taree, with scattered occurrences further north to the Macleay Valley.	Between Wyong and The Branch on the Lower North and Hunter coasts. The distribution of this PCT is concentrated on the rises north of Warnervale, around West Wallsend and the footslopes of Mount Sugarloaf and extending north onto Carboniferous sandstone and conglomerate north of the Hunter River.	Between Gosford and Wallis Lake on the Lower North and Hunter coasts. A southern outlier in Pittwater and extending north through Kincumber, Gosford and western Lake Macquarie and the foothills of the Watagan Escarpment. North and north-east of Lake Macquarie, also Medowie and Karuah districts including a small area either side of the Karuah River.	Between Gosford and Bulahdelah on the central, Hunter and lower North Coast. Either side of Lake Macquarie, on toeslopes of the Sugarloaf Range and is common in the Medowie area north to Bulahdelah. Outlier at Stratford near Gloucester.	Between Wyong and Karuah, central and Hunter coast. A break in distribution occurs in an area between Toronto and Raymond Terrace, with the northern plots recorded on or near terraces above 12 Mile and Pipeclay creeks in the Medowie district.	Between Gosford and Kempsey, central and lower north coast
Elevation	Elevation is below 260 metres asl.	Between 10 and 400m asl.	Mainly occurs below 160 metres asl, however may reach over 350 metres on highest peaks.	This PCT is found at elevations of between 5-150 metres asl.	This PCT is extensively distributed between 10-80 metres	This PCT most commonly occurs at 0-20 metres asl, and rarely reaches higher elevations.

Potential PCTs	3244	3432	3581	3582	3583	3998
					asl, most commonly between 30-40 metres asl.	
Soil Profiles	This PCT primarily occurs on sediments, with its southern occurrences often associated with clay rich Narrabeen or Permian sediments, however it is also known from acid volcanics.	Carboniferous sandstone and conglomerate	Very common on Narrabeen sandstone, also some areas of Permian sandstones, Carboniferous sandstone and Nerong Volcanics.	Clay enriched Permo-Triassic and Carboniferous sandstones. A north-western outlier also occurs on Permian coal measures.	Low-lying exposed Triassic Narrabeen or Carboniferous sandstones	Poorly drained clay alluvium
Habitat Restrictions	Lower slopes in the escarpment foothills - low-elevation, wet coastal foothills	Coastal hills, rises and escarpment footslopes	Enriched sedimentary hills and rises on the coastal plains	Low elevation on exposed aspects	Gentle gradients of the central coast lowlands	Low-lying creek flats. It has also occasionally been recorded on coastal sand plains on impeded clay pans.
Current Land Use (disturbance and weed loads)	Land management practices including land clearing and high levels of disturbance and weed growth.					
Previous land use (including disturbance levels, plantings)	Historical disturbance such as land clearing, pasture improvement and ongoing grazing.					
Surrounding Vegetation	Similar condition as Study Area					
PCT Determination	PCT 3244 was discarded due to its geographical restrictions. Further, although the site-dominant species *Angophora costata; Corymbia gummifera; Eucalyptus capitellata* are part of the species list for this PCT, they are not considered diagnostic. Finally, the site is not located in escarpment foothills. Based on the information above, this PCT was not determined as an accurate description of the vegetation community within the Study Area.	PCT 3432 was discarded as, although the site-dominant species *Angophora costata;* and *Eucalyptus capitellata* are part of the species list for this PCT, they are not considered diagnostic. Further, the site is not located in coastal hills, rises or escarpment footslopes. Based on the information above, this PCT was not determined as an accurate description of the vegetation community within the Study Area.	PCT 3581 was discarded as, although the site-dominant species *Angophora costata; Corymbia gummifera; Eucalyptus capitellata* are part of the species list for this PCT, they are not considered diagnostic. Further, the site is not location in hills and rises of the coastal plains. Based on the information above, this PCT was not determined as an accurate description of the vegetation community within the Study Area.	PCT 3582 was discarded as the PCT present on site. It is closely related to the SVTM (DPE 2022) choice of PCT 3583. PCT 3583 was chosen over PCT 3582 due to the presence of a dead *Eucalyptus haemastoma* in Plot 2.	PCT 3583 was chosen as, although no living *Eucalyptus haemastoma* was observed on site, a dead fallen *E haemastoma* was observed in Plot 2. The area has been mapped according the SVTM (DPE 2022) as PCT 3583.	PCT 3998 was discarded as, although the site-dominant species *Angophora costata; Corymbia gummifera; Eucalyptus capitellata* are part of the species list for this PCT, they are not considered diagnostic. Further, this area of vegetation on site did not correspond with a wetland or swamp forest-type. Based on the information above, this PCT was not determined as an accurate description of the vegetation community within the Study Area.
Result	**3583 - Hunter Coast Lowland Scribbly Gum Forest**					

Estimate cleared value of PCT (%)	64
TEC	No associated TEC.
Description of Vegetation	This area is within the western – and north-western portion of the Study Area and had been roughly regionally mapped as PCT 3583. Whilst there is a dominance of *Eucalyptus capitellata* (Brown Stringy-bark) within the BAM Plot, *Angophora costata (*Smooth-barked Apple) and *Eucalyptus fibrosa* (Red Ironbark) are also within the locality, as is *Corymbia gummifera* (Red Bloodwood) in lower levels. *Melaleuca nodosa* (Ball Honey Myrtle) dominates the mid storey with smaller amounts of *Hakea dactyloides* (Broad-leaved Hakea), *Glochidion ferdinandi var. ferdinandi* (Cheese Tree), *Cupaniopsis anacardioides* (Tuckeroo) and *Acacia longifolia* and *falcata* (wattles). The ground layer is dominated by *Themeda triandra* (Kangaroo Grass), planted *Digitaria didactyla* (Queensland Blue Couch), followed by *Parsonsia straminea, Calochlaena dubia, Gonocarpus teucrioides, Cassytha pubescens, Aristida vagans* and *Echinopogon caespitosus.* Remnant vegetation patches are surrounded by non-native grasslands that are regularly slashed. Non-native species dominating were *Rubus laudatus* (Blackberry) *and Chrysanthemoides monilifera subsp. monilifera* (Boneseed) with smaller amounts of *Bidens pilosa, Lonicera japonica, Cyperus eragrostis, Cyperus sesquiflorus, Juncus cognatus, Cenchrus clandestinum, Paspalum urvillei, Setaria pumila and Solanum americanum.* **Plates 1 & 2** show examples of PCT 3583 (Highly degraded condition).
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 0. 20ha of the Study Area.

Plate 1 - PCT 3583 BAM plot 2, in a highly degraded condition

Plate 2 - PCT 3583 next to managed lands

Table 6 – PCT Determination for Plots 3 & 4

Potential PCTs	3436	3983	3985	4006	4028	4044
Regional Vegetation	Mapped on site under SVTM (DPE 2022).	Not mapped on site.	Mapped on site under SVTM (DPE 2022).	Not mapped on site.	Not mapped on site.	Not mapped on site.
IBRA Region	Sydney Basin					
IBRA Subregion	Wyong					
NSW Landscape	Gosford-Cooranbong Coastal Slopes / Sydney – Newcastle Coastal Alluvial Plains					
Present Key Diagnostic Species within Study Area	**Canopy Species:** *Glochidion ferdinandi* **Mid-Stratum:** *Melaleuca nodosa, Pittosporum undulatum* **Ground-Stratum** *Parsonsia straminea, Pteridium esculentum*	**Canopy Species:** *Glochidion ferdinandi* **Mid-Stratum:** *Melaleuca nodosa* **Ground-Stratum:** *Typha orientalis, Baumea (Machaerina) articulata, Pteridium esculentum, Calochlaena dubia, Parsonsia straminea*	**Canopy Species:** *Glochidion ferdinandi* **Mid-Stratum:** *Melaleuca nodosa* **Ground-Stratum:** *Baumea (Machaerina) articulata, Calochlaena dubia, Parsonsia straminea*	**Canopy Species:** *Glochidion ferdinandi* **Mid-Stratum:** *Melaleuca nodosa* **Ground-Stratum:** *Typha orientalis, Baumea (Machaerina) articulata, Pteridium esculentum, Calochlaena dubia, Parsonsia straminea*	**Canopy Species:** *Glochidion ferdinandi* **Mid-Stratum:** *Melaleuca nodosa* **Ground-Stratum:** *Typha orientalis, Baumea (Machaerina) articulata, Pteridium esculentum, Calochlaena dubia, Parsonsia straminea*	**Canopy Species:** *Glochidion ferdinandi* **Mid-Stratum:** *Melaleuca nodosa* **Ground-Stratum:** *Typha orientalis, Baumea (Machaerina) articulata, Pteridium esculentum, Calochlaena dubia, Parsonsia straminea*
PCT Description	A mid-high to very tall sclerophyll open forest with a layered understorey of Melaleucas and dry shrubs with a grassy ground cover. The tree canopy has a mid-dense cover however no single species dominates. *Angophora costata*, *Eucalyptus resinifera* and *Eucalyptus globoidea* are common and have high foliage cover however are also occasionally absent and replaced by other coastal species such as *Corymbia maculata*, *Eucalyptus fibrosa*, *Eucalyptus umbra* or *Eucalyptus tereticornis* amongst others. The mid-stratum has some elements of forested wetland communities with *Melaleuca sieberi* and *Melaleuca* nodosa common as a taller sparse cover of smaller trees, along with occasional *Melaleuca linariifolia*, *Melaleuca decora* or *Callistemon salignus*. Other members of the mid-stratum are sclerophyll species, commonly *Pultenaea villosa*, *Leptospermum polygalifolium* and *Persoonia linearis*. The ground layer is characterised by an even cover of grasses, forbs, graminoids and sedges. *Entolasia stricta, Imperata cylindrica, Lomandra longifolia, Dianella caerulea* are almost always present, very frequently with *Themeda australis*. The sedge	A restricted tall to very tall sclerophyll open forest with a sub-canopy of Melaleuca trees, mesophyll small trees, shrubs and climbers and a ground layer of sedges and ferns. The tree canopy is very frequently exclusively dominated by *Eucalyptus robusta*, which is rarely replaced or accompanied by other eucalypts such as *Eucalyptus saligna* or *Eucalyptus deanei*. A mid-high to tall sub-canopy is characterised by a high cover of Melaleuca species of which *Melaleuca biconvexa* is very frequently the most abundant, however is commonly accompanied (or very rarely replaced) by *Melaleuca linariifolia* and occasionally *Melaleuca styphelioides*. The climber *Parsonsia straminea* is almost always present on the trunks of the sub-canopy trees. Other common small trees in the sub-canopy include a sparse cover of *Glochidion ferdinandi*, *Callistemon salignus* or palms *Livistona australis* or rarely *Archontophoenix cunninghamiana*. Lower shrubs include *Ficus coronata* and *Pittosporum undulatum*. The ground layer very frequently includes a high cover of *Gahnia clarkei*, which is characteristic of this community, and the fern *Hypolepis muelleri*, accompanied by smaller sedges such as *Carex appressa* and grasses including *Oplismenus imbecillis*.	A low to mid-high Melaleuca closed forest rarely with eucalypt emergents, associated with coastal freshwater floodplain swamps. The tree canopy is almost always dominated by dense stands of *Melaleuca ericifolia* very frequently with a sparse cover of *Casuarina glauca*. A sparse layer of woody shrubs is common including Acacia longifolia and occasionally *Leptospermum juniperinum* or *Melaleuca* spp. The ground layer is a dense cover of sedges and rushes that very frequently include *Gahnia clarkei, Baumea juncea* and rarely *Baumea articulata* or *Juncus* spp. Other abundant or common species are grasses including *Entolasia marginata, Hemarthria uncinata* and *Imperata cylindrica*.	A mid-high to very tall mixed eucalypt and Melaleuca open to closed forest with a sparse mid-stratum of mesophyll small trees and palms and a dense ground layer of sedges and ferns. The tree canopy very frequently includes both *Melaleuca quinquenervia* and *Eucalyptus robusta*, rarely with other eucalypts. The vine *Parsonsia straminea* is very frequently recorded in the canopy or mid-stratum. The mid-stratum is otherwise sparse, however often layered with small trees that very frequently includes *Glochidion ferdinandi*, occasionally *Livistona australis* and *Casuarina glauca*, rarely with *Melaleuca linariifolia*. A patchy cover of smaller sclerophyll shrubs occasionally includes *Acacia longifolia* and *Breynia oblongifolia*. The ground layer is very often dense and almost always includes a high cover of the tall sedge *Gahnia clarkei* together with the ferns *Telmatoblechnum indicum*, *Pteridium esculentum, Hypolepis muelleri* and *Calochlaena dubia*. Other species include grasses such as *Entolasia marginata*, which is common and occasionally sedges *Baumea rubiginosa, Baumea articulata* or *Carex* appressa.	A tall to very tall open forest or woodland featuring Casuarina glauca and usually *Baumea juncea* and *Juncus kraussii* subsp. *australiensis*. *Casuarina glauca* almost always forms a sparse to mid-dense tree layer, rarely accompanied by Melaleuca quinquenervia. A sparse or very sparse small tree or scrub layer of *Melaleuca ericifolia* is occasionally present, while other Melaleuca species and other trees or shrubs only rarely occur. The mid-dense ground layer is primarily comprised of sedges, rushes, reeds and grasses that are tolerant of inundation, very frequently including *Baumea juncea* and *Juncus kraussii* subsp. *australiensis*, commonly with *Phragmites australis*. Other species occasionally occurring in the ground layer include *Samolus repens*, *Lobelia anceps* and *Gahnia clarkei*, while more rare species include *Sporobolus virginicus, Apium prostratum* and *Hemarthria uncinata*, the latter three with variable cover from site to site.	A structurally variable coastal swamp forest. This PCT ranges from a tall to very tall eucalypt open forest with a sub-canopy of Melaleuca and mesophyll trees, to a mid-high closed forest, commonly with emergent eucalypts. Where eucalypts are present they represent the tallest stratum, although the cover and composition ranges from very sparse (emergent) to mid-dense. A diverse suite of coastal species may be encountered, however none occur more than occasionally, with the most frequent including *Eucalyptus resinifera, Eucalyptus robusta* and *Eucalyptus piperita*. Characteristic of the PCT is the open to closed sub-canopy (or upper stratum where eucalypts are absent) of smaller trees. Species very frequently include a patchy cover of *Melaleuca linariifolia,* commonly *Callistemon salignus*, occasionally *Melaleuca styphelioides* and rarely *Casuarina glauca, Melaleuca quinquenervia, Melaleuca nodosa,* and on the central coast *Melaleuca biconvexa*. There are also mesic species, almost always including *Glochidion ferdinandi* and occasionally *Acmena smithii*. The vine *Parsonsia straminea* is very frequently recorded on the stems of the sub-canopy species. A sparse to very sparse cover of lower

Potential PCTs	3436	3983	3985	4006	4028	4044
	Ptilothrix deusta is locally common and where present is abundant and occasionally associated with *Gahnia clarkei.*					shrubs commonly includes *Breynia oblongifoli*a, occasionally with *Acacia irrorata* and *Notelaea longifolia*. The ground layer is a mid-dense to dense cover of tall sedges, ferns, grasses and mesic climbers. Species very frequently include the tall sedge *Gahnia clarkei*, with a sparse to mid-dense cover, *Adiantum aethiopicum* and *Oplismenus imbecillis*, commonly *Entolasia marginata, Geitonoplesium cymosum, Gynochthodes jasminoides* and *Lomandra longifolia*, occasionally with *Calochlaena dubia* and *Pteridium esculentum*.
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Forested Wetlands	Forested Wetlands	Forested Wetlands	Forested Wetlands	Forested Wetlands
Vegetation Class	Hunter-Macleay Dry Sclerophyll Forests	Coastal Floodplain Wetlands	Coastal Swamp Forests	Coastal Swamp Forests	Coastal Floodplain Wetlands	Coastal Floodplain Wetlands
Geographical Restrictions	Between Wyong and Wallis Lake on the Central, Hunter and Lower North Coasts.	This PCT has a narrow, restricted distribution between Gosford and Wyong, with a small number of northern locations on the margins of the Lake Macquarie district.	Between Moruya and Taree on the South, Central and Lower North Coasts.	Between Sydney and Yamba, Central and North Coast. It is mainly constrained to within a few kilometres of the coastline, although spatial outliers occur on coastal floodplains that extend some way inland.	This PCT has been recorded from Sawtell south to Tuross Head, however is likely to occur elsewhere along the NSW coast.	Found on central and lower North Coast. It is distributed most extensively, however not exclusively, in the coastal lowlands more than 10 kilometres from the coastline
Elevation	This PCT is typically recorded below 50 metres asl.	It occupies very low elevations of less than 30 metres asl.	Below 20m	At elevations of almost always below 20 metres asl	Usually at elevations of below 10 metres asl.	It occurs below 90 metres asl.
Soil Profiles	Alluviums, fine grained Permo-Triassic and Carboniferous sediments	On periodically inundated clay-rich alluviums sourced from the surrounding Narrabeen shale and sandstone hills and ranges.	Information not available.	This PCT occurs on very low-lying alluvium, estuarine deposits, back barrier flats, back swamps and rarely sand swales	Information not available.	This PCT very frequently occurs on low-lying coastal valley alluvial deposits.
Habitat Restrictions	Flats and depressions and occasionally on adjoining gentle gradient hill slopes that retain soil moisture from subsurface water	Very wet coastal zones	This PCT occurs in poorly drained creek flats or margins of coastal lagoons.	This PCT occurs on low-lying coastal alluvial swamps and depressions.	Occurring on the edges of tidal estuarine flats and tidal creek flats along the NSW coast	Positioned between low to gently rising coastal hills. Alluvial creek flats.
Current Land Use (disturbance and weed loads)	Land management practices including land clearing and high levels of disturbance and weed growth.					
Previous land use (including disturbance levels, plantings)	Historical disturbance such as land clearing, pasture improvement and ongoing grazing.					

Potential PCTs	3436	3983	3985	4006	4028	4044
Surrounding Vegetation	Similar condition as Study Area					
PCT Determination	PCT 3436 was discarded as the vegetation being assessed does not match a dry sclerophyll type. Although this PCT has been mapped on site and some diagnostic species are present, other potential PCTs provide more suitable matches. Based on above information this PCT was determined as not being an accurate description of this vegetation community within the Study Area.	PCT 3983 was discarded due to the lack of *Eucalyptus robusta*, which is the key diagnostic canopy species for this PCT. The Melaleuca on site is *Melaleuca nodosa*, which is also not considered diagnostic of this PCT. Based on the information above, this PCT was determined as an accurate description of the vegetation community within the Study Area.	PCT 3985 was discarded as the dominant diagnostic species *Melaleuca ericifolia* is not present on site. Other diagnostic species are present but do not provide a better fit compared to other potential PCTs. Based on the information above, this PCT was not determined as the most accurate description of the vegetation community within the Study Area.	PCT 4006 was chosen as the PCT on site due to the presence of multiple diagnostic species and its position in the landscape, being on a drainage channel with a swampy character and standing water. The site matches the geographical description, being on the Central Coast, and a few kilometres from the coastline. Based on the information above, this PCT was determined as the most accurate description of the vegetation community within the Study Area.	PCT 4028 was discarded due to the lack of key diagnostic species *Casuarina glauca* on site. The groundcover layer also does not match the somewhat brackish water-tolerant species of this PCT. Based on the information above, this PCT was not determined as the most accurate description of the vegetation community within the Study Area.	PCT 4044 was discarded due to the geographical distribution of the PCT. PCT 4044 is found on the north coast of NSW, whilst the site is located on the Central Coast. Based on the information above, this PCT was not determined as the most accurate description of the vegetation community within the Study Area.
Result	**PCT 4006 Northern Paperbark-Swamp Mahogany Saw-sedge Forest**					

Estimate cleared value of PCT (%)	22.61
TEC	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (*BC Act*)
Vegetation Areas	
Vegetation Zones of this PCT within Study Area	*Highly Degraded* The vegetation at Plot 4 had a VIS of 20 which is in the ‘highly degraded’ category. *Severely Degraded* The vegetation at Plot 3 had a VIS of 3.2 which is in the ‘severely degraded’ category.
Severely Degraded Condition	
Description of Vegetation Zone	This vegetation zone is within the northern portion of the Study Area and had been roughly regionally mapped as PCTs 3436 and 3985, and non-native vegetation. This vegetation zone is severely degraded as demonstrated with the VIS score of 3.2. Whilst there is a dominance of Coral Trees in the upper stratum, the shrub layer contains the natives *Melaleuca nodosa, Glochidion ferdinandi var. ferdinandi* and *Pittosporum undulatum* (Sweet Pittosporum) although the mid stratum was dominated by *Ligustrum sinense* (Small-leaved Privet). The ground layer contains the natives *Calochlaena dubia* and *Parsonsia straminea* but is dominated by non-native species *Tradescantia fluminensis* (Trad). Remnant vegetation patches are surrounded by exotic grasslands that are regularly slashed. Non-native species dominating, as stated above, include; *Erythrina x sykesii, Ligustrum sinense* and *Tradescantia fluminensis*, with smaller amounts of *Zantedeschia aethiopica, Ageratina adenophora, Delairea odorata, Lonicera japonica, Rubus laudatus* and *Lantana camara.* **Plates 3 & 4** show examples of PCT 4006 (Severely degraded condition).
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 0.44ha of the Study Area.

Plate 3 - PCT 4006 BAM plot 3

Plate 4 – Disturbed edge of PCT 4006 PCT

Highly Degraded Condition	
Description of Vegetation Zone	This vegetation zone is within the northern portion of the Study Area and had been roughly regionally mapped as PCTs 3436 and 3985. This vegetation zone is highly degraded as demonstrated by the VIS score of 20. Plot 4 was placed in a section of standing water where *Typha orientalis* and *Baumea articulata* had high coverage. There were no mid-storey or canopy species in this area, whilst the immediate surrounds were dense with native ferns and *Lantana camara*. **Plates 5 & 6** show examples of PCT 4006 (highly degraded condition).
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 0.02ha of the Study Area.

Plate 5 - PCT 4006 Plot 4

Plate 6 - PCT 4006 Plot 4

For the purposes of this SBDAR, the dominant PCT 4006 has been retained in the BAM-C as it covers the largest area. In addition, PCT 4006 is commensurate with a TEC.

1.5.4 Non-native / Cleared / Existing Infrastructure

The remaining 4.83ha of the Study Area have been identified as non-native vegetation, cleared land, and existing caravan park and associated infrastructure. This area also includes easements and road reserves. The vegetation within that area was ground-truthed along with the other vegetation zones through random meander (refer **Plate 7**).

Additional site photographs are included in **Appendix G**.

Plate 7 – Cleared land, non-native vegetation and caravan park infrastructure present

Table 7 – Vegetation Zones

Vegetation Zones	PCT 3583	PCT 4006	PCT 4006	Non-native / Cleared / Existing Infrastructure
Condition of Vegetation Zones within Study Area	Highly Degraded	Severely Degraded	Highly Degraded	Non-native
Description of Vegetation Zone	Whilst there is a dominance of *Eucalyptus capitellata, Angophora costata* and *Melaleuca nodosa* and a scrub layer occurring as a scattered stand of paddock trees/shrubs, it is in a highly degraded condition with a high weed load consisting predominately of Blackberry and Boneseed.	This vegetation zone is severely degraded as demonstrated with the VIS score of 4.3. Whilst there is a dominance of Coral Trees in the upper stratum, diagnostic shrub natives *Melaleuca nodosa, Glochidion ferdinandi var. ferdinandi* were utilised to determine the PCT. Weed load was high and dominated by Small-leaved Privet in the mid stratum and Trad in the lower stratum.	This vegetation zone is a small section, that was very weedy and slightly wet underfoot and also in a highly degraded condition. Mostly only ground stratum species present and dominated by *Pteridium esculentum*, *Typha orientalis* and *Baumea articulata.* This area was also almost equally dominated by Crofton Weed followed by Blackberry.	This zone was highly managed and only consisted of a ground stratum dominated entirely by weeds when a BAM plot and ground truthing of the area were conducted. Few native species were present, including *Baumea articulata* and *Schoenus apogon.* With no tree or shrub layer and <15% native cover which calculated out at 6%, it was excluded from the Native Vegetation Extent (NVE) calculation and mapped as exotic/cleared land.
Area of Vegetation Zone within Study Area (ha)	0.2	0.44	0.016	4.83

Figure 4 shows the location of these vegetation communities within the Study Area.

Additional site photographs are included in **Appendix G.**

For the purposes of assessing native vegetation, associated habitat constraints and threatened species, and to comply with the requirements of the Streamlined Assessment Module for Small Area Development of the BAM, the following Vegetation Zone was entered in the BAM-C. In particular, the area covered by PCT 3583 was amalgamated with the dominant PCT being 4006 as prescribed in the streamlined assessment module.

Table 8 – BAM-C Vegetation Zones

Vegetation Zone	BAM plot ID	Area (ha)	Associated TEC (Y/N)
PCT 4006 – Highly degraded	4	0.22	Y
PCT 4006 – Severely degraded	3	0.44	Y

Data from Plots 1 and 2 were not entered in the BAM-C. Data from Plot 1 was not included as this vegetation zone was determined to be non-native and the data from Plot 2 was not included as per the BAM. The vegetation zone was absorbed into the dominant PCT on the site. It would have been allowable to absorb the vegetation zone into PCT 4006 – Severely degraded, however given the vegetation zone for PCT 3583 was identified as “highly degraded”, it was appropriate and precautionary to absorb the vegetation zone into PCT 4066 – Highly degraded.

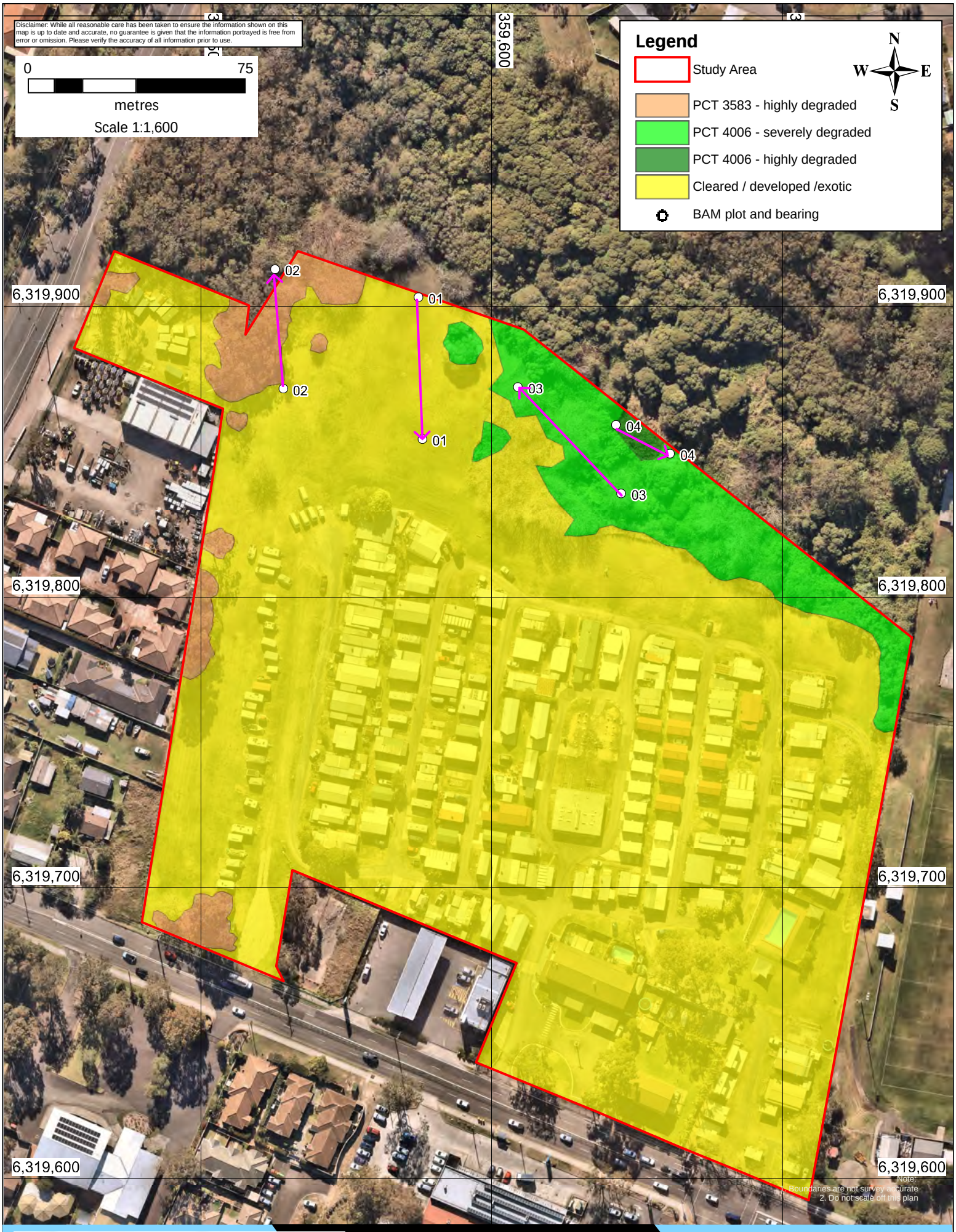


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Figure 4 - Ground-truthed Plant Community Types Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal BOAMs Ref: 42630

Client: Vivacity Property AEP Ref: 2642.01

1.5.5 Vegetation Integrity Assessment

1.5.5.1 Patch Size

The native vegetation that exists within the Study Area is connected to vegetation to the north, and to a lesser degree in the south, east and west that, as defined by the BAM, extends as a patch for more than 25ha. The maximum patch size of '≥25ha' is therefore appropriate for each vegetation zone and was entered as such in the Calculator.

1.5.6 Vegetation Integrity Score

Plot data was used to determine the composition, structure and function condition score of the vegetation zones within the Study Area, which informed the Vegetation Integrity Score (VIS). Plot data has been tabulated (refer **Table 9**) and includes corresponding condition scores along with the overall vegetation integrity score. Vegetation Condition Class has been rated using the following bands associated with the VISs:

- 70 – 100 Good;
- 50 – 69 Moderate;
- 35 – 49 Poor;
- 25 – 34 Degraded;
- 17 – 24 Highly Degraded; and
- <17 Severely Degraded.

Table 9 – Vegetation Integrity Score Table

Site Attribute	PCT 4006 Severely Degraded	PCT 4006 Highly Degraded
Plot #	**3**	**4**
Location	E359634 N6319848	E359642 N6319857
Bearing	315	110
Tree	1	1
Shrub	2	0
Grass & Grass-like	1	2
Forb	0	0
Fern	0	1
Other	2	1
Composition Total Score	**11.2**	**9.9**
Tree	0.5	1
Shrub	1.1	0
Grass & Grass-like	0.1	70
Forb	0	0
Fern	0	60
Other	0.3	5
Structure Total Score	**0.1**	**54.3**
Regenerating Stems (<5cm DBH)	Absent	Absent
Stem Classes (cm DBH)	10-19, 20-29	0
# Large Trees	0	0
Hollow-bearing Trees	0	0
Litter Cover (%)	67	80
Coarse Woody Debris (m)	0	0
High Threat Weed Cover	100	61
Function Total Score	**23.9**	**15**
Overall Vegetation Integrity Score	**3.2**	**20**

1.5.7 Assessment of Swamp Sclerophyll Forest TEC

PCT 4006 is associated under the BC Act with *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* EEC. Diagnostic species for the EEC which are present on site include *Melaleuca nodosa* and *Glochidion ferdinandi* (OEH, 2011a). In particular, *Melaleuca nodosa* is not listed in the diagnostic list in Item (1.) under the EEC's Scientific Determination. However, mention is made in Item (4.) therein, that "*Melaleuca* spp." may be part of the diagnostic shrub layer.

Despite the highly to severely degraded condition of the PCT on site, as evidenced by VISs of 3.2 and 20, the precautionary principle was applied and it was considered that the PCT as it occurs on site was potentially associated with the BC Act listed EEC. It was entered as such in the BAM-C. Further assessment for potential association with the EPBC Act listed *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland* EEC is provided in **Appendix H**.

1.6 Threatened Species

Under the BAM, threatened species are classified into two types: 'Ecosystem Credit' and 'Species Credit' species, as detailed within the BioNet Atlas Threatened Species Profile Database.

A predicted Ecosystem Credit Species assessment is presented in **Table 10** and a Species Credit Species assessment is presented in **Table 11**.

Field surveys were undertaken on site from June 2022 to August 2023. A summary of survey effort within the Study Area is described in **Section 1.6.3** and **Table 11**, and species listed are presented in **Appendix B** and **Appendix C.**

A Streamlined Assessment for Small Area only requires targeted surveys for candidate threatened species associated with the dominant PCTs and/or TECs on site, that have potential to be subject to Serious and Irreversible Impacts (SAII) as a result of the proposed development. Furthermore, if a threatened species is incidentally recorded on site, further assessment must be undertaken to determine if species credits are required.

1.6.1 Ecosystem Credit Species

Ecosystem Credit species are associated with PCTs and other habitat surrogates that are used to predict their occurrence on a particular site.

The 'biodiversity risk weighting' (BRW) for a species is based on the 'sensitivity to loss' and 'sensitivity to potential gain' score using criteria listed in Appendix I of the BAM and are used in credit calculations to assess impacts of the proposal on a threatened species. The sensitivity to gain class is listed within the BAM calculator for Ecosystem Credit species.

Those Ecosystem Credit species predicted to occur within the site are provided in **Table 10** below.

Table 10 – Predicted Ecosystem Credit Species

Scientific Name	Common Name	Sensitivity to Gain Class	Recorded within 10km (BioNet Atlas 2023)
			Y/N
Anthochaera phrygia	Regent Honeyeater	High	Y
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Moderate	Y
Botaurus poiciloptilus	Australasian Bittern	Moderate	Y
Calidris alba	Sanderling	High	N
Calidris canutus	Red Knot	High	N
Calidris ferruginea	Curlew Sandpiper	High	Y
Calidris tenuirostris	Great Knot	High	Y
Calyptorhynchus lathami	Glossy Black-Cockatoo	High	N
Charadrius leschenaultii	Greater Sand-plover	High	N
Charadrius mongolus	Lesser Sand-plover	High	Y
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	High	Y
Dasyurus maculatus	Spotted-tailed Quoll	High	Y
Ephippiorhynchus asiaticus	Black-necked Stork	Moderate	Y
Falco subniger	Black Falcon	Moderate	N
Glossopsitta pusilla	Little Lorikeet	High	Y
Haliaeetus leucogaster	White-bellied Sea-Eagle	High	Y
Hirundapus caudacutus	White-throated Needletail	High	Y
Lathamus discolor	Swift Parrot	Moderate	Y
Limosa lapponica baueri	Bar-tailed Godwit (baueri)	High	N
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	High	Y
Miniopterus australis	Little Bent-winged Bat	High	Y
Miniopterus orianae oceanensis	Large Bent-winged Bat	High	Y
Numenius madagascariensis	Eastern Curlew	High	Y
Pandion cristatus	Eastern Osprey	Moderate	Y
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Moderate	N
Pteropus poliocephalus	Grey-headed Flying-fox	High	Y
Rostratula australis	Australian Painted Snipe	Moderate	N
Xenus cinereus	Terek Sandpiper	High	N

1.6.2 Species Credit Species

For the streamlined assessment, targeted surveys for species that are not designated as having the potential to be subjected to SAII are not required. This assessment focuses only on those entities at risk of SAII as a result of the proposal. **Figure 5** depicts the BioNet records of listed SAII candidate species within the Assessment Area.

Despite the highly to severely degraded condition of the site, *Corunastylis* sp. *Charmhaven* and *Genoplesium insigne* were surveyed for, as outlined below. Further assessment of the vegetation zones against the new eastern PCT classification enacted in March 2023 suggests that additional species prescribed as Candidate Threatened Species in the updated BAM-C, namely *Thelymitra adorata* and Giant Dragonfly, do not require survey on the basis of degraded habitat. This is further discussed thereafter.

The flora and fauna species lists for the site are included in **Appendix B** and **Appendix C**.

Table 11 – Candidate SAII Species Credit Species

Species	Biodiversity Risk Weighting (BRW)	Candidate for SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
Flora								
Corunastylis sp. *Charmhaven* (NSW896673)	3	Y	Nov-Apr	It occurs within low woodland to heathland with a shrubby understorey and ground layer. Dominants include Black She-oak (*Allocasuarina littoralis*), Prickly Tea-tree (*Leptospermum juniperinum),* Prickly-leaved Paperbark (*Melaleuca nodosa*), Narrow-leaved Bottlebrush (*Callistemon linearis*) and Zig-zag Bog-rush (*Schoenus brevifolius*).	Parallel transects 5m apart in dense vegetation, and 10m apart in open vegetation.	Parallel transects 5m apart	20/12/2022 8/03/2023 27/03/2023	1
Native Guava *Rhodomyrtus psidioides*	3	Y	All year	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Parallel transects 10m apart in dense vegetation, and 20m apart in open vegetation.	Parallel transects 10m apart in dense vegetation, and 20m apart in open vegetation.	16/08/2023	1
Scrub Turpentine *Rhodamnia rubescens*	3	Y	All year	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Parallel transects 10m apart in dense vegetation, and 20m apart in open vegetation.	Parallel transects 10m apart in dense vegetation, and 20m apart in open vegetation.	16/08/2023	1
Variable Midge Orchid *Genoplesium insigne*	3	Y	Sep-Nov	Appears to be associated with Scribbly Gum – Red Bloodwood – *Angophora inopina* (not always present) heathy woodland on lowlands of the Central Coast and variations containing *Angophora costata* (Smooth-barked Apple). Recent and historic disturbance regimes (fire, clearing, routine slashing) appear to influence above ground emergence (i.e. leaf and flowers). Several known sites exhibit a removed/managed shrub layer and canopy, therefore shading and competition/biomass is likely to inhibit above ground emergence. However, a lack of disturbance is not considered an adequate justification to exclude the potential existence of the species, as the species can remain dormant underground for a number of years and has been known to emerge and swarm in dense and intact vegetation after fire. Known locations/populations of plants exhibit dormancy for greater than four years (likely to persist underground for greater than four years). Therefore, absence in a given year may be a 'false absence' and the plants can re-emerge once conditions are favourable (e.g. rainfall in winter and appropriate disturbance). Grows in patches of *Themeda triandra* (Kangaroo Grass), which can be ephemeral. Other associated species include, but are not limited to, *Mirbelia speciosa*, *Ptilothrix deusta*, *Leptospermum trinervium* and *Leptospermum juniperinum* in wet (seasonal) heath settings, *Banksia spinulosa* and *Xanthorrhoea latifolia*, and *Xanthorrhoea media*. Other seasonal and cryptic species commonly associated with known populations include: *Cryptostylis subulata, Cryptostylis erecta, Thelymitra ixioides, Thelymitra pauciflora, Microtis* spp., *Burchardia umbellata, Tricoryne elatior, Thysanotus juncifolius*. Flowering period is typically from September to October, but has been recorded flowering in mid to late November to early December. Local climatic conditions appears to play a key role in flowering events, with rainfall possibly driving flowering. In drier periods, initial signs of above ground activity may emerge (e.g. leaf and spike), though flowers have been observed to wither in the absence of suitable conditions (e.g. soil moisture).	Parallel transects 5m apart in dense vegetation, and 10m apart in open vegetation.	Parallel transects 5m apart	26/08/2022 21/09/2022	1
Fauna								
Swift Parrot *Lathamus discolor*	3	Y	N/A Mapped Important Habitat	On the mainland the species favours areas where eucalypts are flowering profusely or where there are abundant lerp infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta, Corymbia maculata, Corymbia gummifera, Eucalyptus tereticornis, Eucalyptus sideroxylon*, and *Eucalyptus albens*. Only present in non-breeding season; present in northern NSW for a shorter period than southern NSW. Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland.	Area based survey methods and review Mapped Important Areas	Habitat Assessment	21/06/2022 &15/07/2022	2
						Diurnal Bird Census	21/06/2022	1
						Incidental surveys	June to Aug 2022	2

The following candidate threatened species did not require further consideration and were ruled out of the above list as habitat or location constraints were not met.

- Wyong Sun Orchid (*Thelymitra adorata*): According to the species' ecological profile (as described in the TBDC),

  > *"It occurs from 10-40 m a.s.l. in grassy woodland or occasionally derived grassland in well-drained clay loam or shale derived soils. The vegetation type in which the majority of populations occur (including the largest colony) is a Spotted Gum - Ironbark Forest with a diverse grassy understorey and occasional scattered shrubs. A number of sites where the species occurs are subject to past and ongoing disturbance, including sites on the edges of roads that contain a mixture of native and introduced species in the understorey, though competition with invasive introduced species is a threat. At Wyong (Pacific Hwy) the species occurs as the only native amongst an array of exotic species, where weedy grasses dominate."*

  A review of site condition as evidenced by the floristic data collected and subsequent determination of VISs in both vegetation zones, indicates a significant level of disturbance and weed infestation which constitutes highly to severely degraded habitat. Where shrubs or trees are not present, the site comprises regularly mown, exotic-dominated lawn. Furthermore, the size presents poor connectivity to areas of more suitable habitat, and has been subjected to a history of anthropogenic disturbance, being used as caravan park.

  Therefore, it was determined that the site was too degraded to be considered suitable for the species. As per Section 5.2.3 item 2a.ii. of the BAM, the habitat constraints are degraded and the species is unlikely to use the subject land, such that survey is not required.

- Curlew Sandpiper (*Calidris ferruginea*): The species is required to be surveyed (and assumed present) where the site contains land mapped as Important Habitat on DPE's Important Habitat Map for threatened migratory shorebirds. The Study Area does not contain such land. Therefore, as per Section 5.2.2 2b of the BAM, the Study Area does not contain habitat constraints for this species and survey is not required.

- Great Knot (*Calidris tenuirostris*): The species is required to be surveyed (and assumed present) where the site contains land mapped as Important Habitat on DPE's Important Habitat Map for threatened migratory shorebirds. The Study Area does not contain such land. Therefore, as per Section 5.2.2 2b of the BAM, the Study Area does not contain habitat constraints for this species and survey is not required.

- Eastern Curlew (*Numenius madagascariensis*): The species is required to be surveyed (and assumed present) where the site contains land mapped as Important Habitat on DPE's Important Habitat Map for threatened migratory shorebirds. The Study Area does not contain such land. Therefore, as per Section 5.2.2 2b of the BAM, the Study Area does not contain habitat constraints for this species and survey is not required.

- Giant Dragonfly (*Petalura gigantea*): According to the species' ecological profile (as described in the TBDC), Giant Dragonfly

  > "*Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence. Adults spend most of their time settled on low vegetation on or adjacent to the swamp. They hunt for flying insects over the swamp and along its margins. Adults fly over the swamp and along its margins hunting for flying insects. Males sometimes congregate waiting for females to mate with. Females lay eggs into moss, under other soft ground layer vegetation, and into moist litter and humic soils, often associated with groundwater seepage areas within appropriate swamp and bog habitats. The species*

does not utilise areas of standing water wetland, although it may utilise suitable boggy areas adjacent to open water wetlands. Larvae dig long branching burrows under the swamp. Larvae are slow growing and the larval stage may last 10 years or more. It is thought that larvae leave their burrows at night and feed on insects and other invertebrates on the surface and also use underwater entrances to hunt for food in the aquatic vegetation."

A Riparian Assessment undertaken for the purposes of a previous DA over the site concluded that the mapped hydroline located in adjacent lands to the north does not present features of a permanent watercourse. Furthermore, the vegetation to the north, within the site's boundary, comprises a very thick, near impassable, weedy understory, which was deemed to be in a highly to severely degraded condition. Recent surveys also noted heavy nutrient load and possible pollutants within observed surface water. Such habitat is not considered to be suitable for Giant Dragonfly.

As per Section 5.2.3 item 2a.ii. of the BAM, the habitat constraints are degraded and the species is unlikely to use the subject land, such that survey is not required.

- Large Bent-winged Bat (*Miniopterus orianae oceanensis*): The species is at risk of SAII if breeding habitat in the form of caves is likely to be impacted by the proposal. However, there is no such habitat feature on site. The Study Area does not contain habitat constraints for this species as per Section 5.2.2 2b of the BAM.
- Little Bent-winged Bat (*Miniopterus australis*): The species is at risk of SAII if breeding habitat in the form of caves is likely to be impacted by the proposal. However, there is no such habitat feature on site. The Study Area does not contain habitat constraints for this species as per Section 5.2.2 2b of the BAM.
- Regent Honeyeater (*Anthochaera phrygia*): The species is required to be surveyed (and assumed present) where the site contains land mapped as Important Habitat on DPE's Important Habitat Map for Regent Honeyeater. The Study Area does not contain such land. Therefore, as per Section 5.2.2 2b of the BAM, the Study Area does not contain habitat constraints for this species and survey is not required.

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Figure 4 - BioNet Atlas Records

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

BOAMs Ref: 42630

Client: Vivacity Property

AEP Ref: 2642.01

1.6.3 Field Survey Methods

Surveys to date are deemed to fulfill minimum survey requirement. Details of the flora and fauna survey are presented in **Table 12** and were conducted using relevant guidelines, in particular: Council survey guidelines (CCC, 2019), DPIE survey guidelines for threatened plants (2020c) and DEC survey guidelines for fauna (2004). Flora Survey Effort, Threatened Flora Sightings and Fauna Survey Effort are shown in **Figure 6** and **Figure 7** respectively.

Field sheets are provided in **Appendix D**, and flora and fauna species list for those species recorded during field surveys are provided in **Appendix B** and **Appendix C**.

Table 12 – Survey Effort

Date	Staff	Survey description
21/06/2022	Frances O'Brien	3 x BAM plots 1 x Koala SAT survey Flora and fauna incidental survey
21/06/2022	Warwick Muir	Tree survey Flora and fauna incidental survey
21/06/2022	Frances O'Brien and Warwick Muir	Nocturnal survey including spotlighting and call playback for Koala
30/06/2022	Jeremy Burrill	Riparian corridor survey Flora and fauna incidental survey
15/7/2022	Chris Wark	1 x BAM plot Deployment of two (2) arboreal and one (1) ground motion-sensing camera trap Flora and fauna incidental survey
1-2/8/2022	Jeremy Burrill	Tree survey Retrieval of motion-sensing camera traps Flora and fauna incidental survey
10/8/2022	Jeremy Burrill	Finalisation of tree survey Flora and fauna incidental survey
26/08/2022	Darcy Kilvert	Targeted survey for *Genoplesium insigne*
21/09/2022	Warwick Muir	Targeted survey for *Genoplesium insigne*
20/12/2022	Alana Guest	Targeted survey for *Corunastylis* sp. *Charmhaven*
8/03/2023	Stephen Curry	Targeted survey for *Corunastylis* sp. *Charmhaven*
27/03/2023	Samuel Rayfield	Targeted survey for *Corunastylis* sp. *Charmhaven*
15/08/2023	Stevie Kay	Target survey for *Rhodamnia rubescens* and *Rhodomyrtus psidioides*

1.6.3.1 Habitat Features

An assessment of the relative habitat values present within the Study Area was undertaken. This assessment focused primarily on the identification of specific habitat types and resources within the Study Area favoured by known threatened species listed in **Section 1.6.** The assessment also considered the potential value of the Study Area (and surrounding areas) for all major guilds of native flora and fauna. The assessment was based on the specific habitat requirements of each threatened

fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements.

Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages. In particular, focus was put on documenting the presence of key habitat features such as tree hollows. Hollows are an important resource utilised by a variety of forest fauna, and are particularly relevant for several of the likely key threatened species in this locality.

1.6.3.2 Flora Field Survey

All required flora survey techniques were utilised for targeted survey of the species listed in **Table 11** above and guided by DPIE guidelines *Surveying Threatened Plants and their Habitats* (DPIE 2020c) and the BAM (DPIE 2020a).

The following survey methods were undertaken to record the presence of threatened species on site:

- Ground-truthing of regional vegetation mapping to identify all vegetation communities present onsite as well as segregate vegetation zones according to condition and current management practices;
- Identification of all vascular plant species encountered during fieldwork. Study Area coverage was both systematic to ensure all key points of the site were checked, and therein the Random Meander Technique (Cropper 1993) was utilised to maximise species encountered;
- Four (4) BAM plots were undertaken in accordance with BAM 2020 within the Study Area, and some were modified due to the vegetation arrangement;
- Updated Vegetation Community Mapping involving traversal over the entire Study Area, concentrating particularly on mapping any boundaries between identified Biometric Vegetation Types of the BAM 2020 and confirming the original mapping.

1.6.3.3 Fauna Field Surveys

All required fauna survey techniques were utilised for targeted survey of the species listed in **Table 11** above and guided by the Threatened Species Survey and Assessment Guidelines (DEC 2004), the Central Coast Council Flora and Fauna Guidelines (CCC, 2019), and *Threatened Species Survey and Assessment Guidelines (2004 Working Draft)* (DEC 2004). Survey effort is shown in **Figure 7**.

1.6.3.4 Incidental Observations

Incidental records of any fauna species observed during fieldwork were noted. This included opportunistic sightings of secondary indications (scratches, scats, diggings, tracks, etc.) of any resident or migratory species. Searches were also conducted for whitewash, regurgitation pellets and prey remain from Owls, chewed Casuarina cones from Black-Cockatoos, chewed fruit remains from frugivorous birds, etc.

These surveys are deemed to fulfill minimum survey requirement. Details of the flora and fauna survey are presented in **Table 11**. Flora Survey Effort, Threatened Flora Sightings and Fauna Survey Effort are shown in **Figure 6** and **Figure 7**.

Field sheets are provided in **Appendix D**, and flora and fauna species list for those species recorded during field surveys are provided in **Appendix B** and **Appendix C.**

1.6.4 Survey Effort Results

1.6.4.1 Habitat Trees

Three (3) hollow-bearing trees (HBTs) were identified on site. Details of the HBT survey are provided **in Table 13** below. Hollow-bearing tree locations are presented in **Figure 7**.

Table 13 – Habitat Tree Detail

ID	Species	DBH (cm)	Hollows						Vegetation Zone
			XS	S	M	L	XL	Other Habitat Features	
HBT001	Stringybark sp.	50		2				Arboreal termite nest	TBC
HBT002	Stag	60		1				Arboreal termite nest	TBC
HBT003	*Angophora costata*	40			1				TBC
Total			**4**						

Notes for hollow size: XS <5cm, S 5-10cm, M 10-15cm, L 15-20cm, XL >20cm, DBH - diameter at breast height

1.6.4.2 Water Features

The Study Area, identified as a first order stream and which begins in the north of the Study Area. The Riparian Assessment Report by AEP (2023) revealed that; "*The field investigations showed that Survey ID # 1 – 6 did not show key features of a watercourse. The area is not recognised as a wetland due to the absence of a number of key features. A low level of water within the surveyed area suggests the area is not frequently wet and the abundance of overgrown exotic vegetation is not commensurate with a typical wetland environment, where a distinct change in vegetation type can indicate a wetland area. As there was no watercourse present on site in accordance with DPE Natural Resource Access Regulator Waterfront Land Tool; there is no requirement for Riparian Corridors (RC) or Vegetation Riparian Zones (VRZ).*"

No hydrolines were observed on the site during field surveys.

1.6.4.3 Other habitat features

The Study Area contains very limited habitat features as it is very weedy and there some areas of dumped rubbish, pipes and pots. Habitat within the site is overall sparse and highly disturbed.

1.6.5 Species Credit Species Survey Results

Overall survey effort within the Study Area (for plots, targeted searches and habitat assessments) and within the Study Area (from past surveys, including plots, targeted searches, habitat assessments, camera traps) are detailed in **Table 12**, and was conducted using relevant guidelines, in particular Council survey guidelines (CCC, 2019) and DPIE survey guidelines for plants (2020c). Survey periods are shown in **Table 11** and survey effort is shown in **Figure 6** and **Figure 7**. **Table 14** summarises survey results.

Table 14 – Species Credit Species

Species	Survey Technique Adhere to Guidelines in Table 13 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Details of BioNet Record	Geographical Restrictions (Y/N)	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Species Credits Apply (Y /N)
Flora									
Corunastylis sp. *Charmhaven* (NSW896673)	Y	Y	155	Location description withheld – most records in Woongarrah and between Wallarah and Bushells Ridge	N	Present – highly degraded site, yet contains possible habitat in the north where it adjoins a nature reserve.	N/A	N	N
Native Guava *Rhodomyrtus psidioides*	TBC	TBC	3	Records from 1989, 2010 and 2012 in Magenta	N	Present – damp habitat occurs in the adjacent reserve to the north. As such, there is a small probability of occurrence on site.	N/A	N	N
Scrub Turpentine *Rhodamnia rubescens*	TBC	TBC	1	Record from 1994 in Magenta	N	Present – damp habitat occurs in the adjacent reserve to the north. As such, there is a small probability of occurrence on site.	N/A	N	N
Variable Midge Orchid *Genoplesium insigne*	Y	Y	104	Location description withheld - in Woongarrah and Charmhaven	N	Present – the species tolerates a certain level of disturbance, such that the site may present suitable conditions for the species.	N/A	N	N
Fauna									
Swift Parrot *Lathamus discolor*	Y	Y	72	The records are spread throughout the 10km area, four of these records are within 1500m of the Study Area but none are within the Study Area or within 600m of the Study Area	Y As per Important Habitat Map	Habitat and diurnal surveys were undertaken, resulting in potential feed trees for the species. The survey did not detect the species. No further surveys were required as foraging habitat for the species is not considered to be at risk of SAII.	N	N	Y **Assumed present**

1.6.6 Summary Survey Results

Given the survey works conducted on the development site and adjacent lands as detailed in **Table 12,** with results summarised in **Appendices B** and **C**, it is considered that sufficient information exists to determine that there are no listed species present within the Study Area.

AEP

Figure 6 - Flora Survey Effort

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

BOAMs Ref: 42630

Client: Vivacity Property

AEP Ref: 2642.01

AEP

Figure 7 - Fauna Survey Effort

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

BOAMs Ref: 42630

Client: Vivacity Property

AEP Ref: 2642.01

2.0 Avoid & Minimise recommendations

2.1 Project Design Avoidance Measures

The Study Area is located within an urban landscape within the suburb of Kanwal, which lies to the east of the Pacific Highway in the Central Coast Council LGA.

The Planning Proposal has considered the site's biodiversity constraints and it is noted that there is potential to avoid impacts to multiple trees along the western and northern boundaries, to support mobility of local fauna species and retain landscape values. This would also further contribute to the site's visual amenity and integration in the landscape.

Overall, the site is considered to be in a highly to several degraded condition, as evidence by the aggregated Vegetation Integrity Score for PCT 4006, and separate VIS when entering each set of BAM plot data in the BAM-C. In particular, the extent of exotic vegetation in the north of the site suggests that modification and/or removal of such vegetation could benefit the ecosystem occurring in the adjoining RE1-zoned nature reserve. As such, indirect impacts and edge effects are considered unlikely to negative affect the vegetation therein.

No threatened species were identified on site, and Swift Parrot is only assumed present due to the site's being partly mapped on DPE's Important Habitat Map for Swift Parrot.

2.2 Water quality and Hydrology

Considerations of water quality and hydrology are expected to be dealt with a development design is achieved. The following elements will contribute to the mitigation of impacts to water quality and hydrology:

- An Erosion and Sedimentation Control Plan (ESCP) should be prepared for the proposal following guidelines from *Landcom* (2004);
- Best practice erosion and sedimentation controls should be put in place to limit offsite movement of materials into the adjacent vegetation to the north; and
- Erosion and sedimentation controls should be checked daily and maintained in working order especially after rain events.

2.3 Fencing, Services and Vehicular Access

Fauna movement is most likely along the northern boundary. As such, in this location, barbed-wire fencing should not be used to avoid any possible fauna injury.

Furthermore, speed limits of up to 20km/h are expected to be enforced throughout the future mixed-use precinct, thus limiting the risk of collision with fauna.

2.4 General Construction & Operation

At development stage, the following measures are proposed to help mitigate impacts of the construction and ongoing operation of the proposed development on the biodiversity values on adjoining land:

- For the clearing phase, retained vegetation, specifically trees as per an Arboricultural Impact Assessment Report, will be delineated by safety bunting flags, fencing and signage indicating environmental protection zone, which will still allow fauna to egress the development area as needed. Following the completion of clearing works, permanent delineation features such as logs should be installed to protect the retained vegetation during operational phase of the development;

- Plantings incorporated in the landscape design of the proposed development site to provide future resources for native fauna in the area;
- Vegetation clearing is to be timed to avoid cold weather periods where overnight temperatures are forecast to be less than 12°C. Cold weather is likely to make it difficult for resident hollow dependent fauna to successfully relocate. This is particularly relevant for low body-weight species;
- A staged approach to clearing is to be undertaken to provide fauna the opportunity to disperse outside the area of impact. Staging to include Phase 1 Clearing: Underscrubbing, Phase 2 Clearing: Removal of non-habitat trees, and Phase 3 Clearing: Removal of habitat and connecting trees;
- Clearing should occur in a direction from previously disturbed lands towards retained lands;
- Implement clearing protocols, including pre-clearance surveys to identify habitat and vegetation to be retained;
- All clearing works to be attended by a suitable equipped and experienced ecologist to deal appropriately with any displaced fauna species;
- All hollow bearing features will be sectionally lowered by tree climbers (where safe to do so);
- Any fauna rescued during vegetation clearing is to be assessed for injuries, and subsequently released to a suitable nearby location; this may require holding fauna until dusk for release in accordance with relevant animal ethics licencing and standards;
- If any fauna is injured during vegetation clearing, they are to be taken promptly to a nearby veterinarian or suitable wildlife carer contact;
- In addition, prior to clearing of any vegetation, an Ecologist is to inspect the area for any signs of resident fauna requiring attention, and in particular nesting birds. Where such is identified, appropriate strategies are to be developed and instigated to minimise impacts. Pre-clearance surveys to include diurnal surveys, stagwatching and nocturnal surveys;
- Civil Construction staff to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection;
- Installation of nest boxes within the retained lands prior to construction to mitigate the removal of HBTs within the development footprint and provide supplementary roosting / nesting habitat for resident fauna species that utilise such features. Retained lands has the capacity to accept a 1:2 of removed hollows on the development lands to nest boxes in the retained lands for a variety of fauna guilds.
- Any suitable hollows recovered during clearing works should be reconditioned into suitable hollows and installed in retained lands in addition to the manufactured nest boxes;
- All manufactured boxes are to be industry best practice including either marine or hardwood plywood with a minimum thickness of 15mm. Boxes will not have hinged lids to ensure longevity of the boxes and installation methods will not inhibit growth of the host tree;
- All cleared vegetation is to be mulched on site and spread to help stabilise any exposed soil and minimise offsite movement of biomass. Fallen timber and hollow logs identified to be retained to be relocated into the retained lands;
- Live mulch and topsoil of local provenance is an ideal way to begin rehabilitation of conservation lands;

- Implement hygiene protocols for machinery to prevent the spread of weeds outside the development site; and
- Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise downstream hydrology changes.

2.4.1.1 Management of Vegetation for Bush Fire Protection

APZs will be located wholly within the boundary of the land holdings. Selective tree removal, clearing of shrubs and landscaping of grasses will be enforced, resulting in partial clearing of native vegetation within this section.

The future vegetation integrity score for the site reflects the proposed retention of selected trees.

2.4.1.2 Landscaping

- Where possible, landscaping is to occur in conjunction with the proposed development and provide some future resources for native fauna in the area, particularly along the western boundary;
- Proposed future landscaping areas are expected to incorporate plantings with species that occur within the PCTs that have been ground-truthed, namely PCTs 3583 and 4006.

2.5 Impact Summary

Biodiversity Offsets Credits are likely to be required based on the removal of 0.66ha determined as being associated with PCT 4006, in compliance with the streamlined assessment module for small area development of the BAM.

2.5.1 Serious and Irreversible Impacts (SAIIs)

Species at risk of SAII as a result of development are determined by decision makers (i.e., Council) for each particular threatened species / community based upon four (4) principles listed within the Guidance and criteria to assist a decision maker to determine a serious and irreversible impact (DPIE 2019).

Table 15 details the SAII candidate species that were predicted as potentially occurring within the Study Area, based on the BAM-C and a search of BioNet Atlas records within the Assessment Area.

Table 15 – Candidate SAII species with potential to occur on site

Scientific name	Common name	Commentary
Corunastylis sp. *Charmhaven* (NSW896673)	*Corunastylis* sp. *Charmhaven* (NSW896673)	Survey concluded the species does not occur on site.
Genoplesium insigne	Variable Midge Orchid	Survey concluded the species does not occur on site.
Rhodamnia rubescens	Scrub Turpentine	Survey concluded the species does not occur on site.
Rhodomyrtus psidioides	Native Guava	Survey concluded the species does not occur on site.
Thelymitra adorata	Wyong Sun Orchid	Survey scheduled in September. Unlikely to occur on site

Scientific name	Common name	Commentary
Anthochaera phrygia	Regent Honeyeater	The site is not mapped as containing Important Habitat for the species. No assessment required.
Calidris tenuirostris	Great Knot	The site is not mapped as containing Important Habitat for the species. No assessment required.
Calidris ferruginea	Curlew Sandpiper	The site is not mapped as containing Important Habitat for the species. No assessment required.
Lathamus discolor	Swift Parrot	The is mapped as containing Important Habitat. Presence was assumed and Biodiversity Offsets Credits are incurred. Further assessment for potential SAII is provided in **Table 16**.
Numenius madagascariensis	Eastern Curlew	The site is not mapped as containing Important Habitat for the species. No assessment required.
Miniopterus orianae oceanensis	Large Bent-winged Bat	The site does not contain or is not adjacent to suitable breeding habitat. No assessment required.
Miniopterus australis	Little Bent-winged Bat	The site does not contain or is not adjacent to suitable breeding habitat. No assessment required.
Petalura gigantea	Giant Dragonfly	The site is not considered suitable for the species. No assessment required.

Table 16 – Swift Parrot SAII Assessment

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment
2a	*Evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:* *i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or* *ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites*	The Swift Parrot breeds in Tasmania with the entire population travelling to the woodlands of mainland Australia during non-breeding season. The breeding population has declined from in excess of 10,000 pairs to less than 1,000 pairs, populations in NSW are considerably less than this. This species suffers variable rates of predation to breeding sites from introduced sugar gliders, future population models predict that this species will suffer severe population declines of 79-95% within the next two decades due to sugar glider predation. Other factors such as land clearing and habitat degradation have contributed to declines, with habitat loss increasing sugar glider predation. Significant population declines were first observed in the late 1980's. Despite recovery efforts, habitat loss is far greater than habitat gained through restoration practices. **Species meets the Criteria for Principle 1**
2b	*Evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:* *i. an estimate of the species' current population size in NSW, and* *ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and* *iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations*	Swift Parrots form a single genetically homogenous breeding population which migrate between Tasmania and mainland Australia. They do not occur as disjunct local populations in NSW, therefore relationships within the overall population are difficult to assess. This is why assessment of this species is based on important habitat mapping in NSW, which the study site forms part of. The current population estimate for this species is 2000 across its range (Garnett et al 2011), between breeding habitat in Tasmania and foraging habitat on mainland Australia. Olah et al 2020 suggested an *effective population* to be as low as 300 individuals, however this lower bound estimate is not supported by extensive reports on the mainland within the 2021 season. Notwithstanding, it is likely that the population is currently between 300 and 2000 individuals. **Unable to determine if species meets the Criteria for Principle 2 in NSW**

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment
2c	*Evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:* *i. extent of occurrence* *ii. area of occupancy* *iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and* *iv. whether the species' population is likely to undergo extreme fluctuations*	The Swift Parrot is endemic to (found only in) south-eastern Australia, breeding in Tasmania. It is found mainly in southern and central Victoria in winter and also in eastern New South Wales. While a marginal 0.17ha of mapped Important Swift Parrot Habitat is proposed to be impacted or modified as a result of the proposal, it is evident that the species utilises a significant geographic range across south-eastern Australia. Furthermore, 31.3ha of mapped Important Habitat occurs within 1500m of the Study Area, and 672ha within 5km. Therefore, the potential retention of several trees within the Study Area combined with the availability of larger extents of more intact habitat in the locality means that impacts resulting from the proposal will not be significant. **Species does not meet Criteria for Principle 3**
2d	*Evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:* *i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g., species is clonal) on, a biodiversity stewardship site* *ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g., karst systems) on a biodiversity stewardship site, or* *iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).*	The protection and planting of preferred feed trees has the potential to contribute to the recovery of this species. Habitat protection is recommended to offset impacts to this species. If this option is not available species credits apply. **Species does not meet Criteria for Principle 4**
3	*Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.*	Population estimates for this species are difficult to determine.
4a	*The impact on the species' population (Principles 1 and 2) presented by:*	As stated above, population estimates in NSW are difficult to determine as this species does not occur in disjunct local populations. Only 0.17ha of mapped Important Habitat is proposed to be removed or modified as part of this development, while the availability of high-quality habitat is in excess of

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment
	i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and *ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or* *iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal*	670ha within 5km, including over 31.4ha of mapped Important Swift Parrot Habitat within 1.5km, which occurs as fragmented patches throughout the locality. Impacts to this species by the removal of trees as part of this proposal are considered likely to be minimal. Although the species meets the criteria for Principles 1 and 2, the proposed impact is considered negligible, further reduced by the potential retention of several trees and the fact that large tracts of potential habitat in excess of 670ha occur within 5km. Removal of the 0.17ha of mapped Swift Parrot Habitat is not expected to contribute to population decline, due to the availability of more suitable remnant vegetation within the locality. **Impact of development on species does not meet Criteria for Principles 1 & 2**
4b	*Impact on geographic range (Principles 1 and 3) presented by:* *i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW* *ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted* *iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species* *iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been*	Given this species is highly mobile and distributed across the state, and across south-eastern Australia it is considered unlikely that the proposed impact on 0.17ha of mapped Important Swift Parrot Habitat will have an impact on the habitat resulting in fragmentation or affecting the species range. Due to the availability of suitable foraging habitat in C2 zoned lands across the locality, impacts from this proposed development are considered unlikely to be significant. **Impact of development on species does not meet Criteria for Principle 1 & 3**

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment
	considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	
5	*The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAII, is inaccurate.*	Due to the proportionally small area of recently mapped Swift Parrot Important Habitat proposed to be removed or modified by the proposed development (0.17ha) and the potential retention of multiple trees, which would support connectivity to the adjacent nature reserve, in addition to high-quality habitat in excess of 670ha within 5km, it is considered unlikely that the proposed development and associated removal of mapped habitat would place this species at risk of an SAII.

2.5.1.1 Ecosystem Credits

As per Section 10.3 of the BAM, the removal of native vegetation within the site will require offsetting to achieve the 'no net loss standard' detailed within Section 11 of the BAM. To calculate the required offsets in the form of ecosystem credits, the BAM Calculator has taken into consideration the impact area and the projected loss in vegetation integrity score along with the biodiversity risk weighting of the PCT. Details of the required ecosystem credit outputs is provided in **Table 17**. A total of two (2) Ecosystem Credits are required to offset the proposed development.

Table 17 – Ecosystem Credit Requirements

Remnant Vegetation (PCT)	Impact Area (ha)	Future VIS	Vegetation Integrity Score Loss	Biodiversity Risk Weighting	Credit Requirements
4006 – severely degraded	0.22	0	3.2	2	0
4006 – highly degraded	0.44	0	20	2	2

2.5.1.2 Species Credit

If a Species Credit species is either identified on the site during survey, assumed to be present, or confirmed present within an expert report, a 'species polygon' is required to be produced for the area of suitable habitat within the site for the species. **Table 18** outlines the credits incurred and **Figure 9** shows the polygon for Swift Parrot. The size of this polygon is entered into the BAM Calculator, which determines the number of credits required to offset the removal of suitable habitat based upon the quality of habitat and biodiversity risk weighting of the species.

Table 18 – Species Credit Species Credit Requirements

Species Credit Species	PCT	Impact Area (ha)	Biodiversity Risk Weighting	Credit Requirements
Swift Parrot	4006	0.17	3	2

2.5.2 Areas not requiring assessment

The total Study Area is 5.49ha, of which 4.83ha was deemed not requiring assessment. This area indicated in **Figure 8**.

2.6 Biodiversity Credit Report

The Biodiversity Credit Report generated within the BAM Calculator is provided in **Appendix F** and includes potential offset variations that are applicable to the proposal.

AEP

Figure 8 - Ecosystem Credit Polygon

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

BOAMs Ref: 42630

Client: Vivacity Property

AEP Ref: 2642.01

AEP

Figure 9 - Swift Parrot Species Polygon

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

BOAMs Ref: 42630

Client: Vivacity Property

AEP Ref: 2642.01

3.0 Conclusion

Application of the BAM against the proposal has quantified current biodiversity values within the site and calculated offset requirements for residual impacts following avoid and mitigation efforts.

The native vegetation within the proposed impact area was found to be commensurate with PCTs 3583 and 4006, in highly to severely degraded conditions. The remainder of the Study Area consists predominantly of exotic species, cleared and built areas.

The proposal will incur impacts to 0.66ha of native vegetation identified as PCT 4006 in the BAM-C. As a result, two (2) ecosystem credits and two (2) Swift Parrot credit would be incurred by the proposal in order to offset the residual impacts and achieve a no-net loss.

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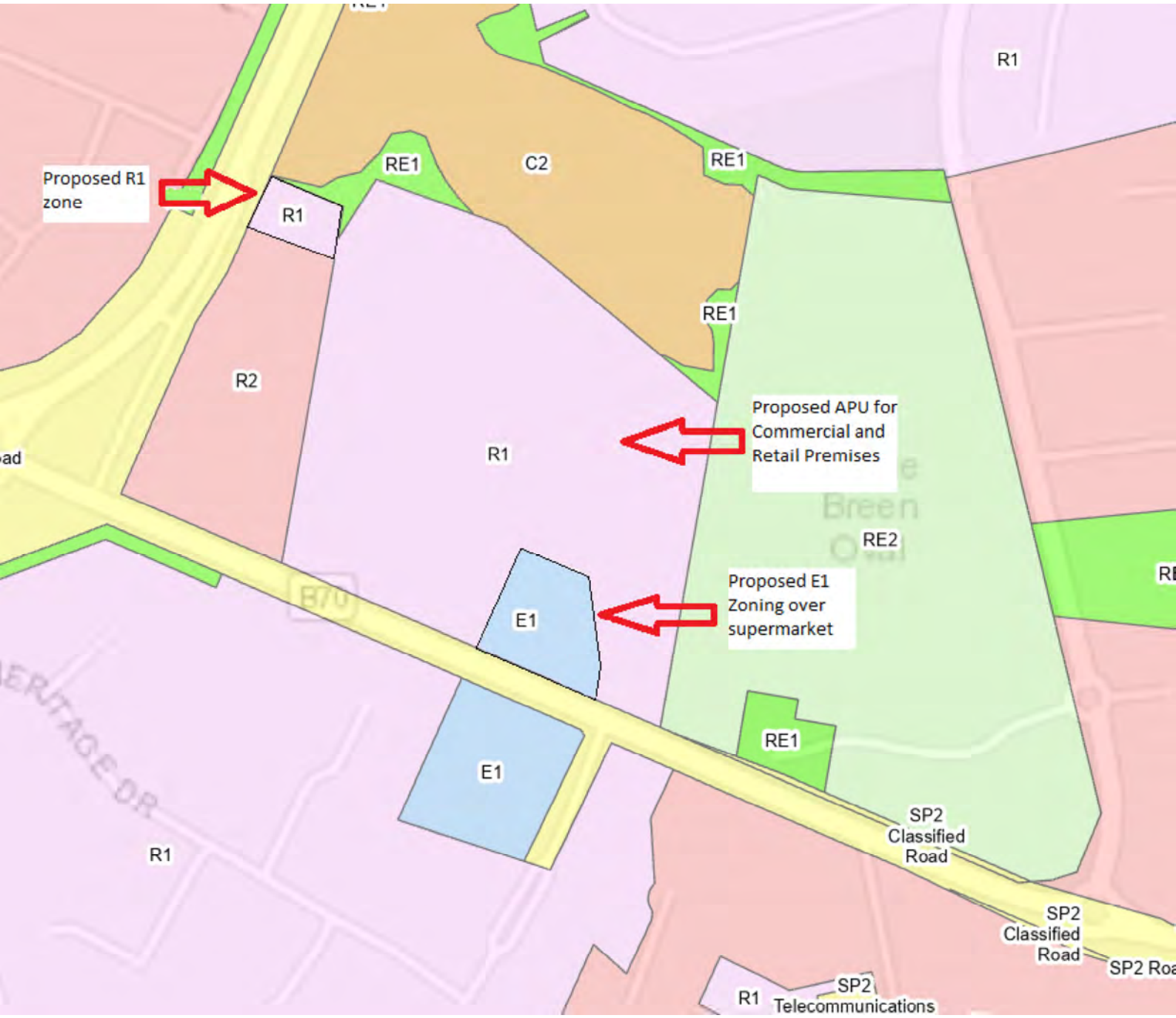
Appendix A – Rezoning Plan


Proposed R1 zone
R1
RE1
C2
RE1
R1
RE1
R2
Proposed APU for Commercial and Retail Premises
R1
RE2
Proposed E1 Zoning over supermarket
E1
E1
RE1
SP2 Classified Road
R1
SP2 Classified Road
SP2 Telecommunications
R1

Appendix B – Flora Species List

Family	Scientific Name	Common Name
Apiaceae	*Hydrocotyle algida*	Pennywort
Apiaceae	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Araceae	*Zantedeschia aethiopica**	White Arum Lily
Asteraceae	*Ageratina adenophora**	Crofton Weed
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Delairea odorata**	Cape Ivy
Asteraceae	*Senecio madagascariensis**	Fireweed
Caprifoliaceae	*Lonicera japonica**	Japanese Honeysuckle
Commelinaceae	*Tradescantia fluminensis**	Wandering Jew
Cyperaceae	*Baumea articulata*	Jointed Twig-Rush
Cyperaceae	*Cyperus aggregatus**	
Cyperaceae	*Cyperus brevifolius**	Mullumbimby Couch
Cyperaceae	*Cyperus eragrostis**	Umbrella Sedge
Cyperaceae	*Cyperus polystachyos*	
Cyperaceae	*Cyperus rotundus**	Nutgrass
Cyperaceae	*Cyperus sesquiflorus**	
Cyperaceae	*Schoenus apogon*	Fluke Bog-rush
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern
Fabaceae	*Acacia falcata*	Sickle Wattle
Fabaceae	*Acacia longifolia*	
Fabaceae	*Erythrina x sykesii**	Coral tree
Fabaceae	*Lotus subbiflorus**	Hairy Birds-foot Trefoil
Haloragaceae	*Gonocarpus teucrioides*	Raspwort
Juncaceae	*Juncus cognatus**	
Juncaceae	*Juncus homalocaulis*	
Lauraceae	*Cassytha pubescens*	Common Devil's Twine
Myrtaceae	*Angophora costata*	Smooth-barked Apple
Myrtaceae	*Corymbia gummifera*	Red Bloodwood
Myrtaceae	*Eucalyptus capitellata*	Brown Stringybark
Myrtaceae	*Eucalyptus fibrosa*	Broad Leaved Ironbark
Myrtaceae	*Eucalyptus siderophloia*	Northern Grey Ironbark
Myrtaceae	*Melaleuca nodosa*	Ball Honey Myrtle
Oleaceae	*Ligustrum sinense**	Small-leaved Privet
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Poaceae	*Andropogon virginicus**	Whisky Grass
Poaceae	*Aristida vagans*	Three-awn Speargrass
Poaceae	*Cenchrus clandestinum**	Kikuyu
Poaceae	*Digitaria didactyla*	Queensland Blue Couch
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass
Poaceae	*Paspalum sp.**	
Poaceae	*Paspalum urvillei**	Vasey Grass

Family	Scientific Name	Common Name
Poaceae	*Setaria pumila**	Pale Pigeon Grass
Poaceae	*Sporobolus africanus**	Parramatta Grass
Poaceae	*Themeda triandra*	Kangaroo Grass
Proteaceae	*Hakea dactyloides*	Broad-leaved Hakea
Rosaceae	*Rosa rubiginosa**	Sweet Briar
Rosaceae	*Rubus anglocandicans**	Blackberry
Rosaceae	*Rubus laudatus**	Blackberry
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
Solanaceae	*Solanum americanum**	Glossy Nightshade
Typhaceae	*Typha orientalis*	Cumbungi
Verbenaceae	*Lantana camara**	Lantana
Verbenaceae	*Verbena sp.**	

Appendix C – Fauna Species List

The following list includes fauna species that could be reasonably expected to occur on the Study Area at some point, given site attributes and location.

"●" - species observed or indicated by scats, tracks etc. on, over or near the site during recent surveys by AEP (2022-2023).

"*" – Non-native species

Threatened species listed under the BC Act or the EPBC Act are indicated in bold font.

V: Vulnerable; E: Endangered; CE: Critically Endangered.

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
		Observed (O), Heard (W), Scat (P), Track/scratchings (F), Nest (E), Burrow (FB)	Anabat (U), Songmeter (AR), Camera Trap (Q)
Amphibians			
Crinia signifera	Common Eastern Froglet		
Paracrinia haswelli	Haswell's Froglet		
Pseudophryne bibronii	Bibron's Toadlet		
Pseudophryne coriacea	Red-backed Toadlet		
Uperoleia fusca	Dusky Toadlet		
Uperoleia laevigata	Smooth Toadlet		
Litoria caerulea	Green Tree Frog		
Litoria dentata	Bleating Tree Frog		
Litoria ewingii	Brown Tree Frog		
Litoria fallax	Eastern Dwarf Tree Frog		
Litoria freycineti	Freycinet's Frog		
Litoria gracilenta	Dainty Green Tree Frog		
Litoria jervisiensis	Jervis Bay Tree Frog		
Litoria latopalmata	Broad-palmed Frog		
Litoria lesueuri	Lesueur's Frog		
Litoria peronii	Peron's Tree Frog		
Litoria phyllochroa	Leaf-green Tree Frog		
Litoria tyleri	Tyler's Tree Frog		
Litoria verreauxii	Verreaux's Frog		
Adelotus brevis	Tusked Frog		
Limnodynastes dumerilii	Eastern Banjo Frog		
Limnodynastes peronii	Striped Marsh Frog	W	
Limnodynastes tasmaniensis	Spotted Grass Frog		
Reptilia			
Chelodina longicollis	Eastern Snake-necked Turtle		
Pygopus lepidopodus	Common Scaly-foot		
Concinnia tenuis	Barred-sided Skink		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
		Observed (O), Heard (W), Scat (P), Track/scratchings (F), Nest (E), Burrow (FB)	Anabat (U), Songmeter (AR), Camera Trap (Q)
Cryptoblepharus virgatus	Cream-striped Shinning-skink		
Ctenotus robustus	Robust Ctenotus		
Cyclodomorphus michaeli	Mainland She-oak Skink		
Egernia cunninghami	Cunningham's Skink		
Eulamprus quoyii	Eastern Water-skink		
Lampropholis delicata	Dark-flecked Garden Sunskink	O	
Lampropholis guichenoti	Pale-flecked Garden Sunskink		
Saiphos equalis	Three-toed Skink		
Saproscincus mustelinus	Weasel Skink		
Tiliqua scincoides	Eastern Blue-tongue		
Amphibolurus muricatus	Jacky Lizard		
Diporiphora nobbi	Nobbi Dragon		
Intellagama lesueurii	Eastern Water Dragon		
Pogona barbata	Bearded Dragon		
Varanus varius	Lace Monitor		
Anilios nigrescens	Blackish Blind Snake		
Morelia spilota	Carpet & Diamond Pythons		
Boiga irregularis	Brown Tree Snake		
Dendrelaphis punctulatus	Common Tree Snake		
Cacophis krefftii	Southern Dwarf Crowned Snake		
Cacophis squamulosus	Golden-crowned Snake		
Cryptophis nigrescens	Eastern Small-eyed Snake		
Demansia psammophis	Yellow-faced Whip Snake		
Drysdalia coronoides	White-lipped Snake		
Hemiaspis signata	Black-bellied Swamp Snake		
Pseudechis porphyriacus	Red-bellied Black Snake		
Pseudonaja textilis	Eastern Brown Snake		
Aves			
Synoicus ypsilophora	Brown Quail		
Anas superciliosa	Pacific Black Duck		
Chenonetta jubata	Australian Wood Duck	O	
Columba livia	Rock Dove		
Ocyphaps lophotes	Crested Pigeon		
Spilopelia chinensis	Spotted Turtle-Dove		
Podargus strigoides	Tawny Frogmouth		
Apus pacificus	Fork-tailed Swift		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
		Observed (O), Heard (W), Scat (P), Track/scratchings (F), Nest (E), Burrow (FB)	Anabat (U), Songmeter (AR), Camera Trap (Q)
Hirundapus caudacutus	**White-throated Needletail**		
Ardea pacifica	White-necked Heron		
Bubulcus ibis	Cattle Egret		
Egretta novaehollandiae	White-faced Heron		
Nycticorax caledonicus	Nankeen Night Heron		
Threskiornis moluccus	Australian White Ibis		
Threskiornis spinicollis	Straw-necked Ibis		
Accipiter cirrocephalus	Collared Sparrowhawk		
Accipiter fasciatus	Brown Goshawk		
Accipiter novaehollandiae	Grey Goshawk		
Aquila audax	Wedge-tailed Eagle		
Aviceda subcristata	Pacific Baza		
Circus approximans	Swamp Harrier		
Elanus axillaris	Black-shouldered Kite		
Haliaeetus leucogaster	**White-bellied Sea-Eagle**		
Haliastur sphenurus	Whistling Kite		
Lophoictinia isura	**Square-tailed Kite**		
Falco cenchroides cenchroides	Nankeen Kestrel		
Falco longipennis	Australian Hobby		
Falco peregrinus	Peregrine Falcon		
Gallinula tenebrosa	Dusky Moorhen		
Hypotaenidia philippensis	Buff-banded Rail		
Lewinia pectoralis	Lewin's Rail		
Porphyrio porphyrio	Purple Swamphen		
Gallinago hardwickii	Latham's Snipe		
Cacatua galerita	Sulphur-crested Cockatoo		
Cacatua sanguinea	Little Corella		
Cacatua tenuirostris	Long-billed Corella		
Eolophus roseicapilla	Galah		
Zanda funereus	Yellow-tailed Black-Cockatoo		
Alisterus scapularis	Australian King-Parrot		
Glossopsitta concinna	Musk Lorikeet		
Glossopsitta pusilla	**Little Lorikeet**		
Platycercus elegans	Crimson Rosella		
Platycercus eximius	Eastern Rosella	OW	
Psephotus haematonotus	Red-rumped Parrot		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
		Observed (O), Heard (W), Scat (P), Track/scratchings (F), Nest (E), Burrow (FB)	Anabat (U), Songmeter (AR), Camera Trap (Q)
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet		
Trichoglossus haematodus	Rainbow Lorikeet	OW	
Cacomantis flabelliformis	Fan-tailed Cuckoo		
Centropus phasianinus	Pheasant Coucal		
Eudynamys orientalis	Eastern Koel		
Scythrops novaehollandiae	Channel-billed Cuckoo		
Ninox novaeseelandiae	Southern Boobook		
Dacelo novaeguineae	Laughing Kookaburra	OW	
Todiramphus sanctus	Sacred Kingfisher		
Eurystomus orientalis	Dollarbird		
Cormobates leucophaea	White-throated Treecreeper		
Ptilonorhynchus violaceus	Satin Bowerbird		
Sericulus chrysocephalus	Regent Bowerbird		
Malurus cyaneus	Superb Fairy-wren	OW	
Malurus lamberti	Variegated Fairy-wren		
Stipiturus malachurus	Southern Emu-wren		
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	O	Q
Acanthiza lineata	Striated Thornbill		
Acanthiza nana	Yellow Thornbill		
Acanthiza pusilla	Brown Thornbill	O	
Gerygone mouki	Brown Gerygone		
Gerygone olivacea	White-throated Gerygone		
Sericornis frontalis	White-browed Scrubwren	OW	
Pardalotus punctatus	Spotted Pardalote	W	
Acanthorhynchus tenuirostris	Eastern Spinebill	OW	
Anthochaera carunculata	Red Wattlebird	W	
Anthochaera chrysoptera	Little Wattlebird		
Caligavis chrysops	Yellow-faced Honeyeater		
Entomyzon cyanotis	Blue-faced Honeyeater		
Lichmera indistincta	Brown Honeyeater		
Manorina melanocephala	Noisy Miner	OW	
Manorina melanophrys	Bell Miner		
Meliphaga lewinii	Lewin's Honeyeater		
Melithreptus brevirostris	Brown-headed Honeyeater		
Melithreptus lunatus	White-naped Honeyeater		
Myzomela sanguinolenta	Scarlet Honeyeater		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
		Observed (O), Heard (W), Scat (P), Track/scratchings (F), Nest (E), Burrow (FB)	Anabat (U), Songmeter (AR), Camera Trap (Q)
Philemon corniculatus	Noisy Friarbird		
Phylidonyris niger	White-cheeked Honeyeater	OW	
Phylidonyris novaehollandiae	New Holland Honeyeater		
Plectorhyncha lanceolata	Striped Honeyeater		
Psophodes olivaceus	Eastern Whipbird	OW	Q
Coracina novaehollandiae	Black-faced Cuckoo-shrike	OW	
Colluricincla harmonica	Grey Shrike-thrush		
Pachycephala pectoralis	Golden Whistler		
Pachycephala rufiventris	Rufous Whistler		
Oriolus sagittatus	Olive-backed Oriole		
Sphecotheres vieilloti	Australasian Figbird		
Artamus leucoryn	White-breasted Woodswallow		
Cracticus nigrogularis	Pied Butcherbird		
Cracticus torquatus	Grey Butcherbird	W	
Gymnorhina tibicen	Australian Magpie	OW	
Strepera graculina	Pied Currawong		
Dicrurus bracteatus	Spangled Drongo		
Rhipidura albiscapa	Grey Fantail		
Rhipidura leucophrys	Willie Wagtail		
Rhipidura rufifrons	Rufous Fantail		
Corvus coronoides	Australian Raven		
Corvus orru	Torresian Crow		
Grallina cyanoleuca	Magpie-lark	OW	
Eopsaltria australis	Eastern Yellow Robin		
Cisticola exilis	Golden-headed Cisticola		
Acrocephalus australis	Australian Reed-Warbler		
Cincloramphus timoriensis	Tawny Grassbird		
Poodytes gramineus	Little Grassbird		
Hirundo neoxena	Welcome Swallow		
Petrochelidon ariel	Fairy Martin		
Petrochelidon nigricans	Tree Martin		
Pycnonotus jocosus	Red-whiskered Bulbul	W	
Turdus merula	Eurasian Blackbird		
Acridotheres tristis	Common Myna		
Sturnus vulgaris	Common Starling		
Zosterops lateralis	Silvereye		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
		Observed (O), Heard (W), Scat (P), Track/scratchings (F), Nest (E), Burrow (FB)	Anabat (U), Songmeter (AR), Camera Trap (Q)
Dicaeum hirundinaceum	Mistletoebird		
Neochmia temporalis	Red-browed Finch		
Passer domesticus	House Sparrow		
Anthus novaeseelandiae	Australian Pipit		
Mammalia			
Tachyglossus aculeatus	Short-beaked Echidna		
Antechinus mimetes	Mainland Dusky Antechinus		
Antechinus stuartii	Brown Antechinus		
Isoodon macrourus	Northern Brown Bandicoot		
Perameles nasuta	Long-nosed Bandicoot		
Pseudocheirus peregrinus	Common Ringtail Possum	O	Q
Acrobates pygmaeus	Feathertail Glider		
Trichosurus vulpecula	Common Brushtail Possum	O	Q
Macropus giganteus	Eastern Grey Kangaroo		
Notamacropus rufogriseus	Red-necked Wallaby		
Wallabia bicolor	Swamp Wallaby		
Pteropus poliocephalus	**Grey-headed Flying-fox**		
Pteropus scapulatus	Little Red Flying-fox		
Rhinolophus megaphyllus	Eastern Horseshoe-bat		
Saccolaimus flaviventris	**Yellow-bellied Sheathtail-bat**		
Austronomus australis	White-striped Freetail-bat		
Micronomus norfolkensis	**Eastern Coastal Free-tailed Bat**		
Ozimops planiceps	South-eastern Free-tailed Bat		
Ozimops ridei	Eastern Free-tailed Bat		
Chalinolobus gouldii	Gould's Wattled Bat		
Chalinolobus morio	Chocolate Wattled Bat		
Falsistrellus tasmaniensis	**Eastern False Pipistrelle**		
Myotis macropus	**Southern Myotis**		
Nyctophilus geoffroyi	Lesser Long-eared Bat		
Scoteanax rueppellii	**Greater Broad-nosed Bat**		
Scotorepens orion	Eastern Broad-nosed Bat		
Vespadelus darlingtoni	Large Forest Bat		
Vespadelus pumilus	Eastern Forest Bat		
Vespadelus regulus	Southern Forest Bat		
Vespadelus vulturnus	Little Forest Bat		
Miniopterus australis	**Little Bent-winged Bat**		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
		Observed (O), Heard (W), Scat (P), Track/scratchings (F), Nest (E), Burrow (FB)	Anabat (U), Songmeter (AR), Camera Trap (Q)
Miniopterus orianae oceanensis	**Large Bent-winged Bat**		
Hydromys chrysogaster	Water-rat		
Mus musculus	House Mouse		
Rattus fuscipes	Bush Rat		
Rattus lutreolus	Swamp Rat		
Rattus norvegicus	Brown Rat		
Rattus rattus	Black Rat		
Rattus sp.	rat	O	Q
Vulpes vulpes	Fox		
Lepus capensis occidentalis	Hare		
Oryctolagus cuniculus	Rabbit		

Appendix D – BAM Field Sheets

Job:	Kanwal	Job number:	2642	Date:	21/06/22	Observers:	FOB	
Mapped Vegetation community:		non native						
Upper stratum	**C [1]**	**Ab [2]**	**Mid stratum**	**C [3]**	**Ab [4]**	**Lower stratum**	**C [5]**	**Ab [6]**
			Rosa rubiginosa	0.3	20	Hydrocotyle bonariensis	15	
						Paspalum urvillei	2	50
						Juncus cognatus	0.5	50
						Verbena spp.	0.1	10
						Cyperus brevifolius	0.1	5
						Cyperus rotundus	0.5	40
						Lotus subbiflorus	2	50
						Schoenus apogon	0.1	20
						Cyperus eragrostis	1	50
						Juncus homocaulis	0.1	10
						Digitaria didactyla	5	
						Machaerina articulata	0.2	5
						Cyperus polystachyos	0.1	4
						Cyperus aggregatus	0.1	7
						Andropogon virginicus	0.5	30
						Senecio madagascariensis	0.1	3
						Iridaceae spp.	2	40
						Machaerina spp.	5	
						Cenchrus clandestina	5	
						Sporobolus africanus	0.1	1
Total Cover DO FIRST								
20mx20m plot = 400m2	Note: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m							

Arrival time:	10.15	**Departure time:**	11.09	**Weather:**	sunny, 16.6	**TWO transect photos (one landscape, one portrait) taken**	☑	**Transect GPS points taken**	☑
Start easting/northing:	359,574	6319902	**End easting/northing:**	**359,576**	**6319853**	**Zone:**	56	**Bearing:**	292

Tree Stem Size Class at DBH [7]	**Presence/Absence**	**Count of Hollow Bearing Trees**	**Leaf Litter Cover within 5 x 1m2 sub-plots [8]**						
< 5 cm [9]	☐			**Leaf litter**	**Live vegetation**	**Bare ground**	**Rocks**	**Other**	**Total**
5 - 9 cm	☐		**1**	1	30	69	0	0	**100**
10 – 19 cm	☐	0	**2**	0	90	10	0	0	**100**
20 – 29 cm	☐	**Length of logs (m) [10]**	**3**	0	80	20	0	0	**100**
30 – 49cm	0		**4**	1	94	5	0	0	**100**
50 -79cm	0	0	**5**	1	99	0	0	0	**100**
>80cm	0		**Average**	0.6	78.6	20.8	0	0	**100**

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

weedy and damp area that sometimes gets mowed, few native species

Habitat features, comments and incidental fauna observations:

No habitat or fauna observed. One discarded bird feather in plot

Job:	Kanwal	Job number:	2642	Date:	21/06/22	Observers:	FOB	
Mapped Vegetation community:		1636						
Upper stratum	**C [1]**	**Ab [2]**	**Mid stratum**	**C [3]**	**Ab [4]**	**Lower stratum**	**C [5]**	**Ab [6]**
Eucalyptus capitellata	10		Glochidion ferdinandi	1	2	Rubus fruticosis agg	20	
Melaleuca nodosa	5		Cupaniopsis anacardioides	0.1	1	Paspalum urvillei	5	
Angophora costata	5		Acacia longifolia	0.1	2	Aquatic weed	0.1	5
Corymbia gummifera	0.5	1	Hakea dactyloides	0.5	1	Cyperus eragrostis	0.2	50
			Acacia falcata	0.1	1	Cyperus sessquiflorus	0.1	20
			Chrysanthemoides monifera	10		Hydrocotyle bonariensis	0.5	50
						Gonocarpus teucroides	0.1	20
						Cenchrus clandestinum	4	100
						Calochlaena dubia	0.2	20
						Bidens pilosa	0.1	3
						Digitaria didactyla	0.5	50
						Juncus cognatus	0.1	10
						Themeda triandra	0.5	20
						Parsonsia straminea	0.1	3
						Cassytha pubescens	0.1	5
						Aristida vagans	0.1	20
						Echinopogon caespitosus	0.1	20
						Solanum americanum	0.1	1
						Lonicera japonica	0.3	10
						Setaria pumilla	0.1	10
Total Cover DO FIRST								
20mx20m plot = 400m2 Note: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m								

Arrival time:	12	**Departure time:**	12.34	**Weather:**	Sunny, 18	**TWO transect photos (one landscape, one portrait) taken**	☑	**Transect GPS points taken**	☑
Start easting/northing:	359,528	6319870	**End easting/northing:**	**359,526**	**6319911**	**Zone:**	56	**Bearing:**	299

Tree Stem Size Class at DBH [7]	**Presence/Absence**	**Count of Hollow Bearing Trees**	**Leaf Litter Cover within 5 x 1m2 sub-plots [8]**						
< 5 cm [9]	☐			**Leaf litter**	**Live vegetation**	**Bare ground**	**Rocks**	**Other**	**Total**
5 - 9 cm	☑		**1**	70	25	5	0	0	**100**
10 – 19 cm	☑	0	**2**	100	0	0	0	0	**100**
20 – 29 cm	☑	**Length of logs (m) [10]**	**3**	10	90	0	0	0	**100**
30 – 49cm	P		**4**	75	20	5	0	0	**100**
50 -79cm	#	32	**5**	50	50	0	0	0	**100**
>80cm	#		**Average**	61	37	2	0	0	**100**

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

Attempts to poison blackberry, large area of dead kikuyu, higher weed density towards northern end

Habitat features, comments and incidental fauna observations:

lbb, dead Scribbly outside quadrat, also pittosporum, lantana, small privet

Job:	Kanwal	**Job number:**	2642	**Date:**	21/06/22	**Observers:**	FOB	
Mapped Vegetation community:		site-by-site assessment						
Upper stratum	**C [1]**	**Ab [2]**	**Mid stratum**	**C [3]**	**Ab [4]**	**Lower stratum**	**C [5]**	**Ab [6]**
Erythryina x sykesii	30		Ligustrum sinense	75		Lonicera japonica	3	50
Melaleuca nodosa	1	1	Parsonsia straminea	0.2	5	Tradescantia flumunensis	25	
Glochidion ferdinandi	0.5	1	Pittosporum undulatum	0.1	2	Calochlaena dubia	0.1	3
			Lantana camara	2	50	Rubus laudatus	0.1	2
			Delairea odorata	2	100	Ageratina adenophora	0.1	10
			Zantedeschia aethiopica	0.1	1			
			Gahnia v thin	0.1	5			
Total Cover DO FIRST								
20mx20m plot = 400m2 Note: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m								

Arrival time:	13:00	**Departure time:**	13:42	**Weather:**	sunny, 20	**TWO transect photos (one landscape, one portrait) taken**	☑	**Transect GPS points taken**	☑
Start easting/northing:	359,634	6319848	**End easting/northing:**			**Zone:**	56	**Bearing:**	

Tree Stem Size Class at DBH [7]	**Presence/Absence**	**Count of Hollow Bearing Trees**	**Leaf Litter Cover within 5 x 1m2 sub-plots [8]**						
< 5 cm [9]	☐			**Leaf litter**	**Live vegetation**	**Bare ground**	**Rocks**	**Other**	**Total**
5 - 9 cm	☐		**1**	50	50	0	0	0	**100**
10 – 19 cm	☑	0	**2**	75	20	5	0	0	**100**
20 – 29 cm	☑	**Length of logs (m) [10]**	**3**	70	10	0	0	20	**100**
30 – 49cm	P		**4**	90	5	5	0	0	**100**
50 -79cm	#	#	**5**	50	40	10	0		**100**
>80cm	#		**Average**	67	25	4	0	5	**101**

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

Very weedy, canopy of coral trees, some dumped rubbish

Habitat features, comments and incidental fauna observations:

Pipes and pots, a colony of wbscrubwrens, white cheeked honeyeater, some areas of standing water, dark flecked garden skink

Job:	Kanwal	Job number:	2642	Date:	15/07/22	Observers:	cw	BAM4
Mapped Vegetation community:		1738	non standard plot 13mx19m		photo taken at point 4 looking towards point 2			
Upper stratum	**C [1]**	**Ab [2]**	**Mid stratum**	**C [3]**	**Ab [4]**	**Lower stratum**	**C [5]**	**Ab [6]**
Glochidion ferdinandi	0.01	1	typha orientalis	40		Pteridium esculentum	60	
Coral tree	0.01	1	Baumea articulata	30		Parsonsia straminea	5	
			Crofton weed	50		rubus fruticosis	5	
						paspalum sp	0.2	5
						hydroctyl bonariensis	0.5	100+
						Lonicera jaonica	5	
Total Cover DO FIRST	0.02			120			75	
20mx20m plot = 400m2 Note: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m								

Arrival time:	12.15	**Departure time:**	1.15	**Weather:**	sunny, no clouds	**TWO transect photos (one landscape, one portrait) taken**	☐	**Transect GPS points taken**	☐
Start easting/northing:			**End easting/northing:**			**Zone:**		**Bearing:**	

Tree Stem Size Class at DBH [7]	**Presence/Absence**	**Count of Hollow Bearing Trees**	**Leaf Litter Cover within 5 x 1m2 sub-plots [8]**						
< 5 cm [9]	☐			**Leaf litter**	**Live vegetation**	**Bare ground**	**Rocks**	**Other**	**Total**
5 - 9 cm	☐		**1**	80	20	0	0	0	**100**
10 – 19 cm	☐	0	**2**	80	20	0	0	0	**100**
20 – 29 cm	☐	**Length of logs (m) [10]**	**3**	80	20	0	0	0	**100**
30 – 49cm	#		**4**	80	20	0	0	0	**100**
50 -79cm	#	0	**5**	80	20	0	0	0	**100**
>80cm	#		**Average**	80	20	0	0	0	**100**

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

Major infestation of crofton weed. Some blackberry throughtout but hard to quantify due to massively overgrown nature of area.

Habitat features, comments and incidental fauna observations:

Heavily overgrown, very weedy. Unable to undertake full plot due to limited size. Wet currently underfoot but likely to dry without continued rain. GPS points taken at 4 corners of plot. B

Appendix E – Biodiversity Values Threshold Report

Department of Planning and Environment

Biodiversity Values Map and Threshold Report

This report is generated using the Biodiversity Values Map and Threshold (BMAT) tool. The BMAT tool is used by proponents to supply evidence to a consent authority to determine whether or not a Biodiversity Development Assessment Report (BDAR) is required under the Biodiversity Conservation Regulation 2017 (Cl. 7.2 & 7.3).

The report provides results for the proposed development footprint area identified by the user and displayed within the blue boundary on the map.

There are two pathways for determining whether or not a BDAR is required for the proposed development:

1. Is there Biodiversity Values Mapping?
2. Is the 'clearing of native vegetation area threshold' exceeded?

Biodiversity Values Map and Threshold Report

Date of Report Generation		16/08/2023 11:08 PM
Biodiversity Values (BV) Map Threshold - Results Summary		
1	**Does the development Footprint intersect with BV mapping?**	yes
2	**Was ALL of the BV Mapping within the development footprinted added in the last 90 days?** (dark purple mapping only, no light purple mapping present)	no
3	**Date of expiry of dark purple 90 day mapping***	N/A
4	**Is the Biodiversity Values Map threshold exceeded?**	yes
Area Clearing Threshold - Results Summary		
5	**Size of the development or clearing footprint**	52,557.1 sqm
6	**Native Vegetation Area Clearing Estimate (NVACE)**	10,259.5 sqm
7	**Method for determining Minimum Lot Size**	LEP
8	**Minimum Lot Size** (10,000sqm = 1ha)	450 sqm
9	**Area Clearing Threshold** (10,000sqm = 1ha)	2,500 sqm
10	**Is the Area Clearing Threshold exceeded?**	yes

Is the proposed development assessed above the Biodiversity Offsets Schema (BOS) threshold? Exceeding the BOS threshold will require completion of a Biodiversity Development Assessment Report (BDAR). More details provided on page 2.	**yes**

What do I do with this report?

• If the result above indicates a BDAR is required, a Biodiversity Development Assessment Report may be required with your development application. Go to https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor to access a list of accredited assessors. An accredited assessor can apply the Biodiversity Assessment Method and prepare a BDAR.

• If the result above indicates a BDAR is not required, you have not exceeded the BOS threshold. This report can be provided to Council to support your development application. You may still require a permit from your local council. Review the development control plan and consult with council. You may still be required to assess whether the development is '"likely to significantly affect threatened species" as determined under the test in Section 7.3 of the Biodiversity Conservation Act 2016. You may also be required to review the area where no vegetation mapping is available.

• If all Biodiversity Values mapping within your development footprint are less than 90 days old, i.e. mapping is displayed as dark purple on the map, a BDAR may not be required if your Development Application is submitted within that 90 day period. *Any BV mapping less than 90 days old on this report will expire on the date provided in Line item 3 above.

For more detailed advice about actions required, refer to the Interpreting the evaluation report section of the Biodiversity Values Map Threshold Tool User Guide.

Review Options:

• If you believe the Biodiversity Values mapping is incorrect please refer to our BV Map Review webpage for further information.

• If you disagree with the NVACE result for Line Item 6 above (i.e. area of Native Vegetation within the Development footprint proposed to be cleared) you can undertake a self-assessment. For more information about this refer to the Guide for reviewing BMAT Tool area clearing threshold results.

Acknowledgement

I, as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature: _____ Date:_____

(Typing your name in the signature field will be considered as your signature for the purposes of this form)

16/08/2023 11:08 PM

Biodiversity Values Map

250.7 0 125.37 250.7 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days
- Native Vegetation Area Clearing Estimate (NVACE)
- Development area selected by proponent

16/08/2023 11:08 PM

The results provided in this tool are generated using the best available mapping and knowledge of species habitat requirements.

This map is valid as at the date the report was generated. Checking the Biodiversity Values Map viewer for mapping updates is recommended.

Appendix F – Biodiversity Credit Report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00042630/BAAS18147/23/00042631

Proposal Name
2642_01 Kanwal SAPP

BAM data last updated *
22/06/2023

Assessor Name
Ian Douglas Benson

Assessor Number
BAAS18147

BAM Data version *
61

Proponent Names

Report Created
17/08/2023

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
17/08/2023

BOS entry trigger
BOS Threshold: Biodiversity Values Map

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

Potential Serious and Irreversible Impacts

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

Species
Lathamus discolor / Swift Parrot

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
4006-Northern Paperbark-Swamp Mahogany Saw-sedge Forest	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.7	0	2	2

4006-Northern Paperbark-Swamp Mahogany Saw-sedge Forest	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	4006_severely_degraded	No	0	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	4006_highly_degraded	No	2	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Lathamus discolor / Swift Parrot	**4006_severely_degraded, 4006_highly_degraded**	0.2	2.00

Credit Retirement Options

Like-for-like credit retirement options

Lathamus discolor / Swift Parrot	Spp	IBRA subregion
	Lathamus discolor / Swift Parrot	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00042630/BAAS18147/23/00042631

Proposal Name
2642_01 Kanwal SAPP

BAM data last updated *
22/06/2023

Assessor Name
Ian Douglas Benson

Assessor Number
BAAS18147

BAM Data version *
61

Proponent Name(s)

Report Created
17/08/2023

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
17/08/2023

BOS entry trigger
BOS Threshold: Biodiversity Values Map

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

Potential Serious and Irreversible Impacts

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

Species
Lathamus discolor / Swift Parrot

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
4006-Northern Paperbark-Swamp Mahogany Saw-sedge Forest	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.7	0	2	2.00

4006-Northern Paperbark-Swamp Mahogany Saw-sedge Forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	4006_severely_degraded	No	0	Wyong,Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	4006_highly_degraded	No	2	Wyong,Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Forested Wetlands	Tier 3 or higher threat status	4006_severely_degraded	No	0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Forested Wetlands	Tier 3 or higher threat status	4006_highly_degraded	No	2	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Lathamus discolor / Swift Parrot	**4006_severely_degraded, 4006_highly_degraded**	0.2	2.00

Credit Retirement Options

Like-for-like options

Lathamus discolor/ Swift Parrot	Spp		IBRA region
	Lathamus discolor/Swift Parrot		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Appendix G – Site Photographs

Above: View of caravan park from exotic grassland

Below: Remnant vegetation in north-west of the Study Area

Above: Rushland in north of Study Area

Below: Poor condition Melaleuca spp. near Coral Tree Forest in northern section of Study Area

Above: Riparian Assessment being completed on mapped hydroline

Below: Caravan Park infrastructure

Above: Common Ringtail Possum observed from Camera Trap 3B

Below: Arborist Assessment being completed

Appendix H – Other Legislation

EPBC Act Assessment

A Protected Matters Search within a 5km radius of the Study Area was conducted in August 2023 for Matters of National Environmental Significance as relevant to the Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act). The following Matters of National Significance are considered in this assessment.

World Heritage Properties:

The site is not a World Heritage area and is not in close proximity to any such area.

National Heritage Places:

The site is not a National Heritage place, and it is not in close proximity to any such place.

Wetlands of International Significance (declared Ramsar wetlands):

The site is not a Wetlands of International Significance, and it is not in close proximity to any such place.

Great Barrier Reef Marine Park:

The site is not part of, or within close proximity to, the Great Barrier Reef Marine Park.

Commonwealth Marine Areas:

The site is not part of, or within close proximity to, any Commonwealth Marine Area.

Threatened Ecological Communities:

From the search of the EPBC Act Protected Matters, four (4) listed Threatened Ecological Communities (TECs) were considered likely to occur within a 5km radius of the Study Area.

Two (2) Endangered Ecological Communities:

- *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community*; and
- *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland.*

Two (2) Critically Endangered Ecological Community

- *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia*
- *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria.*

A review of vegetation zones was undertaken against the Conservation Advice for *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland* as follows.

As per Table 2 of the *Conservation Advice for the Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland*, the PCT as it occurs on site covers approx. 0.46ha and connects with a larger area of native vegetation of at least 5ha, to the north. Furthermore, non-native species comprise 20% to 50% of total ground layer vegetation cover as per data collected in BAM Plot 3. As such, the PCT on site is categorised as Class C2, described as "*A small patch that meets key diagnostics and has a mostly native ground layer AND is contiguous with another large of native vegetation.".*

As per Section 2.3 of the Conservation Advice, "*the referral, assessment, approval, and compliance provisions of the EPBC Act apply*". An assessment of significance of impacts to the TEC is proposed thereafter, as per the Significant Impact Criteria for Critically Endangered and Endangered Ecological Communities of the former Department of Environment's *Matters of National Environmental Significance – Significant Impact Guidelines 1.1 – Environment Protection and Biodiversity Conservation Act 1999* (DoE, 2013). Under the Guidelines:

> *"An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:"*

- *"reduce the extent of an ecological community"*

  0.46ha of vegetation commensurate with Coastal Swamp Forest EEC is proposed to be cleared. It is to be noted that it occurs in a highly degraded state, as evidenced by the VIS of 24.5. As such, the extent of clearing is considered minimal, and the condition of the vegetation community is such that it's unlikely that the extent of the ecological community will be significantly impacted.

- *fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines*

  Connectivity will remain post-development given the site interfaces with a C2 and RE1 zoned nature reserve to the north. Therefore, while 0.46ha of the EEC are proposed to be cleared, such clearing occurs in a severely disturbed section of the patch of native vegetation, and as such, increased fragmentation as a result of the clearing is not considered to be of significance. Furthermore, multiple trees are proposed to be retained, specifically in the north-east, which interfaces with and supports connectivity to northern protected lands and along the western boundary.

- *adversely affect habitat critical to the survival of an ecological community*

  As mentioned above, the community occurs on site in a severely degraded condition with significant presence of exotic weeds. Furthermore, no threatened species were identified during the surveys. Swift Parrot is assumed present due to occurrence of vegetation mapped as Important Habitat for the species under the NSW BC Act. However, multiple trees have potential to be retained and the nature reserve to the north will not be impacted, thus limiting any potential impacts to mapped Important Habitat for Swift Parrot to approx. 0.17ha of clearing.

  As such, habitat is considered to be of low value in comparison with standards for the community as established in the Conservation Advice for this TEC, and no adverse effects on habitat critical to the survival of an ecological community are expected.

- *modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns*

  No drainage pattern was observed on site. A potential water body was ground-truthed and it was concluded that it did not meet the definition of a stream. Furthermore, Stormwater Management and WSUD will be implemented to limit any potential indirect impacts to groundwater and downstream hydrology. Therefore, it is not expected that abiotic factors will be modified or destroyed to such an extent that it would threaten the ecological community's survival.

- *cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting*

  As stated above, the PCT occurs in a severely degraded condition over a small patch (0.46ha), with a dominance of *Ligustrum sinense, Tradescantia fluminensis* and *Erythrina x sykesii*. As such, in the context of the occurrence of the PCT in the locality, the proposal is unlikely to cause a substantial change in the species composition of the TEC.

- *cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: assisting invasive species, that are harmful to the listed ecological community, to become established, or*

  As stated above, the PCT already occurs in a severely degraded condition and as such, no substantial reduction in the quality and integrity of the TEC is expected as a result of the proposal.

- *causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or*

  The development of lands within the Study Area has the potential to lead to an increase in pollutants being released into the adjoining lands. However, construction environmental protocols as well as compliant urban design will limit such risks. Furthermore, fencing will prevent access into the nature reserve from the proposed caravan park, thus limiting the risk for pollution through rubbish dumping.

- *interfere with the recovery of an ecological community.*

  The clearing of the TEC on site is limited to 0.46ha of highly to severely disturbed PCT 4006. As such, the extent of clearing and condition of the PCT mean that the proposal is unlikely to interfere with the recovery of the ecological community.

Threatened Species:

Threatened species listed under the EPBC Act considered likely to occur on site were assessed from field inspections, Bird Data and using the BioNet Atlas search tool over a 100km^2 area with the Study Area as the centroid, with most recent records assessed. Habitat assessment and surveys did not identify suitable habitat for threatened species listed under the EPBC Act and it is not expected that impacts to EPBC listed species would occur as a result of this development. However, under the NSW BC Act, Swift Parrot important habitat is mapped as occurring on site. Site inspection revealed that the site is highly disturbed and unsuitable to the species. Furthermore, the clearing of 0.17ha of mapped important habitat in a highly to severely degraded condition is not considered to be a significant impact.

As such, no further assessment was deemed necessary for impact to EPBC Act listed Swift Parrot.

Migratory Species:

A number of EPBC listed migratory species have the potential to utilise the site on an irregular basis. The limited number and sporadic nature of records close to the Study Area appear to reflect opportunistic rather than regular use of any habitat considered of importance to any threatened species.

It is not considered that the development of this land is likely to significantly affect the availability of potential habitat for such mobile species, or disrupt migratory patterns.

EPBC Act Assessment Conclusion:

It was concluded that the clearing of 0.46ha of the Swamp Sclerophyll Forest TEC did not constitute a significant impact.

Furthermore, the presence of mapped important habitat for Swift Parrot was identified through desktop assessment. However, field surveys confirmed that 0.17ha of mapped important habitat occurred in a highly to severely degraded condition, with more suitable habitat occurring in the locality. As such, no further assessment of significance of impacts was deemed necessary for the species.

As a result, the proposal would not result in any significant changes to available habitat if avoid and minimise measures, as discussed is the main report, are applied to development on the Study Area. Therefore, an EPBC Act Referral is not considered as necessary for this proposal.

Water Management Act 2000

The Objects of the NSW *Water Management Act, 2000* (WM Act) are to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. *Section 91* of the WM Act provides the legislative framework for management works within 40m of a watercourse.

DPE Natural Resource Access Regulator Waterfront Land Tool, 2020, AEP surveyed the mapped hydro lines (refer to **Appendix I** and **Figure 2**). The field investigations showed that Survey ID # 1 - 6 did not show key features of a watercourse. The area is not recognised as a wetland due to the absence of a number of key features. A low level of water within the surveyed area suggests the area is not frequently wet and the abundance of overgrown exotic vegetation is not commensurate with a typical wetland environment, where a distinct change in vegetation type can indicate a wetland area. As there was no watercourse present on site in accordance with DPE Natural Resource Access Regulator Waterfront Land Tool; there is no requirement for Riparian Corridors (RC) or Vegetation Riparian Zones (VRZ)."

Therefore, no streams or waterways are to be impacted by this development and as such the development will not require assessment under the *Water Management Act 2000*.

Fisheries Management Act 1994

DPE Natural Resource Access Regulator Waterfront Land Tool, 2020, AEP surveyed the mapped hydro lines (refer to **Appendix I** and **Figure 2**). The field investigations showed that Survey ID # 1 - 6 did not show key features of a watercourse. The area is not recognised as a wetland due to the absence of a number of key features. A low level of water within the surveyed area suggests the area is not frequently wet and the abundance of overgrown exotic vegetation is not commensurate with a typical wetland environment, where a distinct change in vegetation type can indicate a wetland area. As there was no watercourse present on site in accordance with DPE Natural Resource Access Regulator Waterfront Land Tool; there is no requirement for Riparian Corridors (RC) or Vegetation Riparian Zones (VRZ)."

Therefore, no streams or waterways are to be impacted by this development and as such the development will not require assessment under the *Fisheries Management Act 1994*.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 4 Koala Habitat Protection 2021

The State Environmental Planning Policy (Biodiversity and Conservation) 2021 (BC SEPP) commenced on 1 March 2022. The State Environment Planning Policy (Koala Habitat Protection) 2021 was one SEPP that was consolidated within the BC SEPP 2021 under Chapter 4 Koala Habitat Protection. No policy changes were made as part of the consolidation nor did the legal effect of the existing SEPPs, with section 30A of the *Interpretation Act 1987* applying to the transferred provisions. The consolidation was undertaken in accordance with section 3.22 of the *Environmental Planning and Assessment Act 1979*.

The land which comprises the Study Area has no approved koala plan of management. According to the BC SEPP 2021, the policy applies if:

4.9 Development assessment process—no approved koala plan of management for land

(1) This section applies to land to which this Chapter applies if the land—

(a) has an area of at least 1 hectare (including adjoining land within the same ownership), and

(b) does not have an approved koala plan of management applying to the land.

The Study Area has an area of at least 1ha and does not have an approved koala plan of management.

(5) However, despite subclauses (3) and (4), the council may grant development consent if the applicant provides to the council –

a. information, prepared by a suitably qualified and experienced person, the council is satisfied demonstrates that the land subject of the development application –

i. does not include any trees belonging to the koala use tree species listed in Schedule 2 for the relevant koala management area, or

ii. is not core koala habitat,

Site inspections confirmed that some koala use trees listed in Schedule 2 are present within the Study Area. Therefore, it is classified as core koala habitat and further investigations are required.

Tier 2 Assessment

Part A: Presence of highly suitable Koala Habitat

Determine the PCT (using suitable methods) and if PCT have Schedule 3 listed trees an assessment must be undertaken to determine koala presence.

The Study Area does contain Schedule 3 listed trees. Therefore, a Tier 2 Assessment is required.

Assess BioNet for records - All records within set distance (2.5km OR 5km) in the last 18 years apply = Core Habitat. Requiring a Part B Assessment to determine koala presence.

An assessment of BioNet Atlas records showed two (2) records since 2006 approx. 3km to the south-south-west and 4km to the north-north-west from the Study Area.

Part B Assessment

i) Koala Presence – Spot Assessment Technique (SAT), Nocturnal Survey and Call Playback

The Study Area contains Schedule 3 listed trees therefore, a Tier 2 Assessment is required.

A SAT survey and nocturnal survey was undertaken on 21/06/2022 and did not result in the identification of evidence of site use by Koala.

ii) Koala Records

As stated above, two (2) BioNet records occur within 4km from the Study Area as sighted within the last 18 years. The north-western record is located to the west of the railway extending from Sydney to Newcastle, such that the infrastructure presents a major interruption in connectivity. Therefore, only the record identified in 2006 in the south-west between Wadalba and Tuggerawong has been considered for the purposes of this assessment.

Records within these maximum distances must only be considered after a careful examination of the broader landscape. That is, within areas of contiguous habitat or between areas of habitat with connectivity. For example, a record from 2.5km from the Study Area must not be used if natural or artificial landscape features would prevent koalas from the area with the record ever moving to the site (e.g., due to large rivers, roads, fences or built up areas).

Table B – Koala Assessment

Principles	Criteria	Assessment
Introduction	Describe the nature of the proposed development.	Proposed rezoning to enable the construction of a mixed-use precinct which would include apartments, retail services and public parkland.
	Define how the SEPP applies to the proposed development.	Parent lot >1ha in size and one (1) Koala record identified within 3km in the last 18 years.
Koala habitat values – addressing criteria 1 and 2	Describe the site area, including the general environment and condition, location and extent of the development area and any other areas that may be directly or indirectly impacted by the proposed development.	The site occurs as a caravan park on land proposed to be rezoned to allow for a mixed-use precinct. It is located within an urban landscape and adjoins a small nature reserve to the north. Adjacent lands in other directions are either cleared of native vegetation or developed. Development resulting from the proposed rezoning would incur the clearing of up to 0.66ha of native vegetation identified as being in a highly to severely disturbed condition and as such, holding limited biodiversity value. No indirect impacts other than potential increase in light spill and noise as a result of the new precinct, are expected.
	Provide details of Koala survey as undertaken in accordance with Appendix C. This should include details of the results of the koala surveys, including how the site area meets the definition of core koala habitat and	A survey using the Spot Assessment Technique and a nocturnal survey using spotlights and call playback were undertaken on 21/06/2022. As per the SAT, 30 potentially suitable trees were surveyed and no evidence of use by

Principles	Criteria	Assessment
	mapping that shows habitat areas and koala records within the site area and adjoining areas.	Koala was found. Details of the survey are provided on **Figure 7.** Furthermore, a search for records of Koala in the BioNet Atlas revealed only one sighting in an area with limited to connectivity to the site, in the last 18 years, 3km to the south-south-west of the Study Area.
	Describe the site context (including mapping showing habitat that might be associated with vegetation in the adjoining landscape and records within the vicinity of the site area) and provide an analysis of the koala habitat values (including how koalas might use the site area and the relative importance of the site area to a local koala population).	Native vegetation on site occurs in a highly to severely degraded and fragmented condition, with exotic species being prevalent throughout vegetated areas. Connectivity to remnant vegetation is limited to trees located along the northern boundary which interface with a nature reserve, itself located within an urban context. The high level of disturbance combined with paucity of records in the locality mean that the site is unlikely to have any importance for any Koala population.
Measures taken to avoid impacts to koalas – addressing criteria 3, 4, 5, 6, 7 and 8	Describe the site selection process, including how koala habitat was taken into account and any avoidance outcomes achieved through this process.	As described above, habitat values for Koala within the Study Area and broader Study Area are negligible. Notwithstanding the unlikelihood of Koala using the site, there is potential to retain native trees as part of future landscaping. Furthermore, adjacent areas of better habitat to the north of the site are unlikely to be impacted.
	Describe how the proposed development avoids or minimises direct impacts to koala habitat and habitat function within the site area.	As above.
Analysis of potential impacts – addressing criteria 9	Identify the residual direct impacts to koalas and koala habitat within the site area, including the nature and extent of impacts and the likely implications for the viability of a local koala population.	No residual impacts to Koala are expected. More broadly, residual impacts to biodiversity have been quantified as per the BAM, resulting in the incurring of two (2) Ecosystem Credits being incurred as a result of the clearing of 0.66ha of highly to severely degraded native vegetation on site.
	Identify the relevant potential indirect impacts to koalas and koala habitat within the site area and adjacent habitat areas, including the nature and extent of potential indirect impacts and the likely implications for the viability of a local koala population.	As discussed above, the absence of evidence of site use by Koala, the paucity of records in the locality and the fragmentation of bushland in the near surrounds means that direct or indirect impacts to Koala as a result of the proposal are considered highly unlikely.
Plan to manage and protect koalas and their habitat –	Describe the management measures that will be implemented as part of proposed construction and operations	Whilst impacts to Koala, whether direct or indirect, are not expected as a result of the proposal, the application of

Principles	Criteria	Assessment
addressing criteria 10, 11, 12 and 13	to manage the direct and indirect impacts identified. These measures should be outcomes focussed and include performance targets.	Avoid & Minimise principles through the design and construction process would lead to the implementation of impact mitigation measures on site, as follows: • Protective fencing to prevent incursions of fauna from the northern nature reserve into the site; • Use of fauna-friendly protective fencing (i.e., no barbed-wire); • Implementation of CEMP to control potential indirect impacts resulting from construction works; • Implementation of low speed limits throughout the caravan park to reduce the risk of vehicle strikes.
	Describe any compensatory measures that will be delivered, including an analysis of the suitability of these measures against criteria 9 and 10.	No Koala were sighted on site, nor was any evidence of site use found. As such, compensatory measures were not deemed necessary in this instance.
	Outline a plan for monitoring, adaptive management and reporting against the key outcomes and performance targets.	Not applicable.

Conclusion

The Study Area does contain Schedule 3 trees. However, only one (1) BioNet Atlas record of Koala was noted in an area with highly disturbed connectivity to the site, and no evidence of site use was found. Impacts to potential habitat will be limited to the removal of 0.66ha of highly to highly degraded native vegetation. Therefore, it was considered that the proposal will not incur any significant impacts on Koala.

Appendix I – AEP Riparian Assessment Report

AEP

ECOLOGY | OFFSETS | BUSHFIRE | ARBORICULTURE

Riparian Assessment Report

205-209 Wallarah Road, Kanwal, NSW 2259
755-757 Pacific Highway, Kanwal, NSW 2259

Prepared for: Vivacity Property

17 August 2023
AEP Ref: 2642.01
Revision: 01

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Document Control

Document Name	Riparian Assessment Report for 207 – 209 Wallarah Road and 755 – 757 Pacific Highway, Kanwal, NSW 2259
Project Number	2642.01
Client Name	Vivacity Property
AEP Project Team	Edouard Loisance Ian Benson Natalie Black

Revision

Revision	Date	Author	Reviewed	Approved
Draft	14/08/2023	Edouard Loisance	Natalie Black	Ian Benson
01	17/08/2023	Edouard Loisance	Natalie Black	Ian Benson

Distribution

Revision	Date	Name	Organisation
01	17/08/2023	Tom Copping	Vivacity Property

Contents

Tables

Figures

Appendices

1.0 Introduction

Anderson Environment & Planning was commissioned by Vivacity Property (the client) to undertake a Riparian Assessment Report (RAR) to inform a Planning Proposal at 207-209 Wallarah Road, Kanwal, NSW refer **Figure 1**.

For the purposes of referencing, this document should be referred to as:

> Anderson Environment & Planning (2023). *Riparian Assessment Report for* 207- 209 Wallarah Road, Kanwal, NSW. Unpublished report for Vivacity Property. August 2023.

2.0 Site Particulars

Table 1 – Site Details

Detail	Comments
Client	Vivacity Property
Address	205-209 Wallarah Road, Kanwal, NSW 2259 755-757 Pacific Highway, Kanwal, NSW 2259
Title(s)	Lot 1 DP 518378, Lot 1223 DP 1004170, Lots 14 & 15 DP 23235
Study Area	Consists of the entirety of Lot 1 DP 518378, Lot 1223 DP 1004170 and Lots 14 & 15 DP 23235. The Study Area consists of land currently in use as a caravan park, which is proposed to be rezoned to enable the development of a mixed-use precinct. The caravan park currently includes onsite permanent accommodation, site office, swimming pool and bathroom facilities. The Study Area totals 5.06ha and comprises predominately of infrastructure relevant to the caravan park and areas of vegetation connected to the adjacent allotment of the north. (Refer to **Figure 1**).
LGA	Central Coast Council.
Zoning	Under the Wyong Local Environment Plan 2013 (the LEP pub.18-11-2015), the Study Area is zoned R1 – General Residential.

AEP

Figure 1 - Site Map

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP Ref: 2642.01

3.0 Methodology

Field surveys for determining the status of waterfront land occurring within the Subject Site have been prepared and performed as per the Natural Resources Access Regulator, 2020, *Waterfront Land Tool*. The tool identifies waterfront land based on three key factors:

- The presence of defined bed and banks;
- Evidence of flow and geomorphic features (whether water is present or not); and
- The presence of aquatic/riparian vegetation.

3.1 Information Sources

Information and spatial data provided within this RAR has been compiled from various sources including:

- Department of Planning and Environment (2020), Natural Resources Access Regulator Waterfront Land Tool;
- Aerial Photograph Interpretation (API) of the site using the latest Nearmap imagery (July 2022) and surrounding locality;
- NSW Government (2018) *Determining Stream Order* Fact Sheet;
- Water Management (General) Regulation 2018 Hydroline spatial data, accessed 2022; and
- Collective knowledge gained from previous ecological survey and assessment in the area over the past 25 years.

3.2 Desktop Assessment

The following desktop analysis was conducted for the Subject Site:

- Stream orders were determined using the Strahler Order system via both API and *Water Management (General) Regulation 2018 Hydroline spatial data 1.0*;
- Regional vegetation mapping, *Central Coast Vegetation 2019*, was utilised to identify vegetation communities occurring within the Subject Site;
- Literature review of stream ordering assessment and field assessment criteria to determine accuracy of mapped hydrolines; and
- Assignment of survey identification numbers to potential watercourses (Survey ID) (**Figure 3)**.

3.3 Field Survey

The following field surveys were undertaken to ground-truth the data collected at the desktop level:

- Assessing each mapped hydroline to determine if defined bed and banks (including locating high bank) are present;
- Identifying what type of watercourse is present (in accordance with NRAR Guide – Watercourse types);
- Determine and notate watercourse features;
- Determine presence of any Lakes or Wetlands; and
- Determine and notate changes in vegetation communities.

AEP

Figure 2 - Desktop Stream Order

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP Ref: 2642.01

4.0 Riparian Assessment Results

Fieldwork was conducted in June 2022 to ground-truth the stream order of the watercourses within the Subject Site as is mapped in the New South Wales Hydroline Data Set. Investigations revealed the 1st order stream does not occur within the Subject Site (Refer to **Table 2** to **7**).

AEP

Figure 3 - Survey ID Number & Survey Effort

Date: Aug 2023

Location: 205-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP Ref: 2642.01

Table 2 – Field Survey Results Survey ID 1

Watercourse Characteristics	Assessment	Figures
Desktop - Strahler System Order	1st	2
Define Bed and Banks (Yes / No)	No	
Type of Watercourse (Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None Appendix 5 NRAR Guide)	None	
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None	
Lakes or Wetlands (Appendix 3 – NRAR Guides)	No	
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guide)	No	
High Bank (Appendix 8 NRAR Guide)	None	
Ground-truthed stream order	0	
Controlled Activity Approval required (Y / N)	No	
Vegetation Riparian Zone Required (m)	None	
Comments	No clear stream basin. All water is stagnant and contained within a small area. Vegetation is exotic. **Not considered a stream or wetland.**	

Plate 1: Survey ID 1: Overgrown exotic vegetation area.

Table 3 – Field Survey Results Survey ID 2

Watercourse Characteristics	Assessment	Figures
Desktop - Strahler System Order	1	2
Define Bed and Banks (Yes / No)	No	
Type of Watercourse (Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None Appendix 5 NRAR Guide)	None	
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None	
Lakes or Wetlands (Appendix 3 – NRAR Guides)	No	
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guide)	No	
High Bank (Appendix 8 NRAR Guide)	None	
Ground-truthed stream order	0	
Controlled Activity Approval required (Y / N)	No	
Vegetation Riparian Zone Required (m)	None	
Comments	No clear stream basin. Pools of water are stagnant and contained within a small area. Vegetation is exotic. **Not considered a stream or wetland.**	

Plate 2: Survey ID 2: Overgrown exotic vegetation area.

Table 4 – Field Survey Results Survey ID 3

Watercourse Characteristics	Assessment	Figures
Desktop - Strahler System Order	1	2
Define Bed and Banks (Yes / No)	No	
Type of Watercourse (Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None Appendix 5 NRAR Guide)	None	
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None	
Lakes or Wetlands (Appendix 3 – NRAR Guides)	No	
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guide)	No	
High Bank (Appendix 8 NRAR Guide)	None	
Ground-truthed stream order	0	
Controlled Activity Approval required (Y / N)	No	
Vegetation Riparian Zone Required (m)	None	
Comments	No defined stream basin. All water is stagnant and contained within the drainage area as seen in **Plate 3** below. **Not considered a stream or wetland.**	

Plate 3: Survey ID 3: Water within drainage area.

Table 5 – Field Survey Results Survey ID 4

Watercourse Characteristics	Assessment	Figures
Desktop - Strahler System Order	1	2
Define Bed and Banks (Yes / No)	No	
Type of Watercourse (Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None Appendix 5 NRAR Guide)	None	
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None	
Lakes or Wetlands (Appendix 3 – NRAR Guides)	No	
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guide)	No	
High Bank (Appendix 8 NRAR Guide)	None	
Ground-truthed stream order	0	
Controlled Activity Approval required (Y / N)	No	
Vegetation Riparian Zone Required (m)	None	
Comments	No clear stream basin. No movement of water. Area is a flat drainage area. **Not considered a stream or wetland.**	

Plate 4: Survey ID 4: Flat drainage area.

Table 6 – Field Survey Results Survey ID 5

Watercourse Characteristics	Assessment	Figures
Desktop - Strahler System Order	1	2
Define Bed and Banks (Yes / No)	No	
Type of Watercourse (Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None Appendix 5 NRAR Guide)	None	
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None	
Lakes or Wetlands (Appendix 3 – NRAR Guides)	No	
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guide)	No	
High Bank (Appendix 8 NRAR Guide)	None	
Ground-truthed stream order	0	
Controlled Activity Approval required (Y / N)	No	
Vegetation Riparian Zone Required (m)	None	
Comments	No clear stream basin and has no water present. **Not considered a stream or wetland.**	

Plate 5: Survey ID 5: Damp area with no water present.

Table 7 – Field Survey Results Survey ID 6

Watercourse Characteristics	Assessment	Figures
Desktop - Strahler System Order	1	2
Define Bed and Banks (Yes / No)	No	
Type of Watercourse (Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None Appendix 5 NRAR Guide)	None	
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None	
Lakes or Wetlands (Appendix 3 – NRAR Guides)	No	
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guide)	No	
High Bank (Appendix 8 NRAR Guide)	None	
Ground-truthed stream order	0	
Controlled Activity Approval required (Y / N)	No	
Vegetation Riparian Zone Required (m)	None	
Comments	Low lying drainage area which habits Melaleuca swamp forest but has no water present. **Not considered a stream or wetland.**	

Plate 6: Survey ID 6: Melaleuca Forest with no water present.

5.0 Conclusion

The field investigations showed that Survey ID # 1 - 6 did not show key features of a watercourse. The area is not recognised as a wetland due to the absence of a number of key features. A low level of water within the surveyed area suggests the area is not frequently wet and the abundance of overgrown exotic vegetation is not commensurate with a typical wetland environment, where a distinct change in vegetation type can indicate a wetland area.

As there was no watercourse present on site in accordance with DPE *Natural Resource Access Regulator Waterfront Land Tool;* there is no requirement for Riparian Corridors (RC) or Vegetation Riparian Zones (VRZ).

6.0 References

Department of Planning, and Environment (2020) *Natural Resources Access Regulator Waterfront Land Tool* https://www.dpie.nsw.gov.au/nrar/how-to-apply/controlled-activities/tools accessed August 2023.

Department of Primary Industries Office of Water (2018) *Guideline for Riparian Corridors on Waterfront Lands,* https://www.industry.nsw.gov.au/__data/assets/pdf_file/0003/160464/licensing_approvals_controlled_activities_riparian_corridors.pdf, last accessed August 2023.

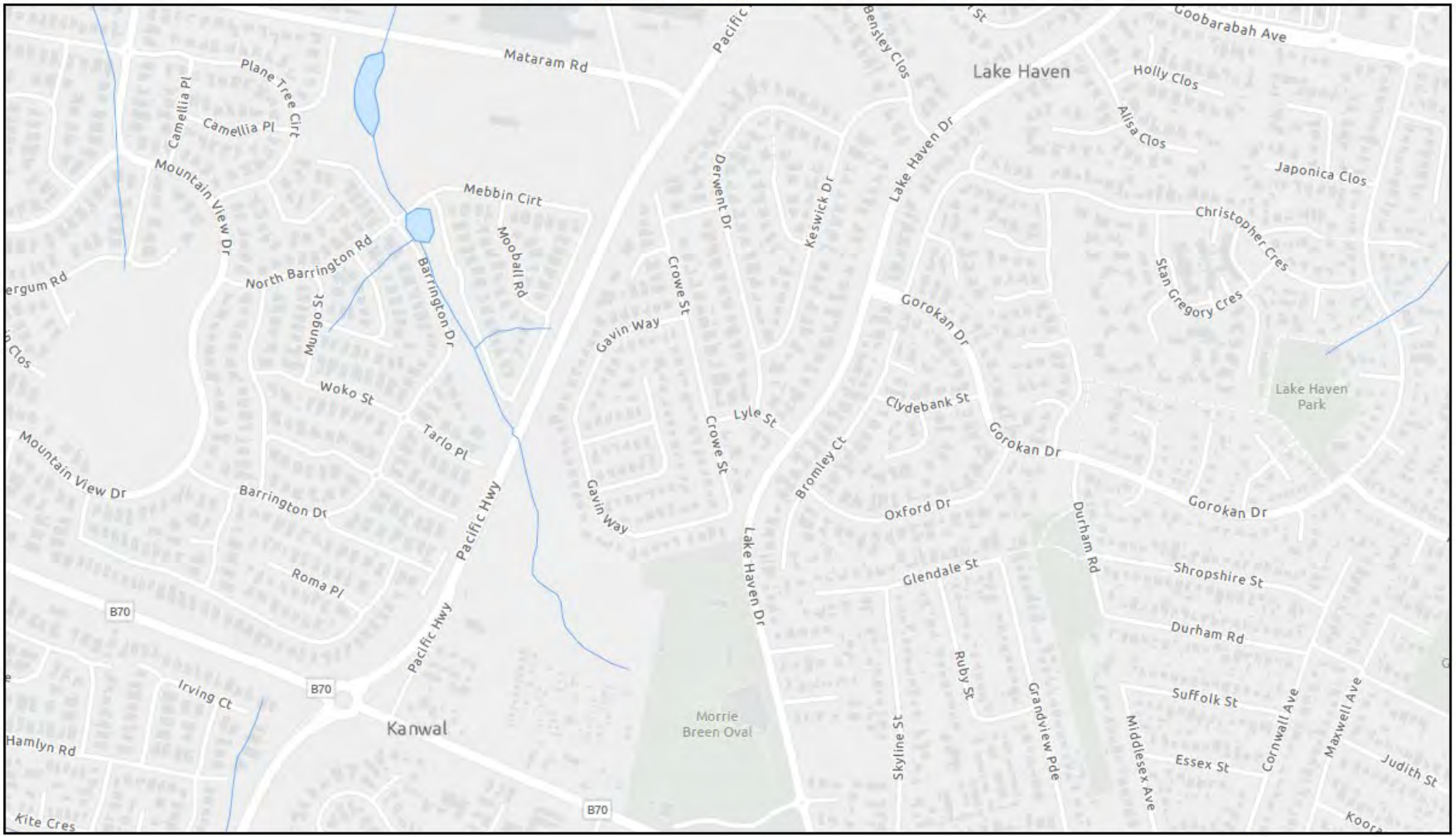
NSW Government (2018) *Determining Stream Order Fact Sheet*; https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/172091/Determining-Strahler-stream-order-fact-sheet.pdf accessed August 2023.

NSW Government (2021) *Water Management (General) Regulation 2018 Hydroline spatial data*, https://trade.maps.arcgis.com/apps/webappviewer/index.html?id=07b967fd0bdc4b0099fc5be45b6d1392 last accessed August 2023.

New South Wales Office of Water (2012) Controlled activities on waterfront land - Guidelines for riparian corridors on waterfront land. Department of Primary Industries.

Appendix A – NRAR Hydroline Spatial Data

2018 Hydroline spatial data 1.0



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0 0.05 0.1 0.2 mi

0 0.1 0.2 0.4 km

Esri Community Maps Contributors, Geoscape, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS

Water Management (General) Regulation

NSW Department of Industry | Lands and Water | Water

Appendix J – SBDAR Checklist

BAM Reference	Information	SBDAR Section	Completed
Report			
Introduction - Chapters 2 and 3	Introduction to the biodiversity assessment including: • brief description of proposed development • identification of subject land boundary, including: operational footprint and construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure • general description of the subject land	**1.1**	✓
	Sources of information used in the assessment, including reports and spatial data	**1.1.5**	✓
	Identification of assessment method applied (i.e. linear or site-based)	**1.1.2**	✓
Landscape - Section 3.1, 3.2 and Appendix E	General description of subject land topographic and hydrological setting, geology and soils	**1.2.2**	✓
	Percent native vegetation cover in the assessment area (as described in BAM Subsection 3.2(4.)	**1.3.1**	✓
	IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	**1.2.1**	✓
	Rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3–4.) and Appendix E)	**1.2.2**	✓
	Wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(4.))	**N/A**	
	Connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	**1.2.2**	✓
	Areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(10.)	**1.2.2**	✓
Native vegetation, TECs and vegetation integrity - Chapter 4	Patch size (in accordance with BAM Subsection 4.3.2)	**1.3.1**	✓
	Identification of the dominant PCT on the subject land and extent (ha) with justification of method used (existing information or plot-based survey data)	**1.5.3**	✓
	Identification of any TEC associated with the PCT (BAM Subsection 4.2.2)	**1.5.7**	✓
	Estimate of percent cleared value of dominant PCT (BAM Subsection 4.2.1(5.)	**1.5.3**	✓
	Identification of any TEC on site that is not associated with the dominant PCT (Note: This TEC is required to be assessed and offset.)	**1.5.7**	✓
	Equivalence with mapping units of previous vegetation maps reviewed as part of the assessment (i.e. equivalent mapping units)	**1.5.1**	✓

BAM Reference	Information	SBDAR Section	Completed
	Vegetation integrity of the PCT(s) on the subject land as individual vegetation zones	**1.5.5** **1.5.6**	✓
	Justification for how this was determined (i.e. qualitatively by observing values for the condition attributes set out in Table 2 of the BAM or quantitatively by collecting field data for the condition attributes at a plot in accordance with BAM Subsection 4.3.4)	**1.5.3**	✓
	Use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsections 4.3.3(5.)) Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A): • identify the PCT or vegetation class for which local benchmark data will be applied • identify published sources of local benchmark data (if benchmarks obtained from published sources) • describe methods of local benchmark data collection (if reference plots used to determine local benchmark data) • provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	**1.5.3**	✓
Chapter 5 and Section 9.1	Describe the review of existing information and any field survey undertaken to assess habitat constraints and microhabitats for threatened species within the subject land	**1.6**	✓
	Determination of the suite of threatened species likely to occur on or use the proposed site according to Steps 1 and 2 in BAM Section 5.2 including species to be assessed for ecosystem credits and the list of species to be assessed for species credits	**1.6.1** **1.6.2**	✓
	List of ecosystem credit species derived from the TBDC (as described in BAM Subsections 5.2.1 and 5.2.2) with justification for the exclusion of any ecosystem credit species based on habitat constraints (as described in BAM Subsection 5.2.2)	**1.6.1**	✓
	Identification of candidate species credit species that are at risk of an SAII and therefore, must be further assessed (BAM Section 9.1). Note: Candidate species credit species that are not at risk of an SAII and not incidentally recorded on the subject land do not require further assessment.	**1.6.2**	✓
	For candidate species credit species that are at risk of an SAII, a description of the species, any habitat constraints or microhabitats associated with the species on the subject land and information used to create the species polygon/s in accordance with Steps 3 to 5 of BAM Section 5.2 including: • justification for determining that a candidate species credit species at risk of an SAII is unlikely to have suitable habitat on the subject land or specific vegetation zone (based on a field assessment of the subject land and published literature or an expert report prepared in accordance with Box 3 of the BAM)	**1.6.2**	✓

BAM Reference	Information	SBDAR Section	Completed
	• determination of the presence of remaining candidate species credit species at risk of an SAII (by assuming presence, conducting a threatened species survey or an expert report). Note: If the subject land is mapped on an important habitat map for a species, or for a component of its habitat, the subject land is considered to have suitable habitat for the species to be present. • species polygons identifying the location and area of suitable habitat for each candidate threatened species at risk of an SAII that is recorded on the subject land and is measured by area, OR • species polygons identifying the area of suitable habitat and targeted surveys identifying the count and location of individuals on the subject land for each candidate threatened flora species at risk of an SAII that is recorded on the subject land and is measured by count • species polygons for each threatened species identified on the subject land that is not at risk of an SAII (i.e. incidentally observed during site visit)		
	Determination of habitat condition within species polygon/s for each threatened species (measured by area) at risk of an SAII or incidentally observed during the site visit (Step 6 of BAM Section 5.2)	**1.6.5**	✓
	For flora species credit species at risk of an SAII or incidentally observed during site visit, provide a count, or an estimation, of the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(4.))	**N/A**	
Prescribed impacts Chapter 6	Any prescribed impacts from the small area proposal must be set out in the BDAR consistent with Appendix K	**N/A**	✓
Avoid and minimise impacts – Chapter 7	Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: • modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology • alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location • alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	**N/A**	✓

BAM Reference	Information	SBDAR Section	Completed
	Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Subsections 7.1.2 and 7.2.2	**N/A**	✓
	Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.)	**N/A**	✓
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	Determine the impacts on native vegetation and threatened species habitat, including: • description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Sections 8.1) • description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal (as described in BAM Subsection 8.2	**N/A**	✓
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Subsections 8.4.1 and 8.4.2, including (as described in BAM Subsection 8.4.1(2.): • techniques, timing, frequency and responsibility • identify measures for which there is risk of failure • evaluate the risk and consequence of any residual impacts • document any adaptive management strategy proposed	**N/A**	✓
	Identification of measures for mitigating impacts related to: • displacement of resident fauna (as described in BAM Subsection 8.4.1) • indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)) • mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	**N/A**	✓
	Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	**N/A**	
Thresholds for assessing and offsetting the impacts of the proposal - Chapter 9	Information from the TBDC and/or other sources to report on the current status of threatened species, threatened populations at risk of an SAII and TEC/s for the proposal, and	**2.5**	✓
	Report on impacts of the proposal on TEC/s in accordance with BAM Subsection 9.2.1	**2.5**	✓
	Report on impacts of the proposal on threatened species and/or threatened populations at risk of an SAII in accordance with BAM Section 9.1	**2.5**	✓
	Identification of impacts requiring offset in accordance with BAM Section 9.2	**2.5**	✓
	Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	**2.5**	✓
	Identification of areas not requiring assessment in accordance with BAM Section 9.3	**2.5**	✓
Applying the no	Description of the impact on PCTs/TECs	**2.5**	✓

BAM Reference	Information	SBDAR Section	Completed
net loss standard - Chapter 10	Description of the impact on threatened species at risk of an SAII or incidentally observed via site visit	**2.5**	✓
	Number of ecosystem credits required for impacts on biodiversity values according to BAM Subsection 9	**Table 17**	✓
	Number of species credits required for impacts on biodiversity values according to BAM Subsection 10.1.3, including any species credit species that has been incidentally observed on the subject land Note: Species credits for any species at risk of an SAII are calculated in the event that the decision-maker forms the opinion that the proposed impact is unlikely to be serious and irreversible and therefore can be offset.	**Table 18**	✓
	Identification of credit class for ecosystem credits and species credits according to BAM Section 10.2 (this can be generated from BAM-C)	**Table 17** **Table 18**	✓
Maps			
Introduction - Chapters 2 and 3	Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR)	**Appendix A**	✓
Landscape - Section 3.1, 3.2 and Appendix E	Site Map • boundary of subject land • cadastre of subject land • landscape features identified in BAM Subsection 3.1.3 • areas of outstanding biodiversity value within the subject land	**Figure 1**	✓
	Location Map - digital aerial photography at 1:1,000 scale or finer • boundary of subject land • 1500 m buffer area *or* 500 m buffer for linear development • landscape features identified in BAM Subsection 3.1.3 • additional detail (e.g. local government area boundaries) relevant at this scale • areas of outstanding biodiversity value within the assessment area	**Figure 2**	✓
	Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or • IBRA bioregions and subregions • rivers, streams and estuaries • wetlands and important wetlands • connectivity of different areas of habitat	**Figure 2**	✓

BAM Reference	Information	SBDAR Section	Completed
	• areas of geological significance and soil hazard features		
Native vegetation, TECs and vegetation integrity - Chapter 4	Map of native vegetation extent for the subject land (as described in BAM Section 3.1)	**Figure 4**	✓
	Map of PCT/vegetation zones within the subject land (as described in BAM Section 4.2(1.)	**Figure 4**	✓
	Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	**Figure 4**	✓
	Map of TEC distribution on the subject land	**Figure 4**	✓
	Patch size of native vegetation (as described in BAM Subsection 4.3.2)	**Figure 2**	✓
Chapter 5 and Section 9.1	Map of species credit species records within the subject land and species polygons for flora and fauna species at risk of an SAII or incidentally observed during the site visit (as described in BAM Subsection 5.2.5(1–7.))	**Figures 6 – 7**	✓
Prescribed impacts Chapter 6	If relevant, maps showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, humanmade structures, etc.)	**N/A**	
Avoid and minimise impacts – Chapter 7	Map of final proposal footprint, including construction and operation	**Appendix A**	✓
	Maps demonstrating indirect impact zones where applicable	**N/A**	
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	No Maps		
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	No Maps		
Thresholds for assessing and offsetting the impacts of the proposal - Chapter 9	Map showing the extent of TECs at risk of an SAII within the subject land	**N/A**	
	Map showing the location of threatened species at risk of an SAII within the subject land	**Figure 9**	✓
	Map showing location of: • impacts requiring offset • impacts not requiring offset • areas not requiring assessment	**Figure 8** **Figure 9**	✓
Applying the no net loss standard - Chapter 10	No Maps		

BAM Reference	Information	SBDAR Section	Completed
Tables			
Native vegetation, TECs and vegetation integrity - Chapter 4	Table of current vegetation integrity scores for vegetation zone within the site including: • composition condition score • structure condition score • function condition score	**Table 9**	✓
	Report from BAM-C (Small area module) including vegetation integrity scores (BAM Section 4.4)	**Appendix F**	✓
Chapter 5 and Section 9.1	Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and: • identifying any ecosystem credit species removed from the list of species on the basis of further assessment in accordance with BAM Subsections 5.2.2 and 5.2.3 • identifying the sensitivity to gain class of each species (BAM Section 5.4)	**Table 10**	✓
	Table detailing species credit species within the subject land at risk of an SAII (BAM Section 9.1) or incidentally observed during the site visit including any associated habitat feature/components and its abundance (flora)/extent of habitat (flora and fauna) and biodiversity risk weighting (BAM Sections 5.2–5.4)	**Table 11**	✓
Prescribed impacts Chapter 6	No tables	**N/A**	✓
Avoid and minimise impacts – Chapter 7	Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	**N/A**	✓
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	**N/A**	✓
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	**N/A**	✓

BAM Reference	Information	SBDAR Section	Completed
Thresholds for assessing and offsetting the impacts of the proposal - Chapter 9	No Tables		
Applying the no net loss standard - Chapter 10	Table showing biodiversity risk weightings	**Tables 17 and 18**	✓
	Table of BC Act listing status for PCTs and threatened species requiring offset	**Tables 5 and 6**	✓
	Table of PCTs requiring offset and number of ecosystem credits required (Subsection 10.2.1)	**Table 17**	✓
	Table of species at risk of an SAII or incidentally observed on site assessed for species credits and the number of credits required	**Table 18**	✓
	BAM-C credit report	**Appendix F**	✓
Data			
Landscape - Section 3.1, 3.2 and Appendix E	All report maps as separate jpeg files / Individual digital shape files of: • subject land boundary • assessment area (i.e. buffer area) boundary • cadastral boundary of subject land • areas of native vegetation cover • areas of habitat connectivity	**Attached Files**	✓
Native vegetation, TECs and vegetation integrity - Chapter 4	All report maps as separate jpeg files • Plot field data (MS Excel format) • Digital shape files for all maps and spatial data • Field data sheets (if relevant) for determining vegetation integrity (BAM Subsection 4.3.4)		✓
Chapter 5 and Section 9.1	Digital shape files of species polygons • Species polygon map in jpeg format • Expert reports and any supporting data used to support conclusions of the expert report • Field data sheets (if relevant) for threatened species surveys		✓

BAM Reference	Information	SBDAR Section	Completed
Prescribed impacts Chapter 6	• If relevant, digital shape files of prescribed impact feature locations • Prescribed impact features map in jpeg format		✓
Avoid and minimise impacts – Chapter 7	Digital shape files of: • final proposal footprint • direct and indirect impact zones • Maps in jpeg format		✓
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	No data.		✓
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	No Data		✓
Thresholds for assessing and offsetting the impacts of the proposal - Chapter 9	Digital shape files of: extent of TECs at risk of an SAII within the subject land • threatened species at risk of an SAII within the subject land • boundary of impacts requiring offset • boundary of impacts not requiring offset • boundary of areas not requiring assessment Maps in jpeg format		✓
Applying the no net loss standard - Chapter 10	No Data		✓

Appendix K – CVs

Ian Benson

Curriculum Vitae

Ian works with AEP in the role of Director and Principal Ecologist. He is an experienced field ecologist, bird watcher and a regular participant in wader surveys. Ian has previously had a successful career as a project manager with a local geotechnical engineering firm. His background in project management and soil sciences combined with his ecological knowledge is utilised in a diverse array of applications in his current role.

Qualifications

- Graduate Diploma in Science (Ecology) University of New England (2014)
- Bachelor Engineering (Civil) University of Newcastle (2008)

Further Education & Training

- Biodiversity Accredited Assessor System (BAAS 18147)
- Advanced Plant Identification (University of New South Wales)
- NSW Class C Driver's Licence. Experienced 4WD operator
- Occupational Health & Safety Training
- Remoted Piloted Aircraft Excluded Category Training with Aviassist Pty Ltd
- Rail Industry Worker
- ARTC Safety Induction for Contractors (NSW)
- ARTC Hunter Bulk Terminal Induction

Fields of Competence

- Biobanking & Biodiversity Offset Commissions – initial scoping and feasibility, BAM impact assessments and BDAR reporting, biobank calculations, Stewardship site creation
- Detailed knowledge of environmental legislation and approval pathways
- Ecological field survey and habitat assessment covering terrestrial and aquatic flora and fauna. Experienced in camera trap methods particularly targeting cryptic and difficult to identify mammal species.
- Highly proficient at avifauna surveys, including challenging wetland and shorebird environs
- High level of experience undertaking nocturnal survey of arboreal mammals and nocturnal birds
- Project Management

Relevant Employment History

2022 – Present — **Director & Principal Ecologist**
Anderson Environment & Planning, Newcastle

Ian is a Director of Anderson Environment & Planning whilst continuing in the role of Principal Ecologist overseeing a team of approx. 35 professional ecology staff and all aspects of the business including training and management of field and office staff undertaking ecology and bushfire works to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

2019 – 2022 — **Principal Ecologist**
Anderson Environment & Planning, Newcastle

2018-2019 — **Senior Ecologist**
Anderson Environment & Planning, Newcastle

2016-2018 — **Ecologist**
Anderson Environment & Planning Newcastle

2012 – 2016 — **Project Manager**
Douglas Partners, Newcastle

As a project manager with Douglas Partners Ian was responsible for proposal and tender preparation, planning, implementation and reporting of geotechnical and geo-environmental investigations for a broad range of projects including site classification, foundations, pavements, bridges and slope stability. Ian was required to liaise with clients regarding project requirements, project goals and deadlines. He was responsible for the development and implementation of Work Health and Safety Plans as well as Environmental Plans and documentation. This included the development of safe work procedures, safety inspections on site and implementing improved safety procedures with staff. Ian was responsible for ensuring projects were completed on time and on budget whilst meeting the clients' expectations and achieving quality assurance standards.

2008-2012 — **Geotechnical Engineer**
Douglas Partners, Newcastle

2013-Current — **Bird Surveyor**
Hunter Bird Observers Club

Volunteer survey work for Hunter Bird Observers Club for regular wader and water bird counts and Tomago and Kooragang Island.

2017-Current — **Birddata Moderator**
BirdLife Australia

Volunteer moderating and vetting bird surveys from Birdata which is the Birdlife Australia Atlas to ensure a robust database for both the Hunter Valley and Central Coast reporting areas totalling approximately 5000 surveys per year.

Key Project Experience

- Targeted surveys for *Dichanthium setosum* in Glen Innes Region;
- Target surveys for Eucalyptus cannonii, Western Rail Coal Unloader, Pipers Flat;
- White-bellied Sea-Eagle nest locating and monitoring Glenning Valley and Chisholm;
- Powerful Owl nest locating and monitoring: Salamander Bay, Soldiers Point, Anna Bay North, Wallsend, Cameron Park and Edgeworth;
- Accredited Assessor for approved Biodiversity Development Assessment Reports:
    - Berkeley Vale Road, Glenning Valley;
    - Railway Road, Warnervale;
    - Barden Ridge Townhouses;
    - McFarlane's Road, Chisholm;
    - Fairlands Road, Medowie;
    - Rosella Rise, Warnervale;
    - Carr's Road, Neath;
    - Jack Grant Avenue, Warnervale;
    - Minnesota Road, Hamlyn Terrace;
    - Bellbird North;
    - Waterford, Chisholm;
- Ecological Assessment Report for Proposed Modification To Approved Western Rail Coal Unloader At Pipers Flat;
- Spot Analysis Techniques surveys: Nelsons Plains, Wallsend, Anna Bay, Boat Harbour, Salamander Bay, North Arm Cove, Warnervale, Hamlyn Terrace, Kincumber, Palmdale, Wyee, Charlestown, Chisholm, Gillieston Heights, Mount Vincent, Radford Park, Cessnock
- Infrastructure;
    - Gwandalan Recycled Water Main;
    - Lower Belford Water Main;
    - Raymond Terrace Rising Main;
    - Astra Street Landfill Rehabilitation Assessment;
- Cat Tracker Pilot Program Associated With The Hunter Estuary Wetlands for Hunter Local Land Services;
- Surveys for Squirrel Glider (*Petaurus norfolcensis*) Warnervale Area June 2020

Edouard Loisance

Curriculum Vitae

Edouard works with AEP in the role of Ecologist. He completed a Diploma of Conservation and Land Management and holds a Master in Management. He has extensive experience in business development and corporate strategy consulting, including report writing, and started specialising in ecology in 2018, after acquiring experience in bush regeneration and fauna observation. He is now working towards gaining BAM Accreditation.

Qualifications

- Diploma of Conservation and Land Management, Tocal Agricultural College, Paterson, NSW (2021)
- Master of Management, ESCP Europe Business School, Paris, France (2007)

Further Education & Training

- NSW Driver's Licence.
- Current Senior First Aid.

Fields of Competence

- Field assessment including: targeted fauna and flora surveys, BAM plots, Koala Spot Assessment Technique (SAT) surveys and tree surveys
- Assessment of sites using the Biodiversity Assessment Method (BAM) under the Biodiversity Offsets Scheme, production of Biodiversity Development Assessment Reports and Ecological Assessment Reports
- Production of assessments against various legal instruments such as EPBC Act fauna and flora assessments, comprehensive Koala plans of management and SEPP 44 and SEPP Koala Habitat Protection assessments
- Bushfire threat analysis and reporting
- Advanced GIS user (MapInfo)

Relevant Employment History

2018 – Present	**Lead Ecology Works Manager** Anderson Environment & Planning, Newcastle
2014 - 2018	**Lead Consultant** Quantium, Sydney
2012 - 2014	**Account Director** Catalina Marketing, Leeds UK
2011 – 2012	**Business Development Director** Catalina Marketing, Paris France
2009 - 2011	**Account Executive** Procter and Gamble, Paris France

2005 - 2006 **Assistant Business Manager**
Procter and Gamble, Weybridge UK

Volunteer Experience

- Bush Regeneration Volunteer, Hunter Wetlands Centre Australia, Shortland
- Bush Regeneration Volunteer, National Parks and Wildlife Service jointly with Blue Mountains City Council (various sites in Wentworth Falls and Blackheath, NSW)

Natalie Black

Curriculum Vitae

Natalie works with AEP in the role of Senior Environmental Manager. She has extensive knowledge in environmental management, environmental planning, and report writing and assessment. With a detail understanding of planning, catchment management, coastal management and rehabilitation. Natalie has had a successful career with both state and local government in conservation, planning and field investigation roles. Natalie has also gained extensive communication skills and project management through her previous career in lecturing. Her background and experience in the ecological and planning fields is utilised in a diverse array of application in her current role.

Qualifications

- B.Sc (Hons), University of Newcastle, 2002 Sustainable Resource Management and Marine Science.
- Master Planning, University of Technology Sydney 2007.
- Certificate IV Training and Assessment at NSW TAFE 2012.
- BAM Assessor; accreditation number: BAAS19076.

Further Education & Training

- Evidence Gathering and Legal Process (Australian Institute of Environmental Health).
- Conflict Resolution Course (LGSA).
- Report Writing Course (LGSA).
- Powerful Presentation (LGSA).
- NSW Rural Fire Services Bush Fire Assessment
- Relocation of Threatened Species (Botanical Gardens Sydney).
- Sustainable Home Assessment Reduction Revolution.
- Flora and Fauna Survey Assessments Niche Environment and Heritage.
- First Aid TAFE.

Fields of Competence

- Environmental Planning
- Environmental Management and rehabilitation of catchments coastal waterways. Statement of Environmental Effects (preparation and assessing).
- Fish Passage
- Marine ecosystems including; mangroves, seagrasses, algae, Fauna and habitat assessment.
- vegetation.
- Communicating with a wide range of stakeholders.
- Development Application.
- Education in both Environmental and Planning industries.
- Koala Plans of Management.
- Policy Development.

Relevant Employment History

2019 – Present	**Senior Environmental Manager**
	Anderson Environment & Planning, Newcastle
2010 - 2019	**Principal Environmental Planner**
	Black Earth
2003-2010	**Natural Resource Manager and**
	Development Assessment Officer
	Lismore City
2002- 2003	**Jervis Bay Indigenous Fishing Strategy**

WARWICK MUIR

Curriculum Vitae

Warwick works with AEP in the role of Senior Ecologist and Arborist. Whilst studying at the University of Newcastle, he conducted ecological field studies as a requirement of his degree courses, gaining experience in the field. He has also undertaken volunteering for higher-level students in field reporting to assist in completion of their studies.

Qualifications

- Bachelor of Science (Biology), University of Newcastle (2019)
- Diploma of Arboriculture (AQF5) (2021)

Further Education & Training

- First Aid Certificate
- Class C NSW Drivers Licence
- Construction White Card
- Level 1 Tree Access Systems certified.

Key Experience and Competencies (Arborist)

Warwick is experienced and competent in providing a number of arboricultural services, including but not limited to;

- Tree Field Data Collection using Tree Visual Assessment methodology including species name, common name, Structure and Health condition, SULE, TPZ, SRZ, Landscape Significance, Retention Value and general notes as required for small and large - scale projects;
- Tree stock and planting inspections for ecological rehabilitation works;
- Construction supervision, certification and long-term Tree monitoring;
- Preparation of Arboricultural Impact Assessment(s) and Tree Protection Plans as per AS4970:2009 for small and large – scale projects including but not limited to;
    - Subdivisions and associated civil works;
    - Services installations;
    - Roads and associated civil works;
    - Bushfire Asset Protection Zones (APZs); and
    - Single Lot Developments.
- Tree Hazard assessments using ISA hazard assessment methodology;
- Tree pruning specifications as per AS 4373 Pruning Amenity Trees, management and maintenance programs; and
- Tree root mapping.

Relevant Employment History

Feb 2020 – Current **Ecologist/ Arborist (AQF5)**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, legal and government sectors. Covering arboricultural, ecological, project management, environmental, planning services, advices, strategy and representation.

Volunteer Experience

- Bush Regeneration Volunteer, Newcastle Landcare
- Field data collection for environmental Honours and PHD candidates in various locations.

Ecological Field Experience

University

- Riparian vegetation study, including vegetation species and cover surveys, vegetation zone classification and biobanking assessment methods to assessment methods to assess for proposed restoration works.
- Avifauna survey and observation to complete an independently hypothesised animal behaviour investigation in situ.
- Forest and woodland investigations, including vegetation species and cover surveys, habitat appraisal and leaf litter invertebrate observation.
- Macro-bat spotlighting, flight, roost and forage habitat surveys to develop a suggested management strategy for the studied species.

Chris Wark

Curriculum Vitae

Chris works as an Ecologist with AEP. He has been involved in ecology for the past 15 years both in the UK and Australia undertaking a diverse range of terrestrial fauna surveys. While in the UK Chris focused on microbat survey and call identification and herpetological survey, capture and translocation. He has used the experience gained in the UK and undergone further training in Australia and now undertakes AEPs bat call analysis and identification works among his other roles within the company.

Qualifications

- Diploma of Conservation and Land Management (2017)
- Bachelor of Teaching (Secondary School), University of Technology, NSW (2008)
- Bachelor of Science Hons (Ecology and Zoology), University of Sydney (2004)
- Bachelor of Science (Cell Biology and Biochemistry), University of Newcastle (2000)

Further Education & Training

- Microbat Call Analysis Workshop
- QLD WHS General Construction Induction (White Card)
- NSW Class C Driver's Licence
- Experienced 4wd operator
- GIS Mapping and training courses (ArcGiS, QGiS and Mapinfo)

Fields of Competence

- Fauna survey and identification utilising camera traps and audio technology
- Microbat survey, call analysis and ID
- GIS mapping and analysis
- Land conservation management
- Ecological field survey, covering terrestrial flora and fauna
- Arid zone ecology and feral cat management

Field Survey Experience

- Fauna survey including bird and reptile survey, spotlighting, koala habitat and SAT assessment, microbat emergence and return surveys along with transect surveys;
- Trapping and translocation works with mammals, reptiles and amphibians;
- Camera trapping, acoustic detection and call playback surveys;
- Vegetation quadrats and transects to identify flora species presence and abundance;
- Targeted vegetation transects for cryptic species;
- Brush-tailed Rock-wallaby habitat survey and macropod scat identification;
- Audio lure surveys including track and carnivore scat identification.

Relevant Employment History

2018 – Present	**Senior Ecologist** Anderson Environment & Planning, Newcastle
2013 - 2017	**Ecologist** Applied Ecology Ltd, Cambridge UK
2012	**Laboratory and Field Technician** Cygnet Potato Breeders, Cambridge UK
2009 – 2011	**Secondary School Science Teacher** Taylors College, Waterloo Sydney
2005 – 2007	**Research Assistant and University Tutor** Biological Sciences, University of Syney

Frances O'Brien

Curriculum Vitae

Frances is a Senior Ecologist and Lead Botanist with Anderson Environment and Planning, being an Accredited Assessor with over 12 years-experience in environmental impact assessment, environmental education, conservation land management, bush regeneration, wildlife rescue and rehabilitation, environmental sustainability, and environmental law.

Qualifications

- Biodiversity Accredited Assessor Scheme no. 20013
- Master of Environmental Law (University of Sydney NSW)
- Graduate Diploma of Legal Practice (Australian National University ACT)
- Bachelor of Environment (Climate Science) with Bachelor of Laws (Macquarie University NSW)

Further Education & Training

- NSW Driver's Licence.
- First Aid in Remote Situations (HLTAID005)
- General Construction Induction Card (White Card)
- Advanced Plant Identification (University of New South Wales NSW)

Fields of Competence

- Biodiversity Assessment Method application
- Plant identification
- PCT determination
- Environmental legislation interpretation
- GIS

Relevant Employment History

2021 – Present	**Senior Ecologist / Lead Botanist** Anderson Environment & Planning, Newcastle
2021	**Senior Scientist – Ecology** Ecology Team, Sustainability, Ecology and Climate Change Division, SMEC, Newcastle
2018 - 2021	**Senior Ecologist** Anderson Environment & Planning, Newcastle
2014 - 2017	**Environmental Officer** Projects Team, Seventh-day Adventist Aged Care, Greater Sydney, Wahroonga

Professional Affiliations / Memberships

- Ecological Consultants Association of NSW member
- Australian Plants Society NSW member
- Hunter Intrepid Landcare – Group Coordinator
- Wahroonga Waterways Landcare - Group Coordinator for three years (past)
- Lane Cove National Park Bushcare volunteer (past)
- Ku-ring-gai Municipal Council Bushcare volunteer (past)

Darcy Kilvert

Curriculum Vitae

Darcy works with AEP in the role of Senior Ecologist / Project Lead, with a wide range of Skills including Botany, Report Writing, Project Management and GIS. He graduated with a Bachelor of Science majoring in Biology. Darcy has worked as a Bush Regenerator for over 5 years and undertaken numerous volunteering projects in the environmental sector. These experiences have given him experience in flora & fauna identification, surveying, reporting, mapping, and ecological restoration.

Qualifications

- Bachelor of Science (Biology), The University of Newcastle, completed in September 2021

Further Education & Training

- Class C NSW Driver's Licence
- NSW Construction White Card
- Working at Heights
- Chemcert and EPA ground applicator licence
- Apply First Aid

Fields of Competence

- Flora & fauna surveying both terrestrial and aquatic
- Botanical Surveys including BAM plots and threatened flora identification.
- Plant Community Type Identification
- GIS including QGIS & MapInfo
- Remote working, Adept experience in operating 4x4 vehicles
- Report Writing
- Environmental legislation.

Relevant Employment History

2021 – Present — **Ecologist**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

2018 - 2021 — **Senior Field Supervisor**
Traditional Aussie Gardens, Newcastle

2015 - 2017 — **Field Worker**
Newcastle City Council, Newcastle

Alana Guest

Curriculum Vitae

Alana works with AEP in the role of Ecologist. She graduated with a Bachelor of Science majoring in Biology and a Bachelor of Arts, majoring in History and minoring in Ancient History. She has worked in various roles unrelated to the science field over the past 5 years. Alana has worked at AEP since October 2022, and in addition to this has, experience in a variety of environmental work, from her university degree in, flora and fauna field surveys, reporting, and data management.

Qualifications

- Bachelor of Science, Biology major and Bachelor of Arts, History major and Ancient History minor – University of Newcastle (2022)

Further Education & Training

- Class C NSW Driver's Licence
- First Aid and CPR

Fields of Competence

- Field assessment including: targeted fauna and flora surveying, Koala Spot Assessment Technique (SAT) surveys, targeted fauna trapping
- High proficiency in written and verbal communication skills
- Gaining skill in botanical surveys
- Growing proficiency in Biodiversity Development Assessment report and Ecological Assessment report writing
- Data management and the use of Excel and Word

Relevant Employment History

2022 – Present **Ecologist**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation. Expanding knowledge of field survey methodology, report writing, mapping and data manipulation

- Biodiversity Stewardship Agreements including:
    - • Bobs Farm (approved);
    - • Cedar Brush Creek (ready for signing);
    - • Girvan (final assessment);
    - • Mardi (under assessment);
    - • Wallsend (report being drafted);
    - • Ellalong (report being drafted);
    - • Blueys Beach (surveys continuing);
    - • South-West Rocks (surveys continuing).

Jeremy Burrill

Curriculum Vitae

Jeremy works with AEP in the role of Ecologist. He is a graduate of environmental science and management, and has experience in voluntary roles in environmental fields, involving fauna and flora surveying, consultancy projects and natural resource management. His background in environmental fields with his growing ecological knowledge is utilised in a diverse array of applications in his current role.

Qualifications

- Bachelor of Environmental Science (Environmental Management and Sustainability) Deakin University (2020)

Further Education & Training

- Apply First Aid
- Victorian Driver's License
- Work Health & Safety General Construction Induction
- Work Safely at Heights

Fields of Competence

- Ecological field surveys
- Fauna surveys and trapping
- Natural resource management

Relevant Employment History

2020 – Present **Ecologist**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, legal and government sectors. Covering ecological, project management, environmental, bushfire, planning services, advices, strategy and representation.

Volunteer Experience

- Overseas University Volunteer Placement (New Zealand, 2018)
- Industry Placement (Parks Victoria, 2019)

Kelly Drysdale

Curriculum Vitae

Kelly works with AEP in the role of Ecology Project Manager. She has extensive experience in various land management operations in several regions, with both small and large enterprises, in Australia and internationally. Her strong environmental stewardship knowledge, lateral thinking, project and change management, business development, strategic planning and human resource management skills are adding value to the AEP team.

Qualifications

- Certificate IV in Training and Assessment TAE40110, TAFE Hunter Institute, NSW 2016
- Graduate Certificate in Business Administration (with honours), Newcastle University, Newcastle, NSW 2013
- Associate Diploma of Applied Science (VITICULTURE), Charles Sturt University, Wagga Wagga, NSW 1992

Further Education & Training

- Australian Rural Leadership Foundation Program, Fellow 2011
- Class C NSW Drivers Licence Class, Defensive Driving, FL & experienced 4WD operator
- First Aid Certificate inc CPR 2021
- SafeWork NSW Construction White Card CGI1713214SEQ01
- Farm Chemical User Accreditation Certificate III (ChemCert Australia)
- Negotiation skills (Rogen International), Crucial conversations (ME Consulting)
- Media Training (Doyle Media Services)
- Various WHS management training, legislation and compliance courses, EEO, cultural competency and diversity in the workplace
- Workplace Trainer and Workplace Assessor
- Open Water PADI Dive Certificate

Fields of Competence

- Field assessment including: targeted fauna and flora surveys, BAM plots, Koala Spot Assessment Technique (SAT) surveys, tree surveys, HBT and nest box inspections.
- Assessment of sites using the Biodiversity Assessment Method (BAM) under the Biodiversity Offsets Scheme, production of Biodiversity Development Assessment Reports and Ecological Assessment Reports
- Production of assessments against various legal instruments such as EPBC Act fauna and flora assessments, State Environmental Planning Policy Biodiversity and Conservation) 2021 – Chapter 4 Koala Habitat Protection 2021, State Environmental Planning Policy (Resilience and Hazards) 2021 – Chapter 2 Coastal Management, Water Management Act 2000 and the Environment Protection and Biodiversity Conservation Act 1999
- Bushfire threat analysis and reporting
- Liaison with clients/site/company/government representatives

Relevant Employment History

Feb 2021- Current **Ecology Project Manager**- Anderson Environment & Planning, Newcastle, NSW

Assisting in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

Aug 2019 - July 2021 **Business Development Manager** - RLF

Business development and strategic targeting of corporate and larger enterprises leveraging a vast network of contacts in the Australian Wine Industry and Agricultural sector to add value to farming systems with agronomic and fertiliser solutions.

Jul 2015 - Aug 2019 **Viticultural & Trade Resource Manager**- Hope Estate, Pokolbin, NSW

Operational and strategic management of five estate owned vineyards in NSW, WA & VIC. CRM & BDM of wine and beer portfolio of on/off premise sales on >1,800 customer base with PR responsibilities and hosting of events.

Jul 2017 - Aug 2019 **Casual teacher in Viticulture & Wine** - Kurri Kurri Tafe NSW

Revising, formulating and developing resources for and delivering all units of competency in the AHC51516 Diploma of Viticulture and strengthening relationships within the Hunter wine region.

Jul 2014 – July 2015 **Sales Acquisition Agent** – Wine Selectors & Choice, NSW

Wine appraisals, wine sales, developing staff training manuals, exceeding sales targets.

Jan 2004 - May 2010 **Viticultural Manager** – Casella Family Brands, Yenda NSW

Primarily responsible for the effective and efficient viticultural, land management operations and programs reporting to the company directors on 1,800ha with up to 160 staff. Primarily viticulture but also managed a large prune/plum orchard, broad acre cropping-dry and pivot, cattle, biodiversity tree planting program, compost making, winery waste water treatment plant and traded water.

June 2002 - Jan 2004 **Viticulturist** - Brown Brothers**,** Milawa VIC

Grower liaison for 84 growers and 5 diverse company owned vineyards; strategic plan development, asset assessments and evaluations.

June 2001 - June 2002 **One-year overseas travel - study/work tour**

Studied wine and agricultural markets in Asia and London, travelled through Italy, Switzerland and Spain's wine regions and worked vintage periods in Portugal, France and mostly in South Africa- Flagstone Wines, Cape Town, sourcing fruit from 48 vineyards across the Western Cape.

May 2000 - June 2001 **Viticultural Projects Manager** – Nepenthe**,** Adelaide Hills

Viticultural consultancy, contract management, development and management of investment projects, costing systems, reporting and management protocols.

Jan 1998 - May 2000 **General Manager –** Pertaringa Wines, McLaren Vale, SA

Strategic operational and financial planning for company land portfolio and brand development, including contract management for clients and winery liaison with 15 customer wineries.

Dec 1992 - Jan 1998 **Viticulturist** –Southcorp Wines, SA

Grower Liaison in McLaren Vale, Technical Officer in Barossa/Clare/Adelaide Hills and Riverland, Greenfield Vineyard Development in Barooga and Robe, and Vine Propagation Manager for the group successively.

1993 - Vintages **Cellar hand** - Murphy-Goode Estate Winery- Alexander Valley, California USA and Willamette Valley Vineyards- Willamette Valley, Oregon USA and CSUR, Wagga Wagga, NSW

Samuel V. Rayfield

Curriculum Vitae

Samuel works with AEP in the role of Ecologist. He graduated with a Bachelor of Communication and is working towards completion of a Diploma in Conservation and Ecosystems Management. Samuel has previously worked in ecological restoration and land management before coming to AEP. Samuel has experience in a variety of environmental work, both paid and unpaid, including flora and fauna terrestrial and aquatic field surveys, weed management, reporting, GIS and mapping and habitat restoration. His background in ecological surveying projects and growing flora knowledge and experience is utilised in a diverse array of applications in his current role.

Qualifications

- Working at Heights Certificate
- First Aid & CPR Cert – HLTAID003
- Driver Licence – Class C, unrestricted
- National Police Check
- Working with Children Check

Further Education & Training

2020	**Introduction to Anatomy & Physiology; Individual Determinants of Health** Latrobe University
2017	**Diploma in Conservation and Land Management** Hunter TAFE – partial completion
2012 –2016	**Bachelor of Communication** University of Newcastle

Relevant Employment History

2022 – Present	**Ecologist** Anderson Environment and Planning, Newcastle
2020	**Bush Regenerator** Litoria Ecological Restoration Services
2018 – 2020	**Bush Regenerator** Toolijooa Environmental Restoration
2016 – 2017	**Bush Regenerator** Newcastle City Council

Stephen Curry

Curriculum Vitae

Stephen Currently works as an Ecologist for AEP. He has completed a Certificate III and Diploma in Conservation and Land Management at Hunter TAFE and is currently studying a Bachelor of Environmental Science and Management at The University of Newcastle. Stephen has worked as a Bush Regenerator for over four years and maintains an additional role Supervising Bushcare Volunteers for Central Coast Council. These experiences have enabled Stephen to develop skills in native fauna and flora identification and surveys, ecological restoration and report writing.

Qualifications

- Bachelor of Environmental Science & Management (Ecosystems and Biodiversity Major), University of Newcastle, Expected Completion 2023
- Diploma of Conservation and Land Management, Hunter TAFE, 2018
- Certificate III in Conservation and Land Management, Hunter TAFE, 2017
- Bachelor of Education Studies, University of Newcastle, 2016

Further Education and Training

- NSW Driver's Licence - Class C
- QLD Construction White Card
- Apply First Aid
- AQF3 Chemical Accreditation

Fields of Competence

- Flora and Fauna terrestrial surveys
- Developing proficiency in botanical surveying and Biodiversity Assessment Method

Relevant Employment History

2022 – Present **Ecologist**

Anderson Environment and Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, legal and government sectors. Covering ecological, project management, environmental, bushfire, planning services, advices, strategy and representation. Expanding knowledge of field survey methodology, report writing and data manipulation.

2022 – Present **Bushcare Volunteer Supervisor**

Central Coast Council, Gosford

2018 – 2022 **Bush Regenerator**

Community Environment Network, Ourimbah

Appendix L – Council Request For Information

Comments from Environment

To	Ryan Lennox
From	Jed Field| Ecologist
Date	13-Apr-2023
DA Number	DA/3997/2022
Proposed	Extension of Existing Caravan Park (Oasis Caratel) Nominated Integrated & Integrated - Approval is also sought from the Department of Planning - Water (NRAR)- under the Water Management Act 2000, the NSW Rural Fire Service - Under the Rural Fires Act 1997 & the Mine Subsidence Board - Under the Coal Mine Subsidence Act 2017
Property	Oasis Caravan Park, 207-209 Wallarah Road, KANWAL NSW 2259
Site Inspection	Yes (by de Witt Ecology)
Site Inspection Date	27/03/2023
Recommendation	Insufficient Information

Comments

The SBDAR and development plans were reviewed by de Witt Ecology on behalf of Council's Ecologist (refer to D15628479 for technical review report). Council's Ecologist has reviewed the technical report by de Witt Ecology. An RFI is provided below to clarify threatened species survey effort.

Insufficient Information

The following information is to be provided before further assessment:

- In accordance with BAM section 5.2 and pre-DA advice, provide further justification for exclusion for the following threatened species:
  - *Genoplesium branwhiteorum* (previously known as Corunastylis sp. Charmhaven) – targeted surveys should be completed or further justification on why the site is unsuitable for the species (degraded habitat is known to support the species)
  - Variable Midge Orchid (*Genoplesium insigne*) – targeted surveys should be completed or further justification on why the site is unsuitable for the species (degraded habitat is known to support the species)

- Confirm if sufficient field surveys were completed to determine presence of Charmhaven Apple (*Angophora inopina*) and Wyong Paperbark (*Melaleuca biconvexa*).

Appendix M – AEP Response to Council Request For Information

ECOLOGY | OFFSETS | BUSHFIRE | ARBORICULTURE

AEP Ref: **2642**

Date: **4 August 2023**

To: **Vivacity Property**

Attention: **Tom Copping**

Via Email: **tom@vivacityproperty.com.au**

Dear Tom,

RE: **Response to request for information from Central Coast Council**
207-209 Wallarah Road, Kanwal, NSW

As requested, Anderson Environment & Planning (AEP) herewith provide this response to the request for information from Central Coast Council dated 13 April 2023 and entitled "Comments From Environment".

AEP have reviewed the queries from Central Coast Council and offer the following itemised response:

Item 1: *In accordance with BAM section 5.2 and pre-DA advice, provide further justification for exclusion for the following threatened species:*

- *Genoplesium branwhiteorum (previously known as Corunastylis sp. Charmhaven) – targeted surveys should be completed or further justification on why the site is unsuitable for the species (degraded habitat is known to support the species)*
- *Variable Midge Orchid (Genoplesium insigne) – targeted surveys should be completed or further justification on why the site is unsuitable for the species (degraded habitat is known to support the species)*

AEP Response:

The Biodiversity Development Assessment Report (BDAR) was lodged prior to completion of seasonal survey for *Corunastylis* sp. Charmhaven. Surveys were undertaken in compliance with the recommended survey period and methods. An addendum letter was issued specifically for *Corunastylis* sp. Charmhaven (see **Attachment A**).

Regarding *Genoplesium insigne,* it was initially considered that the habitat was too degraded to be suitable for the species. However, despite this assessment a conservative approach was taken and surveys were undertaken, but not documented in the report, as follows:

- 26/08/2022 – 1 staff – parallel transects across the site;
- 21/09/2022 – 1 staff – parallel transects across the site.

The above surveys confirmed that the species does not occur on site.

Item 2: *Confirm if sufficient field surveys were completed to determine presence of Charmhaven Apple (Angophora inopina) and Wyong Paperbark (Melaleuca biconvexa).*

AEP Response:

It is to be noted that both species are not required to be surveyed under the BAM, as they are not prescribed as candidate threatened species in the BAM-C for this project and are not candidates for potential Serious and Irreversible Impacts. Furthermore, a tree survey was undertaken to inform the Arborist Report. The tree survey did not identify the above species on site. See **Attachment B** for reference.

We trust this information meets your requirements. Should you require any further details or clarification, please contact the writer.

Kind regards,

Edouard Loisance

Lead Ecology Works Manager

0422 791 947

Anderson Environment & Planning

Attachments:

A – SBDAR addendum letter for *Corunastylis* sp. Charmhaven survey

B – Arborist Report (AEP, 2022)

ECOLOGY | OFFSETS | BUSHFIRE | ARBORICULTURE

AEP Ref: **2642**

Date: **29 March 2023**

To: **Vivacity Property**

Attention: **Tom Copping**

Via Email: **tom@vivacityproperty.com.au**

Dear Tom,

RE: **Survey for *Corunastylis* sp. Charmhaven**
207-209 Wallarah Road, Kanwal, NSW

As requested, Anderson Environment & Planning (AEP) herewith provide this addendum to the Streamlined Biodiversity Development Assessment Report dated 17 November 2022.

AEP wishes to advise the proponent that three (3) targeted surveys for *Corunastylis* sp. Charmhaven were undertaken at the above site within the recommended seasonal survey period, on 20 December 2022, 8 March 2023 and 27 March 2023. Surveys concluded that the species does not occur on site and as such, will not be impacted by the proposed development.

Correspondence from Council indicated that the reference population was flowering in low numbers on 27 February 2023. AEP recorded *Corunastylis* sp. Charmhaven at another site within the Central Coast on 8 March 2023.

The extent of each survey is depicted in **Figure 1**.

We trust this information meets your requirements. Should you require any further details or clarification, please do contact the writer.

Kind regards,

Edouard Loisance

Lead Ecology Works Manager

0422 791 947

Anderson Environment & Planning

Attachments:

- Figure A – *Corunastylis* sp. Charmhaven survey effort

AEP

Figure A: Corunastylis sp. Charmhaven survey — Date: Mar 2023

Location: 207-209 Wallarah Road, Kanwal, NSW

Client: Vivacity Property — AEP Ref: 2642

ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arborist Report

207-209 Wallarah Road, Kanwal NSW

Prepared for: **Vivacity Property**

4 November 2022

AEP Ref: **2642**

Revision: **01**

P 0420 624 707 E INFO@ANDERSONEP.COM.AU
10 DARVALL ST CARRINGTON NSW 2294 ABN 57 659 651 537

Document Control

Document Name	Arborist Report 207-209 Wallarah Road, Kanwal, NSW
Project Number	2642
Client Name	Vivacity Property
AEP Project Team	Warwick Muir Lucy Knutson Thomas Stephens Jeremy Burrill

Revision

Revision	Date	Author	Reviewed	Approved
00	05/07/2022	Warwick Muir	Lucy Knutson	Warwick Muir
01	4/11/2022	Jeremy Burrill	Warwick Muir	Warwick Muir

Distribution

Revision	Date	Name	Organisation
00	05/07/2022	Tom Copping	Vivacity Property
01	4/11/2022	Tom Copping	Vivacity Property

Disclaimer

Direct observations are relevant only to the trees identified within this report. This report utilizes a rapid assessment of tree health and condition to inform retention value. This assessment of tree health and condition is based on non-destructive visual observations from ground level. Thus, it is not possible to identify all structural faults at high levels in the tree, internal structural faults or within the root system. Observations about Tree Health, Structure, SULE and other characteristics have been made at the time of assessment and these characteristics may change over time due to natural growth of the tree as a living organism or due to unforeseen events. As such the observations that are supplied within are relevant for a period of 12 months from the time of assessment, after which re-assessment may be required for the trees assessed within this report. The recommendations and methodologies for Tree Protection within this report are relevant only to the Trees assessed within this report. The author is not responsible for tree damage related to failure to apply these recommendations or methodologies for Tree Protection in full within this report or for tree damage relating to works conducted by an unaffiliated person. No responsibility for damage to persons or property is accepted for damage by trees referred to within this report.

Contents

Tables

Figures

Appendices

1.0 Introduction

1.1 Background

At the request of Vivacity Property (the client), Anderson Environment & Planning (AEP) have prepared an Arborist Impact Assessment Report to address the potential Arboricultural impacts from a proposed caravan park expansion and associated civil infrastructure. The report assesses the impact of the proposal at 207-209 Wallarah Road, Kanwal, NSW.

1.2 Objectives

Further to the above the following objectives for this report have been assigned:

- Tree identification plan and schedule identifying tree species, size, canopy spread and the like**;**
- Assessment of trees within close proximity to the proposal footprint including, but not limited to, the health and vigour of the trees, structural integrity, life expectancy, retention value and landscape significance;
- Likely impact the proposed development will have on trees to be retained including TPZ and SRZ encroachments; and
- Tree protection plan and methodologies throughout the development for all impacted trees to be retained.

2.0 Site Description and Locality

Table 1 provide the site details for the Subject Site.

Table 1: Site Particulars

Detail	Comments
Client	Vivacity Property
Address	207-209 Wallarah Road, Kanwal, NSW
Title(s)	Lot 1223 DP 100417, Lots 14 and 15 DP 23235
Study Area	Consists of the entirety of Lot 1223 DP 1004170 and Lots 14 and 15 DP 23235. The Study Area consists of Oasis Caravan Park that will be modified as part of the development. Within the caravan park includes onsite permanent accommodation, site office, swimming pool and bathroom facilities. The Study Area totals 5.06ha of which, the area is predominately infrastructure relevant to the caravan park and areas of vegetation connected to the adjacent allotment of the north. (Refer to **Figure 1**).
Subject Site	The Subject Site Area totals approx. 1.90ha, comprising approx. 1.80ha of exotic / cleared / existing infrastructure and 0.08ha of native vegetation. An access road to the current caravan park is located to the east of the Subject Site.
LGA	Central Coast Council.
Zoning	Under the Wyong Local Environment Plan 2013 (the LEP pub.18-11-2015), the Study Area is zoned • R1 – General Residential.
Current Land Use	The site currently contains onsite permanent accommodation, site office, swimming pool and bathroom facilities. 179 trees located on site were assessed.

Detail	Comments
Surrounding Land Use	To the north of the site occurs native vegetation while land to the west contains low-density residential properties. Land to the south of the Subject Site is Wallarah Road with a small shopping village and a residential area beyond. To the east of the Subject Site is multiple sporting ovals, car parks and Wyong Leagues Club. Further to the east is residential houses.
Soil	The location landscape is described as occurring on broad poorly deltaic floodplains and alluvial flats of Quaternary sediments on the Central Coast Lowlands. The soil profile includes brownish black loam to silty clay loam within the topsoil, and a brownish silty to heavy clay within the subsoil. Qualities and limitations include permanent waterlogging, stream bank erosion hazard and mine subsidence district. Runoff is considered moderate and minimal salting is evident.

3.0 Proposed Development

The proposed includes construction of a caravan park expansion and associated civil works within 207-209 Wallarah Road, Kanwal. The Civil Works include a stormwater basin and extensive soil cut and fill within the development footprint.

A 30m Asset Protection Zone (APZ) from the northern boundary is proposed for the site, to comply with the guidelines within *Planning for Bushfire Protection* 2019.

Figure 1 depicts the location of the site and **Figure 2** shows a concept plan for the proposed development.

AEP

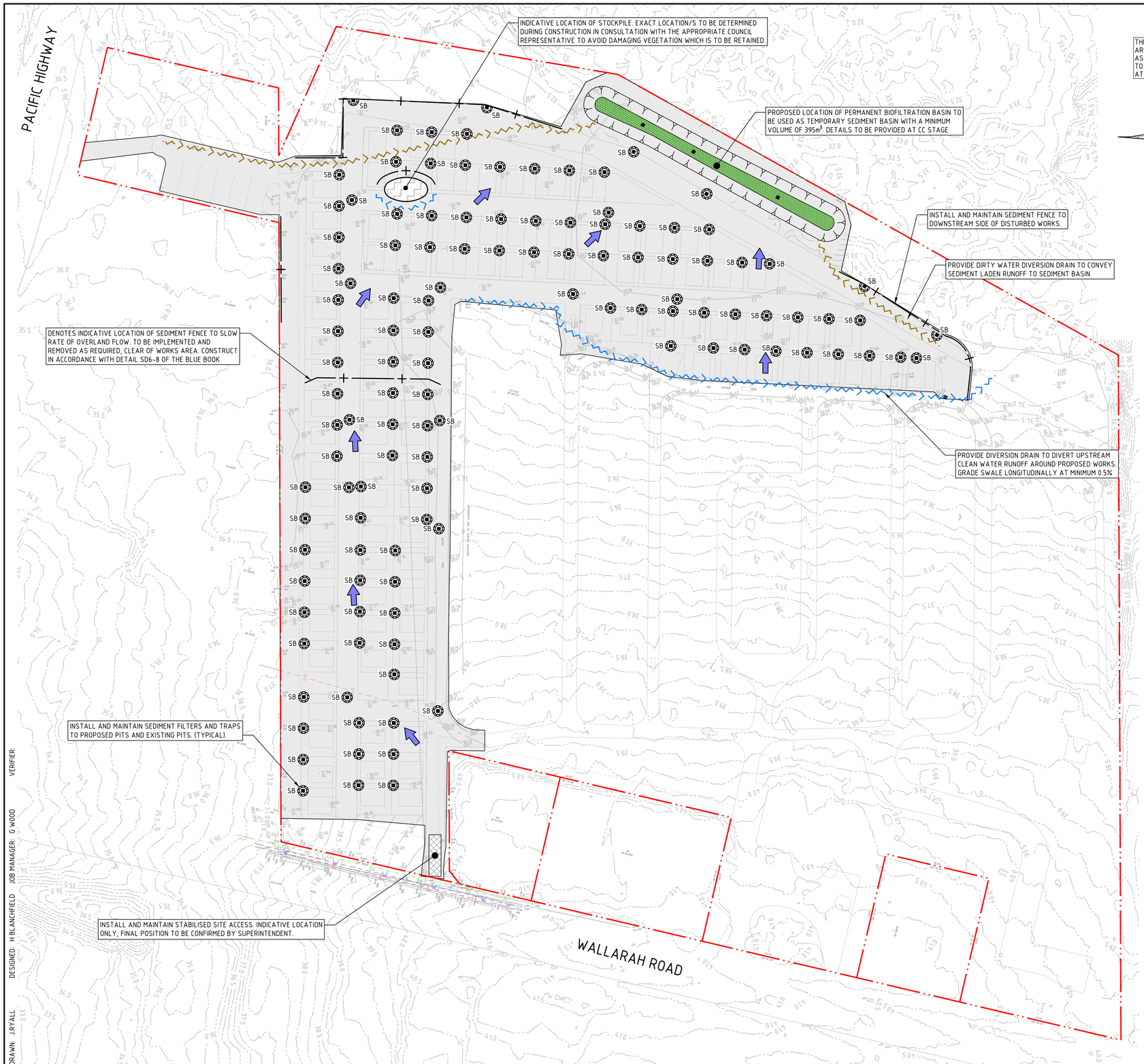
Title: Figure 1 - Site Location

Date: June 2022

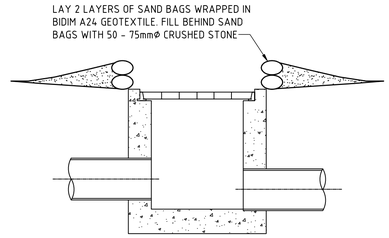
Location: 207-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP ref: 2642



THE CONTRACTOR SHALL ENSURE COUNCIL ASSETS AND THE UTILITIES ARE PROTECTED AT ALL TIMES. ANY AND ALL DAMAGES TO COUNCIL ASSETS AND/OR UTILITIES SHALL BE REPAIRED BY THE CONTRACTOR TO THE SPECIFICATION OF COUNCIL AND THE UTILITIES AUTHORITY AND AT NO COST TO THE PRINCIPAL OR NORTHROP CONSULTING ENGINEERS.



PIT PROTECTION DETAIL
(ALTERNATIVE DETAIL SD6-11 OR SD6-12 OF THE BLUE BOOK AS APPROPRIATE)

INSTALL PIT PROTECTION TO ALL NEW & EXISTING STORMWATER PITS.

LEGEND

- DENOTES PROPOSED SITE BOUNDARY LINE
- DENOTES PROPOSED AREA OF DISTURBANCE
- DENOTES PROPOSED SEDIMENT FENCE. DETAILS TO BE PROVIDED AT CC STAGE
- SB — DENOTES PROPOSED SANDBAG SEDIMENT FILTER. REFER TO ADJACENT DETAIL FOR MORE INFORMATION
- DENOTES PROPOSED OVERLAND FLOW PATH
- DENOTES PROPOSED DIVERSION DRAIN (CLEAN). DETAILS TO BE PROVIDED AT CC STAGE
- DENOTES PROPOSED DIVERSION DRAIN (DIRTY). DETAILS TO BE PROVIDED AT CC STAGE
- DENOTES PROPOSED STABILISED SITE ACCESS. DETAILS TO BE PROVIDED AT CC STAGE
- DENOTES PROPOSED STOCKPILES. DETAILS TO BE PROVIDED AT CC STAGE
- DENOTES PROPOSED SEDIMENT BASIN. DETAILS TO BE PROVIDED AT CC STAGE
- 34.30 — DENOTES EXISTING SPOT HEIGHTS
- 35.00 — DENOTES EXISTING CONTOURS (0.25m INTERVALS)

SEDIMENT BASIN SIZING CALCULATION

THE SITE IS LOCATED WITHIN THE GOROKAN SOIL LANDSCAPE WHICH HAS THE FOLLOWING PROPERTIES (IN ACCORDANCE WITH TABLE C17 OF THE "BLUE BOOK"):

SITE PARAMETERS	
CONSTRAINT	VALUE
SEDIMENT TYPE	D (DISPERSIBLE SOILS)
SOIL HYDROLOGY GROUP	C
K = SOIL ERODIBILITY (K-FACTOR)	0.05
R = RAINFALL EROSIVITY (R-FACTOR)	2380
S = 2 YEAR, 6 HOUR STORM INTENSITY	10.4mm/hr
LS = SLOPE LENGTH/GRADIENT	1.70 (250m SLOPE @ 5% GRADE)
P = EROSION CONTROL PRACTICE (P-FACTOR)	1.3 (TYPICAL)
C = GROUND COVER (C-FACTOR)	1.0 (TYPICAL FOR STRIPPED SITE)
SOIL LOSS (RUSLE METHOD) (tonnes/ha/yr)	263
EROSION HAZARD (TABLE 4.2 BLUE BOOK)	LOW-MODERATE

SEDIMENT BASIN SIZING (TYPE C/D SOILS)		
CONSTRAINT	VALUE	UNITS
CV = VOLUMETRIC RUNOFF COEFFICIENT	0.51	
R = 5 DAY, 80TH PERCENTILE RAINFALL	33.8	mm
A = CATCHMENT AREA	1.910	ha
SETTLING ZONE VOLUME (10xCVxRxA)	329	m^3
SOIL LOSS (CALC ABOVE)	202	m^3/ha/yr
A2 = DISTURBED CATCHMENT AREA	1.910	ha
SEDIMENT STORAGE VOLUME (0.17xSOIL LOSSxA2)	66	m^3
TOTAL BASIN VOLUME REQUIRED	395	m^3

NOTES

1. ALL EROSION AND SEDIMENTATION CONTROL MEASURES MUST BE APPROPRIATE FOR THE SEDIMENT TYPE(S) OF THE SOILS ON-SITE, IN ACCORDANCE WITH THE 'BLUE BOOK' (MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION. LANDCOM, 2004), OR OTHER CURRENT RECOGNISED INDUSTRY STANDARDS FOR EROSION AND SEDIMENT CONTROL FOR AUSTRALIAN CONDITIONS. THIS INCLUDES SEDIMENT TRAPS AND LINING OF CHANNELS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION AND SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS AND SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ALL MAINTENANCE, CLEANING AND BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
3. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
4. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
5. INSTALL SEDIMENT FENCING, OR OTHER SEDIMENT CONTROL DEVICES, AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT OR APPROPRIATE COUNCIL OFFICER.
6. ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
7. THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB AND GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION.
8. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ON-SITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
9. STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE SPREAD ON-SITE AS DIRECTED BY THE SUPERINTENDENT OR REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
10. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
11. ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
12. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
13. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.

NOT FOR CONSTRUCTION

DESIGNED: H BLANCHFIELD
DRAWN: JRYALL
JOB MANAGER: G WOOD
VERIFIER:

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR REVIEW	JR		GW	27.09.22

CLIENT: Vivacity

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: SDA SPACE·DESIGN·ARCHITECTURE

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:600@ A1 — 0 6 12 18 24 30m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: OASIS CARATEL CARAVAN PARK CIVIL ENGINEERING PACKAGE
207 - 209 WALLARAH ROAD, KANWAL NSW 2259

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
CONCEPT EROSION AND SEDIMENT CONTROL PLAN

JOB NUMBER: NL221828
DRAWING NUMBER: DA-C02.01
REVISION: 1
DRAWING SHEET SIZE = A1

Date : 27.09.2022 5:44 PM Plotted By : JAMES RYALL Found : \\ne-ncfp1\job_files1\year 2022\jobs\nl221828 -oasis caratel caravan park\c - drawings\CIVIL\03-CAD\DA\NL221828-DA-C02.01 SEDIMENT PLAN.dwg

4.0 Methodology

The site inspection was undertaken on the 21st June, 1st, 2nd and 10th August 2022. Each tree observed within the site was assigned a unique tree number (refer **Figures 3-5**). Tree 6 is an exemption as its located within close proximity on a footpath outside of the site. Tree species were identified based on guidance from regional identification guides (Fairley and Moore 1989, Robinson 2003), and descriptions and records provided by the Royal Botanic Gardens (Plantnet 2022).

4.1 Visual Tree Assessment

A visual tree assessment to evaluate the health and condition of these trees in relation to the impacts of the proposed development was undertaken from ground level following the methodology described by Mattheck and Breloer (1994). Tree height was estimated following the guidance outlined in the Private Native Forestry Code of Practice (DECC 2007) and confirmed with a laser range finder. The Diameter at Breast Height (DBH) and Diameter Above Buttress (DAB) was determined using a DBH tape and methods of calculation for the Structural Root Zone (SRZ) and Tree Protection Zone (TPZ) applied as outlined in Australian Standard 4970-2009 *Protection of trees on development Sites* (AS 4970 – 2009) (Standards Australia 2009). Tree Total Canopy Area was estimated from the formula Pi x (average canopy spread)^2.

4.2 SULE

The SULE method (Safe Useful Life Expectancy) estimates the suitability of the tree in the urban landscape based on the species and age of the subject tree (Barrell 1996). The following ranges have been allocated to each assessed tree:

- Greater than 40 years (Long);
- Between 15 and 40 years (Medium);
- Between 5 and 15 years (Short);
- Dead, dying, suppressed, defective or damaged (Remove); and
- Less than 5m in height or 15 years of age (Young or small tree).

A full explanation of SULE methodology is included in **Appendix B**.

4.3 Tree Retention Value

To determine Tree Retention Value a Landscape Significance Rating (LSR) was assigned to each tree. The LSR value provides consideration of the tree's amenity, environmental and heritage values (refer **Appendix A**). Trees are then assigned one of the following LSR categories:

- Significant (1);
- Very High (2);
- High (3);
- Moderate (4);
- Low (5);
- Very Low (6); and
- Insignificant (7).

Once the landscape significance value has been determined the following assessment matrix that utilises estimated life expectancy and landscape significance (**Table 1**) was applied to each tree.

Table 2: Tree Retention Status Matrix Assessment matrix adopted from Morton (2006).

	Landscape significance rating						
Estimated Life Expectancy	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Greater than 40 Years							
15 to 40 Years			Moderate				
5 to 15 Years				Low			
Less than 5 Years					Very low		
Dead or Hazardous							

4.4 Limitations

This report utilises a rapid assessment of tree health and condition to inform retention value. Should a detailed assessment of tree structural health and condition be required a tree risk assessment report should be commissioned.

This assessment of tree health and condition is based on non-destructive visual observations from ground level. Thus, it is not possible to identify all structural faults at high levels in the tree, internal structural faults or within the root system. Should a detailed assessment for structural faults be required a tree risk assessment report should be commissioned.

Weather conditions such as extreme wind, storm activity, lightning as well as other events or disturbances independent of the proposed activities are unpredictable. Unforeseeable damage to trees may occur as a result of unpredictable or unplanned weather events or disturbances.

Tree identifications are based on identifying features (fruit, inflorescence, etc.) found and made at ground level from within the subject site during June and August.

The total canopy area for each tree utilised within this report is an estimation based on field observation of canopy spread and the true amount of canopy area may differ.

Tree identified within by this plan are located to GPS accuracy and there may be some minor discrepancy in the true location.

Impact assessment was based to limited concept design confined to identification of the approximate proposal footprint at the time of preparation of this report. Variation of this concept design will alter some of the recommendations and this report should be updated to reflect these changes.

5.0 Tree Assessment Results

A total of 179 trees within the site were assessed within the Subject Site. Observations were made for each assessed tree (**Appendix A).** Tree locations are shown in **Figures 3-5.**

It is noted that a further assessment has been completed for Tree 25 as it was observed to be an imminent hazard for to adjacent housing (**Appendix E**). It is a high possibility that this tree is removed by the time of DA submission. This is in accordance with exemptions for imminently hazardous trees within the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (SEPP Vegetation).

5.1 Summary of Tree Condition and Characteristics

The assessed trees were generally in Poor to Good Structural and Health Condition. Tree 25 (*Angophora costata*) had hollows and significant decay. Tree 17 *(Melaleuca nodosa)* and tree 24 *(Melaleuca nodosa)* had decay present. High amounts of pruning for adjacent powerlines have modified the natural form of Trees 5 & 6 (*Angophora costata*) to significantly affect the health of these trees.

Trees were assessed within native vegetation which was ground-truthed and identified as *PCT 1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands, PCT 1728 - Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* and *PCT 1715 - Prickly-leaved Paperbark - Flax-leaved Paperbark swamp forest on poorly drained soils of the Central Coast.* The following landscape significance ratings (LSRs) have been applied to these assessed trees;

- Eight (8) 'Very High', due to canopy size, visual prominence, good form and habitat value (hollows).
- 126 'High', due to their canopy size and good health and as representatives of the original vegetation of the area.
- Seven (7) 'Low' due to their status as exotic species or dead/dying;
- 38 'Very Low' due to their status as exotic species (*Erythrina sp.*) which are on the *Central Coast Council Undesirable Species List.*

With consideration of the LSR and estimated life expectancy for each tree, Retention Values were assigned to each tree within the site. This identified;

- Twenty- three (23) 'High' Retention values trees;
- 110 'Moderate' Retention values trees;
- 35 'Low' Retention values trees; and
- 11 'Very Low' Retention value trees.

AEP

Title: Figure 3 - Tree Locations (South)

Date: Aug 2022

Location: 207-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP ref: 2642

AEP

Title: Figure 4 - Tree Locations (North)

Date: Aug 2022

Location: 207-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP ref: 2642

AEP

Title: Figure 5 - Tree Locations (East)

Date: Aug 2022

Location: 207-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP ref: 2642

6.0 Tree Impact Assessment

6.1 Proposed Impacts

Upon review of the supplied proposal footprint, 114 trees will require removal as they are located within the proposed development footprint including the stormwater basin and civil cut and fill areas and APZ. These include:

- 18 High Retention Value Trees;
- 50 Moderate Retention Value Trees;
- 35 Low Retention Value Trees; and
- 11 Very Low Value Trees (refer to **Figures 6-9**)

Impacts are unlikely to be mitigated through tree protection measures without major design changes, and tree stability and viability cannot be guaranteed.

The removal of trees identified as *Erythrina sp.* (Coral Tree) are classified as Exempt tree works not requiring DA Approval, as these exotic species are on the *Central Coast Council Undesirable Species List.* However, appropriate evidence and due diligence should be gathered prior to removing any trees of this species.

Tree 1 (*Angophora costata*) can be retained, but has an ~5% encroachment into the TPZ by civil works. The TPZ can be offset into un-affected areas and TPZ fencing should be installed at the boundary of these civil works along with standard tree protection measures.

Of the remaining trees, A continuous TPZ fence should be installed to the south and east Trees 105, 107 and 112 (**Figure 7**) at the edge of the development footprint should be as displayed for the duration of works to prevent accidental ingress into the TPZ of these and other unassessed trees during construction.

It is to be noted that the majority of trees located along the western boundary as depicted on **Figure 6** are proposed to be retained as per the Landscape Plan (Lean, 2022). Further precision on the level of allowable cut and fill (usually approx. 10-20%) in this section of the site will be provided at construction stage.

6.2 APZ Establishment

In total 48 trees may require removal to comply with the guidelines within *Planning for Bushfire Protection 2019* for the proposed APZ. These include:

- 2 ‘High’;
- 21 ‘Moderate’,
- 17 ‘Low’; and
- 8 ‘Very Low’ Retention value trees (refer **Figure 7-9**).

These Preference should be given to the removal of trees identified as “Very Low” or “Low” retention value within the APZ, particularly exotic species (*Erythrina sp., Pinus radiata, Cinnamomum camphora*)

Retention of trees identified as ‘High’ Retention value should be prioritised within the APZ, with additional removal of these trees only conducted as necessary to comply with the guidelines for APZs within *Planning for Bushfire Protection 2019*

Tree removal and pruning within APZ should be at the direction of the Bushfire consultant for this project and undertaken by a qualified tree worker.

AEP

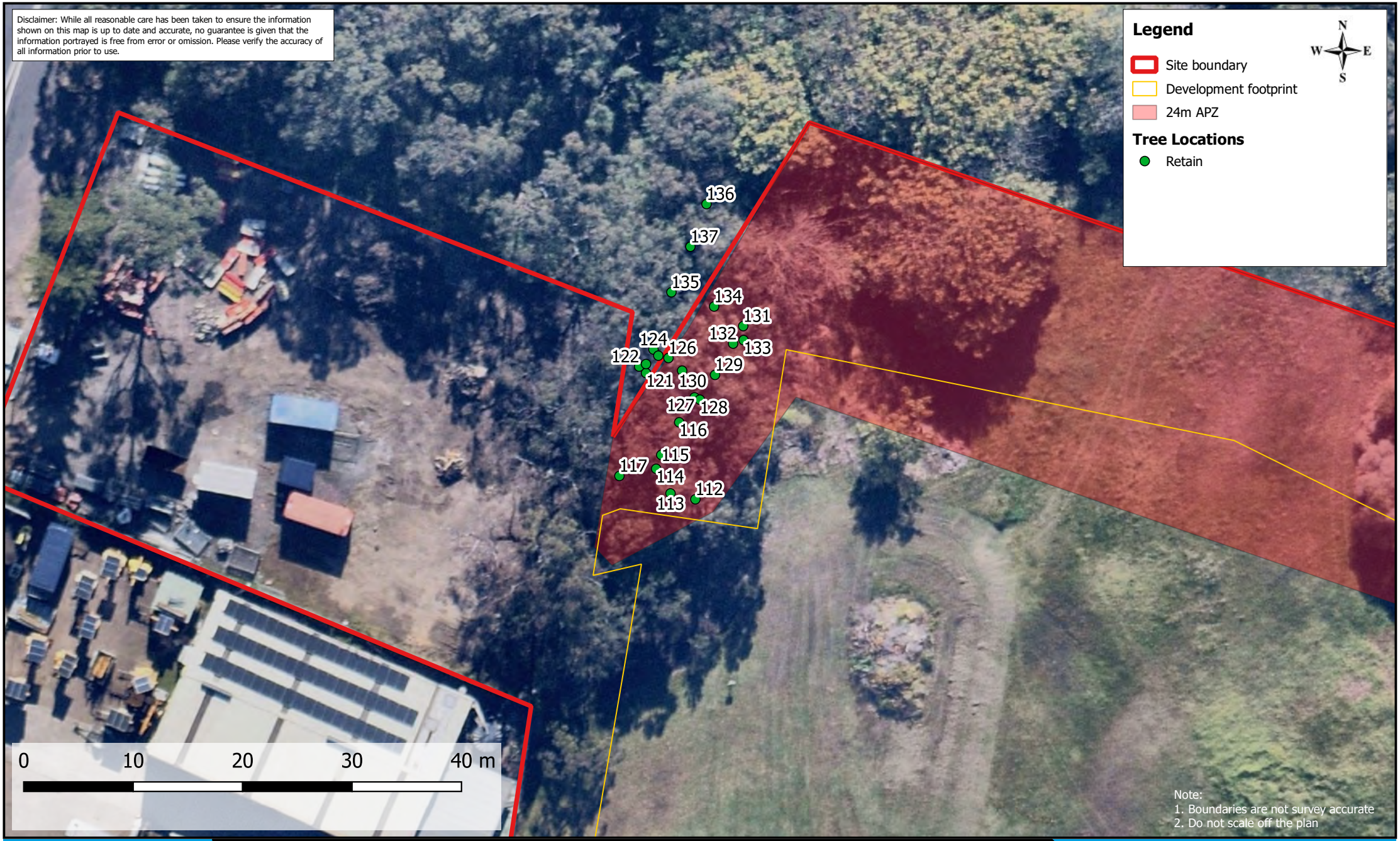
Title: Figure 6 - Tree Removal and Retain (South)

Date: Nov 2022

Location: 207-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP ref: 2642



AEP

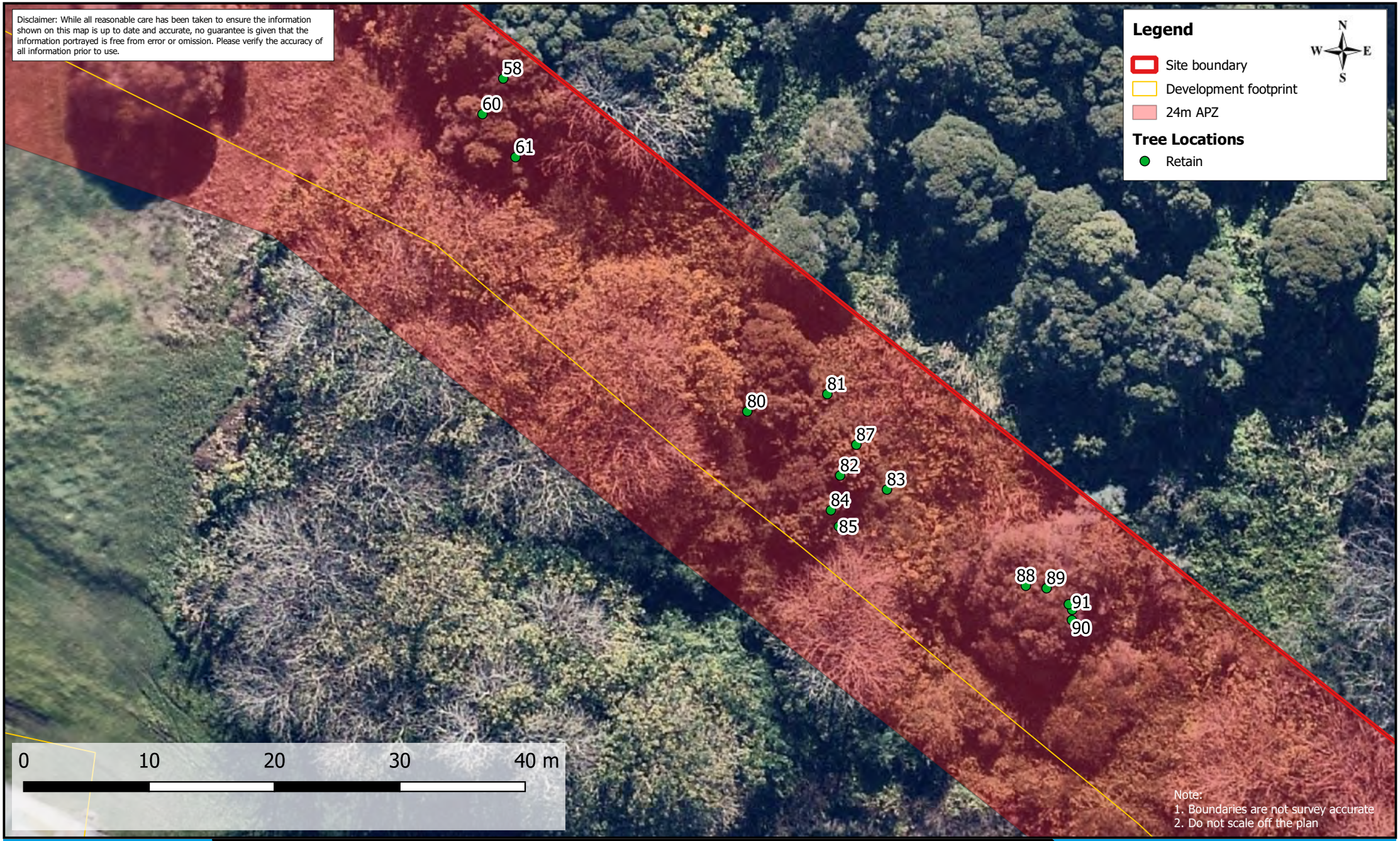
Title: Figure 7b - Tree Retantion (West)

Date: Aug 2022

Location: 207-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP ref: 2642



AEP

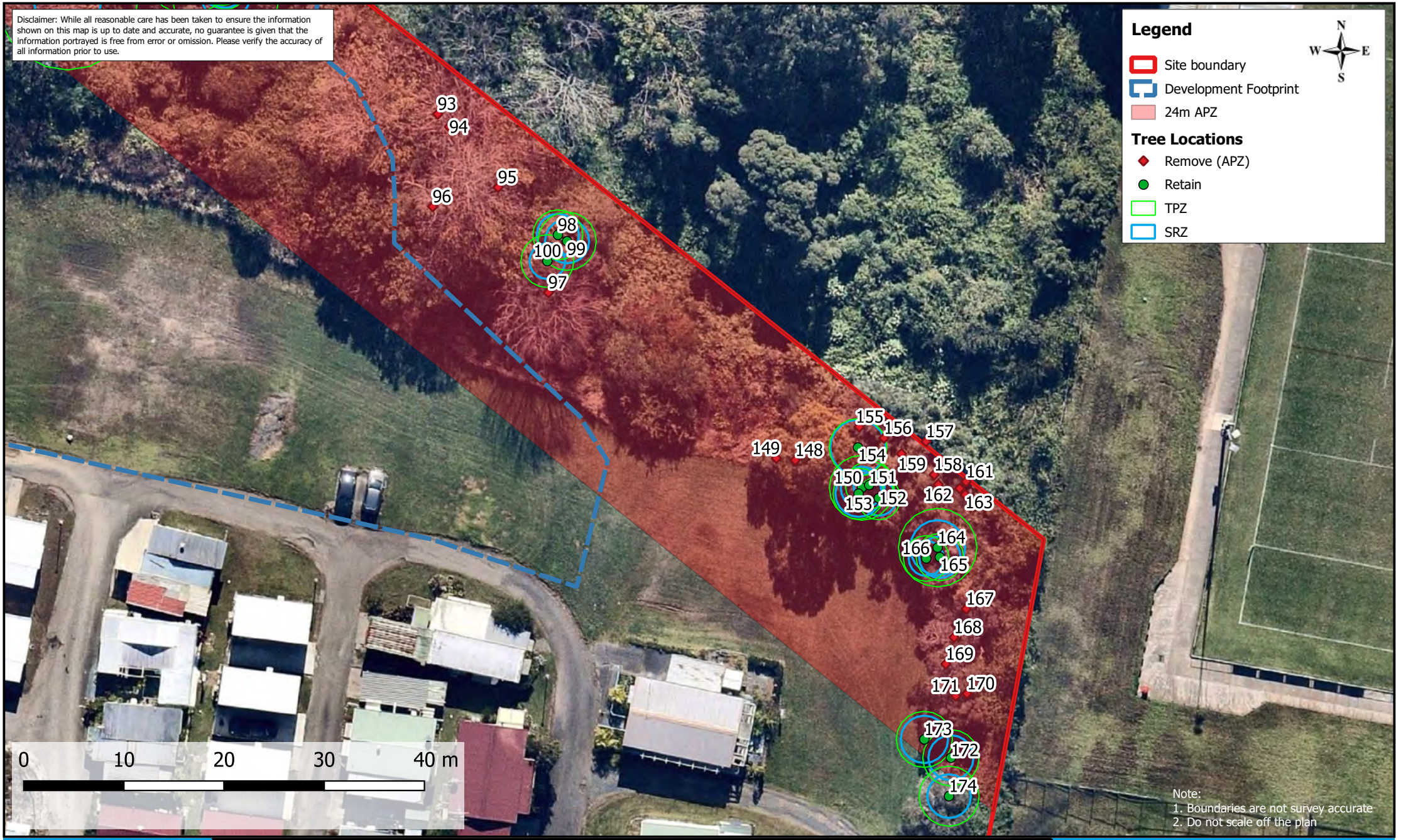
Title: Figure 8b - Tree Retention (North)

Date: Aug 2022

Location: 207-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP ref: 2642



AEP

Title: Figure 9 - Tree Retention (East)

Date: Sep 2022

Location: 207-209 Wallarah Road, Kanwal

Client: Vivacity Property

AEP ref: 2642

7.0 Recommendations

7.1 Tree Retention and Removal

- Trees designated for removal within this report as outlined in **Section 6** should be removed by a qualified tree worker with appropriate professional liability insurance, and removed in a manner to prevent damage to retained trees.
- Trees designated for retention within this report as outlined in **Section 6 in** close proximity to the development footprint should be retained with Tree Protection Measures.

7.2 Tree Protection Measures

- All tree maintenance and pruning works should be carried out by a qualified tree worker in accordance with AS4373 –2007 Pruning of Amenity Trees.
- TPZ fencing should be installed for retained trees in close proximity to the southern boundary of the proposal footprint, on the calculated TPZ radius presented in **Appendix A** for each retained tree and displayed in **Figure 6-9.** The TPZ shall be delineated by a 1.8m interlocking chain wire fence located around trees designated to be retained within close proximity to the Works, in accordance with AS 4687. **Appendix D** details tree protection fencing that should be implemented.
- TPZ fencing must be installed before the commencement of any Works. The fencing should not be removed or altered until after the completion of works.
- All Contractors working in close proximity to the TPZ of Trees to be retained should be briefed as to the requirements of the Tree Protection Zone.
- The TPZ fencing and zone should be certified by the project arborist before construction commences.
- Tree health and condition should be monitored by the project arborist at regular stages during construction, at practical completion of construction, and after completion.
- Tree tags should remain in place on retained trees until after tree removal, construction and tree pruning works have been completed.
- The following activities should be avoided within the TPZ of trees to be retained where practicable:
    - Machine excavation of soil including trenching;
    - Operation of heavy equipment;
    - Stockpiling of soils;
    - Storage of heavy or other equipment;
    - Parking of vehicles;
    - Wash down and cleaning of equipment;
    - Excavation for silt fencing;
    - Dumping of waste;
    - Change of soil level or gradient; and
    - Covering with concrete, impermeable, or compacted surfaces.
- Where works are required that encroach into TPZ of trees to be retained, additional protection measures, which include trunk and low branch guards, and ground protection measures should

be implemented following guidance in Australian standard *AS 4970 – 2009 Protection of trees on development Sites.* These works should only be conducted under supervision of the project arborist. The use of "soft" construction methods including manual and vacuum removal of soils is recommended for works conducted within the TPZ of Trees to be retained.

7.3 Other Recommendations

- Clothing, equipment and boots should be clean and sanitised prior to each site visit to prevent onsite introduction of plant pests and diseases such as Myrtle rust.
- Vehicles and construction equipment should utilise designated entry and egress points to avoid potential of impacts on Trees to be retained. Construction Access to the proposal footprint should be restricted to the southern boundary of the proposal footprint for this reason.

8.0 Conclusion

The recommendations for tree retention and removal have been made with consideration of minimising Arboricultural impacts.

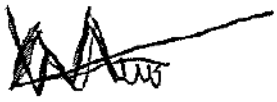
Based on the tree retention and removal proposed above, the current proposal footprint will require to the potential removal of 114 of the assessed trees, while 65 of the assessed trees can be retained within the site, including 4 tree requiring Tree Protection Measures with Tree Protection Fencing for the duration of the development works.

Please note that assessment of tree removal and retention has been made with regards to a concept plan. These recommendations may be subject to change once further design and engineering detail has been prepared and this report will require updating in accordance with these changes.

The implementation of a detailed Tree Protection Plan and Tree Protection measures will be an essential part of the Construction Environment Management Plan to avoid further loss of trees in close proximity to the construction footprint.

We trust this meets your requirements. Should you require further details or clarification, please do not hesitate to contact the author of the report (0448 689 698) or Natalie Black Senior Environmental Manager (0431 249 360).

Yours faithfully,



Warwick Muir

Ecologist / Arborist

BSc AQF5

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Appendix A – Tree Schedule

Appendix A – Assessed Tree Schedules

Tree ID	*Scientific Name*	Common Name	DBH (m)	DAB (m)	Canopy Spread (m)				Canopy Spread Average	Estimated Total Canopy Area	Height (m)	SULE	Age Class	Health	Structure	Landscape significance rating	Estimated life expectancy	Retention Value	TPZ (m)	SRZ (m)	Remove/Retain
					N	E	S	W	(m)	(m^2)											
1	*Angophora costata*	Smooth-barked Apple	0.82	0.83	7	8	3	8	6.5	133	11	Moderate (15-40)	Mature	Good	Fair	High	40+	High	9.9	3.1	Retain
2	*Eucalyptus siderophloia*	Northern Grey Ironbark	0.58	0.78	9	9	7	8	8.25	214	17	Moderate (15-40)	Mature	Good	Good	Very High	40+	High	7	3	Remove
3	*Angophora costata*	Smooth-barked Apple	0.28	0.38	5	6	5	6	5.5	95	9	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	3.4	2.2	Remove
4	*Erythina sp.*	Coral Tree *	1.05	1.1	5	6	6	6	5.75	104	9	Short (5-15)	Mature	Fair	Fair	Very Low	15-40	Low	12.6	3.4	Remove
5	*Angophora costata*	Smooth-barked Apple	0.29	0.32	5	3	1	3	3	28	12	Short (5-15)	Mature	Fair	Fair	High	5-15,	Moderate	3.5	2.1	Retain
6	*Angophora costata*	Smooth-barked Apple	0.35	0.37	3	4	0	6	3.25	33	7	Short (5-15)	Mature	Fair	Fair	High	5-15,	Moderate	4.2	2.2	Retain
7	*Melaleuca nodosa*	Ball Honey Myrtle	0.27	0.27	2	3	3	3	2.75	24	7	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	3.3	1.9	Retain
8	*Melaleuca nodosa*	Ball Honey Myrtle	0.31	0.35	1	4	3	2	2.5	20	7	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	3.8	2.1	Retain
9	*Melaleuca nodosa*	Ball Honey Myrtle	0.19	0.21	2	4	2	3	2.75	24	5	Short (5-15)	Mature	Good	Fair	High	5-15,	Moderate	2.3	1.7	Retain
10	*Melaleuca nodosa*	Ball Honey Myrtle	0.22	0.26	0	3	6	3	3	28	6	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	2.6	1.9	Retain
11	*Eucalyptus fibrosa*	Broad Leaved Ironbark	0.17	0.2	1	4	5	3	3.25	33	8	Moderate (15-40)	Semi-mature	Good	Good	High	40+	Moderate	2	1.7	Retain
12	*Melaleuca nodosa*	Ball Honey Myrtle	0.15	0.17	1	4	1	2	2	13	6	Short (5-15)	Semi-mature	Good	Fair	High	5-15,	Moderate	2	1.6	Retain
13	*Melaleuca nodosa*	Ball Honey Myrtle	0.17	0.19	3	4	3	3	3.25	33	7	Short (5-15)	Mature	Good	Fair	High	15-40	Moderate	2	1.6	Retain
14	*Eucalyptus fibrosa*	Broad Leaved Ironbark	0.43	0.55	7	7	5	1	5	79	13	Moderate (15-40)	Mature	Good	Fair	High	40+	High	5.2	2.6	Remove
15	*Eucalyptus fibrosa*	Broad Leaved Ironbark	0.37	0.44	5	6	7	7	6.25	123	16	Moderate (15-40)	Mature	Good	Good	High	40+	High	4.4	2.3	Retain
16	*Eucalyptus fibrosa*	Broad Leaved Ironbark	0.46	0.55	1	1	7	7	4	50	15	Moderate (15-40)	Mature	Good	Good	High	40+	Moderate	5.5	2.6	Retain
17	*Melaleuca nodosa*	Ball Honey Myrtle	0.18	0.3	2	3	1	2	2	13	6	Short (5-15)	Mature	Good	Poor	High	5-15,	Moderate	2.2	2	Remove
18	*Melaleuca nodosa*	Ball Honey Myrtle	0.27	0.23	3	4	3	3	3.25	33	8	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	3.2	1.8	Retain
18	*Melaleuca nodosa*	Ball Honey Myrtle	0.13	0.18	3	1	2	2	2	13	4	Short (5-15)	Semi-mature	Good	Fair	High	5-15,	Moderate	2	1.6	Retain
19	*Melaleuca nodosa*	Ball Honey Myrtle	0.1	0.15	2	3	2	2	2.25	16	5	Short (5-15)	Mature	Good	Fair	High	5-15,	Moderate	2	1.5	Retain
21	*Melaleuca nodosa*	Ball Honey Myrtle	0.15	0.16	3	3	3	3	3	28	5	Short (5-15)	Semi-mature	Good	Fair	High	5-15,	Moderate	2	1.5	Retain
22	*Eucalyptus fibrosa*	Broad Leaved Ironbark	0.58	0.75	8	7	6	7	7	154	17	Moderate (15-40)	Mature	Good	Good	High	40+	High	7	2.9	Remove
23	*Eucalyptus fibrosa*	Broad Leaved Ironbark	0.12	0.12	3	3	3	3	3	28	5	Short (5-15)	Semi-mature	Good	Good	High	5-15,	Moderate	2	1.5	Retain
24	*Melaleuca nodosa*	Ball Honey Myrtle	0.26	0.35	4	5	5	0	3.5	38	6	Short (5-15)	Mature	Good	Fair	High	5-15,	Moderate	3.1	2.1	Retain
25	*Angophora costata*	Smooth-barked Apple	0.65	0.7	6	6	6	6	6	113	15	Remove (<5)	Mature	Poor	Poor	High	15-40	Moderate	7.8	2.8	Remove
26	*Melaleuca nodosa*	Ball Honey Myrtle	0.36	0.48	4	3	3	3	3.25	33	6	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	4.3	2.4	Remove
27	*Eucalyptus fibrosa*	Broad Leaved Ironbark	0.43	0.53	7	5	6	5	5.75	104	12	Moderate (15-40)	Mature	Good	Fair	High	40+	High	5.2	2.5	Retain

Tree ID	*Scientific Name*	Common Name	DBH (m)	DAB (m)	Canopy Spread (m)				Canopy Spread Average	Estimated Total Canopy Area	Height (m)	SULE	Age Class	Health	Structure	Landscape significance rating	Estimated life expectancy	Retention Value	TPZ (m)	SRZ (m)	Remove/Retain
					N	E	S	W	(m)	(m^2)											
28	*Eucalyptus fibrosa*	Broad Leaved Ironbark	0.36	0.4	6	5	2	6	4.75	71	10	Short (5-15)	Mature	Fair	Good	High	15-40	Moderate	4.3	2.3	Retain
29	*Angophora costata*	Smooth-barked Apple	0.52	0.58	8	6	5	7	6.5	133	15	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	6.2	2.6	Retain
30	*Melaleuca nodosa*	Ball Honey Myrtle	0.25	0.35	5	5	4	4	4.5	64	6	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	3.1	2.1	Retain
31	*Angophora costata*	Smooth-barked Apple	0.33	0.38	5	4	5	5	4.75	71	15	Moderate (15-40)	Mature	Good	Good	High	15-40	Moderate	4	2.2	Retain
32	*Eucalyptus fibrosa*	Broad Leaved Ironbark	0.42	0.55	8	8	7	5	7	154	14	Short (5-15)	Mature	Good	Fair	High	15-40	Moderate	5	2.6	Retain
33	*Eucalyptus capitellata*	Brown Stringybark	0.34	0.45	5	5	6	5	5.25	87	14	Short (5-15)	Mature	Fair	Fair	High	15-40	Moderate	4.1	2.4	Retain
34	*Eucalyptus capitellata*	Brown Stringybark	0.34	0.37	6	7	6	5	6	113	12	Short (5-15)	Mature	Fair	Fair	High	15-40	Moderate	4.1	2.2	Retain
35	*Melaleuca nodosa*	Ball Honey Myrtle	0.25	0.35	4	4	4	3	3.75	44	5	Short (5-15)	Mature	Good	Fair	High	5-15,	Moderate	3	2.1	Retain
36	*Melaleuca nodosa*	Ball Honey Myrtle	0.25	0.28	4	3	4	3	3.5	38	6	Moderate (15-40)	Mature	Good	Fair	High	5-15,	Moderate	3	1.9	Retain
37	*Melaleuca nodosa*	Ball Honey Myrtle	0.22	0.24	5	5	4	4	4.5	64	8	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	2.6	1.8	Retain
38	*Angophora costata*	Smooth-barked Apple	0.46	0.58	7	6	6	6	6.25	123	15	Short (5-15)	Mature	Good	Fair	High	15-40	Moderate	5.5	2.6	Retain
39	*Erythina sp.*	Coral Tree *	0.94	1.3	7	6	6	6	6.25	123	7	Short (5-15)	Mature	Fair	Fair	Very Low	15-40	Low	11.3	3.7	Remove
40	*Corymbia gummifera*	Red Bloodwood	0.3	0.37	6	6	6	6	6	113	12	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	3.6	2.2	Remove
41	*Eucalyptus capitellata*	Brown Stringybark	0.33	0.38	4	6	5	5	5	79	8	Short (5-15)	Mature	Fair	Fair	High	5-15,	Moderate	4	2.2	Remove
42	*Hakea salicifolia*	Willow Hakea	0.18	0.24	2	2	2	2	2	13	3.5	High (40+)	Mature	Good	Fair	High	40+	High	2.1	1.8	Remove
43	*Erythina sp.*	Coral Tree *	0.26	0.34	3	5	2	3	3.25	33	5	Short (5-15)	Mature	Poor	Poor	Very Low	5-15,	Low	3.1	2.1	Remove (APZ)
44	*Erythina sp.*	Coral Tree *	0.14	0.21	1	2	1	0	1	3	3.5	Moderate (15-40)	Semi-mature	Poor	Poor	Very Low	15-40	Low	2	1.7	Remove (APZ)
45	*Erythina sp.*	Coral Tree *	0.28	0.65	5	4	4	6	4.75	71	8	Moderate (15-40)	Mature	Dead	Fair	Very Low	15-40	Low	3.3	2.8	Remove (APZ)
46	*Erythina sp.*	Coral Tree *	0.38	0.54	3	5	5	2	3.75	44	9	Moderate (15-40)	Mature	Poor	Fair	Very Low	15-40	Low	4.6	2.6	Remove (APZ)
47	*Erythina sp.*	Coral Tree *	0.54	1.1	4	4	4	4	4	50	10	Moderate (15-40)	Mature	Poor	Poor	Very Low	15-40	Low	6.5	3.4	Remove (APZ)
48	*Erythina sp.*	Coral Tree *	0.09	0.18	0	0	7	0	1.75	10	2.5	Short (5-15)	Semi-mature	Poor	Poor	Very Low	5-15,	Very Low	2	1.6	Remove (APZ)
49	*Erythina sp.*	Coral Tree *	0.28	0.54	1	5	2	0	2	13	7	Moderate (15-40)	Mature	Poor	Poor	Very Low	15-40	Low	3.4	2.6	Remove (APZ)
50	*Erythina sp.*	Coral Tree *	0.28	0.56	4	5	6	6	5.25	87	9	Moderate (15-40)	Mature	Poor	Fair	Very Low	15-40	Low	3.4	2.6	Remove (APZ)
51	*Erythina sp.*	Coral Tree *	0.27	0.54	6	5	6	5	5.5	95	7	Moderate (15-40)	Mature	Fair	Good	Very Low	15-40	Low	3.2	2.6	Remove (APZ)
52	*Melaleuca ericifolia*	Swamp Paperbark	0.19	0.34	1	1	2	4	2	13	5	Short (5-15)	Mature	Poor	Poor	High	5-15,	Moderate	2.3	2.1	Retain
53	*Melaleuca ericifolia*	Swamp Paperbark	0.26	0.4	4	3	2	4	3.25	33	6	Moderate (15-40)	Mature	Poor	Fair	High	15-40	Moderate	3.1	2.3	Retain
54	*Melaleuca ericifolia*	Swamp Paperbark	0.14	0.18	3	1	0	1	1.25	5	4	Short (5-15)	Mature	Poor	Fair	High	5-15,	Moderate	2	1.6	Retain
55	*Melaleuca ericifolia*	Swamp Paperbark	0.12	0.26	0	3	3	0	1.5	7	5	Short (5-15)	Semi-mature	Fair	Fair	High	5-15,	Moderate	2	1.9	Retain
56	*Melaleuca nodosa*	Ball Honey Myrtle	0.42	0.54	5	6	3	4	4.5	64	8	Moderate (15-40)	Mature	Poor	Fair	High	15-40	Moderate	5	2.6	Remove (APZ)
57	*Ligustrum sinense*	#N/A	0.25	0.74	2	2	2	2	2	13	5	Moderate (15-40)	Mature	Fair	Poor	Very Low	15-40	Low	3	2.9	Remove (APZ)
58	*Melaleuca nodosa*	Ball Honey Myrtle	0.51	1.42	6	5	4	5	5	79	10	Moderate (15-40)	Mature	Poor	Fair	High	15-40	Moderate	6.1	3.8	Remove (Basin)

Tree ID	*Scientific Name*	Common Name	DBH (m)	DAB (m)	Canopy Spread (m)				Canopy Spread Average	Estimated Total Canopy Area	Height (m)	SULE	Age Class	Health	Structure	Landscape significance rating	Estimated life expectancy	Retention Value	TPZ (m)	SRZ (m)	Remove/Retain
					N	E	S	W	(m)	(m^2)											
59	*Ligustrum sinense*	Large - Leaved Privet *	0.24	0.36	2	2	3	2	2.25	16	8	Moderate (15-40)	Mature	Fair	Poor	Very Low	15-40	Low	2.9	2.2	Remove (APZ)
60	*Melaleuca nodosa*	Ball Honey Myrtle	0.25	0.65	0	0	0	0	0	0	5	Remove (<5)	Over-mature	Dead	Dead	High	<5	Low	3	2.8	Remove (Basin)
61	*Melaleuca nodosa*	Ball Honey Myrtle	0.19	0.27	0	0	0	0	0	0	7	Remove (<5)	Semi-mature	Poor	Fair	High	<5	Low	2.3	1.9	Remove (Basin)
62	*Erythina sp.*	Coral Tree *	0.51	0.98	8	7	5	6	6.5	133	8	Moderate (15-40)	Mature	Poor	Fair	Very Low	15-40	Low	6.1	3.3	Remove (APZ)
63	*Erythina sp.*	Coral Tree *	0.34	0.68	5	6	6	7	6	113	7	Moderate (15-40)	Mature	Poor	Poor	Very Low	15-40	Low	4.1	2.8	Remove (APZ)
64	*Erythina sp.*	Coral Tree *	0.32	0.75	5	7	7	6	6.25	123	9	High (40+)	Mature	Poor	Poor	Very Low	5-15,	Very Low	3.8	2.9	Remove (APZ)
65	*Erythina sp.*	Coral Tree *	0.49	0.95	6	7	7	8	7	154	10	Remove (<5)	Mature	Poor	Fair	Very Low	<5	Low	5.8	3.2	Remove (APZ)
66	*Erythina sp.*	Coral Tree *	0.61	1.5	7	8	7	9	7.75	189	11	Remove (<5)	Mature	Poor	Fair	Very Low	<5	Low	7.4	3.9	Remove
67	*Erythina sp.*	Coral Tree *	0.52	1.05	6	8	9	9	8	201	11	Remove (<5)	Mature	Fair	Fair	Very Low	<5	Low	6.3	3.4	Remove
68	*Erythina sp.*	Coral Tree *	0.54	0.87	7	8	9	7	7.75	189	13	Remove (<5)	Mature	Fair	Fair	Very Low	<5	Low	6.5	3.1	Remove
69	*Erythina sp.*	Coral Tree *	0.3	0.4	6	8	6	7	6.75	143	13	Remove (<5)	Mature	Fair	Fair	Very Low	<5	Low	3.6	2.3	Remove
70	*Erythina sp.*	Coral Tree *	0.42	0.85	8	7	8	9	8	201	11	Remove (<5)	Mature	Fair	Fair	Very Low	<5	Low	5.1	3.1	Remove (APZ)
71	*Erythina sp.*	Coral Tree *	0.37	0.45	4	4	3	5	4	50	8	Remove (<5)	Mature	Fair	Poor	Very Low	<5	Low	4.4	2.4	Remove
72	*Erythina sp.*	Coral Tree *	0.3	0.6	6	5	7	6	6	113	10	Remove (<5)	Mature	Fair	Fair	Very Low	<5	Low	3.6	2.7	Remove
73	*Erythina sp.*	Coral Tree *	0.34	0.6	6	8	10	9	8.25	214	14	Remove (<5)	Mature	Fair	Poor	Very Low	<5	Low	4.1	2.7	Remove
74	*Erythina sp.*	Coral Tree *	0.44	0.7	7	6	7	7	6.75	143	15	Remove (<5)	Mature	Fair	Poor	Very Low	<5	Low	5.3	2.8	Remove
75	*Erythina sp.*	Coral Tree *	0.52	0.67	6	7	8	7	7	154	15	Remove (<5)	Mature	Fair	Fair	Very Low	<5	Low	6.2	2.8	Remove
76	*Erythina sp.*	Coral Tree *	0.65	0.73	7	6	8	8	7.25	165	14	Remove (<5)	Mature	Fair	Fair	Very Low	<5	Low	7.8	2.9	Remove
77	*Erythina sp.*	Coral Tree *	0.15	0.2	5	4	5	6	5	79	10	Remove (<5)	Semi-mature	Fair	Fair	Very Low	<5	Low	2	1.7	Remove
78	*Erythina sp.*	Coral Tree *	0.36	0.45	6	8	7	8	7.25	165	16	Remove (<5)	Mature	Fair	Fair	Very Low	<5	Low	4.4	2.4	Remove
79	*Erythina sp.*	Coral Tree *	0.11	0.1	1	1	3	2	1.75	10	4	Remove (<5)	Juvenile	Fair	Fair	Very Low	5-15,	Very Low	2	1.5	Remove
80	*Melaleuca nodosa*	Ball Honey Myrtle	0.51	0.6	3	3	2	2	2.5	20	5	Short (5-15)	Mature	Poor	Fair	High	15-40	Moderate	6.1	2.7	Remove (Basin)
81	*Melaleuca nodosa*	Ball Honey Myrtle	0.48	0.67	6	3	3	3	3.75	44	6	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	5.7	2.8	Remove (Basin)
82	*Glochidion ferdinandi*	Cheese Tree	0.16	0.21	3	1	2	2	2	13	6	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2	1.7	Remove (Basin)
83	*Glochidion ferdinandi*	Cheese Tree	0.2	0.22	2	2	2	2	2	13	7	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.4	1.8	Remove (Basin)
84	*Glochidion ferdinandi*	Cheese Tree	0.14	0.18	2	2	2	2	2	13	7	Moderate (15-40)	Mature	Fair	Good	High	15-40	Moderate	2	1.6	Remove (Basin)
85	*Glochidion ferdinandi*	Cheese Tree	0.16	0.22	3	2	4	4	3.25	33	10	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2	1.8	Remove (Basin)
86	*Erythina sp.*	Coral Tree *	0.59	1.05	8	10	9	8	8.75	241	15	Remove (<5)	Mature	Fair	Poor	Very Low	<5	Very Low	7	3.4	Remove
87	*Glochidion ferdinandi*	Cheese Tree	0.3	0.25	3	3	2	4	3	28	8	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	3.6	1.8	Remove (Basin)
88	*Melaleuca ericifolia*	Swamp Paperbark	0.37	0.36	3	2	3	3	2.75	24	5	Moderate (15-40)	Mature	Poor	Poor	High	15-40	Moderate	4.4	2.2	Remove (Basin)
89	*Melaleuca ericifolia*	Swamp Paperbark	0.21	0.31	4	3	3	2	3	28	5	Short (5-15)	Mature	Fair	Fair	High	15-40	Moderate	2.5	2	Remove (Basin)
90	*Melaleuca ericifolia*	Swamp Paperbark	0.44	0.45	3	2	3	3	2.75	24	5	Short (5-15)	Mature	Poor	Fair	High	15-40	Moderate	5.3	2.4	Remove (Basin)
91	*Melaleuca ericifolia*	Swamp Paperbark	0.16	0.25	1	2	3	3	2.25	16	5	Short (5-15)	Mature	Poor	Fair	High	5-15,	Moderate	2	1.8	Remove (Basin)

Tree ID	*Scientific Name*	Common Name	DBH (m)	DAB (m)	Canopy Spread (m)				Canopy Spread Average	Estimated Total Canopy Area	Height (m)	SULE	Age Class	Health	Structure	Landscape significance rating	Estimated life expectancy	Retention Value	TPZ (m)	SRZ (m)	Remove/Retain
					N	E	S	W	(m)	(m^2)											
92	*Glochidion ferdinandi*	Cheese Tree	0.17	0.44	3	4	3	1	2.75	24	9	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2	2.3	Remove (Basin)
93	*Erythina sp.*	Coral Tree *	0.53	1.26	11	10	8	9	9.5	284	13	Remove (<5)	Mature	Fair	Poor	Very Low	<5	Very Low	6.4	3.6	Remove (APZ)
94	*Erythina sp.*	Coral Tree *	0.53	0.9	10	8	7	9	8.5	227	15	Remove (<5)	Mature	Fair	Fair	Very Low	<5	Very Low	6.4	3.2	Remove (APZ)
95	*Erythina sp.*	Coral Tree *	0.49	1.1	8	7	7	9	7.75	189	11	Remove (<5)	Mature	Fair	Poor	Very Low	<5	Very Low	5.9	3.4	Remove (APZ)
96	*Erythina sp.*	Coral Tree *	0.15	0.2	4	3	3	2	3	28	5	Remove (<5)	Juvenile	Fair	Good	Very Low	5-15,	Very Low	2	1.7	Remove (APZ)
97	*Erythina sp.*	Coral Tree *	0.27	0.63	0	0	0	0	0	0	12	Remove (<5)	Over-mature	Dead	Dead	Very Low	<5	Very Low	3.2	2.7	Remove (APZ)
98	*Melaleuca nodosa*	Ball Honey Myrtle	0.21	0.34	3	2	2	1	2	13	9	Short (5-15)	Mature	Poor	Fair	High	5-15,	Moderate	2.5	2.1	Retain
99	*Melaleuca nodosa*	Ball Honey Myrtle	0.24	0.38	3	4	2	3	3	28	10	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.9	2.2	Retain
100	*Melaleuca nodosa*	Ball Honey Myrtle	0.22	0.23	4	2	3	2	2.75	24	10	Moderate (15-40)	Mature	Poor	Good	High	15-40	Moderate	2.6	1.8	Retain
101	*Angophora costata*	Smooth-barked Apple	0.17	0.21	2	4	1	2	2.25	16	8	Moderate (15-40)	Semi-mature	Fair	Good	High	15-40	Moderate	2	1.7	Remove
102	*Angophora costata*	Smooth-barked Apple	0.25	0.28	1	3	4	1	2.25	16	10	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	3	1.9	Remove
103	*Eucalyptus capitellata*	Brown Stringybark	0.42	0.53	1	7	4	3	3.75	44	7	Short (5-15)	Mature	Fair	Poor	High	15-40	Moderate	5.1	2.5	Remove
104	*Glochidion ferdinandi*	Cheese Tree	0.07	0.1	0.5	0.5	0.5	0.5	0.5	1	3	High (40+)	Juvenile	Fair	Good	High	40+	High	2	1.5	Remove
105	*Melaleuca nodosa*	Ball Honey Myrtle	0.25	0.33	1	2	3	2	2	13	5	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	3.1	2.1	Remove
106	*Angophora costata*	Smooth-barked Apple	0.26	0.32	2	5	3	2	3	28	11	High (40+)	Mature	Fair	Fair	High	40+	High	3.1	2.1	Remove
107	*Eucalyptus capitellata*	Brown Stringybark	0.08	0.11	1	1	1	1	1	3	5	High (40+)	Juvenile	Good	Fair	High	40+	High	2	1.5	Remove
108	*Eucalyptus capitellata*	Brown Stringybark	0.06	0.1	1	1	1	1	1	3	3	High (40+)	Juvenile	Fair	Fair	High	40+	High	2	1.5	Remove
109	*Eucalyptus capitellata*	Brown Stringybark	0.11	0.15	1	1	1	1	1	3	5	High (40+)	Semi-mature	Good	Good	High	40+	High	2	1.5	Remove
110	*Eucalyptus capitellata*	Brown Stringybark	0.2	0.22	3	3	2	2	2.5	20	8	High (40+)	Mature	Good	Good	High	40+	High	2.4	1.8	Remove
111	*Eucalyptus capitellata*	Brown Stringybark	0.09	0.14	1	1	1	1	1	3	4	High (40+)	Juvenile	Good	Good	High	40+	High	2	1.5	Remove
112	*Angophora costata*	Smooth-barked Apple	0.2	0.29	3	4	2	0	2.25	16	17	Short (5-15)	Mature	Fair	Poor	High	15-40	Moderate	2.4	2	Retain
113	*Angophora costata*	Smooth-barked Apple	0.22	0.27	3	3	3	2	2.75	24	13	Moderate (15-40)	Mature	Good	Fair	High	40+	High	2.6	1.9	Retain
114	*Eucalyptus capitellata*	Brown Stringybark	0.28	0.41	6	3	4	3	4	50	9	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	3.4	2.3	Retain
115	*Angophora costata*	Smooth-barked Apple	0.26	0.33	0	7	0	0	1.75	10	8	Short (5-15)	Mature	Fair	Poor	High	15-40	Moderate	3.1	2.1	Retain
116	*Angophora costata*	Smooth-barked Apple	0.1	0.16	0	1	2	0	0.75	2	4	Moderate (15-40)	Juvenile	Poor	Poor	High	15-40	Moderate	2	1.5	Retain
117	*Angophora costata*	Smooth-barked Apple	0.17	0.22	3	5	3	2	3.25	33	10	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2	1.8	Retain
118	*Eucalyptus capitellata*	Brown Stringybark	0.09	0.13	1	1	1	1	1	3	5	High (40+)	Juvenile	Good	Fair	High	40+	High	2	1.5	Remove
119	*Eucalyptus capitellata*	Brown Stringybark	0.22	0.28	4	5	4	6	4.75	71	7	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.6	1.9	Remove
120	*Eucalyptus capitellata*	Brown Stringybark	0.4	0.42	2	5	3	1	2.75	24	14	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	4.8	2.3	Remove
121	*Eucalyptus capitellata*	Brown Stringybark	0.22	0.27	2	2	2	2	2	13	13	Remove (<5)	Mature	Fair	Good	High	5-15,	Moderate	2.6	1.9	Remove (APZ)

Tree ID	*Scientific Name*	Common Name	DBH (m)	DAB (m)	Canopy Spread (m)				Canopy Spread Average	Estimated Total Canopy Area	Height (m)	SULE	Age Class	Health	Structure	Landscape significance rating	Estimated life expectancy	Retention Value	TPZ (m)	SRZ (m)	Remove/Retain
					N	E	S	W	(m)	(m^2)											
122	*Angophora costata*	Smooth-barked Apple	0.38	0.48	3	4	2	4	3.25	33	15	Moderate (15-40)	Mature	Good	Good	High	40+	High	4.6	2.4	Remove (APZ)
123	*Angophora costata*	Smooth-barked Apple	0.1	0.12	0	2	0	0	0.5	1	8	Remove (<5)	Semi-mature	Fair	Fair	High	5-15,	Moderate	2	1.5	Remove (APZ)
124	*Eucalyptus capitellata*	Brown Stringybark	0.16	0.2	0	0	0	0	0	0	8	Remove (<5)	Semi-mature	Dead	Dead	Low	<5	Very Low	2	1.7	Remove (APZ)
125	*Eucalyptus capitellata*	Brown Stringybark	0.15	0.28	2	0	0	5	1.75	10	9	Short (5-15)	Mature	Poor	Poor	High	5-15,	Moderate	2	1.9	Remove (APZ)
126	*Angophora costata*	Smooth-barked Apple	0.07	0.09	0	2	0	0	0.5	1	5	Short (5-15)	Juvenile	Poor	Fair	High	5-15,	Moderate	2	1.5	Remove (APZ)
127	*Angophora costata*	Smooth-barked Apple	0.19	0.21	3	7	0	5	3.75	44	10	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.3	1.7	Retain
128	*Angophora costata*	Smooth-barked Apple	0.21	0.25	3	5	2	3	3.25	33	10	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.5	1.8	Retain
129	*Eucalyptus capitellata*	Brown Stringybark	0.31	0.37	3	7	4	2	4	50	11	Moderate (15-40)	Mature	Fair	Poor	High	15-40	Moderate	3.7	2.2	Retain
130	*Eucalyptus capitellata*	Brown Stringybark	0.57	1.22	4	7	7	6	6	113	11	Short (5-15)	Mature	Fair	Fair	High	15-40	Moderate	6.8	3.6	Retain
131	*Angophora costata*	Smooth-barked Apple	0.16	0.21	4	3	6	2	3.75	44	9	Moderate (15-40)	Mature	Poor	Fair	High	15-40	Moderate	2	1.7	Retain
132	*Angophora costata*	Smooth-barked Apple	0.2	0.21	0	7	0	0	1.75	10	5	Short (5-15)	Mature	Fair	Poor	High	5-15,	Moderate	2.4	1.7	Retain
133	*Angophora costata*	Smooth-barked Apple	0.05	0.09	1	1	1	1	1	3	4	Moderate (15-40)	Juvenile	Fair	Fair	High	15-40	Moderate	2	1.5	Retain
134	*Angophora costata*	Smooth-barked Apple	0.12	0.15	4	0	0	0	1	3	7	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2	1.5	Retain
135	*Eucalyptus capitellata*	Brown Stringybark	0.19	0.31	3	3	2	3	2.75	24	12	High (40+)	Mature	Fair	Good	High	40+	High	2.3	2	Remove (APZ)
136	*Eucalyptus capitellata*	Brown Stringybark	0.36	0.45	2	3	2	4	2.75	24	12	Short (5-15)	Mature	Fair	Fair	High	15-40	Moderate	4.3	2.4	Remove (APZ)
137	*Eucalyptus capitellata*	Brown Stringybark	0.49	0.52	8	5	0	0	3.25	33	11	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	5.9	2.5	Remove (APZ)
138	*Erythina sp.*	Coral Tree *	0.59	1.3	3	6	7	4	5	79	11	Moderate (15-40)	Mature	Poor	Fair	Very Low	15-40	Low	7.1	3.7	Remove (APZ)
139	*Araucaria heterophylla*	Norfolk Island Pine	0.47	0.61	4	3	4	3	3.5	38	20	High (40+)	Mature	Good	Good	Low	40+	Moderate	5.6	2.7	Retain
140	*Araucaria heterophylla*	Norfolk Island Pine	0.45	0.63	5	3	3	4	3.75	44	20	High (40+)	Mature	Good	Good	Low	40+	Moderate	5.4	2.7	Retain
141	*Eucalyptus robusta*	Swamp Mahogany	0.51	0.72	6	6	6	7	6.25	123	15	High (40+)	Mature	Fair	Fair	Very High	40+	High	6.1	2.9	Retain
142	*Angophora costata*	Smooth-barked Apple	0.6	0.66	6	6	2	3	4.25	57	16	Moderate (15-40)	Mature	Poor	Poor	Very High	15-40	High	7.2	2.8	Remove
143	*Angophora costata*	Smooth-barked Apple	0.47	0.56	0	7	3	7	4.25	57	16	Moderate (15-40)	Mature	Fair	Fair	Very High	15-40	High	5.6	2.6	Remove
144	*Angophora costata*	Smooth-barked Apple	0.31	0.37	3	5	0	2	2.5	20	10	Short (5-15)	Mature	Poor	Poor	Very High	5-15,	Moderate	3.7	2.2	Remove
145	*Stag*	#N/A	0.5	0.51	0	0	0	0	0	0	12	Remove (<5)	Over-mature	Dead	Dead	Very High	<5	Very Low	6	2.5	Remove
146	*Angophora costata*	Smooth-barked Apple	0.54	0.81	6	7	9	2	6	113	18	High (40+)	Mature	Fair	Fair	Very High	40+	High	6.5	3	Remove
147	*Melaleuca nodosa*	Ball Honey Myrtle	0.3	0.33	2	2	2	2	2	13	5	Moderate (15-40)	Mature	Fair	Fair	Very High	15-40	High	3.6	2.1	Remove
148	*Cinnamomum camphora*	Camphor Laurel *	0.48	0.94	4	3	3	5	3.75	44	10	Moderate (15-40)	Mature	Fair	Fair	Low	15-40	Low	5.8	3.2	Remove (APZ)

Tree ID	*Scientific Name*	Common Name	DBH (m)	DAB (m)	Canopy Spread (m)				Canopy Spread Average	Estimated Total Canopy Area	Height (m)	SULE	Age Class	Health	Structure	Landscape significance rating	Estimated life expectancy	Retention Value	TPZ (m)	SRZ (m)	Remove/Retain
					N	E	S	W	(m)	(m^2)											
149	*Cinnamomum camphora*	Camphor Laurel *	0.12	0.15	1	0	1	2	1	3	4	Moderate (15-40)	Semi-mature	Good	Good	Low	15-40	Low	2	1.5	Remove (APZ)
150	*Melaleuca nodosa*	Ball Honey Myrtle	0.27	0.34	2	1	1	3	1.75	10	6	Moderate (15-40)	Mature	Fair	Good	High	15-40	Moderate	3.2	2.1	Retain
151	*Melaleuca nodosa*	Ball Honey Myrtle	0.2	0.17	2	3	2	2	2.25	16	6	Moderate (15-40)	Mature	Poor	Poor	High	15-40	Moderate	2.4	1.6	Retain
152	*Melaleuca nodosa*	Ball Honey Myrtle	0.18	0.22	1	0	4	3	2	13	5	Moderate (15-40)	Mature	Fair	Poor	High	15-40	Moderate	2.2	1.8	Retain
153	*Melaleuca nodosa*	Ball Honey Myrtle	0.21	0.43	1	0	0	1	0.5	1	6	Moderate (15-40)	Mature	Poor	Fair	High	15-40	Moderate	2.6	2.3	Retain
154	*Melaleuca nodosa*	Ball Honey Myrtle	0.24	0.66	2	0	0	1	0.75	2	6	Short (5-15)	Mature	Poor	Poor	High	5-15,	Moderate	2.9	2.8	Retain
155	*Melaleuca nodosa*	Ball Honey Myrtle	0.21	0.39	1	1	0	1	0.75	2	6	Short (5-15)	Semi-mature	Poor	Poor	High	5-15,	Moderate	2.5	2.2	Remove (APZ)
156	*Melaleuca nodosa*	Ball Honey Myrtle	0.31	0.41	4	1	0	0	1.25	5	6	Short (5-15)	Mature	Poor	Poor	High	5-15,	Moderate	3.7	2.3	Remove (APZ)
157	*Melaleuca nodosa*	Ball Honey Myrtle	0.25	0.34	4	1	0	0	1.25	5	5	Short (5-15)	Mature	Poor	Poor	High	5-15,	Moderate	3	2.1	Remove (APZ)
158	*Melaleuca nodosa*	Ball Honey Myrtle	0.3	0.25	3	3	2	1	2.25	16	8	Short (5-15)	Mature	Fair	Poor	High	15-40	Moderate	3.6	1.8	Remove (APZ)
159	*Melaleuca nodosa*	Ball Honey Myrtle	0.22	0.25	2	5	1	0	2	13	6	Moderate (15-40)	Mature	Poor	Good	High	15-40	Moderate	2.6	1.8	Remove (APZ)
160	*Melaleuca nodosa*	Ball Honey Myrtle	0.25	0.34	2	4	0	0	1.5	7	5	Short (5-15)	Mature	Poor	Poor	High	5-15,	Moderate	3	2.1	Remove (APZ)
161	*Melaleuca nodosa*	Ball Honey Myrtle	0.2	0.27	3	1	1	3	2	13	6	Moderate (15-40)	Mature	Poor	Poor	High	15-40	Moderate	2.4	1.9	Remove (APZ)
162	*Melaleuca nodosa*	Ball Honey Myrtle	0.15	0.18	3	2	0	2	1.75	10	5	Short (5-15)	Mature	Poor	Poor	High	5-15,	Moderate	2	1.6	Remove (APZ)
163	*Melaleuca nodosa*	Ball Honey Myrtle	0.17	0.22	0	6	0	0	1.5	7	4	Short (5-15)	Mature	Poor	Poor	High	5-15,	Moderate	2	1.8	Remove (APZ)
164	*Melaleuca nodosa*	Ball Honey Myrtle	0.33	0.64	2	3	4	3	3	28	6	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	3.9	2.7	Retain
165	*Melaleuca nodosa*	Ball Honey Myrtle	0.2	0.33	4	2	1	3	2.5	20	5	Moderate (15-40)	Mature	Poor	Poor	High	15-40	Moderate	2.4	2.1	Retain
166	*Melaleuca nodosa*	Ball Honey Myrtle	0.19	0.22	1	2	1	0	1	3	7	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.3	1.8	Retain
167	*Melaleuca nodosa*	Ball Honey Myrtle	0.26	0.77	3	3	4	2	3	28	5	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	3.1	3	Remove (APZ)
168	*Melaleuca nodosa*	Ball Honey Myrtle	0.38	0.7	2	4	3	3	3	28	7	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	4.6	2.8	Remove (APZ)
169	*Melaleuca nodosa*	Ball Honey Myrtle	0.31	0.27	3	4	2	2	2.75	24	5	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	3.7	1.9	Remove (APZ)
170	*Melaleuca nodosa*	Ball Honey Myrtle	0.22	0.35	3	4	3	3	3.25	33	6	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.6	2.1	Remove (APZ)
171	*Melaleuca nodosa*	Ball Honey Myrtle	0.16	0.27	1	2	3	3	2.25	16	4	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2	1.9	Remove (APZ)
172	*Melaleuca nodosa*	Ball Honey Myrtle	0.23	0.4	1	1	2	1	1.25	5	6	Short (5-15)	Mature	Fair	Fair	High	5-15,	Moderate	2.8	2.3	Retain
173	*Melaleuca nodosa*	Ball Honey Myrtle	0.23	0.45	0	0	4	3	1.75	10	5	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.8	2.4	Retain
174	*Melaleuca nodosa*	Ball Honey Myrtle	0.25	0.37	2	2	3	2	2.25	16	7	Short (5-15)	Mature	Fair	Fair	High	15-40	Moderate	3	2.2	Retain
175	*Callistemon viminalis*	Weeping Bottlebrush	0.14	0.16	4	3	1	2	2.5	20	8	Moderate (15-40)	Mature	Good	Fair	High	15-40	Moderate	2	1.5	Remove
176	*Callistemon viminalis*	Weeping Bottlebrush	0.21	0.22	3	2	2	1	2	13	8	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.5	1.8	Remove
177	*Callistemon viminalis*	Weeping Bottlebrush	0.19	0.23	4	1	3	2	2.5	20	7	Moderate (15-40)	Mature	Fair	Fair	High	15-40	Moderate	2.3	1.8	Remove
178	*Cinnamomum camphora*	Camphor Laurel *	0.52	0.61	5	4	4	2	3.75	44	9	Moderate (15-40)	Mature	Fair	Fair	Low	15-40	Low	6.2	2.7	Remove
179	*Cinnamomum camphora*	Camphor Laurel *	0.18	0.19	2	3	2	4	2.75	24	9	Moderate (15-40)	Mature	Fair	Fair	Low	15-40	Low	2.2	1.6	Remove

*- denotes an exotic or non-endemic species.

Appendix B – SULE Methodology

SULE (Safe Useful Life Expectancy)

In planning context, the time a tree can expect to be usefully retained is the most important long- term consideration. SULE i.e., a system designed to classify trees into a number of categories so that information regarding tree retention can be concisely communicated in a non-technical manner. SULE categories are easily verifiable by experienced personnel without great disparity. A tree's SULE category is the life expectancy of the tree modified first by its age, health, condition, safety and location (to give safe life expectancy), then by economics (i.e., cost of maintenance: retaining trees at an excessive management cost is not normally acceptable), effect on better trees, and sustained amenity (i.e., establishing a range of age classes in a local population). SULE assessments are not static but may be modified as dictated by changes in tree health and environment. Trees with a short SULE may be at present by making a contribution to the landscape but their value to the local amenity will decrease rapidly towards the end of this period, prior to their being removed for safety or aesthetic reasons.

SULE Methodology

1. Long SULE - tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance;

A. Structurally sound trees located in positions that can accommodate future growth.

B. Trees which could be made suitable for long term retention by remedial care

C. Trees of special significance which would warrant extraordinary efforts to secure their long-term retention.

2. Medium SULE- tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance;

A. Trees which may only live from 15 to 40 years.

B. Trees which may live for more than 40 years but would be removed for safety or nuisance reasons.

C. Trees which may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.

D. Trees which could be made suitable for retention in the medium term by remedial care.

3. Short SULE - tree appeared to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance:

A. Trees which may only live from 5 to 15 years.

B. Trees which may live for more than 15 years but would be removed for safety or nuisance reasons.

C. Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.

D. Trees which require substantial remediation and are only suitable for retention in the short term.

4. Removal - trees which should be removed within the next 5 years;

A. Dead, dying, suppressed or declining trees.

B. Dangerous trees through instability or recent loss of adjacent trees.

C. Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.

D. Damaged trees that are clearly not safe to retain.

E. Trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.

F. Trees which are damaging or may cause damage to existing structures within the next 5 years.

G. Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f).

H. Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

5. Small, young or regularly pruned - Trees that can be moved or replaced;

A. Small trees less than 5m in height.

B. Young trees less than 15 years old but over 3m in height.

C. Formal hedges and trees intended for regular pruning to artificially control growth.

GLOSSARY

Age Classes

- Juvenile refers to an immature tree.
- Semi-mature refers to a tree between immaturity and full size.
- Mature refers to a full-sized tree with some capacity for further growth.
- Over-mature refers to a tree already in decline.

Diameter at breast height (DBH)

Tree stem diameter at 1.4 meters above ground level.

Diameter at buttress (DAB)

Tree stem diameter as measured above the root buttress at ground level.

Tree Protection Zone (TPZ)

An indicative measure of the area necessary to protect for tree viability, encompassing the area necessary to protect both the crown and woody roots as calculated by the formula TPZ= DBH x 12

Structural Root Zone (SRZ)

An indicative measure of the spread of the primary woody and structural roots necessary for tree stability, as calculated by the formula SRZ= $(DAB*50)^{0.42}x0.64$

Visual Tree Assessment (VTA)

Visual inspection of tree only.

Co-dominant leaders

A tree where two or more stems are of similar diameter.

Included Bark Junctions

A junction where the angle of the union creates an area of ingrown bark. This can create a structural weakness, and is often found on co-dominant stems.

Crown

The portion of the tree consisting of branches and leaves and any part of the trunk from which branches arise.

Stem

The position of the tree consisting of branches and leaves and any part of the trunk from which branches arise. An organ which supports branches, leaves, flowers and fruits.

Epicormic Growth

Refers to shoots produced by dormant buds within the bark or stem of a tree as a result of stress, incorrect pruning or increased light.

Health Condition

Exceptional

- Visually complete crown with dense foliage throughout that indicates strong health and vigour.
- Leaf size and colour that is true to type for the species and free from pest (insect) and disease (pathogen) damage.

- Expected levels of primary growth or seasonal extension and internodal growth evident for the species.
- No evidence of colonising saprophytes and no deadwood evident.

Good

- Visually complete crown, varying in foliage density throughout.
- Leaf size and colour that is true to type for the species with none or minor levels of pest (insect) and/or disease (pathogen) damage evident.
- Expected levels of primary growth or seasonal extension and internodal growth evident for the species.
- No evidence of colonising saprophytes and low levels of deadwood present and approximately 10mm or less in size.

Fair

- Sparse crown, varying in foliage density throughout.
- Reduced leaf size and atypical in colour for the species.
- Low to medium levels of pest (insect) and/or disease (pathogen) damage.
- Reduced, seasonal extension and internodal growth.
- Deadwood easily visible and less than approximately 30mm in size.
- Epicormic growth may be evident.

Poor

- Obvious signs of crown decline, exhibiting significant reduction in live crown volume and foliage density with reduced leaf size and atypical in colour for the species.
- Evidence of defoliation and/or dieback of branch tips.
- Medium to high levels of pest (insect) and disease (pathogen) damage.
- Presence of exudates (kino and resins) from wounds (open and/or weeping).
- Significant reduction in seasonal extension and internodal growth, with significant levels of epicormic growth evident.
- Deadwood easily visible, approximately 30mm to 100mm in size.

Dead

- No evidence of live foliage observed throughout the crown.
- Obvious signs of cracking and shrinking wood.
- Visible evidence of delaminating bark to stems and branches.

Structure Condition

Very Good

- Strong branch unions at attachment points with no acute angles (compression and tension forks) and good branch taper at unions.
- No visibly, defective tree parts or structural defects.
- No wounds to stems and branches, no crossing and rubbing of branches and no wounds to exposed roots.
- No fungal fruiting bodies present to stems, branches and roots indicating, a presence of fungal pathogens.

Good to Fair

- Developing inclusions at unions of leading, codominant stems and branches.
- Evidence of defective tree parts (low levels) including branch and stem inclusions and crossing and rubbing of branches.
- Evidence of mechanical damage to periderm of stems, branches and roots, exposing vascular tissues.
- Exposed wounds for surface, colonising pathogens and entry points for developing decay.
- Presence of fungal fruiting bodies.
- Some evidence of cavities or hollows. (Fair only)
- No evidence of soil upheaval surrounding base of tree.

Poor

- Obvious signs and evidence of included bark to basal unions of codominant, leading stems and branches.
- Advanced, structural defects evident with failure of tree parts determined within 5 years from time of inspection and assessment.
- Evidence of decay from open wounds with presence of exudates (kino and resins) and exposed and degraded woody tissues.
- Presence of fungal fruiting bodies.
- Presence of cavities and hollows.
- Evidence of mechanical damage with advanced degradation of exposed roots.

a) Hazardous Tree

b) Immediate Removal

- Advanced, structural defects evident. Open cracks to codominant stem and branch unions evident.
- Previous branch and stem failures evident. Failure of remaining tree parts determined within 3 months 6 months, from time of inspection and assessment. Arboricultural works to be scheduled immediately to mitigate associated hazard and risk.
- Severed roots and soil upheaval evident indicating failure of root zone.
- Tree failure imminent within 12 months from time of inspection and assessment

Landscape Significance

Assesses a tree within the landscape and rates according to criteria taken from Morton (2006):

1. Significant

- The subject tree is listed as a Heritage Item under the Local Environment Plan (LEP) with a local, state or national level of significance; or
- The subject tree forms part of the curtilage of a Heritage Item (building / structure /artifact as defined under the LEP) and has a known or documented association with that item; or
- The subject tree is a Commemorative Planting having been planted by an important historical person (s) or to commemorate an important historical event; or

- The subject tree is scheduled as a Threatened Species or is a key indicator species of an Endangered Ecological Community as defined under the or Biodiversity Conservation Act 2016 (NSW) or The Environmental Protection and Biodiversity Conservation Act 1999 (Federal); or
- The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species; or
- The subject tree is a Remnant Tree, being a tree in existence prior to development of the area; or
- The subject tree has a very large live crown size exceeding 300m² with normal to dense foliage cover, is located in a visually prominent in the landscape, exhibits very good form and habit typical of the species and makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity; or
- The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.

2. Very high

- The tree has a strong historical association with a heritage item (building/structure/artifact/garden etc.) within or adjacent the property and/or
- Exemplifies a particular era or style of landscape design associated with the original development of the site; or
- The subject tree is listed on Council's Significant Tree Register; or
- The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link/ Wildlife Corridor or has known wildlife habitat value;
- The subject tree has a very large live crown size exceeding 200m²; a crown density exceeding 70% Crown Cover (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area.

3. High

- The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence; or
- The tree is a locally-indigenous species and representative of the original vegetation of the area; or
- The subject tree has a large live crown size exceeding 100m²; and
- The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (e.g., crown distortion/suppression) with a crown density of at least 70% Crown Cover (normal); and
- The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area.

4. Moderate

- The subject tree has a medium live crown size exceeding 40m²; and
- The tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc.) with a crown density of more than 50% Crown Cover (thinning to normal); and
- The tree makes a fair contribution to the visual character and amenity of the area; and

- The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms.
- The tree has no known or suspected historical association

5. Low

- The subject tree has a small live crown size of less than 40m² and can be replaced within the short term with new tree planting; or
- The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% Crown Cover (sparse); and
- The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area.

6. Very low

- The subject tree is listed as an Environment Weed Species in the relevant Local Government Area, being invasive, or a nuisance species.
- The subject tree is scheduled as exempt (not protected) under the provisions of the local Council's Tree Preservation Order due to its species, nuisance or position relative to buildings or other structures.

7. Insignificant

- The tree is a declared Noxious Weed under the Noxious Weeds Act (NSW) 1993 or identified as a priority weed within the local region.

Appendix C – Site Photographs

Plate 1: The stand of Trees containing Trees 1-6.

Plate 2: The stand of Trees located Western boundary (South).

Plate 3: The stand of Trees located along the Western boundary (North).

Plate 5 and 6: Decay and Fruiting Bodies in Tree 25

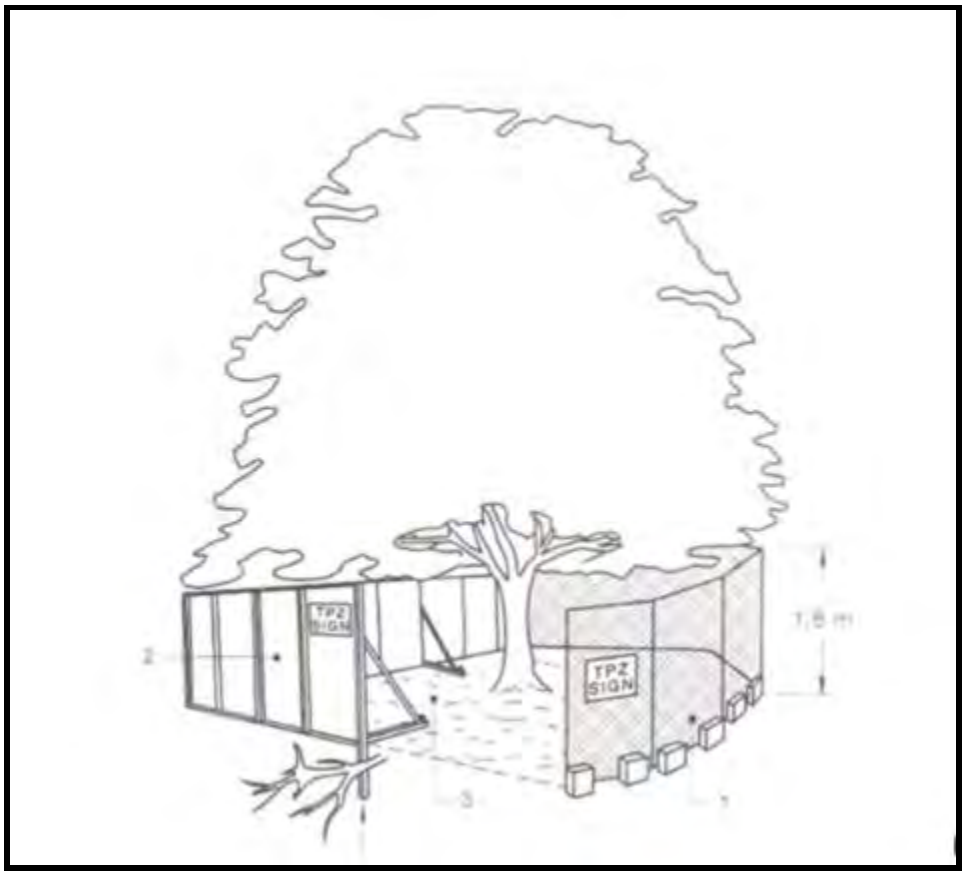
Plate 7: Tree 39 (Coral Tree)

Plate 8: Tree 6 (*Angophora costata*). Note the proximity to the adjacent powerlines and high pruning/

Appendix D - Tree Protection Fencing

Example of tree protection fencing:

- Fence off all trees noted for retention with 1.8m steel mesh fencing at the perimeter of the designated protection zone. Attach signs relating to the importance of tree protection and penalties for breaching tree protection orders to the fencing. If the area is large, install multiple signs.
- Signs should state that this is a restricted area, no entry unless in the company of the arborist. Authorised access to the protected zone could be through a locked gate or via ladders
- Mulching and semi-regular watering for established protection zones.



Appendix E - Tree Risk Assessment (Tree 25)

ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Tom Copping

Date: 03 July, 2022

Via Email: tom@vivacityproperty.com.au

Our Ref: 2642.01

Dear Tom,

Tree Hazard Assessment for one (1) *Angophora costata* (Sydney Red Gum) tree within land identified as Oasis Caratel Caravan Park, located at 207-209 Wallarah Rd, Kanwall, NSW.

This letter has been prepared by AEP at the request of Vivacity Property as an attachment to an Exempt Tree Works - SEPP Exemption Imminent Risk to Human Life or Property application as per the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (SEPP Vegetation). The hazardous tree in question is an ***Angophora costata*** (Sydney Red Gum) located at Oasis Caratel Caravan Park, 207-209 Wallarah Rd, Kanwall, NSW.

1.0 Disclaimer

This assessment of tree health and condition is based on non-destructive visual observations from ground level. Thus, it is not possible to identify all structural faults at high levels in the tree, internal structural faults or within the root system. Observations about Tree Health, Structure, SULE and other characteristics have been made at the time of assessment and these characteristics may change over time due to natural growth of the tree as a living organism or due to unforeseen events. Please note that the recommendations and methodologies for Tree Works within this letter are relevant only to the Trees assessed within this letter. The author is not responsible for tree damage related to failure to apply these recommendations or methodologies for Tree Works in full within this letter or for tree damage relating to works conducted by an unaffiliated person. No responsibility for damage to persons or property is accepted for damage by trees referred to within this report.

2.0 Methods

A Site inspection was undertaken on the 21st of May 2022. Tree species were identified based on guidance from regional identification guides (Fairley and Moore 1989, Robinson 2003), and descriptions and records provided by the Royal Botanic Gardens (PlantNet 2022). Photos within were taken at the time of assessment.

2.1 Visual Tree Assessment

A non-destructive visual tree assessment (VTA Level 2) to evaluate the health and condition of the trees in was undertaken from ground level following the methodology described by Mattheck and Breloer (1994). Tree height was estimated following the guidance outlined in the Private Native Forestry Code of Practice (DECC 2007). The Diameter at Breast Height (DBH) and diameter above buttress (DAB) was determined using a DBH tape.

2.2 International Society of Arboriculture Tree Risk Assessment

An ISA Basic Tree Risk Assessment Form was completed for this tree (**Appendix B**) on the basis of the completed fieldwork as per the *ISA Tree Risk Assessment Manual* and *Appendix I Using the ISA Basic Tree Risk Assessment Form Instructions*.

3.0 Tree Condition and Observations

The assessed tree has been identified as an *Angophora costata* (Sydney Red Gum), and is numbered as Tree 25 with a plastic tag within the Subject Site. Full Observations for this tree are included in **Attachment A. Plates 1** to **6** show photos of the assessed tree, taken at the time of assessment.

Tree 25 is a mature individual with a DBH of 0.65m, a DAB of 0.7m and a height of 15m.

This tree is in Poor Structural condition. The following was observed, split by tree part ;

- **Base and Roots** –A decay column on the western side of the stem, encompassing between 45-55% of the stem circumference, commences at the root collar and extends to 4m on the stem (**Plate 4**). A large fungal fruiting body was observed within 0.3m of the ground level on the western side within this decay column, indicating that this area is in an advanced state of decay (**Plate 4**). Several radial and longitudinal cracks from termite infestation were observed nears running away from the decayed section, potentially weaking the healthy wood. (**Plate 4**) Furthermore, several groups of yellow, dome shaped fungal fruiting bodies resembling *Armillaria sp* (Root rot Fungi) were observed within 0.5m of the base of the tree to the south, indicating the potential for advanced decay within the root system.
- **Stem** – A decay column on the western side of the stem, encompassing between 4588-55% of the stem circumference, commences at the root collar and extends to ~4m on the stem near the first (pruned and decayed) branch junction. (**Plate 3**). Cavities and wounds in the bark showed decay at the centre of the stem, indicating extensive heartwood decay. Furthermore, several large termite cracks were observed encircling the stem radially, particularly between bark wounds (**Plate 5**).The stem is relatively straight until 10m.
- **Crown and Canopy** – There is a codominant leader junction at 10m within a living (western) and dead/decayed leader (eastern). The living leader had a large number of radial/ longitudinal termite cracks along the stem and at minor branch junctions (**Plate 6**). The majority of the remaining living canopy is attached to this is on the western side and is leaning to the west over the adjacent house.

This tree is in Fair Health condition, with a uniform canopy with an approximate radius of 6m, with noted low vigour, dieback and chlorotic tissue present within the canopy.

This tree has a Remove (<5 years) SULE.

Plate 1: The assessed tree 25 from the Western side. Note the large canopy branches over the house (red roof) next door.

Plate 2: The assessed tree 25 from the south western side. Note the proximity to the adjacent house and decay column to ~4m on the western side.

Plate 3: The assessed tree 25 from the south western side. Note the proximity to the adjacent house and decay column to ~4m on the western side which encompasses ~50% of the trunk. Note the radial and longitudinal termite cracks at the base and on the stem.

Plate 4: The assessed tree 25 base from the southern side. Note advanced state of decay within this area, including fungal fruiting bodies and a longitudinal termite crack.

Plate 5: The assessed tree 25 from the northern side. Note the radial termite cracks on the stem, which extend from a bark cavity to the extensive decay. Inspection of this bark cavity noted heartwood decay.

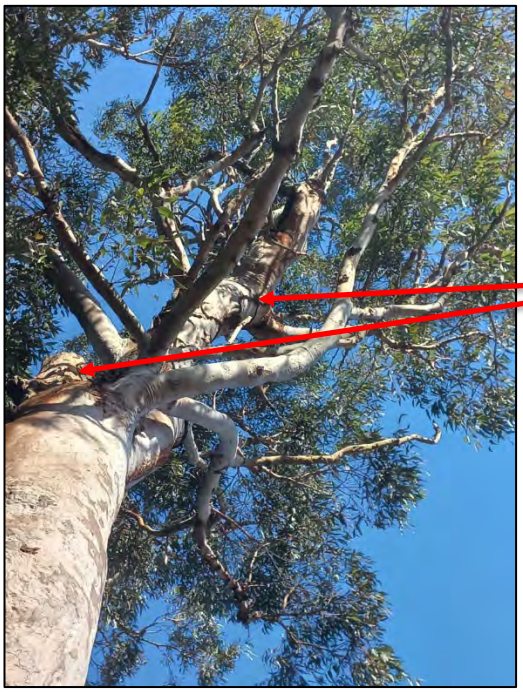


Plate 6: The assessed tree 25 canopy from the northern side. The majority of this canopy is on the western side and extends over the adjacent house. Note the radial/ longitudinal termite cracks on the large leader, the previous failure and decay of another leader. Minor deadwood and other structural defects have been observed within this canopy.

4.0 Hazard assessment

The target is an occupied residential dwelling on an adjoining land, within 5m of the base of the tree on the western side.

Given the lean to the west of this tree, the large size, and the prevalence of structural defects on the western side (particularly the large area of decay), it has a “High” likelihood of impacting the target, with “Severe” Impacts expected.

Following the ISA risk assessment form (**Attachment B**), and given the above major structural defects, the following could occur in the near term;

- Failure of the large leader in the canopy at the decayed junction or termite affected areas. It should be noted that the observed species (*Angophora costata*) is notable for dropping large limbs when under stress. (High Risk)
- Failure across the stem (Full canopy failure) due to termite damage and the heartwood decay column. (High Risk)
- Failure at the root base (Whole Tree Failure) due to the decay columns and potential root rot. As noted previously there is observed decay fungi present on this tree. (Moderate Risk)

This tree is therefore a 'High' Risk with likely failure in the near term and mitigation actions should be taken immediately.

5.0 Hazard Mitigation options

The following options have been considered to mitigate this hazard;

- Target repositioning or strengthening – Impractical as it is a built and occupied dwelling.
- Reduction of crown weight by pruning -This is unlikely to mitigate stem, canopy or root structural defects. Not recommended.
- Removal of the main insect damaged leader in the crown: A 'High' level of residual will remain due to the stem and root hazards. Furthermore, removal of a large percentage of the crown as is necessary to remove this leader will likely negatively affect the health of the remaining tree parts and potentially hasten failure. Not recommended
- Removal of the tree to stump level. This will leave a residual risk of Low, by wholly mitigating all three hazards. This option is recommended.

Therefore, it is recommended to remove the tree to a stump level. Action should be taken immediately by engaging a suitably qualified tree worker.

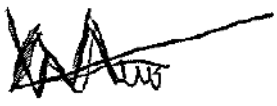
6.0 Recommendations

The following recommendations are made to limit impacts upon the assessed trees and preserve tree stability and viability:

- The identified tree,(Tree 25) should be removed to a minimum of a stump level, by a qualified tree worker with appropriate professional liability insurance, and removed in a manner to prevent damage to retained trees and the adjacent property.

We thank you for the opportunity to be involved in this project. Should you require any further clarification on this matter, please contact Warwick Muir (0448 689 698).

Regards



Warwick Muir

Ecologist / Arborist

BSc Dip Arb (AQF5)

Attachment A – Assessed trees Schedule

Attachment B – ISA Tree Hazard Form

Attachment C – SULE Methodology and Glossary

7.0 References

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Attachment A - Assessed Tree Schedule

Tree ID	25	
Scientific Name	*Angophora costata*	
Common Name	Smooth-barked	
DBH (m)	0.65	
DAB (m)	0.7	
Canopy Spread (m)	**N**	6
	E	6
	S	6
	W	6
Canopy Spread Average	**(m)**	6
Estimated Total Canopy Area	**(m^2)**	113
Height (m)	15	
SULE	**Remove**	
Age Class	Mature	
Health	Poor	
Structure	Poor	
Landscape significance rating	High	
Estimated life expectancy	5-15	
Retention Value	Moderate	
TPZ (m)	7.8	
SRZ (m)	2.8	

Basic Tree Risk Assessment Form

Client Vivacity Property Date 21/06/2022 Time

Address/Tree location 207/209 Wallarah Rd, Kanwall NSW, located on the Western Boundary. Tree no. 25 Sheet 1 of 1

Tree species Angophora costata (Sydney Red Gum) dbh 0.65 (m) Height 15 Crown spread dia. 12

Assessor(s) Warwick Muir (AQF5 Arborist) Time frame Tools used Binoculars

Target Assessment

Target number	Target description	Target zone: Target within drip line	Target zone: Target within 1 x Ht.	Target zone: Target within 1.5 x Ht.	Occupancy rate (1–rare 2–occasional 3–frequent 4–constant)	Practical to move target?	Restriction practical?
1	House on Adjoining Property to W (745-747 Pacific Hwy, Kanwal NSW 2259)	✔			4	No	No
2							
3							
4							

Site Factors

History of failures **Topography** Flat☐ Slope☐ ____% **Aspect**

Site changes None■ Grade change☐ Site clearing☐ Changed soil hydrology☐ Root cuts☐ Describe

Soil conditions Limited volume☐ Saturated☐ Shallow☐ Compacted☐ Pavement over roots■ 15 % Describe House foundations

Prevailing wind direction S/W **Common weather** Strong winds■ Ice☐ Snow☐ Heavy rain☐ Describe

Tree Health and Species Profile

Vigor Low■ Normal☐ High☐ **Foliage** None (seasonal)☐ None (dead)☐ Normal 70 % Chlorotic 20 % Necrotic 10 %

Pests Termites/ Wood Decay Fungi **Abiotic**

Species failure profile Branches■ Trunk☐ Roots☐ Describe Species known to drop large branches under stress

Load Factors

Wind exposure Protected☐ Partial■ Full☐ Wind funneling☐ **Relative crown size** Small☐ Medium■ Large☐

Crown density Sparse☐ Normal☐ Dense☐ **Interior branches** Few■ Normal☐ Dense☐ **Vines/Mistletoe/Moss** ☐

Recent or planned change in load factors

Tree Defects and Conditions Affecting the Likelihood of Failure

— Crown and Branches —

Unbalanced crown■ LCR 40 %

Dead twigs/branches■ ____% overall Max. dia. 20

Broken/Hangers Number Max. dia.

Over-extended branches☐

Pruning history

Crown cleaned☐ Thinned☐ Raised☐

Reduced☐ Topped☐ Lion-tailed☐

Flush cuts■ Other

Cracks■ Longitudinal/ Radial Termite Cracks Lightning damage☐

Codominant☐ Included bark☐

Weak attachments☐ Cavity/Nest hole ____% circ.

Previous branch failures■ Similar branches present☐

Dead/Missing bark☐ Cankers/Galls/Burls☐ Sapwood damage/decay☐

Conks☐ Heartwood decay☐

Response growth

Main concern(s)

Load on defect N/A☐ Minor☐ Moderate■ Significant☐

Likelihood of failure Improbable☐ Possible☐ Probable■ Imminent■

— Trunk —

Dead/Missing bark☐ Abnormal bark texture/color☐

Codominant stems☐ Included bark☐ Cracks☐

Sapwood damage/decay■ Cankers/Galls/Burls☐ Sap ooze☐

Lightning damage☐ Heartwood decay☐ Conks/Mushrooms■

Cavity/Nest hole ____% circ. Depth Poor taper☐

Lean 25 ° Corrected? No

Response growth

Main concern(s)

Termite cracks and Decay column to 4m

Load on defect N/A☐ Minor☐ Moderate☐ Significant■

Likelihood of failure

Improbable☐ Possible☐ Probable■ Imminent☐

— Roots and Root Collar —

Collar buried/Not visible☐ Depth Stem girdling☐

Dead☐ Decay■ Conks/Mushrooms■

Ooze☐ Cavity☐ ____% circ.

Cracks■ Cut/Damaged roots☐ Distance from trunk

Root plate lifting☐ Soil weakness☐

Response growth

Main concern(s) Decay columns with fungi, heartwood decay and potential root rot

Load on defect N/A☐ Minor☐ Moderate☐ Significant■

Likelihood of failure

Improbable☐ Possible☐ Probable■ Imminent☐

Risk Categorization

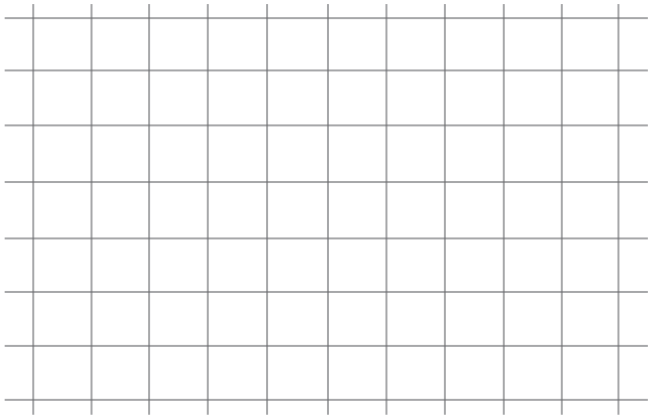
Condition number	Tree part	Conditions of concern	Part size	Fall distance	Target number	Target protection	Likelihood: Failure: Improbable	Likelihood: Failure: Possible	Likelihood: Failure: Probable	Likelihood: Failure: Imminent	Likelihood: Impact: Very low	Likelihood: Impact: Low	Likelihood: Impact: Medium	Likelihood: Impact: High	Likelihood: Failure & Impact (from Matrix 1): Unlikely	Likelihood: Failure & Impact (from Matrix 1): Somewhat	Likelihood: Failure & Impact (from Matrix 1): Likely	Likelihood: Failure & Impact (from Matrix 1): Very likely	Consequences: Negligible	Consequences: Minor	Consequences: Significant	Consequences: Severe	Risk rating of part (from Matrix 2)
1	Crown	Large Leader and Branches with extensive termite damage and decay.				None	○	○	◉	○	○	○	○	◉	○	○	◉	○	○	○	○	◉	High
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
2	Trunk	Heartwood Decay Column and Termite Damage				None	○	○	◉	○	○	○	○	◉	○	○	◉	○	○	○	○	◉	High
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
3	Roots	Decay columns with fungi, heartwood decay and potential root rot				Fence	○	◉	○	○	○	○	○	◉	○	○	◉	○	○	○	○	◉	Moderat
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
4							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	

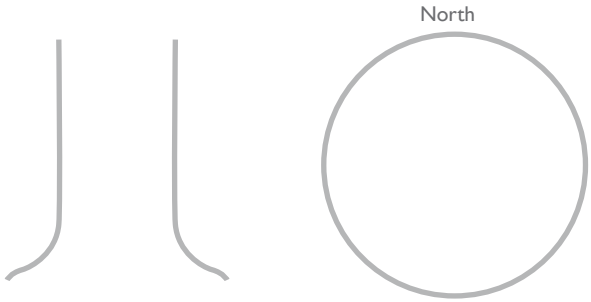
Matrix 1. Likelihood matrix.

Likelihood of Failure	Likelihood of Impacting Target			
	Very low	Low	Medium	High
Imminent	Unlikely	Somewhat likely	Likely	Very likely
Probable	Unlikely	Unlikely	Somewhat likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2. Risk rating matrix.

Likelihood of Failure & Impact	Consequences of Failure			
	Negligible	Minor	Significant	Severe
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low





Notes, explanations, descriptions _____

Mitigation options

Crown pruning of Termite affected leaders in crown — **Residual risk** High

Weight reduction pruning of crown — **Residual risk** High

Tree Removal to stump lower than 2m Fence — **Residual risk** Low

_____ — **Residual risk** _____

Overall tree risk rating Low ☐ Moderate ☐ High ■ Extreme ☐ **Work priority** 1 ■ 2 ☐ 3 ☐ 4 ☐

Overall residual risk Low ■ Moderate ☐ High ☐ Extreme ☐ **Recommended inspection interval** _____

Data ☐Final ☐Preliminary **Advanced assessment needed** ■No ☐Yes-Type/Reason _____

Inspection limitations ☐None ■Visibility ■Access ☐Vines ☐Root collar buried Describe _____

Attachment C – SULE Methodology

SULE (Safe Useful Life Expectancy)

In planning context, the time a tree can expect to be usefully retained is the most important long- term consideration. SULE i.e., a system designed to classify trees into a number of categories so that information regarding tree retention can be concisely communicated in a non-technical manner. SULE categories are easily verifiable by experienced personnel without great disparity. A tree's SULE category is the life expectancy of the tree modified first by its age, health, condition, safety and location (to give safe life expectancy), then by economics (i.e., cost of maintenance: retaining trees at an excessive management cost is not normally acceptable), effect on better trees, and sustained amenity (i.e., establishing a range of age classes in a local population). SULE assessments are not static but may be modified as dictated by changes in tree health and environment. Trees with a short SULE may be at present by making a contribution to the landscape but their value to the local amenity will decrease rapidly towards the end of this period, prior to their being removed for safety or aesthetic reasons.

SULE Methodology

1. Long SULE - tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance;

A. Structurally sound trees located in positions that can accommodate future growth.

B. Trees which could be made suitable for long term retention by remedial care

C. Trees of special significance which would warrant extraordinary efforts to secure their long- term retention.

2. Medium SULE- tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance;

A. Trees which may only live from 15 to 40 years.

B. Trees which may live for more than 40 years but would be removed for safety or nuisance reasons.

C. Trees which may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.

D. Trees which could be made suitable for retention in the medium term by remedial care.

3. Short SULE - tree appeared to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance:

A. Trees which may only live from 5 to 15 years.

B. Trees which may live for more than 15 years but would be removed for safety or nuisance reasons.

C. Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.

D. Trees which require substantial remediation and are only suitable for retention in the short term.

4. Removal - trees which should be removed within the next 5 years;

A. Dead, dying, suppressed or declining trees.

B. Dangerous trees through instability or recent loss of adjacent trees.

C. Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.

D. Damaged trees that are clearly not safe to retain.

E. Trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.

F. Trees which are damaging or may cause damage to existing structures within the next 5 years.

G. Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f).

H. Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

5. Small, young or regularly pruned - Trees that can be moved or replaced;

A. Small trees less than 5m in height.

B. Young trees less than 15 years old but over 3m in height.

C. Formal hedges and trees intended for regular pruning to artificially control growth.

GLOSSARY

Age Classes

- Juvenile refers to an immature tree.
- Semi-mature refers to a tree between immaturity and full size.
- Mature refers to a full-sized tree with some capacity for further growth.
- Over-mature refers to a tree already in decline.

Diameter at breast height (DBH)

Tree stem diameter at 1.4m above ground level.

Diameter at buttress (DAB)

Tree stem diameter as measured above the root buttress at ground level.

Tree Protection Zone (TPZ)

An indicative measure of the area necessary to protect for tree viability, encompassing the area necessary to protect both the crown and woody roots as calculated by the formula SRZ= $(DAB*50)^{0.42}*0.64$

Structural Root Zone (SRZ)

An indicative measure of the spread of the primary woody and structural roots necessary for tree stability, as calculated by the formula SRZ= $(DAB*50)^{0.42}*0.64$

Visual Tree Assessment (VTA)

Visual inspection of tree only.

Co-dominant leaders

A tree where two or more stems are of similar diameter.

Included Bark Junctions

A junction where the angle of the union creates an area of ingrown bark. This can create a structural weakness, and is often found on co-dominant stems.

Crown

The portion of the tree consisting of branches and leaves and any part of the trunk from which branches arise.

Stem

The position of the tree consisting of branches and leaves and any part of the trunk from which branches arise. An organ which supports branches, leaves, flowers and fruits.

Epicormic Growth

Refers to shoots produced by dormant buds within the bark or stem of a tree as a result of stress, incorrect pruning or increased light.

Health Condition

Exceptional

- Visually complete crown with dense foliage throughout that indicates strong health and vigour.
- Leaf size and colour that is true to type for the species and free from pest (insect) and disease (pathogen) damage.
- Expected levels of primary growth or seasonal extension and internodal growth evident for the species.
- No evidence of colonising saprophytes and no deadwood evident.

Good

- Visually complete crown, varying in foliage density throughout.
- Leaf size and colour that is true to type for the species with none or minor levels of pest (insect) and/or disease (pathogen) damage evident.
- Expected levels of primary growth or seasonal extension and internodal growth evident for the species.
- No evidence of colonising saprophytes and low levels of deadwood present and approximately 10mm or less in size.

Fair

- Sparse crown, varying in foliage density throughout.
- Reduced leaf size and atypical in colour for the species.
- Low to medium levels of pest (insect) and/or disease (pathogen) damage.
- Reduced, seasonal extension and internodal growth.

- Deadwood easily visible and less than approximately 30mm in size.
- Epicormic growth may be evident.

Poor

- Obvious signs of crown decline, exhibiting significant reduction in live crown volume and foliage density with reduced leaf size and atypical in colour for the species.
- Evidence of defoliation and/or dieback of branch tips.
- Medium to high levels of pest (insect) and disease (pathogen) damage.
- Presence of exudates (kino and resins) from wounds (open and/or weeping).
- Significant reduction in seasonal extension and internodal growth, with significant levels of epicormic growth evident.
- Deadwood easily visible, approximately 30mm to 100mm in size.

Dead

- No evidence of live foliage observed throughout the crown.
- Obvious signs of cracking and shrinking wood.
- Visible evidence of delaminating bark to stems and branches.

Structure Condition

Very Good

- Strong branch unions at attachment points with no acute angles (compression and tension forks) and good branch taper at unions.
- No visibly, defective tree parts or structural defects.
- No wounds to stems and branches, no crossing and rubbing of branches and no wounds to exposed roots.
- No fungal fruiting bodies present to stems, branches and roots indicating, a presence of fungal pathogens.

Good to Fair

- Developing inclusions at unions of leading, codominant stems and branches.
- Evidence of defective tree parts (low levels) including branch and stem inclusions and crossing and rubbing of branches.
- Evidence of mechanical damage to periderm of stems, branches and roots, exposing vascular tissues.
- Exposed wounds for surface, colonising pathogens and entry points for developing decay.
- Presence of fungal fruiting bodies.
- Some evidence of cavities or hollows. (Fair only)
- No evidence of soil upheaval surrounding base of tree.

Poor

- Obvious signs and evidence of included bark to basal unions of codominant, leading stems and branches.
- Advanced, structural defects evident with failure of tree parts determined within 5 years from time of inspection and assessment.
- Evidence of decay from open wounds with presence of exudates (kino and resins) and exposed and degraded woody tissues.
- Presence of fungal fruiting bodies.
- Presence of cavities and hollows.
- Evidence of mechanical damage with advanced degradation of exposed roots.

a) Hazardous Tree

b) Immediate Removal

- Advanced, structural defects evident. Open cracks to codominant stem and branch unions evident.
- Previous branch and stem failures evident. Failure of remaining tree parts determined within 3 months 6 months, from time of inspection and assessment. Arboriculture works to be scheduled immediately to mitigate associated hazard and risk.
- Severed roots and soil upheaval evident indicating failure of root zone.
- Tree failure imminent within 12 months from time of inspection and assessment