ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Biodiversity Development Assessment Report

Lot 2 DP1015609, 288 Mungo Brush Road, Hawks Nest NSW

Prepared for: Brett Phillips
c/- Lands Advisory Service

May 2024

AEP Ref: 2397.01

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Revision

Revision	Date	Author	BAAS No.
00	01/06/2022	Natalie Black	19076
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Distribution

Revision	Date	Name	Organisation
00	01/06/2022	Brett Phillips	c/o Lands Advisory Service
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02	15/06/2023	Brett Phillips	c/o Lands Advisory Service
03	08/05/2024	Brett Phillips	c/a Lands Advisory Service

EXECUTIVE SUMMARY

Anderson Environment & Planning (AEP) was commissioned by Brett Phillips on behalf of Lands Advisory Service (the client) to undertake a Biodiversity Development Assessment Report (BDAR) for a proposed caravan park (the Subject Site) over land identified as Lot 2 DP1015609, 288 Mungo Brush Road Hawks Nest, NSW (the Study Area) in the MidCoast Local Government Area.

The Study Area (approx. 15.57ha) consists primarily of remnant native vegetation with access tracks, weekender dwellings (2) and a storage shed. The Subject Site is located north of Hawks Nest township in the MidCoast Local Government Area and totals approx. 7.31ha. Comprising approx. 7.15ha of native vegetation and 0.16ha of cleared / exotic species is proposed to be cleared for the establishment of a caravan park.

This report has been prepared to meet the requirements of the *Biodiversity Assessment Method 2020* (BAM) established under Section 6.7 of the *Biodiversity Conservation Act 2016* (NSW). This assessment utilises methods detailed within the BAM Order 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.

The Subject Site covers approximately 7.31ha and contains one (1) plant community type (PCT). The PCTs identified are:

- PCT 3544 (Good) – *Coastal Sands Apple – Blackbutt Forest*. No Associated Threatened Ecological Community (TEC) (7.31ha).

Fauna species recorded were typical of those expected in this locality and in this type of remnant habitat with existing connection to larger patches of habitat offsite. The following listed species have been recorded within the Subject Site, and will generate Credits under the Biodiversity Offset Scheme for Squirrel Glider and Koala (Hawks Nest and Tea Gardens population).

No serious and irreversible impacts (SAIIs) are likely to occur as a result of the proposal.

To address the principles outlined in BAM 2020 for Avoidance and Minimisation AEP has undertaken desktop and fields surveys in accordance with the BAM 2020, assessing candidate species and communities within the Subject Site. It has been determined that the proposed development will require the removal of 7.15ha of native vegetation, including Asset Protection Zones, noting that 25 individual HBTs have been identified for retention within the footprint. The proposal also includes the regeneration of 8.58ha of land within the Study Area consisting of 7.92ha of PCT 3544 and 0.5ha of cleared land.

The proposed amendments to the development include retention of an additional 16 HBTs which will provide for nesting opportunities for listed species, provide foraging opportunities for listed species, including Koalas and Squirrel Gliders and assist with connectivity through the region.

The amended proposal also includes the opportunity to regenerate an area of important habitat, reducing weed loads, creating a natural regenerating community which is proposed to be managed under a Biodiversity Management Plan (BMP). The BMP aims to not only allow for regeneration it also aims to increase habitat, enhance koala feed trees through plantings and promote education of the plant community and fauna through the installation of educational signage.

To offset residual impacts of the proposal upon identified biodiversity values, the proposal will require retirement of a total of 202 Ecosystem Credits (or equivalent) and 269 species credits for Squirrel Glider, and 269 for Koala (Koala, Hawks Nest and Tea Gardens population).

Assessment of the proposal under other relevant environmental policy instruments including *State Environmental Planning Policy* (Biodiversity and Conservation) 2021 (B&C SEPP), *State Environmental Planning Policy (Resilience and Hazards) 2021 (*R&H SEPP) and *Environment Protection and*

Biodiversity Conservation Act 1999 (EPBC Act) was undertaken. It was determined that the Subject Site is core koala habitat due to the large number of records, however, there is limited foraging opportunities, and with no listed Koala feed trees being impacted it has been determined that the proposed development is not deemed a significant impact. Therefore, referral under the EPBC Act is not required.

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Study Certification and Licensing

This report was written by Frances O'Brien BEnv LLB GDLP MEL (BAAS: 20013) and Thomas Stephens BEnvScMgt, reviewed and certified by Natalie Black BSc (Hons), Master Planning, (BAAS 19076) of Anderson Environment & Planning.

Staff	BAAS No	Title/Qualification	Tasks
Ian Benson	18147	Project Manager BEng (Civil) GradDipSc (Ecology) BAAS: 18147	Bird surveys, fauna surveys, threatened flora searches, songmeter review, Powerful Owl Survey
Frances O'Brien	20013	Senior Ecologist / Lead Botanist BEnv LLB GDLP MEL, BAAS: 20013	Contributor, conducting research or investigations that are relied on in preparing the report.
Natalie Black	19076	Senior Environmental Manager BSc (Hons), Master Planning, BAAS: 19076	Accredited person preparing and certifying the report.
Ian Simpson		Senior Ecologist/Botanist BSc (Botany/Ecology), GradCertNatRes	BAM Plots, habitat assessment, threatened flora survey, nocturnal fauna survey, bird survey, hollow bearing tree survey
Andrew Harker		Ecologist BEnvScMgt	Deploy monitoring equipment, habitat assessment, threatened flora survey, nocturnal fauna survey, bird survey
Sarah Currie		Ecologist BEnvScMgt	Deploy monitoring equipment, habitat assessment, threatened flora survey, nocturnal fauna survey, bird survey
Stevie Kay		Ecologist BSc (Marine)	BAM Plots, habitat assessment, threatened flora survey, nocturnal fauna survey, koala SAT assessment, bird survey
Angela Metcalfe		Ecologist BEnvSc (Hons)	Hollow Bearing tree survey, bird survey
Justin Chey		Ecologist BEnvSc&Mgt (Sustainability)	Threatened Flora Survey
Thomas Stephens		Ecologist BEnvSc&Mgt (Sustainability)	Contributor, conducting research or investigations that are relied on in preparing the report, habitat assessment and threatened flora survey.
Sebastien Doleac		Ecologist BSc (Biology), M. Conservation Biology; M. Research (Restoration/Molecular Ecology)	GIS

Kathleen Bushell		BSc. (Marine Biology)	GIS
Kieran Giffen		Ecologist Cert II Conservation and Eco Systems	Powerful Owl Hollow Survey
Magnus Minnaar		Dip Cons & Land Mmgt	Powerful Owl Hollow Survey

Research was conducted under the following licences:

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

Certification:

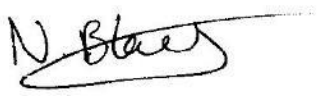
As the principal author and certifier, I, Natalie Black (BAAS: 19076), make the following certification:

- 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;
- Anderson Environment and Planning have no actual, potential or perceived conflicts of interest with Lands Advisory Services. Anderson Environment and Planning has received commercial payment for consulting services and assessment by Lands Advisory Services for this project;
- 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; and

This report has been written to comply with the requirements of the *Biodiversity Conservation Act, 2016* and *Biodiversity Conservation Regulation, 2017* as outlined in the below Table.

Biodiversity Conservation Act, 2016 (BC, Act) Section 6.15 Currency of biodiversity assessment report	
(1) A biodiversity assessment report cannot be submitted in connection with a relevant application unless the accredited person certifies in the report that the report has been prepared on the basis of the requirements of (and information provided under) the biodiversity assessment method as at a specified date and that date is within 14 days of the date the report is so submitted.	I, Natalie Black (BAAS: 19076) declare that I prepared the BDAR and all BDAR amendments for the relevant application on the basis of the requirements within BAM 2020 as at the specified date (below).
(2) A relevant application is an application for planning approval, for vegetation clearing approval, for biodiversity certification or in respect of a biodiversity stewardship agreement.	Not applicable to this application.
Biodiversity Conservation Regulation, 2017 (BC Regulations) Clause 6.8 Content of biodiversity development assessment reports (section 6.16)	
A biodiversity development assessment report must include—	
1. the number and classes of biodiversity credits required to be retired in accordance with the like-for-like requirements of the offset rules, and	Addressed within Section 2.4.5 of this BDAR
2. the number and classes of biodiversity credits that could be retired in accordance with the variation rules (in any case in which the proponent of the development proposes to use the variation rules), and	Addressed within Section 2.4.5 of this BDAR
3. details of any proposal to fund a biodiversity conservation action in accordance with the offset rules, and	Not applicable to this application.
4. details of any ecological rehabilitation of a site impacted by mining under a mining lease that is proposed as a measure to offset or compensate for those impacts, and	Not applicable to this application
5. the date of the report and the requisite certification under section 6.15 of the Act, and	As below.
6. details of the accreditation of the person preparing the report and of the qualifications and experience of any other person commissioned to conduct research or investigations that are relied on in preparing the report, and	As above and Appendix I
7. any other information required by the biodiversity assessment method or ancillary rules to be included in the report.	Refer Appendices for contributing investigations, results and contributing reports prepared by other Professional consultants

Principal Author and Certifier:



Natalie Black

Senior Environmental Manager

Anderson Environment & Planning

BAAS no. 19076

Calculator Ref: 00027081/BAAS19076/23/00040952

8 May 2024

Glossary of Terms and Abbreviations

APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method Order (2020) that determines: Methodology applicable to quantifying biodiversity values inherent within a development site; Avoid and minimise 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.
BC Act	*Biodiversity Conservation Act* 2016
Biodiversity Credit Report	Specifies the number and type of biodiversity credits required to offset the impacts of a development.
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.
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.
Council	MidCoast Council
Development Lands	Land upon which the development is proposed, and within which impacts upon biodiversity are required to be offset. Zoned RU2 – Rural Landscape.
DoEE	The Commonwealth Department of the Environment and Energy
DPIE	The NSW Department of Planning, Industry and Environment
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.
OEH	The former NSW Office of Environment and Heritage.
PFC	Percentage Foliage Cover.
Study Area	Entirety of Lot 2 DP1015609 (approx. 15.57ha). Refer Figure 1 and 2.
Subject Site	The development footprint, including APZ, services and associated civil works. It totals approx. 7.31ha.
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.

1.0 Stage 1 – Biodiversity Assessment

1.1 Introduction

A caravan park is proposed within land known as 288 Mungo Brush Road, Hawks Nest NSW (Lot 2 DP 1015609). At the request of Brett Phillips on behalf of Lands Advisory Service Pty Ltd (the client), Anderson Environment & Planning (AEP) have undertaken the necessary investigations to inform the production of a Biodiversity Development Assessment Report (BDAR) addressing the proposed development.

This BDAR adheres to the approach outlined in the Biodiversity Assessment Methodology (OEH 2020) (the BAM) and the BAM Calculator User Guide (OEH 2020b).

1.1.1 Biodiversity Offset Scheme Threshold Trigger

This BDAR has been triggered as required by 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*

The clearing threshold for the Subject Site is 1ha (based on the minimum lot size of 40ha). As 7.31ha is proposed to be cleared a BDAR is required.

1.1.2 Assessment Scope

The BDAR presented herewith aims to quantify impacts of the proposal upon biodiversity values based upon the methods described within the *Biodiversity Assessment Method Order 2020* (BAM), including threatened entities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act).

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

This report includes:

- **Stage 1 – Biodiversity Assessment** – including the mapping of remnant vegetation communities including Endangered Ecological Communities (EECs) within the site, the location of previously identified threatened species and their habitats, and potential contemporary occurrence of threatened species identified within the BAM Calculator; and
- **Stage 2 – Impact Assessment** – identification of impact avoidance and mitigation measures, and the quantifying of offset requirements in the form of biodiversity credits based upon residual impacts of the proposal.

1.1.3 The Proposal

The proposed development involves a caravan park and associated services, which requires the clearance/impact of approx. 7.15ha of native vegetation.

The development plans are included as **Appendix A**.

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 Subject Site in the surrounding landscape.

Table 1 – Site Particulars

Detail	Comments
Client	Brett Phillips c/o Lands Advisory Services Pty Ltd
Address	*288 Mungo Brush Road, Hawks Nest NSW*
Title(s)	*Lot 2 DP 1015609*
Study Area	*Comprising of 15.57ha, 15.07ha of native vegetation and 0.5ha of non-native/cleared land.*
Subject Site	Consists of the area within the above-mentioned lot identified as the development footprint and covers approx. 7.31ha total 7.15ha of native vegetation and 0.16ha of cleared / exotic.
LGA	MidCoast Council
Zoning	Under the Great Lakes Local Environment Plan 2014 (the LEP), the Subject Site is zoned RU2 – Rural Landscape.
Current Land Use	The current site contains one (1) residential dwelling and several access trails are present onsite.
Surrounding Land Use	The site is surrounded in all directions by RU2 – Rural Landscape lands.

Figure 1 depicts the extent of the site and defines the Subject Site and **Figure 2** depicts the location of the site within the landscape.

1.1.5 Information Sources

Information and spatial data provided within this BDAR have been compiled from various sources including:

- Field surveys conducted within the site and surrounding areas by AEP (2020, 2021 & 2023);
- State survey guidelines (DEC 2004; DECC 2009; DPIE 2020; OEH 2016a, DPIE 2018, DPE 2022);
- PlantNET NSW (https://plantnet.rbgsyd.nsw.gov.au/);
- Review of regional mapping for the site (State Vegetation Type Map, 2022);
- Threatened Biodiversity Profiles (https://www.environment.nsw.gov.au/threatenedSpeciesApp/);
- Search and review of flora and fauna sighting records in the DPIE BioNet Atlas within 10km of the site;
- Aerial Photograph Interpretation (API) of the site and surrounding locality (Nearmap 2022, Google 2023; NSW Department of Finance, Services and Innovation 2023);
- Search and review of flora and fauna sighting records in the BioNet Atlas of NSW within 10km of the site (https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet);

- Protected Matters Search within a 5km radius of the site held by DCCEEW, summarising Matters of National Environmental Significance that may occur in, or relate to the Subject Site;
    - Department of Planning Industry and Environment *BAM – Important Areas Map* to determine whether the site is mapped as *Swift Parrot Important Areas* or *Regent Honeyeater Important Areas;*
    - Collective knowledge gained from previous ecological survey and assessment in the MidCoast Council area over the past 35 years; and
    - Anecdotal records.

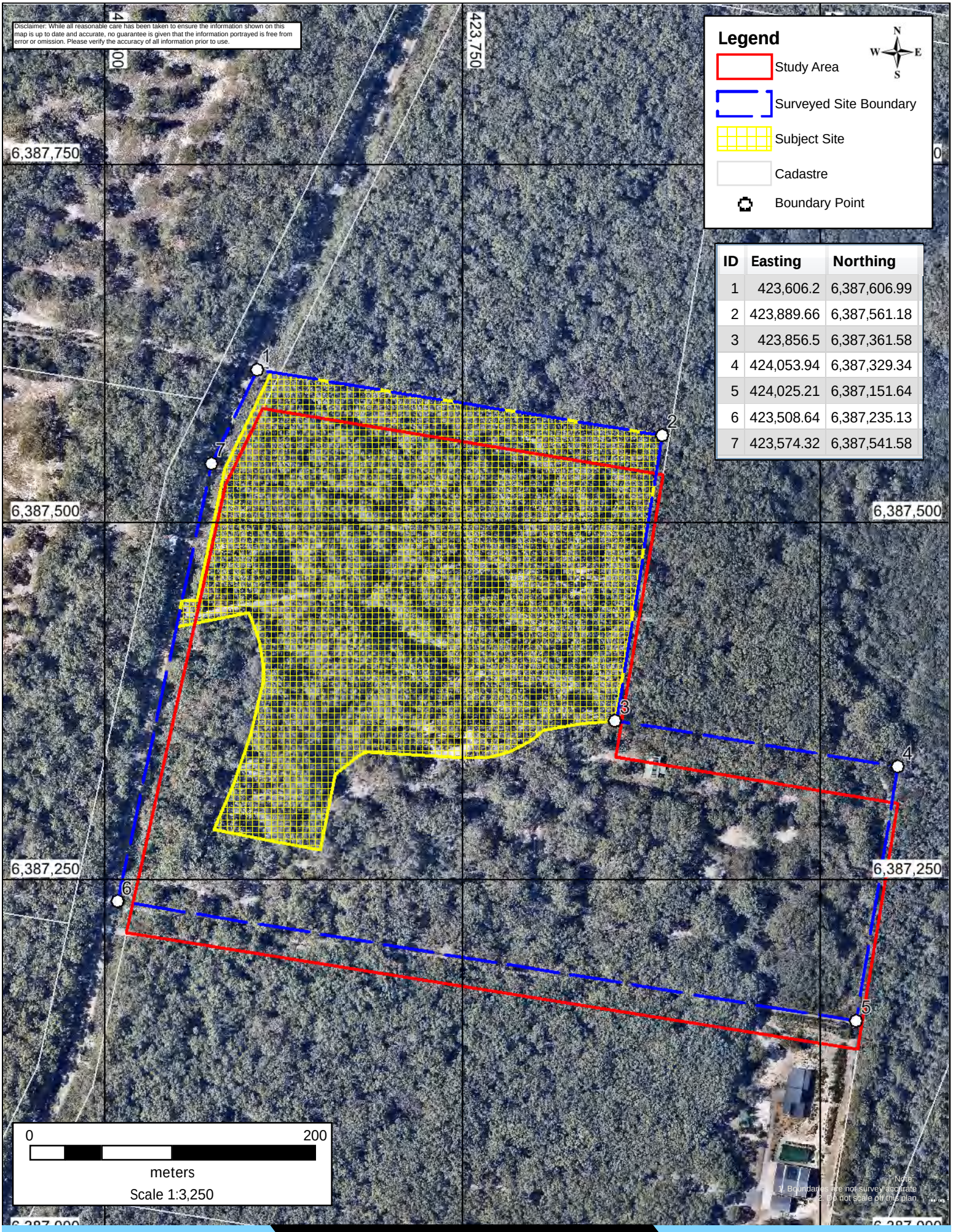


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Figure 1 - Site Location

Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01

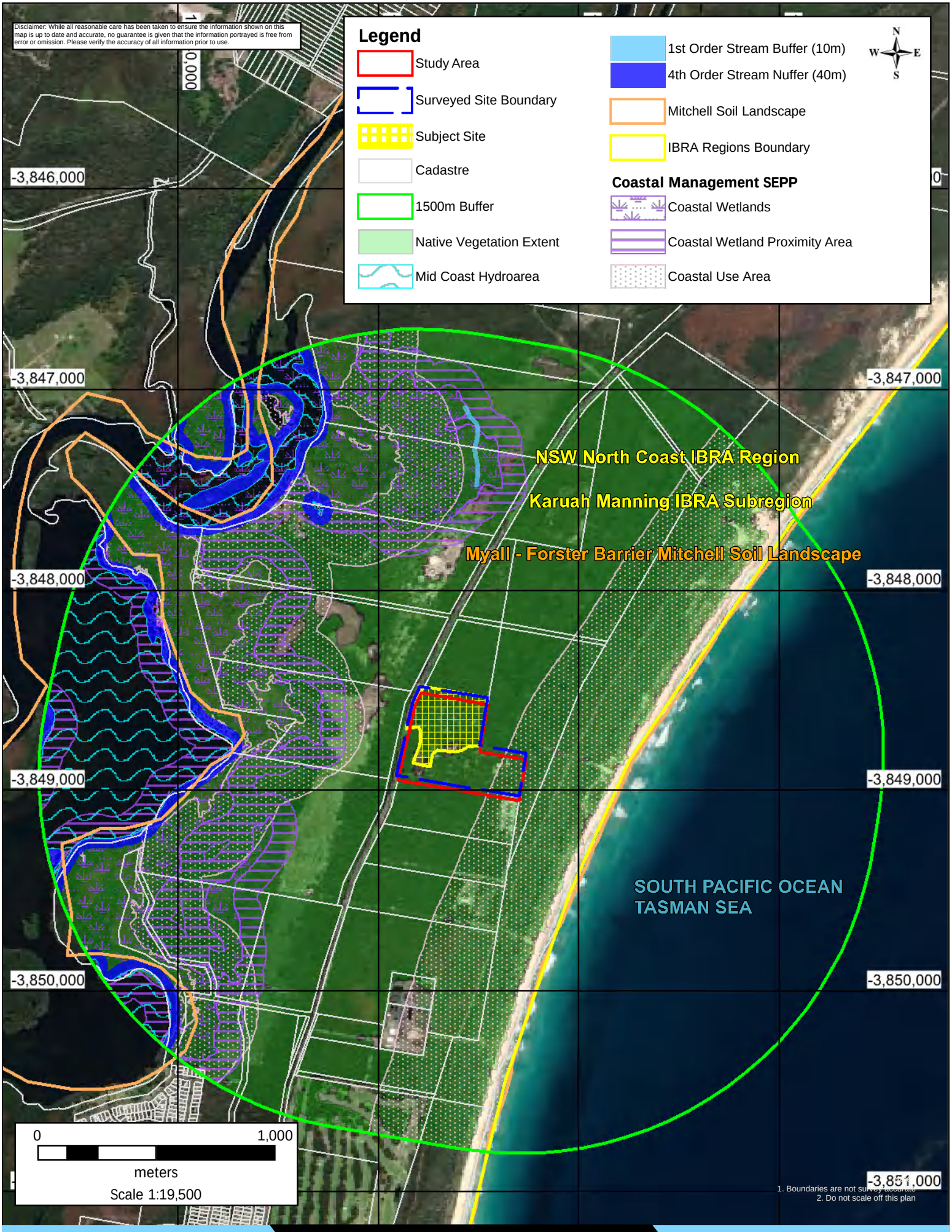

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Figure 2 - Location Map

Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01

1.2 Landscape Features

1.2.1 Regional Landscapes

The development site was identified as occurring within the following landscape areas:

- *IBRA Bioregion* – NSW North Coast.
- *IBRA Subregion* – Karuah - Manning.

1.2.2 Identified Landscape Features

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

Table 2 – Landscape Feature Assessment

Landscape Feature	Assessment
Rivers and Streams	No hydrolines are mapped on the Subject Site.
Wetlands	No mapped wetlands (R&H SEPP or otherwise) occur within the site.
Native Vegetation Extent	Approximately 15.07ha of native vegetation is located within the Study Area, of which 7.15ha will be impacted. Vegetation in the Subject Site is Plant Community Type PCT 3544 – *Coastal Sands Apple-Blackbutt Forest*, with an additional 7.92ha within the Study Area. No Associated Threatened Ecological Community (TEC) is located within the Subject Site.
Connectivity Features	The site is connected to larger tracts of bushland in all cardinal directions. Development of the site will not significantly impact connectivity through the locality as adequate vegetation will remain in the vicinity.
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 Subject Site.
NSW Landscape	Myall – Forster Barrier. Delineation of NSW Landscape areas are shown in 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 areas of AOBV are present on the Subject Site and the adjacent lands.

1.3 Site Context Components

1.3.1 Landscape Native Vegetation Cover

A 1500m was buffer placed around the site, totalling approximately 973ha in size (includes the total area of the Subject Site). Of this, approximately 604.9ha comprises native vegetation as per Section 4.3.2 of the BAM. This equates to approximately 62.17% native vegetation cover and was entered as such within the Calculator.

1.4 Native Vegetation

1.4.1 State Vegetation Type Mapping

State Vegetation Type Mapping utilised for the site was NSW Department of Planning and Environment 2022. *State Vegetation Type Map* (SVTM). The vegetation communities mapped within the assessment area, and their extent, are provided in **Table 3** and **Figure 3.**

Regional vegetation mapping served as a basis for preliminary site assessment. Ground-truthing of vegetation by AEP (2021) was the prime source of data to inform Plant Community Type determination in the present assessment.

Table 3 – Regional Vegetation Mapping Results

PCT ID	PCT Name	Area (ha)
3250	Northern Foothills Blackbutt Grassy Forest	9.84
3544	Coastal Sands Apple-Blackbutt Forest	4.18
3804	Northern Sandplain Damp Wallum Heath	0.59
N/A	Non-Native Vegetation	0.96
	Total	**15.57**

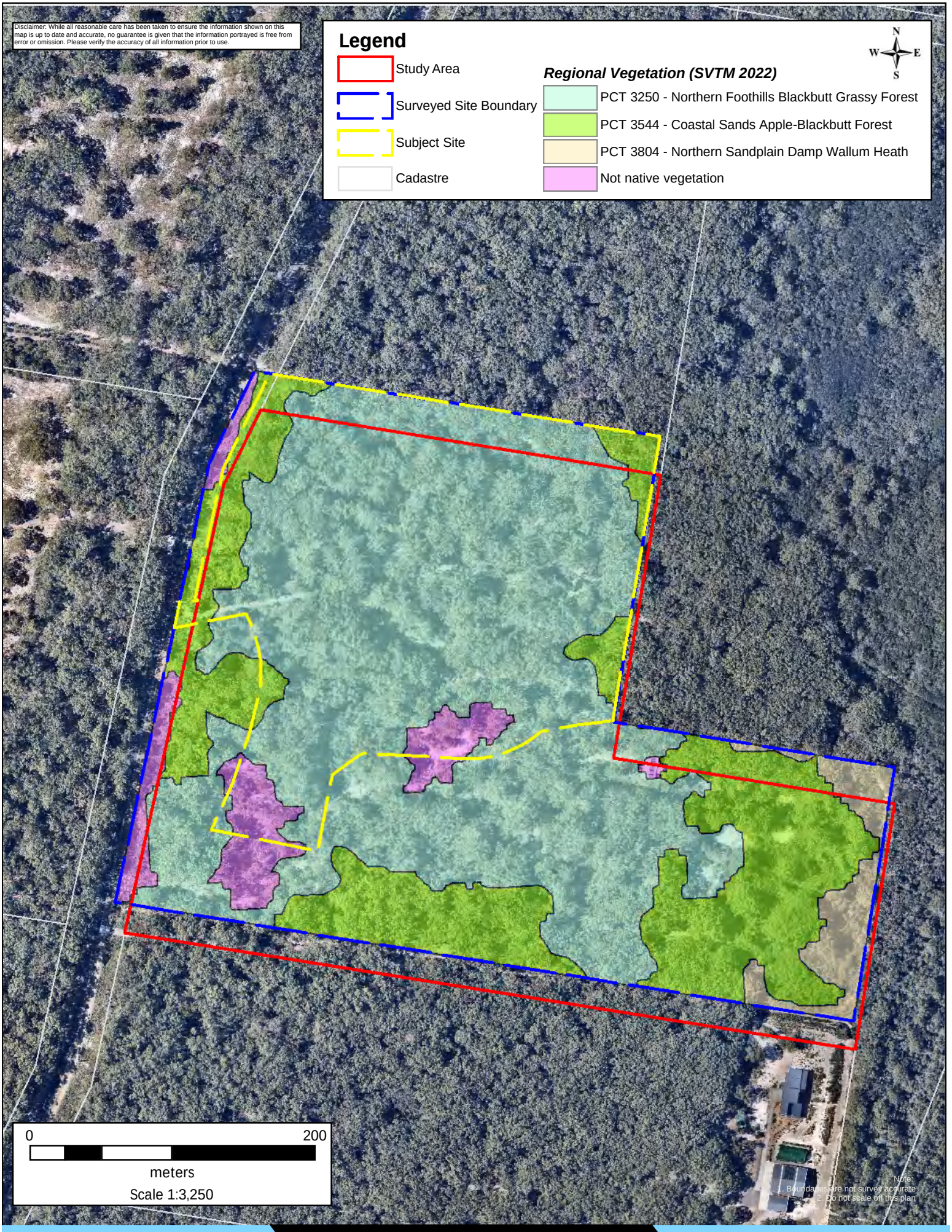

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Figure 3 - Regional Vegetation (SVTM 2022) | Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW | BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd | A EP Ref: 2397.01

1.4.2 Plot Based Floristic Surveys

Plot Based Floristic surveys were undertaken by AEP in February 2021 to identify the most likely Plant Community Types 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.

- 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.
- 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 these data in the BAR.
- Four (4) BAM plots were undertaken within the remnant native vegetation present within the Subject Site. Plots were located by producing random points via GIS software. 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** to **12**. A summary of the plot data and a flora list for all flora species is provided in **Appendix B**.

1.4.2.1 Plant Community Types (PCTs) and Vegetation Zones

The Study Area consists of remnant vegetation, with varying quality of understory and mid-storey vegetation. Overall, the vegetation is in good condition with an intact canopy present, however some disturbance in the mid and ground layers is evident as a result of clearing for informal tracks and rubbish dumping.

1.4.3 PCT Selection Justification

The BAM's assessment module requires the identification of the PCT or the most likely PCTs, 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 System. The identification of TECs must be consistent with the Threatened Species Scientific Committee Final Determination for the TEC.

Table 4 analyses the floristic composition and landscape position of the BAM plot data against the BioNet Vegetation Information System (VIS) to determine the final PCTs. Note that species from plot data in **Table 4** highlighted in bold were used as diagnostic markers to filter PCTs within the VIS.

Analysis of the floristic composition and landscape position of the BAM plots in the community against the Vegetation Classification System provided a conclusive identification of one (1) PCT within the Subject Site:

- PCT 3544 – *Coastal Sands Apple – Blackbutt Forest*

Fieldwork identified one (1) vegetation zones within the Subject Site. PCT and vegetation mapping for the Subject Site is shown in **Figure 4**. Additional site photographs are included in **Appendix F**.

Table 4 – PCT Determination

Plot No		**1, 2, 3, 4**			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
Regional Vegetation		Yes	No	No	Yes
IBRA Region		NSW North Coast; Sydney Bioregion	NSW North Coast; Sydney Basin;	NSW North Coast;	NSW North Coast; South Eastern Queensland; Sydney Basin;
IBRA Subregion		Karuah Manning; Macleay Hastings; Illawara; Jervis; Wyong	Central Coast, Lake Macquarie, Port Stephens, Randwick, Shoalhaven, Sutherland	Karuah Manning; Macleay Hastings;	Chaelundi; Coffs Coast and Escarpment; Comboyne Plateau; Dalmorton; Karuah Manning; Macleay Hastings; Yuraygir; Clarence Lowlands; Clarence Sandstones; Hunter; Sydney Cataract; Wyong;
IBRA Comments		Not Specified	Not Specified	Not Specified	Not Specified
NSW Landscapes		Not Specified	Not Specified	Not Specified	Not Specified
LGA		Central Coast; Lake Macquarie; Mid-Coast; Port Macquarie-Hastings; Port Stephens; Shoalhaven;	Central Coast; Lake Macquarie; Mid-Coast; Port Macquarie-Hastings; Port Stephens; Shoalhaven;	Kempsey; Mid-Coast; Port Stephens;	Bellingen; Central Coast; Cessnock; Clarence Valley; Coffs Harbour; Kempsey; Lake Macquarie; Mid-Coast; Nambucca; Port Macquarie-Hastings; Port Stephens; Richmond Valley; Wollongong;
Key Diagnostic Species Listed	**Tree Species**	*Banksia serrata , Angophora costata , Eucalyptus pilularis , Corymbia gummifera , Glochidion ferdinandi , Banksia integrifolia , Allocasuarina littoralis , Banksia aemula , Ceratopetalum gummiferum , Eucalyptus piperita , Alphitonia excelsa , Endiandra sieberi , Notelaea longifolia , Acacia binervia , Eucalyptus pyrocarpa , Eucalyptus signata , Acacia maidenii , Allocasuarina torulosa , Cupaniopsis anacardioides , Eucalyptus botryoides , Eucalyptus robusta , Melaleuca quinquenervia , Syncarpia*	*Angophora costata , Banksia serrata , Corymbia gummifera , Notelaea longifolia , Banksia integrifolia , Banksia aemula , Allocasuarina littoralis , Eucalyptus pilularis , Glochidion ferdinandi , Cupaniopsis anacardioides , Eucalyptus piperita , Ceratopetalum gummiferum , Eucalyptus haemastoma , Eucalyptus botryoides , Eucalyptus haemastoma x racemosa , Acacia binervata , Acmena smithii , Clerodendrum tomentosum , Endiandra sieberi ,*	*Angophora costata , Corymbia gummifera , Banksia aemula , Eucalyptus signata , Banksia serrata , Eucalyptus piperita , Ceratopetalum gummiferum , Eucalyptus pilularis , Eucalyptus globoidea , Eucalyptus robusta , Eucalyptus saligna , Eucalyptus parramattensis*	*Eucalyptus pilularis , Allocasuarina torulosa , Eucalyptus microcorys , Glochidion ferdinandi , Syncarpia glomulifera , Corymbia intermedia , Angophora costata , Allocasuarina littoralis , Eucalyptus resinifera , Eucalyptus carnea , Acacia maidenii , Eucalyptus propinqua , Alphitonia excelsa , Eucalyptus siderophloia , Corymbia gummifera , Lophostemon confertus , Notelaea longifolia , Trochocarpa laurina , Eucalyptus globoidea , Acacia binervata , Acacia melanoxylon , Angophora floribunda , Banksia integrifolia , Eucalyptus*

Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
		glomulifera , Acmena smithii , Angophora floribunda , Casuarina equisetifolia subsp. incana , Clerodendrum tomentosum , Corymbia maculata , Eucalyptus botryoides <--> saligna , Eucalyptus carnea , Eucalyptus globoidea , Eucalyptus microcorys , Eucalyptus punctata , Eucalyptus sclerophylla , Litsea reticulata	*Eucalyptus camfieldii , Eucalyptus capitellata , Eucalyptus umbra*		*acmenoides , Clerodendrum tomentosum , Eucalyptus eugenioides , Eucalyptus umbra , Lophostemon suaveolens , Melaleuca quinquenervia , Corymbia maculata , Eucalyptus paniculata , Eucalyptus robusta , Eucalyptus signata , Acacia concurrens , Acmena smithii , Guioa semiglauca , Acacia binervia , Cryptocarya microneura , Eucalyptus grandis , Eucalyptus punctata , Eucalyptus saligna , Acacia aulacocarpa , Acacia decurrens , Angophora leiocarpa , Angophora woodsiana , Brachychiton populneus , Casuarina glauca , Cryptocarya glaucescens , Endiandra discolor , Endiandra sieberi , Eucalyptus ancophila , Eucalyptus cameronii , Eucalyptus crebra , Eucalyptus piperita , Eucalyptus rummeryi , Eucalyptus seeana , Eucalyptus tereticornis , Ficus rubiginosa , Jagera pseudorhus var. pseudorhus , Acacia blakei , Acacia parramattensis , Banksia serrata , Brachychiton acerifolius , Ceratopetalum gummiferum , Cleistanthus cunninghamii , Cupaniopsis anacardioides , Cyclophyllum longipetalum , Denhamia bilocularis , Endiandra muelleri , Eucalyptus agglomerata , Eucalyptus baileyana , Eucalyptus biturbinata , Eucalyptus campanulata , Eucalyptus fergusonii , Eucalyptus fibrosa , Eucalyptus planchoniana , Eucalyptus racemosa , Euroschinus falcatus var. falcatus , Olea paniculata , Polyscias elegans ,*

Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
					Quintinia verdonii , Sarcopteryx stipata
	Shrub Species	*Monotoca elliptica , Acacia ulicifolia , Hibbertia linearis , Acacia suaveolens , Leucopogon lanceolatus , Persoonia levis , Bossiaea rhombifolia , Ricinocarpos pinifolius , Acacia longifolia , Dillwynia retorta , Aotus ericoides , Bossiaea heterophylla , Leptospermum trinervium , Pimelea linifolia , Breynia oblongifolia , Tetratheca thymifolia , Gompholobium latifolium , Platysace lanceolata , Xylomelum pyriforme , Acacia terminalis , Monotoca scoparia , Brachyloma daphnoides , Eriostemon australasius , Leptomeria acida , Platysace ericoides , Dodonaea triquetra , Leptospermum polygalifolium , Bossiaea ensata , Persoonia linearis , Dillwynia glaberrima , Hibbertia obtusifolia , Tetratheca ericifolia , Leucopogon margarodes , Polyscias sambucifolia , Correa reflexa , Elaeocarpus reticulatus , Amperea xiphoclada , Conospermum taxifolium , Epacris pulchella , Lambertia formosa , Persoonia lanceolata , Platylobium formosum , Platysace linearifolia , Aotus subglauca , Hibbertia fasciculata , Leucopogon leptospermoides , Astroloma pinifolium , Leucopogon ericoides , Ozothamnus diosmifolius , Phyllanthus hirtellus , Pittosporum undulatum , Podolobium ilicifolium , Zieria smithii , Hibbertia vestita , Leptospermum laevigatum , Persoonia laurina , Acacia floribunda , Astrotricha longifolia , Dillwynia*	*Monotoca elliptica , Acacia longifolia , Acacia suaveolens , Ricinocarpos pinifolius , Bossiaea heterophylla , Acacia ulicifolia , Aotus ericoides , Acacia terminalis , Leptospermum trinervium , Xylomelum pyriforme , Leucopogon ericoides , Dillwynia retorta , Leptospermum laevigatum , Isopogon anemonifolius , Pimelea linifolia , Breynia oblongifolia , Elaeocarpus reticulatus , Persoonia lanceolata , Dodonaea triquetra , Persoonia levis , Correa reflexa , Bossiaea ensata , Eriostemon australasius , Monotoca scoparia , Woollsia pungens , Gompholobium latifolium , Bossiaea scolopendria , Hibbertia obtusifolia , Amperea xiphoclada , Hibbertia linearis , Lambertia formosa , Leptomeria acida , Petrophile pulchella , Pittosporum revolutum , Tetratheca ericifolia , Bossiaea rhombifolia , Conospermum taxifolium , Epacris pulchella , Hakea dactyloides , Homalanthus populifolius , Philotheca salsolifolia , Pittosporum undulatum , Allocasuarina distyla , Brachyloma daphnoides , Hibbertia acicularis , Leucopogon lanceolatus , Persoonia linearis , Phyllota phylicoides , Platylobium formosum , Platysace lanceolata , Zieria pilosa , Banksia ericifolia , Daviesia mimosoides , Grevillea mucronulata , Hibbertia fasciculata , Leptospermum polygalifolium , Lomatia silaifolia , Petrophile sessilis , Platysace ericoides , Platysace linearifolia ,*	*Acacia ulicifolia , Leucopogon leptospermoides , Bossiaea heterophylla , Leptospermum trinervium , Dillwynia retorta , Ricinocarpos pinifolius , Eriostemon australasius , Leptospermum polygalifolium , Monotoca elliptica , Aotus ericoides , Persoonia levis , Acacia suaveolens , Hibbertia linearis , Leucopogon lanceolatus , Amperea xiphoclada , Melaleuca nodosa , Platysace ericoides , Leptomeria acida , Boronia pinnata , Monotoca scoparia , Pimelea linifolia , Tetratheca thymifolia , Acacia longifolia , Isopogon anemonifolius , Euryomyrtus ramosissima , Acacia terminalis , Banksia oblongifolia , Lambertia formosa , Woollsia pungens , Bossiaea rhombifolia , Gompholobium latifolium , Leucopogon ericoides , Persoonia lanceolata , Zieria laxiflora , Epacris pulchella , Hibbertia fasciculata , Bossiaea ensata , Brachyloma daphnoides , Leucopogon virgatus , Platysace linearifolia , Xylomelum pyriforme , Lomatia silaifolia , Melaleuca sieberi , Phyllota phylicoides , Platysace lanceolata , Acacia myrtifolia , Astroloma pinifolium , Baeckea diosmifolia , Dillwynia floribunda , Hibbertia obtusifolia , Persoonia linearis , Petrophile pulchella , Aotus subglauca , Banksia spinulosa , Conospermum taxifolium , Epacris microphylla , Gompholobium virgatum , Hakea dactyloides ,*	*Polyscias sambucifolia , Breynia oblongifolia , Hibbertia aspera , Dodonaea triquetra , Persoonia linearis , Leucopogon lanceolatus , Ozothamnus diosmifolius , Lomatia silaifolia , Persoonia stradbrokensis , Pultenaea retusa , Leucopogon juniperinus , Leptospermum polygalifolium , Rubus parvifolius , Acacia longifolia , Podolobium ilicifolium , Callistemon salignus , Pimelea linifolia , Acacia floribunda , Rubus moluccanus , Hibbertia vestita , Elaeocarpus reticulatus , Acacia irrorata , Acacia ulicifolia , Hibbertia obtusifolia , Jacksonia scoparia , Hibbertia empetrifolia subsp. empetrifolia , Persoonia levis , Pittosporum revolutum , Pultenaea villosa , Daviesia ulicifolia , Denhamia silvestris , Platylobium formosum , Acacia fimbriata , Acacia myrtifolia , Pittosporum undulatum , Banksia spinulosa , Persoonia conjuncta , Synoum glandulosum subsp. glandulosum , Gompholobium latifolium , Monotoca scoparia , Phyllanthus hirtellus , Tetratheca thymifolia , Zieria smithii , Acacia falcata , Acacia implexa , Archirhodomyrtus beckleri , Duboisia myoporoides , Melaleuca linariifolia , Melaleuca styphelioides , Myrsine variabilis , Phyllanthus gunnii , Platysace lanceolata , Solanum hapalum , Tabernaemontana pandacaqui , Trema tomentosa var. aspera , Acacia leiocalyx subsp. leiocalyx , Indigofera australis ,*

Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
		floribunda , Gompholobium virgatum , Isopogon anemonifolius , Jacksonia scoparia , Leucopogon virgatus , Lomatia silaifolia , Podolobium scandens , Styphelia viridis , Zieria laxiflora , Acacia brownii , Acacia implexa , Bauera rubioides , Gompholobium grandiflorum , Hibbertia saligna , Homalanthus populifolius , Indigofera australis , Leucopogon parviflorus , Melichrus procumbens , Acacia falcata , Acacia irrorata , Acacia myrtifolia , Aotus lanigera , Banksia spinulosa , Bursaria spinosa , Comesperma ericinum , Exocarpos cupressiformis , Gonocarpus oreophilus , Hibbertia diffusa , Hibbertia salicifolia , Leucopogon juniperinus , Leucopogon muticus , Lissanthe strigosa , Melaleuca nodosa , Mirbelia baueri , Mirbelia rubiifolia , Myrsine variabilis , Persoonia mollis , Petrophile pulchella , Philotheca myoporoides , Rhytidosporum procumbens , Styphelia triflora , Woollsia pungens , Zieria arborescens , Zieria laevigata , Acacia genistifolia , Acacia leiocalyx subsp. leiocalyx , Astroloma humifusum , Astrotricha floccosa , Astrotricha latifolia , Banksia oblongifolia , Boronia pinnata , Boronia thujona , Bossiaea scolopendria , Brachyloma scortechinii , Calytrix tetragona , Cassinia aculeata , Cassinia compacta , Cassinia longifolia , Chloanthes stoechadis , Choretrum candollei , Coronidium elatum , Correa alba var. alba , Daviesia	*Polyscias sambucifolia , Styphelia viridis , Acacia myrtifolia , Astroloma pinifolium , Chloanthes stoechadis , Epacris longiflora , Gompholobium grandiflorum , Kunzea ambigua , Leucopogon parviflorus , Melaleuca nodosa , Philotheca buxifolia , Phyllanthus hirtellus , Tetratheca thymifolia , Acacia implexa , Acacia linifolia , Acacia longissima , Banksia oblongifolia , Banksia paludosa , Banksia robur , Banksia spinulosa , Boronia thujona , Callicoma serratifolia , Callistemon citrinus , Comesperma ericinum , Conospermum ericifolium , Crowea exalata , Darwinia fascicularis , Dillwynia elegans , Dillwynia floribunda , Gompholobium huegelii , Grevillea sericea , Hakea gibbosa , Hakea sericea , Hakea teretifolia , Hibbertia aspera , Hibbertia monogyna , Hibbertia nitida , Hibbertia riparia , Hibbertia vestita , Isopogon anethifolius , Leionema diosmeum , Leptospermum polyanthum , Leucopogon leptospermoides , Leucopogon virgatus , Lissanthe strigosa , Melaleuca armillaris subsp. armillaris , Melichrus procumbens , Micromyrtus ciliata , Myrsine variabilis , Notelaea ovata , Persoonia mollis , Persoonia pinifolia , Phyllanthus gunnii , Podocarpus spinulosus , Pomaderris ferruginea , Pultenaea linophylla , Pultenaea retusa , Pultenaea villosa , Westringia fruticosa*	*Hibbertia aciculares , Melichrus procumbens , Philotheca myoporoides , Phyllanthus hirtellus , Pseudanthus orientalis , Styphelia viridis , Tetratheca ericifolia , Acacia floribunda , Aotus lanigera , Astroloma humifusum , Breynia oblongifolia , Callistemon pachyphyllus , Calytrix tetragona , Choretrum candollei , Comesperma ericinum , Correa reflexa , Dillwynia glaberrima , Hakea teretifolia , Harmogia densifolia , Hibbertia saligna , Hibbertia vestita , Hovea purpurea , Jacksonia scoparia , Leptospermum juniperinum , Leptospermum liversidgei , Leucopogon deformis , Leucopogon parviflorus , Melaleuca ericifolia , Melaleuca thymifolia , Mirbelia rubiifolia , Olax stricta , Persoonia virgata , Philotheca salsolifolia*	*Myrsine howittiana , Notelaea ovata , Persoonia media , Psychotria loniceroides , Acacia longissima , Acronychia oblongifolia , Astrotricha latifolia , Chorizema parviflorum , Daviesia umbellulata , Exocarpos cupressiformis , Exocarpos strictus , Hibbertia diffusa , Leptospermum liversidgei , Leptospermum trinervium , Notelaea venosa , Pomaderris lanigera , Pultenaea linophylla , Pultenaea myrtoides , Sannantha angusta , Tetratheca ericifolia , Wikstroemia indica , Acacia brownii , Acacia complanata , Acacia decora , Acacia suaveolens , Acacia terminalis , Austromyrtus dulcis , Bossiaea rhombifolia , Bursaria spinosa , Clerodendrum floribundum var. floribundum , Commersonia fraseri , Coronidium elatum , Cryptocarya rigida , Daviesia squarrosa , Dillwynia retorta , Euryomyrtus ramosissima , Gompholobium pinnatum , Hakea dactyloides , Hakea salicifolia , Hibbertia linearis , Homalanthus populifolius , Hovea acutifolia , Hovea longifolia , Leptospermum juniperinum , Melaleuca alternifolia , Melaleuca nodosa , Melichrus procumbens , Olearia nernstii , Podolobium scandens , Rhodamnia rubescens , Styphelia triflora , Wilkiea huegeliana , Acacia elongata , Acacia linifolia , Acacia schinoides , Acacia stricta , Acronychia imperforata , Alectryon coriaceus , Alyxia ruscifolia , Astrotricha floccosa , Banksia oblongifolia , Banksia paludosa , Bertya oblonga , Callistemon*

Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
		ulicifolia , Dillwynia phylicoides , Duboisia myoporoides , Epacris microphylla , Gompholobium pinnatum , Hakea teretifolia , Hibbertia riparia , Isopogon anethifolius , Leptomeria drupacea , Leptospermum liversidgei , Myrsine howittiana , Nematolepis squamea subsp. squamea , Notelaea venosa , Oxylobium arborescens , Philotheca salsolifolia , Phyllanthus gunnii , Phyllota phylicoides , Pimelea ligustrina , Pimelea stricta , Pittosporum revolutum , Pultenaea daphnoides , Pultenaea flexilis , Pultenaea villosa , Rubus parvifolius , Synoum glandulosum subsp. glandulosum , Tetratheca juncea , Westringia fruticosa			*acuminatus , Callistemon rigidus , Cassinia compacta , Claoxylon australe , Conospermum ellipticum , Cryptandra ericoides , Cryptandra propinqua , Daviesia acicularis , Diospyros australis , Epacris microphylla , Eupomatia laurina , Ficus coronata , Gompholobium virgatum , Gonocarpus oreophilus , Grevillea linearifolia , Hakea eriantha , Hibbertia marginata , Hibbertia pedunculata , Hibbertia serpyllifolia , Hymenosporum flavum , Keraudrenia hillii var. hillii , Kunzea ambigua , Leptomeria acida , Leptospermum laevigatum , Leptospermum petersonii , Leucopogon margarodes , Leucopogon parviflorus , Logania albiflora , Melaleuca decora , Melaleuca sieberi , Mirbelia rubiifolia , Monotoca elliptica , Ochrosperma lineare , Oxylobium robustum , Petrophile canescens , Pilidiostigma glabrum , Pimelea biflora , Pimelea ligustrina , Pomaderris angustifolia , Pultenaea paleacea , Rhodomyrtus psidioides , Rubus rosifolius , Sannantha similis , Solanum stelligerum , Solanum vescum , Syzygium australe , Viminaria juncea , Woollsia pungens*
	Grass & Grass-like Species	*Lomandra longifolia , Imperata cylindrica , Themeda triandra , Lomandra glauca , Entolasia stricta , Eragrostis brownii , Lomandra multiflora subsp. multiflora , Lomandra filiformis , Baloskion tetraphyllum , Panicum simile , Digitaria parviflora , Digitaria ramularis , Hypolaena fastigiata , Paspalidium distans , Entolasia*	*Lomandra longifolia , Entolasia stricta , Imperata cylindrica , Themeda triandra , Lepidosperma concavum , Lepidosperma laterale , Hypolaena fastigiata , Lomandra glauca , Poa affinis , Microlaena stipoides , Anisopogon avenaceus , Lomandra cylindrica , Caustis flexuosa , Entolasia marginata , Lomandra multiflora subsp. multiflora , Panicum*	*Lomandra longifolia , Lomandra glauca , Baloskion tetraphyllum , Schoenus ericetorum , Leptocarpus tenax , Entolasia stricta , Hypolaena fastigiata , Imperata cylindrica , Lomandra cylindrica , Anisopogon avenaceus , Panicum simile , Gahnia clarkei , Schoenus brevifolius , Caustis recurvata , Lomandra filiformis , Gahnia sieberiana ,*	*Imperata cylindrica , Lomandra longifolia , Entolasia stricta , Themeda triandra , Lepidosperma laterale , Entolasia marginata , Oplismenus imbecillis , Lomandra filiformis , Microlaena stipoides , Panicum simile , Digitaria parviflora , Cymbopogon refractus , Oplismenus aemulus , Lomandra multiflora subsp. multiflora , Echinopogon caespitosus*

Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
		marginata , Leptocarpus tenax , Microlaena stipoides , Dichelachne micrantha , Lepidosperma laterale , Lepidosperma viscidum , Lomandra cylindrica , Lepidosperma concavum , Anisopogon avenaceus , Cymbopogon refractus , Cyperus laevis , Eragrostis elongata , Gahnia clarkei , Lomandra confertifolia , Oplismenus aemulus , Oplismenus imbecillis , Poa affinis , Poa sieberiana , Schoenus ericetorum , Aristida vagans , Austrostipa pubescens , Baloskion pallens , Caustis flexuosa , Digitaria diffusa , Eragrostis sororia , Eriocaulon australe , Eurychorda complanata , Ficinia nodosa , Gahnia erythrocarpa , Gahnia sieberiana , Lepidosperma elatius , Lepidosperma neesii , Lepidosperma tortuosum , Lepyrodia scariosa , Poa labillardierei var. labillardierei , Pseudoraphis paradoxa , Ptilothrix deusta	*simile , Schoenus ericetorum , Dichelachne micrantha , Lepidosperma filiforme , Lepyrodia scariosa , Austrostipa pubescens , Caustis pentandra , Cyathochaeta diandra , Digitaria ramularis , Eragrostis brownii , Ficinia nodosa , Gahnia clarkei , Lomandra filiformis , Lomandra gracilis , Aristida vagans , Baloskion tetraphyllum , Baumea acuta , Caustis recurvata , Cynodon dactylon , Cyperus sanguinolentus , Digitaria parviflora , Gahnia sieberiana , Hemarthria uncinata , Lepidosperma elatius , Leptocarpus tenax , Lomandra obliqua , Phragmites australis , Schoenus apogon*	*Ptilothrix deusta , Cyathochaeta diandra , Empodisma minus , Eragrostis brownii , Lepidosperma laterale , Themeda triandra , Xyris gracilis , Baloskion pallens , Baumea teretifolia , Caustis flexuosa , Caustis pentandra , Dichelachne micrantha , Entolasia marginata , Gahnia aspera , Juncus usitatus , Lepyrodia muelleri , Lepyrodia scariosa , Lomandra multiflora subsp. multiflora , Microlaena stipoides , Sporadanthus interruptus*	*, Aristida vagans , Poa sieberiana , Lomandra confertifolia , Paspalidium distans , Gahnia clarkei , Poa labillardierei var. labillardierei , Carex breviculmis , Echinopogon ovatus , Eragrostis benthamii , Gahnia aspera , Dichelachne micrantha , Ottochloa gracillima , Paspalum orbiculare , Austrostipa pubescens , Digitaria ramularis , Eragrostis leptostachya , Fimbristylis dichotoma , Gahnia melanocarpa , Gahnia sieberiana , Lomandra obliqua , Lomandra spicata , Panicum pygmaeum , Poa affinis , Sorghum leiocladum , Baumea rubiginosa , Deyeuxia decipiens , Digitaria diffusa , Eragrostis brownii , Eragrostis sororia , Lepidosperma elatius , Lepidosperma neesii , Panicum obseptum , Schoenus apogon , Alloteropsis semialata , Anisopogon avenaceus , Aristida warburgii , Baumea juncea , Capillipedium spicigerum , Carex appressa , Carex brunnea , Carex declinata , Carex hubbardii , Carex inversa , Chorizandra cymbaria , Cyathochaeta diandra , Cyperus polystachyos , Deyeuxia parviseta , Dichelachne inaequiglumis , Digitaria breviglumis , Digitaria divaricatissima , Hemarthria uncinata , Ischaemum australe , Juncus usitatus , Leptocarpus tenax , Lomandra glauca , Panicum effusum , Paspalidium gracile , Paspalidium grandispiculatum , Ptilothrix deusta , Rytidosperma pallidum , Schoenus brevifolius*

Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
	Forb Species	*Dianella caerulea , Gonocarpus teucrioides , Pomax umbellata , Acianthus fornicatus , Trachymene incisa subsp. incisa , Tricoryne elatior , Lobelia purpurascens , Xanthosia pilosa , Actinotus helianthi , Desmodium rhytidophyllum , Gonocarpus tetragynus , Patersonia glabrata , Patersonia sericea , Caladenia carnea , Dianella revoluta , Hybanthus monopetalus , Poranthera microphylla , Pterostylis longifolia , Wahlenbergia stricta , Commelina cyanea , Viola hederacea , Chiloglottis reflexa , Cryptostylis subulata , Dampiera stricta , Dichondra repens , Gonocarpus humilis , Goodenia heterophylla , Hovea linearis , Hydrocotyle sibthorpioides , Mitrasacme polymorpha , Opercularia aspera , Opercularia diphylla , Pseuderanthemum variabile , Scaevola ramosissima , Schelhammera undulata , Aneilema biflorum , Burchardia umbellata , Caladenia alata , Caladenia catenata , Caladenia hillmanii , Caleana major , Centella asiatica , Chamaesyce drummondii , Chiloglottis diphylla , Chiloglottis trapeziformis , Dampiera sylvestris , Desmodium brachypodum , Dianella longifolia , Dianella tasmanica , Drosera peltata , Durringtonia paludosa , Gonocarpus micranthus , Goodenia hederacea , Haemodorum planifolium , Haloragis aspera , Hydrocotyle laxiflora , Hypericum gramineum , Lagenophora gracilis , Lobelia gibbosa , Lotus australis , Mentha*	*Gonocarpus teucrioides , Dianella caerulea , Pomax umbellata , Xanthosia pilosa , Actinotus helianthi , Cryptostylis erecta , Haemodorum planifolium , Dampiera stricta , Dianella revoluta , Patersonia glabrata , Cryptostylis subulata , Hybanthus monopetalus , Opercularia aspera , Poranthera microphylla , Pterostylis acuminata , Scaevola ramosissima , Dianella longifolia , Hovea linearis , Trachymene incisa subsp. incisa , Tricoryne elatior , Acianthus fornicatus , Brunoniella pumilio , Burchardia umbellata , Caladenia hillmanii , Desmodium rhytidophyllum , Drosera auriculata , Goodenia heterophylla , Lagenophora stipitata , Mitrasacme polymorpha , Opercularia diphylla , Oxalis exilis , Oxalis rubens , Patersonia sericea , Pelargonium inodorum , Pseuderanthemum variabile , Stackhousia viminea , Stylidium laricifolium , Vernonia cinerea , Viola hederacea*	*Dianella caerulea , Pomax umbellata , Gonocarpus teucrioides , Actinotus helianthi , Trachymene incisa subsp. incisa , Dampiera stricta , Patersonia glabrata , Caladenia carnea , Patersonia sericea , Xanthosia pilosa , Dianella longifolia , Haemodorum planifolium , Mitrasacme polymorpha , Opercularia varia , Acianthus fornicatus , Chiloglottis trapeziformis , Gonocarpus tetragynus , Poranthera ericifolia , Poranthera microphylla , Pterostylis longifolia , Caladenia alata , Caladenia quadrifaria , Calochilus paludosus , Dampiera sylvestris , Pterostylis acuminata , Scaevola ramosissima , Tricoryne elatior*	*Dianella caerulea , Lobelia purpurascens , Desmodium rhytidophyllum , Pseuderanthemum variabile , Vernonia cinerea , Viola betonicifolia , Gonocarpus tetragynus , Pomax umbellata , Goodenia heterophylla , Viola hederacea , Dichondra repens , Brunoniella australis , Centella asiatica , Hybanthus stellarioides , Lagenophora stipitata , Patersonia glabrata , Hydrocotyle sibthorpioides , Oxalis exilis , Cryptostylis erecta , Opercularia diphylla , Dampiera stricta , Gonocarpus teucrioides , Hydrocotyle laxiflora , Hypericum gramineum , Goodenia rotundifolia , Poranthera microphylla , Cryptostylis subulata , Desmodium brachypodum , Dianella revoluta , Goodenia hederacea , Gymnostachys anceps , Lagenophora gracilis , Brunoniella pumilio , Dampiera purpurea , Dampiera sylvestris , Hydrocotyle acutiloba , Opercularia aspera , Patersonia sericea , Thysanotus tuberosus , Tricoryne elatior , Galium binifolium , Gonocarpus humilis , Oxalis perennans , Plectranthus parviflorus , Caesia parviflora , Caladenia carnea , Caladenia catenata , Commelina cyanea , Dipodium punctatum , Galium leiocarpum , Geranium solanderi , Hybanthus monopetalus , Hydrocotyle geraniifolia , Hypericum japonicum , Opercularia hispida , Oxalis chnoodes , Polygala japonica , Senecio amygdalifolius , Senecio linearifolius , Sigesbeckia orientalis subsp. orientalis , Solanum*

Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
		diemenica , Opercularia hispida , Pterostylis concinna , Pterostylis nutans , Senecio hispidulus , Senecio prenanthoides , Stypandra glauca , Thysanotus tuberosus , Utricularia dichotoma , Vernonia cinerea , Viola banksii , Xanthosia tridentata			*prinophyllum , Tripladenia cunninghamii , Viola banksii , Acianthus fornicatus , Ajuga australis , Boronia polygalifolia , Dampiera lanceolata var. lanceolata , Dianella longifolia , Dipodium variegatum , Hovea linearis , Hypoxis hygrometrica , Lobelia andrewsii , Logania pusilla , Physalis minima , Schelhammera undulata , Senecio pinnatifolius , Senecio tenuiflorus , Solenogyne bellioides , Stackhousia viminea , Stylidium graminifolium , Acianthus exsertus , Alpinia caerulea , Arrhenechthites mixta , Arthropodium milleflorum , Boronia parviflora , Brachyscome angustifolia , Centratherum australianum , Coopernookia chisholmii , Coronidium scorpioides , Desmodium gangeticum , Desmodium nemorosum , Dichondra sp. A , Eclipta platyglossa , Galium liratum , Geranium homeanum , Geranium potentilloides , Gonocarpus micranthus , Goodenia heteromera , Hybanthus vernonii , Hydrocotyle pedicellosa , Laxmannia gracilis , Minuria leptophylla , Plectranthus graveolens , Pterostylis ophioglossa , Pterostylis parviflora , Pterostylis pedunculata , Ranunculus lappaceus , Schenkia spicata , Senecio diaschides , Senecio prenanthoides , Solanum pungetium , Swainsona galegifolia , Trachymene incisa subsp. incisa , Trachymene procumbens , Veronica plebeia , Wurmbea biglandulosa*

Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
	Fern Species	*Pteridium esculentum, Schizaea dichotoma, Schizaea asperula , Schizaea bifida , Nephrolepis cordifolia , Platycerium superbum , Selaginella uliginosa*	*Pteridium esculentum, Schizaea dichotoma, Gleichenia dicarpa, Histiopteris incisa , Schizaea bifida , Selaginella uliginosa*	*Pteridium esculentum, Schizaea bifida, Selaginella uliginosa, Schizaea dichotoma , Gleichenia dicarpa , Lindsaea linearis*	*Pteridium esculentum , Adiantum aethiopicum , Blechnum cartilagineum , Cheilanthes sieberi subsp. sieberi , Blechnum neohollandicum , Botrychium australe , Lindsaea linearis , Adiantum hispidulum , Lindsaea microphylla , Hypolepis muelleri , Lastreopsis decomposita , Schizaea bifida , Lastreopsis microsora subsp. microsora , Asplenium flabellifolium , Blechnum nudum , Blechnum spinulosum , Cheilanthes austrotenuifolia , Davallia solida var. pyxidata , Lastreopsis acuminata , Platycerium bifurcatum , Pteris tremula , Telmatoblechnum indicum*
	Other Species	*Hardenbergia violacea , Billardiera scandens , Pandorea pandorana subsp. pandorana , Glycine clandestina , Macrozamia communis , Kennedia rubicunda , Parsonsia straminea , Cassytha glabella , Desmodium varians , Xanthorrhoea latifolia , Xanthorrhoea macronema , Smilax glyciphylla , Cassytha pubescens , Eustrephus latifolius , Hibbertia scandens , Clematis glycinoides , Dendrophthoe vitellina , Glycine microphylla , Livistona australis , Smilax australis , Amyema miquelii , Cissus hypoglauca , Clematicissus opaca , Clematis aristata , Geitonoplesium cymosum , Glycine tabacina , Lepidozamia peroffskyana , Marsdenia rostrata , Marsdenia suaveolens , Melodinus acutiflorus , Passiflora herbertiana subsp. herbertiana , Stephania japonica var. discolor , Xanthorrhoea*	*Smilax glyciphylla , Billardiera scandens , Hardenbergia violacea , Macrozamia communis , Hibbertia scandens , Geitonoplesium cymosum , Xanthorrhoea latifolia , Cassytha pubescens , Xanthorrhoea arborea , Xanthorrhoea resinosa , Eustrephus latifolius , Glycine clandestina , Parsonsia straminea , Cassytha glabella , Marsdenia suaveolens , Xanthorrhoea media , Clematis aristata , Kennedia rubicunda , Livistona australis , Calochlaena dubia , Calystegia marginata , Cissus hypoglauca , Clematis glycinoides , Cymbidium suave , Desmodium varians , Glycine microphylla , Glycine tabacina , Macrozamia spiralis , Marsdenia rostrata , Pandorea pandorana subsp. pandorana , Sarcopetalum harveyanum , Smilax australis ,*	*Cassytha glabella, Billardiera scandens, Hardenbergia violacea, Xanthorrhoea latifolia , Pandorea pandorana subsp. pandorana , Macrozamia communis , Parsonsia straminea , Dendrophthoe vitellina , Xanthorrhoea fulva , Xanthorrhoea glauca , Livistona australis , Smilax glyciphylla , Xanthorrhoea macronema , Calochlaena dubia , Cassytha pubescens , Cissus antarctica , Glycine tabacina , Marsdenia suaveolens , Xanthorrhoea arborea*	*Billardiera scandens , Hibbertia scandens , Glycine clandestina , Kennedia rubicunda , Eustrephus latifolius , Hardenbergia violacea , Desmodium varians , Geitonoplesium cymosum , Calochlaena dubia , Polymeria calycina , Smilax glyciphylla , Smilax australis , Parsonsia straminea , Cissus hypoglauca , Pandorea pandorana subsp. pandorana , Glycine microphylla , Xanthorrhoea macronema , Gynochthodes jasminoides , Stephania japonica var. discolor , Clematis aristata , Dioscorea transversa , Hibbertia dentata , Cordyline stricta , Cassytha pubescens , Clematis glycinoides , Cassytha glabella , Glycine tabacina , Livistona australis , Marsdenia rostrata , Tylophora paniculata , Sarcopetalum harveyanum , Xanthorrhoea malacophylla ,*

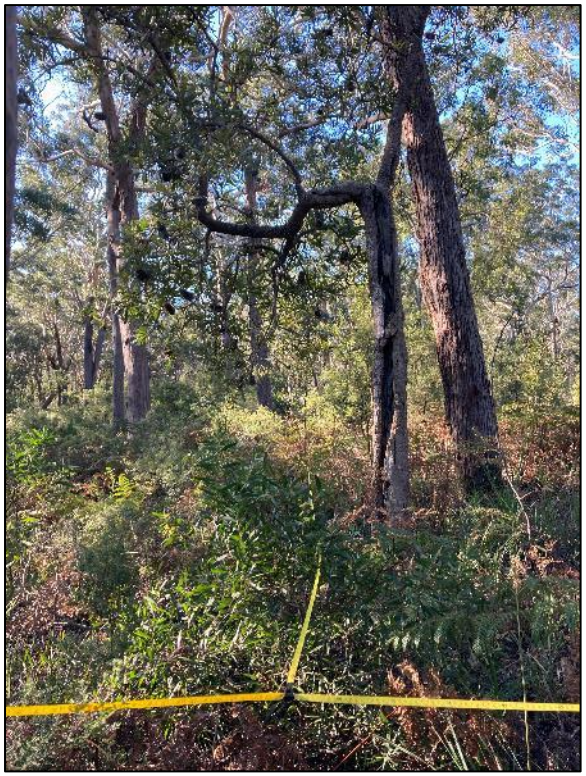
Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
		fulva , Xanthorrhoea glauca , Xanthorrhoea minor , Xanthorrhoea resinosa , Calochlaena dubia , Comesperma volubile , Cuscuta australis , Cymbidium suave , Glycine tomentella , Hibbertia dentata , Pandorea jasminoides , Parsonsia tenuis , Xanthorrhoea arborea , Xanthorrhoea concava , Xanthorrhoea media	*Stephania japonica var. discolor , Xanthorrhoea fulva*		*Amyema congener subsp. congener , Calystegia marginata , Cassytha filiformis , Cayratia clematidea , Cissus antarctica , Cymbidium suave , Echinostephia aculeata , Macrozamia fawcettii , Xanthorrhoea latifolia , Archontophoenix cunninghamiana , Cuscuta australis , Cyathea australis , Glycine tomentella , Tetrastigma nitens , Aphanopetalum resinosum , Benthamina alyxifolia , Celastrus subspicata , Clematicissus opaca , Convolvulus erubescens , Dendrophthoe vitellina , Doryanthes excelsa , Kennedia prostrata , Macrozamia communis , Macrozamia spiralis , Marsdenia fraseri , Marsdenia lloydii , Marsdenia suaveolens , Muellerina celastroides , Muellerina eucalyptoides , Notothixos incanus , Notothixos subaureus , Parsonsia tenuis , Parsonsia ventricosa , Plectorrhiza tridentata , Ripogonum album , Xanthorrhoea arborea , Xanthorrhoea australis , Xanthorrhoea fulva , Xanthorrhoea media*
Present Diagnostic Species within Study Area	**Tree Species**	*Banksia serrata, Angophora costata, Eucalyptus pilularis, Corymbia gummifera*	*Angophora costata , Banksia serrata , Corymbia gummifera , Eucalyptus pilularis*	*Angophora costata, Corymbia gummifera, Banksia serrata, Eucalyptus pilularis*	*Eucalyptus pilularis, Angophora costata, Corymbia gummifera, Banksia serrata*
	Shrub Species	*Monotoca elliptica, Acacia ulicifolia , Acacia suaveolens , Ricinocarpos pinifolius , Acacia longifolia , Dillwynia retorta , Aotus ericoides , Tetratheca thymifolia , Platysace lanceolata , Leptomeria acida , Hibbertia obtusifolia , , Conospermum taxifolium , Epacris pulchella , Persoonia lanceolata ,*	*Monotoca elliptica, Acacia longifolia, Acacia suaveolens, Ricinocarpos pinifolius, Dillwynia retorta, Hibbertia obtusifolia , Hibbertia linearis , Leptomeria acida , Platysace lanceolata , Leucopogon parviflorus ,Tetratheca thymifolia*	*Acacia ulicifolia, Dillwynia retorta, Ricinocarpos pinifolius , Monotoca elliptica , Aotus ericoides , Acacia suaveolens , Hibbertia linearis , Leptomeria acida , Tetratheca thymifolia , Acacia longifolia , Persoonia lanceolata , Epacris pulchella , Platysace lanceolata , Astroloma pinifolium , Hibbertia*	*Acacia longifolia, Acacia ulicifolia, Hibbertia obtusifolia , Platysace lanceolata , Hibbertia linearis*

Plot No		1, 2, 3, 4			
Potential PCTs		**3544**	**3545**	**3549**	**3250**
		Astroloma pinifolium , Styphelia viridis , Leucopogon parviflorus ,		*obtusifolia ,Conospermum taxifolium , Styphelia viridis , Leucopogon parviflorus*	
	Grass & Grass-like Species	*Lomandra longifolia, Imperata cylindrica*	*Lomandra longifolia, Imperata cylindrica*	*Lomandra longifolia, Imperata cylindrica*	*Imperata cylindrica, Lomandra longifolia*
	Forb Species	*Dianella caerulea, Gonocarpus teucrioides , Pomax umbellata , Acianthus fornicatus , Actinotus helianthi , Caladenia catenata*	*Dianella caerulea, Pomax umbellata , Acianthus fornicatus*	*Dianella caerulea, Pomax umbellata , Gonocarpus teucrioides , Acianthus fornicatus ,Poranthera microphylla , r*	*Dianella caerulea, Pomax umbellata ,Gonocarpus teucrioides ,Caladenia catenata , Acianthus fornicatus*
	Fern Species	*Pteridium esculentum*	*Pteridium esculentum*	*Pteridium esculentum*	*Pteridium esculentum*
	Other Species	*Billardiera scandens, Pandorea pandorana subsp. pandorana , Hibbertia scandens , Livistona australis, Hardenbergia violacea ,*	*Billardiera scandens, Hardenbergia violacea Hibbertia scandens, Livistona australis, Pandorea pandorana subsp. pandorana*	*Billardiera scandens, Hardenbergia violacea , Pandorea pandorana subsp. pandorana , Livistona australis*	*Billardiera scandens, Hibbertia scandens, Hardenbergia violacea, Pandorea pandorana subsp. pandorana , Livistona australis*
PCT Description		A tall to very tall sclerophyll open forest with a dry shrubby understorey and ferny ground cover found on coastal sand plains between Jervis Bay and Port Macquarie. The tree canopy very frequently includes a high cover *of Eucalyptus pilularis and Angophora costata occasionally with Corymbia gummifera*. The mid-stratum is characterised by a sparse to mid-dense shrub and small tree cover with Banksia serrata very frequently forming a sparse cover beneath the eucalypts. The lower shrub layer very frequently includes a sparse cover of *Monotoca elliptica, Acacia ulicifolia and Acacia*	A mid-high to tall, rarely very tall, dry shrubby sclerophyll open forest found on the large transgressive sand dunes associated with the prominent headlands and sandplains between Jervis Bay and Port Stephens. The tree canopy very frequently includes a high cover of *Angophora costata and Corymbia gummifera, rarely with Eucalyptus piperita, Eucalyptus pilularis or Eucalyptus haemastoma. Banksia serrata* is very frequently recorded and is occasionally amongst the eucalypt canopy. A lower mid-dense cover of heath and dry shrub species grow on the deeply podsolised soils. *Monotoca elliptica,*	A tall to very tall heathy sclerophyll open forest or woodland found on deep well drained Quaternary sands on major coastal dunes between the Hunter River and south-west Rocks, lower North Coast. The tree canopy very frequently includes a high cover of *Angophora costata and Corymbia gummifera*, commonly accompanied or replaced by *Eucalyptus signata.* Other trees that rarely occur include *Eucalyptus piperita and Eucalyptus pilularis* and these species have a lower cover. A sparse to mid-dense shrub layer is very frequently characterised by heath species including a high cover *of Banksia*	A very tall to extremely tall, grassy or occasionally shrub-grass sclerophyll open forest, which occurs extensively on the coast, coastal ranges and foothills ranges between Grafton and Gosford, with limited outlying occurrences near Woodburn and Wollongong. The canopy very frequently *includes Eucalyptus pilularis* dominating with the highest cover and commonly Eucalyptus microcorys, sometimes with locally high cover. Other canopy species occasionally include *Corymbia intermedia and Syncarpia glomulifera,* rarely with *Angophora costata, Eucalyptus resinifera and*

Plot No	1, 2, 3, 4			
Potential PCTs	**3544**	**3545**	**3549**	**3250**
	suaveolens with Acacia longifolia and Ricinocarpos pinifolius also common. The ground layer almost always includes a sparse to mid-dense cover of Pteridium esculentum and very frequently *Lomandra longifolia and Imperata cylindrica*. This PCT occurs mainly on low elevation coastal dune systems and is only rarely recorded above 40 metres asl. The highest density of plots are on the sand plains of the Tomago Peninsula near Port Stephens and in Myall Lakes National Park. This community grades into northern sand plain forest PCT 3552 around Port Macquarie and into PCT 3545 or PCT 3549 on older podsolised dunes. It is patchy and restricted to larger coastal dune systems on the South Coast where it intergrades with PCT 3638 near Jervis Bay.	*Ricinocarpos pinifolius, Acacia longifolia and Acacia suaveol*ens are very frequently recorded, commonly with *Leptospermum trinervium and Xylomelum pyriform*e. Occasionally other larger shrubs including *Isopogon anemonifolius* and *Leptospermum laevigatum* may also be present. The ground layer almost always includes the fern Pteridium esculentum very frequently with clumps of *Lomandra longifolia*, the climber *Smilax glyciphylla* and grass *Imperata cylindrica*. This PCT has a relatively high species richness compared to other coastal sand forests found in the greater Sydney Basin. This community commonly adjoins sand heath PCT 3805 or taller less shrubby eucalypt forest PCT 3544 on large sandplains, and grades into northern heathy eucalypt forest on sand PCT 3549 on the large dunes near Port Stephens. It has most likely been depleted by clearing on dune systems in the eastern suburbs of Sydney and Central Coast.	*aemula* together with *Leptospermum polygalifolium, Leptospermum trinervium, Acacia ulicifolia and Leucopogon leptospermoides*. Other common shrubs include *Monotoca elliptica, Ricinocarpos pinifolius* and occasionally *Melaleuca nodos*a. The ground layer consists of a mid-dense cover of *Pteridium esculentum with clumps of Lomandra longifolia and Dianella caerule*a and occasional patches of sedge including *Baloskion tetraphyllum*. This PCT is known extensively from the Tomago sandbeds, less so at Myall Lakes and Nabiac, with a northern outlier at Clybucca north of Kempsey. It occurs on low-lying gentle gradient sandplains at 1-20 metres asl in coastal rainfall zones receiving 1040-1350 mm per annum. On highly podsolised dunes, this community grades into the dry wallum heath PCT 3802 and on more fertile dune soils, into PCT 3544.	*Eucalyptus propinqua. Allocasuarina torulosa* occurs very frequently and occasionally forms a mid-dense sub-canopy. The shrub *Polyscias sambucifolia* is very frequently present, commonly with vine Billardiera scandens, usually as scattered individuals. *Polyscias sambucifolia* is sometimes locally abundant and forms thickets in less frequently burnt sites. The grassy ground layer almost always includes a high cover of *Imperata cylindrica*, very frequently with *Pteridium esculentum, Lomandra longifolia, Entolasia stricta and Themeda triandra*, all usually with low cover. This PCT occurs mainly in warm, wet locations receiving 1200-1580 mm mean annual rainfall, at low to mid elevations of 10-370 metres asl. It occurs mainly on clay-rich sedimentary or meta-sedimentary substrates, occasionally higher-quartz sediments, on ridge to mid-slope sites which are frequently burnt. Its range overlaps with that of PCT 3248, which has a similar canopy composition however a more mesic shrub mid-stratum. It may grade into that PCT in some areas, however PCT 3248 occurs in more sheltered, less frequently burnt sites or on more fertile soils.
Other Diagnostic Features	Not Specified	Not Specified	Not Specified	Not Specified
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation);	Dry Sclerophyll Forests (Shrubby sub-formation);	Dry Sclerophyll Forests (Shrubby sub-formation);	Wet Sclerophyll Forests (Grassy sub-formation);

Plot No	1, 2, 3, 4			
Potential PCTs	**3544**	**3545**	**3549**	**3250**
Vegetation Class	Coastal Dune Dry Sclerophyll Forests	Coastal Dune Dry Sclerophyll Forests;	Coastal Dune Dry Sclerophyll Forests;	Northern Hinterland Wet Sclerophyll Forest;
Landscape Position	12.8	25.4	9	47.3
Elevation	2.1-154.2	0-87.4	0-16.7	0.7-735.2
Lithology	Not Specified	Not Specified	Not Specified	Not Specified
PCT Determination	This PCT matches the vegetation on site well, and the landform fits well. This PCT is considered best fit. This community was the best match from the Plot to PCT Assignment Tool (See Appendix J).	While this community fits well floristically, but the community within the Subject Site contains tall canopy species. *Eucalyptus pilularis* is also the dominant species which is not accurate with this community. Therefore, this community was not considered to be best fit.	This community rarely has *Eucalyptus pilularis* listed as a canopy species unlike the community surveyed on site. This community was not considered to be best fit.	While this community fits well floristically but within the Subject Site is considered a dry sclerophyll forest formation. Therefore, this community was not considered to be best fit.
Result	Yes	No	No	No
Estimated Cleared Value of PCT (%)	21.67	21.67	30.18	29.6
EEC	No associated TEC	No associated TEC	No associated TEC	No associated TEC
Vegetation Zones	Good			
Description of Vegetation Zone	Vegetation within this zone is dominant of the presence of *Eucalyptus pilularis* and *Angophora costata* along with various patches of *Banksia serrata* and *Corymbia gummifera.* The mid stratum is very sparse with the exception of dense patches dominant of *Monotoca elliptica* and *Dellwynia retorta.* Leaf litter is evident throughout the ground cover with only *Pteridium esculentum* and *Lomandra longifolia* having a visual prominence. Only three exotic species were identified in the vegetation zone incluidng *Chrysanthemoides monilifera, Pinus radiata* and *Andropogon virginicus.*			
Area of Vegetation Zone (ha)	8.39			

Plot No	1, 2, 3, 4			
Potential PCTs	3544	3545	3549	3250



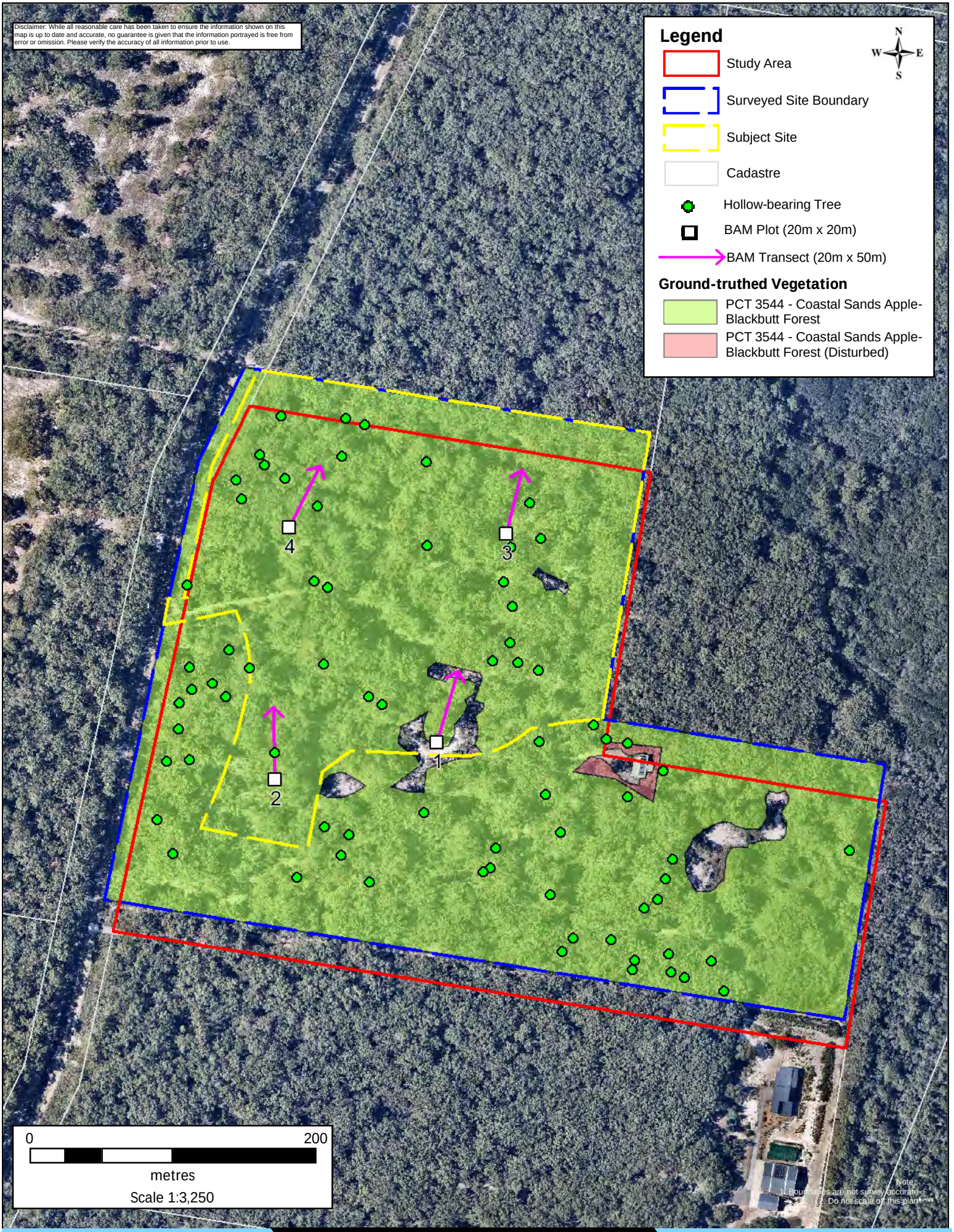
PCT 3544 Good BAM Plot 4

PCT 3544 Good BAM Plot 2

Table 5 provides a summary of the vegetation within the Study Area.

Table 5 – Summary of Vegetation Zones Areas

Zone	Vegetation Community	Condition	Total Study Area (ha)	Total Subject Site (ha)	Area of Removal (ha)	Area of Retention (ha)
1	PCT 3544	Good	15	7.15	7.15	7.85
2	PCT 3544	Disturbed	0.07	0	0	0.07
Total Native Vegetation (ha)			**15.07**	**7.15**	**7.15**	**7.92**
Cleared areas			0.5	0.16	0.16	0.66
Total (ha)			**15.57**	**7.31**	**7.31**	**8.58**



AEP

Figure 4 - Ground-Truthed Vegetation

Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01

1.4.4 Vegetation Integrity Assessment

1.4.4.1 Patch Size

The native vegetation that exists within the Subject Site is connected to vegetation to the north, south and west that, as defined by the BAM, extends as a patch for more than 100ha. The maximum patch size of '≥100ha' is therefore appropriate for each vegetation zone and was entered as such within the Calculator.

1.4.5 Vegetation Integrity Score

Plot data was used to determine the composition, structure and function condition score of the vegetation zones within the Subject Site, which informed the Vegetation Integrity Score (VIS). Plot data has been tabulated (refer **Table 6**) and includes corresponding condition scores along with the overall VIS. Vegetation Condition Class has been rated using the following percentage bands associated with the Vegetation Integrity Scores:

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

Table 6 – Vegetation Integrity Score Table

Site Attribute	PCT 3544 (Good)	PCT 3544 (Good)	PCT 3544 (Good)	PCT 3544 (Good)
Plot #	**1**	**2**	**3**	**4**
Bearing	20	355	15	30
Tree	3	4	3	4
Shrub	14	12	14	11
Grass & Grass-like	3	3	2	1
Forb	4	5	4	3
Fern	1	1	1	1
Other	1	2	1	3
Composition Total Score	**71.9**			
Tree	10.2	48	25	42
Shrub	38.6	39.2	32.1	39.8
Grass & Grass-like	2.5	31.2	5.5	5
Forb	1.4	21.3	3.4	20.3
Fern	5	5	5	10
Other	0.1	0.3	0.1	1.3

Site Attribute	PCT 3544 (Good)	PCT 3544 (Good)	PCT 3544 (Good)	PCT 3544 (Good)
Plot #	**1**	**2**	**3**	**4**
Structure Total Score	**72.2**			
Regenerating Stems (<5cm DBH)	1	1	1	1
Stem Classes (cm DBH)	20-29, 30-49, 50-79	5-9, 10-19, 30-49, 50-79	30-49, 50-79	30-49, 50-79
# Large Trees	1	8	4	1
Hollow-bearing Trees	0	2	1	2
Litter Cover (%)	70	93	96	95
Coarse Woody Debris (m)	27.5	40	9	12
High Threat Weed Cover	0	3.2	0	0
Function Total Score	**82.3**			
Overall Vegetation Integrity Score	**75.3**			

1.5 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 7**, and a Species Credit Species assessment is presented in **Table 10**.

Field surveys were undertaken on site during February, July, August, September, October, November, December 2021, May 2023 and April 2024. A summary of survey effort within the Subject Site is described in **Section 1.5.3** and **Table 8**, and species lists are presented in **Appendix B** and **Appendix C.**

1.5.1 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 7** below.

Table 7 – Predicted Ecosystem Credit Species

Scientific name	Common name	Sensitivity to Gain Class	Recorded within 10km (NSW BioNet Wildlife Atlas 2023) Y/N	Recorded by AEP within site nearby surrounds Y/N
Anthochaera phrygia	Regent Honeyeater	High	N	N
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Moderate	Y	N
Callocephalon fimbriatum	Gang-gang Cockatoo	Moderate	N	N
Calyptorhynchus lathami	Glossy Black Cockatoo	High	Y	N
Chthonicola sagittata	Speckled Warbler	High	N	N
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Moderate	N	N
Daphoenositta chrysoptera	Varied Sittella	Moderate	Y	N
Dasyurus maculatus	Spotted-tailed Quoll	High	Y	N
Esacus maginirostris	Beach Stone -curlew (Foraging)	High	Y	N
Glossopsitta pusilla	Little Lorikeet	High	Y	N
Haliaeetus leucogaster	White-bellied Sea-Eagle	High	Y	N
Hieraaetus morphnoides	Little Eagle (Foraging)	Moderate	Y	N
Hirundapus caudacutus	White-throated Needletail	High	Y	N
Lathamus discolor	Swift Parrot	Moderate	Y	N
Lophoictinia isura	Square-tailed Kite	Moderate	N	N
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Moderate	N	N
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	High	Y	N
Miniopterus australis	Little Bent-winged Bat	Very High	Y	Y
Miniopterus orianae oceanensis	Large Bent-winged Bat	High	Y	Y
Neophema pulchella	Turquoise Parrot	High	N	N
Ninox connivens	Barking Owl	High	Y	N
Ninox strenua	Powerful Owl	High	Y	N
Pandion cristatus	Eastern Osprey	Moderate	Y	

Scientific name	Common name	Sensitivity to Gain Class	Recorded within 10km (NSW BioNet Wildlife Atlas 2023) Y/N	Recorded by AEP within site nearby surrounds Y/N
Petroica boodang	Scarlet Robin	Moderate	N	N
Phascolarctos cinereus	Koala (Foraging)	High	Y	N
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Moderate	N	N
Pseudomys novaeholandiae	New Holland Mouse	High	Y	N
Pteropus poliocephalus	Grey-headed Flying-fox	High	Y	N
Ptilinopus superbus	Superb Fruit-Dove	Moderate	Y	N
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	High	Y	N
Stagonopleura guttata	Diamond Firetail	Moderate	N	N
Tyto novaehollandiae	Masked Owl (Foraging)	High	Y	N

1.5.3 Species Credit Species

Additional threatened fauna species determined by the BAM calculator that have the potential to use the Subject Site area as suitable habitat are identified in **Table 8** and **10**.

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

Table 8 – Candidate Species Credit Species and SAII Species

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
Flora								
Nabiac Casuarina *Allocasuarina simulans*	3	Y	All Year	The Nabiac Casuarina is a straggling shrub of the sheoak family, 1 to 3 m in height. Like all sheoaks it has wiry foliage consisting of jointed branchlets rather than leaves. Leaves are reduced to ribs on the branchlets, projecting at the nodes as small teeth. In the Nabiac Casuarina the green, ridged branchlets grow to 20 cm long and at each joint there is a whorl of six tiny teeth. Male and female flowers are inconspicuous and occur on separate plants. Oblong woody cones to 3cm long contain the small winged seeds. The Nabiac Casuarina is restricted to the mid-north coast of NSW, from Nabiac to Forster and is very rare. The Nabiac Casuarina grows in heathland on coastal sands.	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation.	02/08/2021, 02/05/2023	2
						Incidental surveys.	February 2021 – December 2021	-
Charmhaven Apple *Angophora inopina*	2	N	All year	A small to large tree, up to 8 m high, often multi-stemmed, and with persistent shortly fibrous bark throughout. Adult leaves are moderately glossy, leathery and opposite, 4 – 11 cm long. Inflorescences (groups of buds, flowers or fruits) are compound and terminal; the stalk of each group is bristly. Endemic to the Central Coast region of NSW. The known northern limit is near Karuah where a disjunct population occurs; to the south populations extend from Toronto to Charmhaven with the main population occurring between Charmhaven and Morisset. There is an unconfirmed record of the species near Bulahdelah. Approximately 1250 ha of occupied habitat has been mapped in the Wyong–southern Lake Macquarie area. This species is a member of the *A. bakeri* complex, which also includes *A. crassifolia*, *A. paludosa* and *A. exul*. It is most similar to *A. crassifolia* from which it is distinguished by the broader leaves with shorter petioles. None of these related species are known from the same area as *A. inopina*, although *A. bakeri* does occur sporadically in the ranges to the west, and near Kurri Kurri. Occurs most frequently in four main vegetation communities: (i) *Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina* woodland/forest; (ii) *Hakea teretifolia–Banksia oblongifolia* wet heath; (iii) *Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina* sedge woodland; (iv) *Eucalyptus capitellata–Corymbia gummifera–Angophora inopina* woodland/forest. Ecological knowledge about this species is limited. Is lignotuberous, allowing vegetative growth to occur following disturbance. However, such vegetative reproduction may suppress the production of fruits/seeds, necessary for the recruitment of new individuals to a population, and the time between such disturbance and the onset of sexual reproduction is not known. Flowering appears to take place principally between mid-December and mid-January, but is generally poor and sporadic. Preliminary experiments indicate that neither pollination or seed viability are limiting factors in the life cycle.	Parallel walking transects - Maximum distance between transects 40m in open vegetation, 20m in dense vegetation. For each hectare of potential habitat average field traverse length 0.5km at 20m separation or 0.25km at 40m separation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects - Maximum distance between transects 40m in open vegetation, 20m in dense vegetation.	02/08/2021, 02/05/2023	2
						Incidental surveys.	February 2021 – December 2021	-
Netted Bottle Brush *Callistemon linearifolius*	2	N	Oct to Jan.	This shrub is up to 3-4 m tall, with linear (long and narrow) to linear-lanceolate (lance shaped) leaves 8-10 cm long, and 5-7 mm wide with a sharp tip, thickened margins, and distinct lateral veins. Flowers are clustered into the typical "bottlebrushes" of *Callistemon* species. The brushes are red and usually 9-10 cm long and approximately 50 mm in diameter. The stem upon which the filaments occur are covered in	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation.	24/11/2021 25/11/2021, 02/05/2023	2

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
				a soft downy hair at flowering. The seed capsules are approximately 7 mm in diameter. Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers Spring to Summer. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring – summer.		Incidental surveys.	February 2021 – December 2021	-
Red Helmet Orchid *Corybas dowlingii*	2	N	Jun - Jul	Grows in patches of *Themeda australis* amongst shrubs, sedges in heathland and woodland. The presence of other orchid species and therefore mycorrhiza assemblages can, though not always, be an indication of suitable habitat. Associated vegetation at known populations described as dry sclerophyll woodland dominated by *Eucalyptus haemastoma, Corymbia gummifera, Angophora costata* and *Allocasuarina littoralis*. The species has been recorded in disturbed locations, including in areas lacking upper vegetation strata. Most sites have a mostly native understorey. Flowering period is typically from September to October, but has been recorded flowering in mid to late November to early December. Note, this species is extremely difficult to locate even when in flower and cannot be definitively identified from leaf alone. Local climatic conditions appear 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). Recorded from four localities between Wadalba and Wyong in Central Coast LGA. A small population also occurs within Lake Macquarie LGA. Recent and historic disturbance regimes (fire, clearing, routine slashing) appear to influence above ground emergence. 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	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation. When local reference population is flowering.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	02/08/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-
Leafless Tongue Orchid *Cryptostylis hunteriana*	2	N	Nov to Jan.	As its name implies, the Leafless Tongue Orchid has no leaf. It produces an upright flower-stem to 45 cm tall, bearing five to 10 flowers between November (early flowering in October observed) and February (late flowering in March observed). It has small narrow green sepals and petals to 22 mm long, but is dominated by an erect narrow very hairy 'tongue' (the labellum). This is up to 33 mm long, maroon along the margins and at the widened tip, and with a black central band. The Leafless Tongue Orchid has been recorded from as far north as Gibraltar Range National Park south into Victoria around the coast as far as Orbost. It is known historically from a number of localities on the NSW south coast and has been observed in recent years at many sites between Batemans Bay and Nowra (although it is uncommon at all sites). Also recorded at Munmorah State Conservation Area, Nelson Bay, Wyee, Washpool National Park, Nowendoc State Forest, Ku-Ring-Gai Chase National Park and Ben Boyd National Park. Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation. When local reference population is flowering.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	24/11/2021 25/11/2021, 02/05/2023	2
						Incidental surveys.	February 2021 – December 2021	-

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
				(*C. erecta*). On the Central Coast of NSW, populations have been recorded in woodland dominated by Scribbly Gum (Eucalyptus haemastoma), Brown Stringybark (Eucalyptus capitellata), Red Bloodwood (Corymbia gummifera) and also associated with Large Tongue Orchid (C. subulata) and the Tartan Tongue Orchid (C. erecta).				
White-flowered Wax Plant *Cynanchum elegans*	2	N	All Year	Austral Toadflax is a small, straggling herb to 40 cm tall. Leaves are pale green to yellow-green, somewhat succulent, 1 - 4 cm long and 0.5 - 1.5 mm wide. Flowers are minute and white, emerging where the leaves meet the stems and appearing in spring. The fruit is small and nut-like, developing in summer. This species is often hidden amongst grasses and herbs. Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	17/09/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-
Sand Doubletail *Diuris arenaria*	3	Y	Sep	Sand Doubletail is a small ground orchid. The light purple to mauve flowers appear between August and September and are 20-30 mm wide. There are usually two 15-50 cm long by 2-6 mm wide leaves that grow from the base of the plant. Sand Doubletail is known from the Tomaree Peninsula near Newcastle. This species occurs in coastal heath and dry grassy eucalypt forest on sandy flats. Grows in gently undulating country in eucalypt forest with a grassy understorey on clay soil.	Parallel walking transects – Max. distance between transects 10m in open, 5m in dense vegetation. Use flowers to identify. Flowering period & abundance vary each year, occurs for 2-4 weeks Sep - Oct.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	17/09/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-
Rough Doubletail *Diuris Praecox*	1.5	N	Aug	A terrestrial herb with two or three linear leaves, 15 - 35 cm long, 3 - 5 mm wide, folded flat together lengthwise. Raceme 20 - 40 cm high, 6 - 10-flowered. Flowers nodding, yellow with a few dark brown markings at the base of the dorsal sepal and labellum, ca 2.5 cm across. Dorsal sepal narrow-ovate, 9 - 11 mm long, 4.5 - 6 mm wide, obliquely erect. Lateral sepals linear to lanceolate, 12 - 15 mm long, 1.5 - 2 mm wide, bent sharply downward, parallel. Petals obliquely erect, widely divergent, curved backwards; lamina narrow-elliptic to ovate, 8 - 12 mm long, 5 - 6 mm wide; claw 4 - 6 mm long, blackish. Labellum (median petal) 9 - 12 mm long; lateral lobes linear to more or less obovate, 3 - 4 mm long, 0.8 - 1.4 mm wide. Known from between Bateau Bay and Smiths Lake Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Exists as subterranean tubers most of the year. It produces leaves and flowering stems in winter from Jul to early Sep	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation. When local reference population is flowering.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	17/08/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-
Camfield's Stringybark *Eucalytpus camfieldii*	2	N	All year	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of *E. oblonga* Narrow-leaved Stringybark, *E. capitellata* Brown Stringybark and *E. haemastoma* Scribbly Gum. Population sizes are	Parallel walking transects - Maximum distance between transects 40m in open vegetation, 20m in dense vegetation. For each hectare of potential habitat average field traverse length 0.5km at 20m separation or 0.25km at 40m separation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects - Maximum distance between transects 40m in open vegetation, 20m in dense vegetation.	02/08/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
				difficult to estimate because its extensive lignotubers may be 20 m across. A number of stems arise from these lignotubers giving the impression of individual plants. Flowering period is irregular, flowers recorded throughout the year. Poor response to too frequent fires.				
Eucalyptus parramattensis subsp. decadens	2	N	All year	There are two separate meta-populations of *E. parramattensis* subsp. *decadens*. The Kurri Kurri meta-population is bordered by Cessnock—Kurri Kurri in the north and Mulbring—Abedare in the south. Large aggregations of the subspecies are located in the Tomalpin area. The Tomago Sandbeds meta-population is bounded by Salt Ash and Tanilba Bay in the north and Williamtown and Tomago in the south. Generally, occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant. In the Kurri Kurri area, *E. parramattensis* subsp. *decadens* is a characteristic species of 'Kurri Sand Swamp Woodland in the Sydney Basin Bioregion', an endangered ecological community under the TSC Act. In the Tomago Sandbeds area, the species is usually associated with the 'Tomago Swamp Woodland' as defined by NSW NPWS (2000). Flowers from November to January. Propagation mechanisms are currently poorly known. Seed dispersal is likely to be affected by wind and animals. Likely to be sensitive to over-frequent fire, however there is evidence (i.e., coppicing, epicormic shoots) that the species may be tolerant of low intensity fires. The species has a canopy stored seed bank for dispersal after fire events.	Parallel walking transects - Maximum distance between transects 40m in open vegetation, 20m in dense vegetation. For each hectare of potential habitat average field traverse length 0.5km at 20m separation or 0.25km at 40m separation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects - Maximum distance between transects 40m in open vegetation, 20m in dense vegetation.	02/08/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-
Small-flower Grevillea *Grevillea parviflora subsp. parviflora*	2	N	Aug-Nov	Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from the Mittagong Formation. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. In Sydney it has been recorded from Shale Sandstone Transition Forest and in the Hunter in Kurri Sand Swamp Woodland. However, other communities are occupied in other locations where the species can be found.	Parallel walking transects – Maximum distance between transects 15m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.75km at 15m separation	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	17/09/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-
Grove's Paperbark *Melaleuca groveana*	2	N	All Year	Grove's Paperbark is a shrub or small tree from 2 – 5 m tall, rarely to 10 m, with firm fibrous-papery bark. The narrow, curved leaves are alternate, 20 – 55 mm long, 3 – 8 mm wide and have a mid-vein and lateral veins. The leaves point along the stem and branchlets. The fluffy white flowers form on short spikes 2 – 3 cm long, and appear in the spring. The woody fruit is barrel-shaped with a smooth outer surface, 4 – 7 mm in diameter. Widespread, scattered populations in coastal districts north of Yengo National Park to southeast Queensland. Also found as a disjunct population near Torrington on the northern tablelands. Grove's Paperbark grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcopping granite, rhyolite and sandstone on rocky outcrops and cliffs. It also occurs in dry scrubby open forest and woodlands.	Parallel walking transects - Maximum distance between transects 40m in open vegetation, 20m in dense vegetation. For each hectare of potential habitat average field traverse length 0.5km at 20m separation or 0.25km at 40m separation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects - Maximum distance between transects 40m in open vegetation, 20m in dense vegetation.	02/08/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-
Villous Mint-bush *Prostanthera densa*	2	N	All Year	Villous Mintbush is an erect mint-smelling shrub to 2 m tall, though in the southern part of its range it is rarely more than 1 m tall.		Habitat Assessment	26/07/2021, 27/07/2021	2

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
				Branches and leaves are covered with long, spreading hairs. The leaves are in pairs and almost triangular in shape, to 15 mm long and 12 mm wide. They are dark green above and paler below, with curled-under edges. The tubular flowers are mauve with orange markings and grow in the angles where the leaves meet the stems. Flowering has been observed throughout the year, but occurs chiefly in spring or from May - December. This species has been recorded from the Currarong area in Jervis Bay, Royal National Park (Marley), Cronulla, Helensburgh and Port Stephens (Nelson Bay). The Sydney and Royal National Park populations were thought possibly extinct, but the species is now known to occur at Bass and Flinders Point in Cronulla. *Prostanthera densa* generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea. Plants regenerate from rootstock after fire and flower within the first year or two.	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation.	Parallel walking transects - Maximum distance between transects 20m in open vegetation, 10m in dense vegetation.	26/07/2021 27/07/2021, 02/05/2023	2
						Incidental surveys.	February 2021 – December 2021	-
Eastern Australian Underground Orchid *Rhizanthella slateri*	3	Y	Sept - Nov	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. This is a highly cryptic species (almost growing entirely beneath the soil) and its habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	17/09/2021, 02/05/2023	2
						Incidental surveys.	February 2021 – December 2021	-
Native Guava *Rhodomyrtus psidioides*	3	N	All Year	Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. Flowering occurs from late spring to early summer. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	17/09/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-
Magenta Lilly Pilly *Syzygium paniculatum*	2	N	Apr-Jun	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Use fruit to identify. Naturally occurring plants generally produce low numbers of fruit, while cultivated individuals and offspring generally produce high numbers of fruit. Parallel walking transects – Maximum distance between transects 15m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.75km at 15m separation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation.	02/08/2021, 02/05/2023	1
						Incidental surveys.	February 2021 – December 2021	-
Black-eyed Susan *Tetratheca juncea*	2	N	Sep to Oct.	Cryptic shrub – difficult to distinguish the clumped grass like stems from other vegetation when not in flower. Generally found in low open forest/woodland with a mixed shrub understorey and grassy groundcover, also occurs in heathland and moist forest and is most often associated with low nutrient soils of the Awaba Soil Landscape. Confined to the northern portion of the Sydney Basin	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation When local reference population is flowering	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	17/09/2021, 02/05/2023	2

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
				bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock.		Incidental surveys.	February 2021 – December 2021	-
Austral Toadflax *Thesium australe*	1.5	N	Nov - Feb	Austral Toadflax is a small, straggling herb to 40 cm tall. Leaves are pale green to yellow-green, somewhat succulent, 1 - 4 cm long and 0.5 - 1.5 mm wide. Flowers are minute and white, emerging where the leaves meet the stems and appearing in spring. The fruit is small and nut-like, developing in summer. This species is often hidden amongst grasses and herbs. Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation When local reference population is flowering	Habitat Assessment	26/07/2021, 27/07/2021	2
						Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	24/11/2021 25/11/2021, 02/05/2023	2
						Incidental surveys.	February 2021 – December 2021	-
Fauna								
Bush Stone-curlew *Burhinus grallarius*	2	N	Oct to Jan.	The species favours tall mountain forests and woodlands (particularly heavily timbered/mature wet sclerophyll forests) in spring and summer. In winter and autumn, the species moves to lower latitudes and occupies drier more open eucalypt forests and woodlands including dry forest in coastal areas and is often found in urban areas.	Area based survey methods.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Diurnal Bird Census	26/07/2021, 27/07/2021, 17/09/2021, 24/11/2021 25/11/2021	2
						Nocturnals	26/07/2021, 27/07/2021	2
						Incidental surveys.	February 2021 – December 2021	-
Gang-gang Cockatoo *Callocephalon fimbriatum*	2	N	Oct to Jan.	Gang-gang Cockatoos are one of the more distinctive and charismatic members of Australia's avifauna. These birds are primarily slate-grey, with the males easily identified by their scarlet head and wispy crest, while females have a grey head and crest and feathers edged with salmon pink on the underbelly. The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee. In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (*Eucalyptus pauciflora*) woodland and occasionally in temperate rainforests. Favours old growth forest and woodland	Area based survey methods.	Habitat Assessment	26/07/2021, 27/07/2021, 02/05/2023	2
						Diurnal Bird Census	26/07/2021, 27/07/2021, 17/09/2021, 24/11/2021 25/11/2021	2
						Incidental surveys.	February 2021 – December 2021	-

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
				attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger in eucalypts.				
Glossy Black-Cockatoo *Calyptorhynchus lathami*	2	N	Mar to Aug.	The Glossy Black-Cockatoo is a small brown-black cockatoo with a massive, bulbous bill and a short crest. Males have a prominent red tail panel, while that of females is yellow to orange-red. The coloured tail panel is barred black in juvenile birds, with the extent of barring decreasing with age. The female usually has irregular pale-yellow markings on the head and neck, and may have yellow flecks on the underparts and underwing. They are usually seen in pairs or small groups feeding quietly in sheoaks. The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, *Allocasuaraina diminuta*, and *A. gymnathera*. Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (*Casuarina cristata*). Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.	Area based survey methods.	Habitat Assessment	26/07/2021, 27/07/2021, 02/05/2023	2
						Diurnal Bird Census	26/07/2021, 27/07/2021, 17/09/2021, 24/11/2021 25/11/2021	2
						Songmeter (x1)	26/07/2021-09/08/2021	-
						Incidental surveys.	February 2021 – December 2021	-
Eastern Pygmy-possum *Cercartetus nanus*	2	N	Oct to Mar.	The species can be found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) drays or thickets of vegetation, (e.g., grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. Young can be born whenever food sources are available, however most births occur between late spring and early autumn.	The minimum survey effort for site under 100ha should be 2 per vegetation community or habitat type for 14 consecutive nights. Effort per stratification unit up to 50 hectares: Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Camera Trapping (x30)	01/12/2021 deployed 15/12/2021 Rebaited 29/12/2021 Collected	-
						Spotlighting	24/11/2021 25/11/2021	2
						Incidental surveys.	February 2021 – December 2021	-
Wallum Froglet *Crinia tinnula*	1.5	N	All Year	Wallum Froglets are small (to about 20mm) and extremely variable in colour and pattern. They range from light grey or brown to dark grey above and usually white or light brown below (sparsely flecked or heavily mottled with darker patches). They have a relatively pointed snout that projects beyond the lower jaw. A fine median line of white	Systematic day habitat search – one hour per stratification unit. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at	Habitat Assessment	26/07/2021, 27/07/2021	2
						Spotlighting	24/11/2021 25/11/2021	2

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
				dots often occurs on the underside on the throat that may continue across the belly. They have no webbing on their feet and toe pads are absent. Pupils are horizontal. The call is a distinctive short high-pitched ringing 'tching..tching..', heard throughout the year, particularly following rain. Wallum Froglets are found along the coastal margin from Litabella National Park in south-east Queensland to Kurnell in Sydney. Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. The species breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches. Breeding is thought to peak in the colder months, but can occur throughout the year following rain. Eggs of 1.1-1.2mm are deposited in water with a pH of <6 and tadpoles take 2-6 months to develop into frogs. Wallum Froglets shelter under leaf litter, vegetation, other debris or in burrows of other species. Shelter sites are wet or very damp and often located near the water's edge. Males may call throughout the year and at any time of day, peaking following rain.	approximately 1km per hour on 2 separate nights.	Songmeter (x1)	26/07/2021-09/08/2021	-
						Incidental surveys.	February 2021 – December 2021	-
Emu population in the NSW North Coast Bioregion and Port Stephens LGA *Dromaius novaehollandiae* – endangered population	2	N	All Year	The Emu formerly occurred throughout mainland Australia and Tasmania though only rarely in dense tropical forests or parts of the arid interior. It is now generally absent from densely settled regions and largely absent from south-eastern coastal and subcoastal regions. The Emu is extinct in Tasmania. The species was formerly widespread in north-eastern NSW, but is now restricted to coastal and near-coastal areas between Evans Head and Red Rock and a small isolated population further west in the Bungawalbin area. The range of the species continues to contract in recent years. It now appears to be absent from Broadwater National Park, there are few recent sightings from its former stronghold in Bundjalung National Park and it is not known whether a natural population continues to persist in the Port Stephens area. On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest. Emus are omnivorous, taking a wide range of seeds and fruits, invertebrates (mainly insects) and foliage and other plant material. They take material directly from plants or bend down to take items from the ground, picking up the food and tossing them back in the throat before swallowing. The population of Emus in the NSW North Coast Bioregion and Port Stephens LGA is of significant conservation value as the last known population in northern coastal NSW, and for the role that birds play in dispersing large seeds of native plant species, and over long distances. Most breeding occurs in late autumn and winter, but better data are needed for the north-eastern NSW population. Eggs are laid on a platform of grass, twigs, leaves and bark on the ground, often at the base of some vegetation and with good views from the nest. Incubation and all parental care is by the male. Young are precocial and covered in down at hatching. They can walk within 5 to 24 hours of hatching.	Area based survey methods.	Habitat Assessment	26/07/2021, 27/07/2021, 02/05/2023	2
						Diurnal Bird Census	26/07/2021, 27/07/2021, 17/09/2021, 24/11/2021 25/11/2021	2
						Incidental surveys.	February 2021 – December 2021	-
Beach Stone-curlew (Breeding)	3	N	All Year	Beach Stone-curlew occupy coastlines and are found on wide range of beaches, islands, reefs, estuaries and sometimes at edges of		Habitat Assessment	26/07/2021, 27/07/2021	2

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
Esacus maginirostris				mangroves. They forage in the intertidal zone and breed above the littoral zone at the back of beaches, sandbanks or islands within grasses, shrubs or low trees. The species is mostly active at dawn, dusk and throughout the night.	Two survey seasons are required, the first to detect if the site provides breeding habitat and the second to detect winter roosting habitat.	Diurnal Bird Census	26/07/2021, 27/07/2021, 17/09/2021, 24/11/2021 25/11/2021	2
						Nocturnals	26/07/2021, 27/07/2021	2
						Incidental surveys.	February 2021 – December 2021	-
White-bellied Sea-Eagle *Haliaeetus leucogaster*	2	N	Jul to Dec.	Terrestrial habitat includes coastal dunes, tidal flats, grassland, heathland, woodland and forest. Requires large emergent eucalypts for nesting. Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground. May be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young. Typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days.	Area based survey methods. Habitat assessment – 30 minutes searching each relevant habitat.	Habitat Assessment	26/07/2021, 27/07/2021, 02/05/2023	2
						Diurnal Bird Census	26/07/2021, 27/07/2021, 17/09/2021, 24/11/2021 25/11/2021	2
						Incidental surveys.	February 2021 – December 2021	-
Pale-headed Snake *Hoplocephalus bitorquatus*	2	N	Nov to Mar.	A patchy distribution from north-east Queensland to the north-eastern quarter of NSW. In NSW it has historically been recorded from as far west as Mungindi and Quambone on the Darling Riverine Plains, across the north west slopes, and from the north coast from Queensland to Sydney. A small number of historical records are known for the New England Tablelands from Glenn Innes and Tenterfield; however, the majority of records appear to be from sites of relatively lower elevation. Although the Pale-headed snake distribution is very cryptic, it now appears to have contracted to a patchy and fragmented distribution. The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The diet of the Pale-headed Snake consists largely of tree frogs, although ground-dwelling frogs, lizards and small mammals are also	Survey in dry weather only to minimise damage to sandstone, must not be too warm. As temperatures increase the species moves to utilising hollows in trees, often in sandstone gullies downslope of outcrops.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Spotlighting	24/11/2021 25/11/2021	2
						Incidental surveys.	February 2021 – December 2021	-

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
				taken. The Pale-headed Snake is relatively unusual amongst elapid snakes in that it is well adapted to climbing trees.				
Green and Golden Bell Frog *Litoria aurea*	2	N	Nov to Mar.	Formerly distributed from the NSW north coast near Brunswick Heads, southwards along the NSW coast to Victoria where it extends into east Gippsland. Records from west to Bathurst, Tumut and the ACT region. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range; however, they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs. Preyed upon by various wading birds and snakes.	Systematic day habitat search – one hour per stratification unit. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Spotlighting	24/11/2021 25/11/2021	2
						Incidental surveys.	February 2021 – December 2021	-
Green-thighed Frog *Litoria brevipalmata*	1.5	N	Oct to Mar.	The species was allocated to species credit species because presence cannot be predicted from vegetation or landscape surrogates. Experts noted that it is difficult to detect from survey, detection could be optimised by detailed/strict survey guidelines. Survey: reliant on rainfall events for calling/breeding when it is usually detected/surveyed, strongly suggest >75 mm in 24 hrs or 150 mm over 72 hrs as the most probable time to survey and detect the species. Note that tadpole's susceptible to injury during netting, they can be identified from observation. Whilst there is some information on the species ecology little is known about the species response to management. A ground-dwelling frog that inhabits coastal forest and bushland. Calling males gather around temporary or semi-permanent ponds and flooded ditches after heavy rain. Egg masses are often laid in temporary ponds. Tadpoles are predominately surface dwellers, but feed throughout the water body.	Systematic day habitat search – one hour per stratification unit. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Spotlighting	24/11/2021 25/11/2021	2
						Incidental surveys.	February 2021 – December 2021	-
Southern Myotis *Myotis macropus*	2	N	Oct to Mar.	The habitat constraint for Southern Myotis is hollow bearing trees within 200m of riparian zone. The species was allocated to species credit because it is dependent on waterways with pools of 3m wide or greater for foraging (which will be protected under legislation), habitat surrounding waterways is used for breeding and roosting. The species can be detected via survey using appropriate techniques (see Threatened Bat Survey Guide). Constraints based on information from Campbell Susan (2009). All habitat on the subject land where the subject land is within 200m of a waterbody with pools/ stretches 3m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies on the subject land must be mapped. Use aerial imagery to map waterbodies with pools/ stretches 3m or wider on or within 200m of the subject land. Species polygon boundaries should align with PCTs on the	Minimum four hours of recording immediately after dusk, with whole night recording recommended, ultrasonic recorders located in areas of greatest potential activity A minimum of four nights survey and 16 nights total survey effort per <2.5km riparian length with acoustic recorders. Roost search: Potential breeding habitat searched for bat or bat sign using a torch. If detected, trapping may be necessary to identify species and/or breeding status.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Anabat	Deployed 24/11/2021 Changed batteries and moved 15/12/2022 Collected 29/12/2022	1
						Incidental surveys.	February 2021 – December 2021	-

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
				subject land to which the species is associated that are within 200m of waterbodies mapped.				
Barking Owl *Ninox connivens*	2	N	May - Dec	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Roosts in shaded portions of tree canopies. Requires large old trees with hollows for nesting. Barking Owl are a dual credit species. Foraging habitat is considered an ecosystem credit and breeding is considered a species credit Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset. Tree Hollow Inspection: Close inspection of hollows in trees by sight and hollow inspection camera and record details. Detection dog (in training) was used but did not identify presence on site.	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset. Tree Hollow Inspection: Close inspection of hollows for signs of occupation e.g., pellets, whitewash, claw marks, feathers, fur, using height access methods. Photograph and record sizes of hollows and current state or evidence of occupation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Diurnal Bird Census	26/07/2021, 27/07/2021, 17/09/2021, 24/11/2021 25/11/2021	2
						Songmeter (x1)	26/07/2021-09/08/2021	-
						Nocturnals	26/07/2021 27/07/2021	2
						Incidental surveys.	February 2021 – December 2021	-
						Tree Hollow Inspection	06/03/24, 18/03/24	2
Powerful Owl *Ninox strenua*	2	N	May - Aug	The species inhabits a range of vegetation types from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tree hollows (≥0.5m deep) in large eucalypts (DBH 80-240cm) that are at least 150 years old. Powerful Owl is a dual credit species. Foraging habitat is considered an ecosystem credit and breeding is considered a species credit. Tree Hollow Inspection: Close inspection of hollows in trees by sight and hollow inspection camera and record details. Detection dog (in training) was used but did not identify presence on site.	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset. Tree Hollow Inspection: Close inspection of hollows for signs of occupation e.g., pellets, whitewash, claw marks, feathers, fur, using height access methods. Photograph and record sizes of hollows and current state or evidence of occupation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Diurnal Bird Census	26/07/2021, 27/07/2021, 17/09/2021, 24/11/2021 25/11/2021	2
						Songmeter (x1)	26/07/2021-09/08/2021	-
						Nocturnals	26/07/2021 27/07/2021	2
						Incidental surveys.	February 2021 – March 2024	-
						Tree Hollow Inspection	06/03/24, 18/03/24	2
Squirrel Glider *Petaurus norfolcensis*	2	N	All Year	Inhabits Blackbutt-Bloodwood Forest with heath understorey in coastal areas. Lives in family groups. Requires abundant tree hollows for refuge and nesting. Survey year round but sites with bi-pinnate acacia, autumn winter flowering trees and shrubs such as Eucalyptus robusta and Banksia sp (integrifolia etc.) should be subject to a more retracted survey period of between March-August. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e., no more than 50 m apart). Important known food plants – *Eucalyptus siderophloia/tereticornis/pilularis/robusta, Corymbia maculata/gummifera, Melaleuca quinquenervia, Acacia irrorata/longifolia, Banksia integrifolia/oblongifolia/serrata/spinulosa and Xanthorrhoea spp.*	Effort per stratification unit up to 50 hectares: Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights. Stagwatching - Observing potential roost hollows for 30 minutes prior to sunset and 60 minutes following sunset.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Camera Trapping (x30)	01/12/2021 deployed 15/12/2021 Rebaited 29/12/2021 Collected	-
						Spotlighting	24/11/2021 25/11/2021	2
						Songmeter (x1)	26/07/2021-09/08/2021	-

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
						Incidental surveys.	February 2021 – December 2021	-
Brush-tailed Phascogale *Phascogale tapoatafa*	2	N	All year	The Brush-tailed Phascogale has a patchy distribution around the coast of Australia. In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide. Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater. Feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. Females have exclusive territories of approximately 20 - 40 ha, while males have overlapping territories often greater than 100 ha. Nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span. Mating occurs May - July; males die soon after the mating season whereas females can live for up to three years but generally only produce one litter.	Survey must be undertaken using baited cameras. The bait type used must remain as an effective attractant until replaced. Honeyed oat balls will need to be replaced daily. Other effective baiting methods include using a baited canister with small holes and capped at either end, to limit bait theft by other species, or honey-water, sprayed very liberally in front of each camera. The baited canister and honey-water will require less frequent replenishment of the bait compared to a bait ball. Cameras should be set at head height, or above, facing the branch or tree trunk where a honey-based bait has been placed. Cameras must remain in place for a minimum of 4 weeks with cameras checked and baits replaced after 2 weeks. A minimum of 4 cameras, independent of the size of the subject land, must be used for sites up to 1 ha, then an additional 2 cameras for every ha of potential habitat thereafter. Cameras must be evenly spaced across the site. Where potential habitat is disconnected by gaps of 50 m or more, each habitat patch should have a minimum of 4 cameras for the first ha, and 2 cameras for every ha thereafter. Malfunctioning cameras must be replaced and additional cameras and time must be invested to address the lost survey effort. If the site is over 10 ha, contact DPIE for a modified camera survey approach. You will need to provide DPIE with your field data sheets and aerial mapping of the PCTs, displaying each vegetation zone. Provide information on the condition of each vegetation zone as well as any other information that will help DPIE inform their decision.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Camera Trapping (x30)	01/12/2021 deployed 15/12/2021 Rebaited 29/12/2021 Collected	-
						Spotlighting	24/11/2021 25/11/2021	2
						Incidental surveys.	February 2021 – December 2021	-
Phascolarctos cinereus - endangered population Koala, Hawks Nest and Tea Gardens population	2	N	All Year	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Call playback - 2 sites per stratification unit up to 200 hectares, plus an additional site per 100 hectares above 200 hectares. Each playback site must have the session conducted twice, on separate nights. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights. Habitat assessment - 30 minutes searching each relevant habitat, including trees for scratch marks. BAM-C/TSDC Survey Period: All Year Round.	Habitat Assessment	26/07/2021, 27/07/2021, 02/05/2023	2
						Camera Trapping (x30)	01/12/2021 deployed 15/12/2021 Rebaited 29/12/2021 Collected	-
						Spotlighting	24/11/2021 25/11/2021	2
						SATs (x6)	26/07/2021 27/07/2021	2

Species	Risk Weighting (BRW)	SAII (Y/N)	Specified Survey Period (BAM – C)	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Method Undertaken	Date	Personnel No.
						Songmeter (x1)	26/07/2021-09/08/2021	-
						Incidental surveys.	February 2021 – December 2021	-
Masked Owl *Tyto novaehollandiae*	2	N	May to Aug	Lives in dry eucalypt forests and woodlands from sea level to 1100m. Uses large tree hollows or sometimes caves for nesting. Dead stags are used for roosting/breeding habitat Masked Owl can nest in living or dead trees with hollows greater than 20cm diameter. In Tas and Vic Masked owls have been recording nesting in paddock trees. Has been found to nest in caves in Tasmania but there is no evidence to suggest that this occurs in NSW. Tree Hollow Inspection: Close inspection of hollows in trees by sight and hollow inspection camera and record details. Detection dog (in training) was used but did not identify presence on site.	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated as follows: at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset. Tree Hollow Inspection: Close inspection of hollows for signs of occupation e.g., pellets, whitewash, claw marks, feathers, fur, using height access methods. Photograph and record sizes of hollows and current state or evidence of occupation.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Diurnal Bird Census	26/07/2021, 27/07/2021, 17/09/2021, 24/11/2021 25/11/2021	2
						Songmeter (x1)	26/07/2021-09/08/2021	-
						Nocturnals	26/07/2021 27/07/2021	2
						Incidental surveys.	February 2021 – December 2021	-
						Tree Hollow Inspection	06/03/24, 18/03/24	2
Mahony’s Toadlet *Uperoleia mahonyi*	2	N	Oct - Mar	Mahony's Toadlet is endemic to the mid-north coast of New South Wales (NSW) and to date has been found between Kangy Angy and Seal Rocks. Current observations indicate Mahony’s Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony’s Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Recent studies suggest intact vegetation adjacent to and within water bodies is an important habitat feature for this species. Known records are associated with shallow ephemeral/semi-permanent water bodies with limited flow of water. Aquatic vegetation at breeding sites includes sedges (*Shoenoplectus* spp., *Baumea* spp. and *Lepironia articulata*) and Broadleaf Cumbungi (*Typha orientalis*). Females have been recorded up to 400m from water-bodies indicating moderate dispersal distances and use of multiple habitat types. Tadpoles have been observed using leaf litter in the shallow verges of water bodies on sandy substrate. Rocks, logs and leaf litter may also be used for shelter and provide important foraging areas for invertebrate prey items.	Systematic day habitat search – one hour per stratification unit. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Habitat Assessment	26/07/2021, 27/07/2021	2
						Spotlighting	24/11/2021 25/11/2021	2
						Incidental surveys.	February 2021 – December 2021	-

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:

- Regent Honeyeater – consultation of DPIE's BAM – Important Areas online map (DPIE, 2021) revealed that the Subject Site is not located within Regent Honeyeater Important Areas and hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.
- Swift Parrot - consultation of DPIE's BAM – Important Areas online map (DPIE, 2021) revealed that the Subject Site is not located within Swift Parrot Important Areas and hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.
- Eastern Osprey - the species was not recorded within the Subject Site and there were no stick nest located within the Study Area and hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.
- Square-tailed Kite - the species was not recorded within the Subject Site and there were no stick nest located within the Study Area and hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.
- Little Bent-winged Bat – the species was identified within the Subject Site, however as there are no caves, karst or suitable breeding habitat within 2km of the Subject Site and hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.
- Eastern Cave Bat - the species was identified within the Subject Site, however as there are no caves, karst or suitable breeding habitat within 2km of the Subject Site and hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.
- Large Bent-winged Bat – the species was not recorded within the Subject Site and there are no cliffs, caves, karst or suitable breeding habitat within 2km of the Subject Site and hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.
- Large-eared Pied Bat – the species was not recorded within the Subject Site and there are no cliffs, caves, karst or suitable breeding habitat within 2km of the Subject Site and hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.
- Grey-headed Flying-fox - the species was not recorded within the Subject Site and there were no roosts or maternity camps located within the site and hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.
- Brush-tailed Rock-wallaby – there is no suitable habitat within the Subject Site for this species and hence species has been removed from calculator based on habitat constraint. In

accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.

- Common Planigale - there is no suitable habitat within the Subject Site for this species and no records of sightings within 10km^2, hence species has been removed from calculator based on habitat constraint. In accordance with BAM Section 5.2.2.2(a) the development site lacks the listed habitat constraints and as such, does not require survey.

1.5.4 Field Survey Methods

Surveys are deemed to fulfill minimum survey requirement. Details of the flora and fauna survey are presented in **Table 8** and were conducted using relevant guidelines, in particular DPIE survey guidelines for threatened plants (2020) and amphibians (2020), along with applicable EPBC guidelines (2010; 2011). Flora Survey Effort, Threatened Flora Sightings and Fauna Survey Effort is shown in **Figures 5-12** respectively. The areas that were surveyed were within the Mid Coast Council cadastre. Due to a risk of trespassing, surveys were minimised in areas outside of the cadastre boundary and as this area is similar habitat to the Subject Site, it is determined that no further surveys are required.

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**. Refer **Figures 5-12** for survey effort undertaken on site.

1.5.4.1 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 1.5.2.** The assessment also considered the potential value of the Subject Site (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.

1.5.4.2 Flora Field Survey

All required flora survey techniques were utilised for targeted survey of the species listed in **Table 8** above and guided by the *Threatened Species Survey and Assessment Guidelines* (2004) and the BAM (2020).

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. Subject Site 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.
- Seasonal threatened flora surveys walking 5 – 10m, 10 - 20m, 20 – 40m line transects throughout the site, targeting a range of threatened flora.
- Four (4) BAM plots were undertaken in accordance with BAM 2020.

- Updated/Refined Vegetation Community Mapping involving traversal over the entire Study Area, concentrating particularly on mapping the boundaries between the identified Biometric Vegetation Types of the BAM 2020 and refining the original mapping which involved a larger number of vegetation units.

1.5.4.3 Fauna Field Surveys

All required fauna survey techniques were utilised for targeted survey of the species listed in **Table 8,** above and guided by the Threatened Species Survey and Assessment Guidelines (2004) and Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians (2009). Survey effort is shown in **Figures 5- 12**.

1.5.4.4 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.

1.5.5 Survey Effort Results

1.5.5.1 Habitat Trees

A total of eighty-one Hollow-bearing trees (HBTs) are present within Study Area

- A total of 64 HBTs are being retained: and,
- A total of 17 HBTs are being impacted of which:

Details of the HBT survey are provided in **Table 9** below. Hollow-bearing tree locations are presented in **Figure 4. Table 10** summarises the large hollow survey in search for evidence of *Ninox strenua* (Powerful Owl). An incidental survey was undertaken during this time. Findings of these surveyed are presented in **Figure 12**.

Table 9 – Habitat Tree Detail

GPS ID	Scientific Name	DBH (cm)	Hollow size			
			Small	Med	Large	XL
			5-10	10-15	15-20	>20
HBT1	*Eucalyptus pilularis*	83	3	1	0	0
HBT2	*Eucalyptus pilularis*	85	4	0	0	0
HBT3	*Eucalyptus pilularis*	83	1	1	0	1
HBT4	*Eucalyptus pilularis*	65	0	1	0	1
HBT5	*Eucalyptus pilularis*	73	1	2	0	0
HBT6	*Eucalyptus pilularis*	80	1	1	1	0
HBT7	*Eucalyptus pilularis*	70	1	1	1	0
HBT8	*Eucalyptus pilularis*	66	2	1	0	0
HBT9	*Eucalyptus pilularis*	96	0	2	2	0
HBT10	*Eucalyptus pilularis*	93	0	2	0	0
HBT11	*Eucalyptus pilularis*	85	0	1	1	0
HBT12	*Eucalyptus pilularis*	81	0	0	1	1
HBT13	*Eucalyptus pilularis*	93	1	0	0	1
HBT14	*Eucalyptus pilularis*	94	0	2	1	0

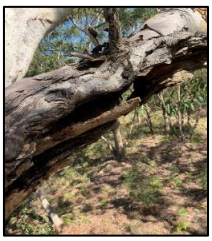
GPS ID	Scientific Name	DBH (cm)	Hollow size			
			Small	Med	Large	XL
			5-10	10-15	15-20	>20
HBT15	*Eucalyptus pilularis*	125	0	2	1	0
HBT16	*Eucalyptus pilularis*	84	2	0	0	0
HBT17	*Eucalyptus pilularis*	42	0	0	0	0
HBT18	*Angophora costata*	65	0	0	1	0
HBT19	*Eucalyptus pilularis*	64	0	1	0	0
HBT20	*Eucalyptus pilularis*	99	2	0	0	0
HBT21	*Eucalyptus pilularis*	84	0	2	0	0
HBT22	*Eucalyptus pilularis*	72	2	0	0	0
HBT23	*Eucalyptus pilularis*	58	0	3	0	0
HBT24	*Eucalyptus pilularis*	63	2	0	0	0
HBT25	*Eucalyptus pilularis*	95	0	0	3	1
HBT26	*Angophora costata*	42	0	1	0	0
HBT27	*Eucalyptus pilularis*	85	0	2	0	1
HBT28	*Eucalyptus pilularis*	108	0	0	1	1
HBT29	*Eucalyptus pilularis*	41	0	1	0	0
HBT30	*Eucalyptus pilularis*	52	2	0	0	0
HBT31	*Eucalyptus pilularis*	108	0	0	2	1
HBT32	*Eucalyptus pilularis*	99	0	1	0	0
HBT33	*Eucalyptus pilularis*	85	1	1	0	0
HBT34	*Eucalyptus pilularis*	60	0	0	0	0
HBT35	*Eucalyptus pilularis*	73	0	0	2	0
HBT36	*Eucalyptus pilularis*	50	1	0	0	0
HBT37	*Eucalyptus pilularis*	60	1	0	0	0
HBT38	*Eucalyptus pilularis*	55	1	0	0	0
HBT39	*Eucalyptus pilularis*	50	1	0	0	0
HBT40	*Eucalyptus pilularis*	70	0	0	0	0
HBT41	*Eucalyptus pilularis*	30	0	1	0	0
HBT42	*Eucalyptus pilularis*	60	1	0	0	0
HBT43	*Eucalyptus pilularis*	40	0	1	0	0
HBT44	*Eucalyptus pilularis*	30	2	0	0	0
HBT45	*Eucalyptus pilularis*	20	0	1	0	0
HBT46	*Eucalyptus pilularis*	50	0	1	0	0
HBT47	*Eucalyptus pilularis*	60	1	0	0	0
HBT48	*Eucalyptus pilularis*	50	0	1	0	0
HBT49	*Eucalyptus pilularis*	70	0	0	0	0
HBT50	*Eucalyptus pilularis*	30	1	1	0	0
HBT51	*Eucalyptus pilularis*	30	0	0	0	0

GPS ID	Scientific Name	DBH (cm)	Hollow size			
			Small	Med	Large	XL
			5-10	10-15	15-20	>20
HBT52	*Eucalyptus pilularis*	70	0	0	2	0
HBT53	*Eucalyptus pilularis*	100	0	0	0	3
HBT54	*Eucalyptus pilularis*	110	0	3	0	0
HBT55	*Eucalyptus pilularis*	100	0	0	0	1
HBT56	*Eucalyptus pilularis*	120	0	0	0	1
HBT57	*Eucalyptus pilularis*	60	2	0	0	0
HBT58	*Eucalyptus pilularis*	130	0	0	1	0
HBT59	*Eucalyptus pilularis*	90	2	0	0	0
HBT60	*Eucalyptus pilularis*	60	1	1	0	0
HBT61	*Eucalyptus pilularis*	35	2	0	0	0
HBT62	*Eucalyptus pilularis*	50	0	2	0	0
HBT63	*Angophora costata*	50	0	0	1	0
HBT64	*Eucalyptus pilularis*	120	0	0	1	0
HBT65	*Eucalyptus pilularis*	90	1	1	0	0
HBT66	*Eucalyptus pilularis*	90	0	1	0	0
HBT67	*Angophora costata*	70	0	1	1	1
HBT68	*Eucalyptus pilularis*	80	0	1	0	0
HBT69	*Eucalyptus pilularis*	90	0	1	0	0
HBT70	*Stag*		3	0	0	0
HBT71	*Angophora costata*	80	1	0	0	0
HBT72	*Eucalyptus pilularis*	100	0	1	1	2
HBT73	*Angophora costata*	80	0	0	1	0
HBT74	*Angophora costata*	110	0	0	0	2
HBT75	*Eucalyptus pilularis*	100	3	1	1	0
HBT76	*Angophora costata*	70	1	0	0	0
HBT77	*Angophora costata*	80	0	0	1	0
HBT78	*Eucalyptus pilularis*	80	0	0	1	0
HBT79	*Eucalyptus pilularis*	110	0	2	0	0
HBT80	*Eucalyptus pilularis*	90	0	0	0	1
HBT81	*Eucalyptus pilularis*	90	0	0	0	0
Total			**50**	**50**	**28**	**19**
Total No. Hollow			**147**			
Total No. HBTs			**81**			

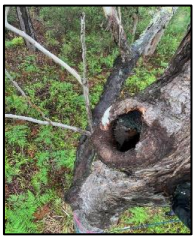
Notes for hollow size: S 5-10cm, M 10-15cm, L 15-20cm, XL >20cm, **DBH** - diameter at breast height

Table 10 – Stage 2 HBT Results

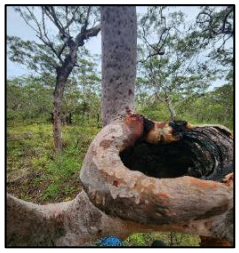
HBT Number	Hollow Details (mm)	Comments	Images
08	Hollow opening: 210 x 160 Depth: 650 Hollow height down: 300 Hollow height up: 600	No evidence of fauna usage, aside from termites, insects.	
10	**West facing:** Hollow opening: 200 x 180 Depth: 500	West facing hollow suitable for fauna, however no direct signs.	
	East facing: Hollow opening: 200 x 180 Depth: 500	East not suitable, shallow and no direct signs.	
11	**Upper north facing hollow:** Hollow opening: 120 x 200 Depth: 400	*Cymbidium sp.* growing from base of entry. Fauna scratch marks present around the entry to the hollow. Fur sample – Potential glider	
	Central/North facing hollow: Hollow opening: 290 x 100 Depth: 500+ down and 800+ up.	No visible signs, however the hollow is very deep and were unable to see the bottom of the hollow.	
	Lower/West facing hollow:	Shallow and not suitable for fauna. Termites present.	
12	**Lower/North facing hollow:** Hollow opening: 220 x 150 Depth: 600 Width: 350	Gumnuts, leaf litter and termite signs. Fur found within the hollow, looks like Brush tailed Possum. Old	

HBT Number	Hollow Details (mm)	Comments	Images
	Hollow height up: 380	unidentified scats present. 2 developing hollows present not showing signs of usage.	 
15	**Western hollow facing South:** Hollow opening: 180 x 210 Depth: 300	The tree has fauna scratch marks across the upper branches of the tree. No further fauna signs present except for termites. 2 corridors towards the back of the hollow. 30mm and 40mm.	
	Central hollow: Hollow opening: 200 x 160 Depth: 400	No visible signs.	
	North facing hollow: Hollow opening: 150 x 200 Depth: 450 one way and 250 another way	Suitable for microbat, however hard to check the internals	
	North lower facing hollow: Hollow opening: 170 x 100 Depth: 450	Termite signs and spider webs present. No immediate signs of fauna occupation.	

HBT Number	Hollow Details (mm)	Comments	Images
28	250 x 300 opening Drops approximately 2m down to a 2nd opening similar diameter entrance. Internal diameter approximately 700 plus.	The tree hollow is very large and connects by different entrances. The bottoming out of the hollow appeared to also have leaf arrangements - due to safety and depth this couldn't be properly inspected.	   
64	**Very large north facing hollow:** Hollow opening: 800 x 420 Internal diameter: 600 Depth: 1400 2nd direction depth: 400	The tree has visible scratch marks around the tree branches and hollow entrances. Fauna scratch marks present on the hollow entrance, largely on the top section. Fern sp and cymbidium present in the lower section of the entrance.	 

HBT Number	Hollow Details (mm)	Comments	Images
25	**North facing hollow:** Hollow opening: 270 x 400 Depth: 1.2m from top of hollow to the bottom.	40mm long fauna scratches at the entry to the hollow. There are signs of termites.	 
	South west facing hollow: Hollow opening: 300 x 320 Depth: Narrow corridor 1.2m from top of hollow to the bottom.	Leaves present within the hollow. Signs of termite and spiders.	 
	Top south facing hollow: Hollow opening: 400 x 450 Depth: 3m from top of hollow to the bottom.	7m hollow from the ground. No fauna signs present aside from signs of termites and spider webs.	 
	South end of branch hollow: Hollow opening: estimated - 250 x 250	The hollow was assessed from the ground using binoculars. After further inspection the hollow is	N/A

HBT Number	Hollow Details (mm)	Comments	Images
	Depth:600.	deemed not to be suitable as fauna habitat – the hollow is only just forming.	
27	**West facing hollow:** Large entrance.	Upon inspection the hollow was deemed not to be suitable due to large amounts of termite refuse and being shallow. There are no signs of immediate fauna occupation.	 
100	**West facing hollow:** Hollow opening: 200 x 160 Depth: 480 from the base of the entrance to the bottom of the hollow.	Scratch and claw marks present on the hollow opening and on the tree branches. Termite signs and spiders present. A fur sample was taken and identified to be a Brush-tailed Possum.	 
	North facing hollow: connects into the below north east facing hollow: Hollow opening: 200 x 235 Depth: 1.3m from the base of the entrance to the	Scratch and claw marks present on the opening of the hollow. Signs of termites. No immediate signs of targeted fauna occupation.	

HBT Number	Hollow Details (mm)	Comments	Images
	bottom of the hollow.		 
	North east facing hollow: connects into the above north facing hollow. Hollow opening: 90 x 90 Depth: 2m from the base of the entrance to the bottom of the hollow. 1.3m up to the entrance of the above hollow, as noted above.	Scratches present on the smooth barked sections of hollow opening. No immediate signs of targeted fauna occupation.	 
101	After further inspection the hollow is deemed not to be suitable as fauna habitat – the hollow is only just forming.	N/A	N/A
102	**North facing hollow:** Hollow opening: 260 x 290 Depth: 690 from the entrance to the bottom of the hollow.	Leaves in the base, spider webs present, no recent occupation or scratch marks observed. The hollow is directly facing upwards and would be affected by the elements.	

HBT Number	Hollow Details (mm)	Comments	Images
			
103	**West facing hollow: connects into the below north east facing hollow:** Hollow opening: 170 x 290 Depth: 3m from the bottom of the entrance to the top of the below north east hollow. The hollow also extends 2m into the upper branch.	Signs of termites. The hollow is affected by the elements (rain). There are visible scratch marks present around the hollow. Potential old beak bite marks around the entrance of the hollow. No immediate signs of targeted fauna occupation.	  
	North east facing hollow: connects into the above west facing hollow: Hollow opening: 270 x 220 Depth: 700 from the entrance to the bottom of the hollow.	Hollow formed by previous limb failure. Signs of termites and spider usage. Leaves within the base of the hollow have potential arrangement. Leaf arrangement is approximately 100mm thick. No immediate signs of targeted fauna occupation.	 

HBT Number	Hollow Details (mm)	Comments	Images
104	Assessed from the ground using binoculars. The angle of the hollow allowed for ground inspection.	The hollow appears shallow and in the process of forming. No signs of fauna are present.	 

1.5.5.2 Water Features

There are no mapped drainage lines in the Study Area.

1.5.5.3 Other habitat features

The Subject Site also possesses other habitat features including large areas of refuse and piles of logs that provide potential habitat for reptiles and small mammals.

1.5.6 Species Credit Species Survey Results

Overall survey effort within the site (for plots, targeted searches and habitat assessments) and within the Subject Site (from past surveys, including plots, targeted searches, habitat assessments, camera traps) are detailed in **Table 8** and **Appendix D**, and was conducted using relevant guidelines, in particular DPIE survey guidelines for plants (2020) and amphibians (2020), along with applicable EPBC guidelines (2010; 2011). Survey periods are shown in **Table 8** and survey effort is shown in **Figures 5-12**.

Table 11 – Species Credit Species

Species	Survey Technique Adhere to Guidelines in Table 11 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Details of BioNet Record	Geographical Restrictions	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Flora										
Nabiac Casuarina *Allocasuarina simulans*	Y	Y	0	NA	The Nabiac Casuarina is restricted to the mid-north coast of NSW, from Nabiac to Forster and is very rare.	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Charmhaven Apple *Angophora inopina*	Y	Y	0	NA	The known northern limit is near Karuah where a disjunct population occurs; to the south populations extend from Toronto to Charmhaven with the main population occurring between Charmhaven and Morisset.	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Netted Bottle Brush *Callistemon linearifolius*	Y	Y	0	NA	No	This species is associated with *Allocasuarina littoralis*, and *Melaleuca nodosa* which is absent from the site. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Red Helmet Orchid *Corybas dowlingii*	Y	Y	0	NA	Known populations have been recorded from four localities between Wadalba and Wyong in Central Coast LGA. A small population also occurs within Lake Macquarie LGA.	Grows in patches of *Themeda australis* amongst shrubs, sedges in heathland and woodland. The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Leafless Tongue Orchid *Cryptostylis hunteriana*	Y	Y	0	NA	Known populations have been recorded Gibraltar Range National Park south into Victoria around the coast as far as Orbost. It is known historically from a number of localities on the NSW south coast and has been observed in recent years at many sites between Batemans Bay and Nowra (although it is uncommon at all sites). Also recorded at Munmorah State Conservation Area, Nelson Bay, Wyee, Washpool National Park, Nowendoc State Forest, Ku-Ring-Gai Chase National Park and Ben Boyd National Park.	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
White-flowered Wax Plant *Cynanchum elegans*	Y	Y	0	NA	The species is restricted to eastern NSW from Brunswick Heads to Gerroa. Records occur at far west as the upper Hunter River Valley.	The habitat on site is marginal for this species. This species prefers dry rainforest vegetation. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Sand Doubletail *Diuris arenaria*	Y	Y	0	NA	Known populations have been recorded Sand Doubletail is known from the Tomaree Peninsula near Newcastle.	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N

Species	Survey Technique Adhere to Guidelines in Table 11 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Details of BioNet Record	Geographical Restrictions	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Rough Doubletail *Diuris praecox*	Y	Y	0	N/A	Known populations have been recorded between Bateau Bay and Smiths Lake Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey.	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Camfield's Stringybark *Eucalytpus camfieldii*	Y	Y	0	N/A	Known populations have been recorded Raymond Terrace area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges.	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Eucalyptus parramattensis subsp. decadens	Y	Y	2	The species are located approx. 1.5km to the north of the Subject Site in 2004.	Known populations have been recorded The Kurri Kurri meta-population is bordered by Cessnock—Kurri Kurri in the north and Mulbring—Abedare in the south. Large aggregations of the subspecies are located in the Tomalpin area. The Tomago Sandbeds meta-population is bounded by Salt Ash and Tanilba Bay in the north and Williamtown and Tomago in the south.	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Small-flower Grevillea *Grevillea parviflora subsp. parviflora*	Y	Y	0	N/A	Distributed in the Sydney Basin with known population occurring near Picton, Appin, Bargo, the Hunter, Central Coast and around Lake Macquarie.	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Grove's Paperbark *Melaleuca groveana*	Y	Y	0	N/A	No	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N

Species	Survey Technique Adhere to Guidelines in Table 11 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Details of BioNet Record	Geographical Restrictions	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Villous Mint-bush *Prostanthera densa*	Y	Y	0	N/A	Currarong area in Jervis Bay, Royal National Park (Marley), Cronulla, Helensburgh and Port Stephens (Nelson Bay). The Sydney and Royal National Park populations were thought possibly extinct, but the species is now known to occur at Bass and Flinders Point in Cronulla	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Eastern Australian Underground Orchid *Rhizanthella slateri*	Y	Y	0	N/A	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	Given the highly cryptic species it is known for to be associated with sclerophyll forest. Habitat is marginal within the Subject Site. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site. Survey efforts also included the road reserve fronting the Subject Site	N/A	N	N	N
Native Guava *Rhodomyrtus psidioides*	Y	Y	0	N/A	The species occurs from Broken Bay in NSW to Maryborough in Queensland. Population of native guava are typically restricted to coastal and sub-coastal areas at low elevation. Records also occur as far as the Hunter and Clarence River.	The habitat on site is marginal for this species. This species prefers subtropical rainforest and wet sclerophyll forest often with creeks or drainage lines. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site	N	N	N	N
Magenta Lilly Pilly *Syzygium paniculatum*	Y	Y	13	Records are located more than 1500m away from the site with the majority occurring to the southern point of Waynderrabah beach. The rest of the records are separated from the Subject Site by Myall River.	Found only in coastal NSW from Upper Lansdowne to Conjola State Forest.	The habitat on site is marginal for this species. This species prefers littoral rainforest vegetation. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Black-eyed Susan *Tetratheca juncea*	Y	Y	0	N/A	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock.	The species is generally found in low open forest/woodland with a mixed shrub understorey and grassy groundcover, also occurs in heathland and moist forest. It is noted that the site is located outside of its known range. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N
Austral Toadflax *Thesium australe*	Y	Y	0	N/A	Known populations have been recorded Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia.	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N/A	N	N	N

Species	Survey Technique Adhere to Guidelines in Table 11 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Details of BioNet Record	Geographical Restrictions	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Fauna										
Bush Stone-curlew *Burhinus grallarius*	Y	Y	0	N/A	N/A	The habitat present on the Subject Site does support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Gang-gang Cockatoo *Callocephalon fimbriatum*	Y	Y	0	N/A	N/A	The Subject Site provides moderate to foraging for the highly mobile species. Given the species is highly mobile it is not likely that the proposed development would have a direct impact on the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Glossy Black-Cockatoo *Calyptorhynchus lathami*	Y	Y	1	Sighted approx. 5km to north of the Subject Site in 2013.	N/A	The Subject Site provides moderate to foraging for the highly mobile species. Given the species is highly mobile it is not likely that the proposed development would have a direct impact on the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Eastern Pygmy-possum *Cercartetus nanus*	Y	Y	1	One sighting approx. 1.5km to the south in 1980 and 2004	N/A	Foraging habitat is present within the Subject Site, and hollows are present. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Wallum Froglet *Crinia tinnula*	Y	Y	13	All results are located 2-3km to the west of the subject with Myall River between the Subject Site and all records.	N/A	All depressions within the Study Area were assessed after and during rainfall events, none were holding water. Therefore, it was determined that the habitat is marginal and unlikely to support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Emu population in the NSW North Coast Bioregion and Port Stephens LGA *Dromaius novaehollandiae* – endangered population	Y	Y	2	Two records from 2001 located 250m south to the Subject Site along Mungo Brush Road.	N/A	The Subject Site provides moderate foraging habitat for this highly mobile species. Given the species is highly mobile it is not likely that the proposed development would have a direct impact on the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Beach Stone-curlew (Breeding) *Esacus maginirostris*	Y	Y	2	Two records located more than 6km south-west to the Subject Site in Corrie Island Nature Reserve.	N/A	The Subject Site provides potential breeding habitat for this species.	N	N	N	N
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Y	Y	45	Sightings of the species are located adjoining properties.	N/A	There is limited to no foraging habitat within the Subject Site and Surveys of the Subject Site failed to detect any sticks nest, therefore it has been determined that given the high mobility the species is likely to be recorded flying over the site, but the site provided no habitat for the species.	N	N	N	N
Pale-headed Snake	Y	Y	0	N/A	N/A	The species preferred habitat comprises hollows within 500m of sandstone escarpments. Gravid females remain near cliffs during the summer. The	N	N	N	N

Species	Survey Technique Adhere to Guidelines in Table 11 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Details of BioNet Record	Geographical Restrictions	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Hoplocephalus bitorquatus						preferred habitat is not located within the Subject Site, Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.				
Green and Golden Bell Frog *Litoria aurea*	Y	Y	0	N/A	N/A	All depressions within the Study Area were assessed after and during rainfall events, none were holding water. Therefore, it was determined that the habitat is marginal and unlikely to support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Green-thighed Frog *Litoria brevipalmata*	Y	Y	0	N/A	N/A	All depressions within the Study Area were assessed after and during rainfall events, none were holding water. Therefore, it was determined that the habitat is marginal and unlikely to support the species. Targeted survey efforts by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Southern Myotis *Myotis macropus*	N	Y	2	The records are located approx. 2-3km to the west on the western banks of the Myall River in 1987 and 2013.	N/A	There are no dams within 200m of the Subject Site, therefore no species credits apply.	N	N	N	N
Barking Owl *Ninox connivens*	Y	Y	1	The record is located approx. 3km west of the Subject in 2006.	N/A	Foraging habitat and hollows are present. Targeted survey efforts including call playback and stagwatching of suitable hollows within the Subject Site, and 16 nights of songmeter, by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N
Powerful Owl *Ninox strenua*	Y	Y	30	The records are spread throughout the 10km area, one recorded on adjoining land to the south west.	N/A	Foraging habitat and hollows are present. Targeted survey efforts including call playback and stagwatching of suitable hollows within the Subject Site, and 16 nights of songmeter was undertaken on site. AEP located a call of this species on the songmeter approx. 350m from Subject Site. Targeted survey efforts by AEP failed to detect this species during recommended seasonality surveys within the site. Therefore, it was determined that there is foraging habitat within the Subject Site, however there is no breeding habitat present and species credits are not incurred for this species	Y (Songmeter)	N	N	N
Squirrel Glider *Petaurus norfolcensis*	Y	Y	13	The records are spread throughout the 10km area, no records within the Subject Site or within 1km of the Subject Site	N/A	Foraging habitat is present within the Subject Site, and there were multiple hollows suitable for use by the species within the Subject Site. Targeted survey efforts including spotlighting, camera trapping (x30 cameras at 28 nights), stagwatching of suitable hollows within the Subject Site, and 16 nights of songmeter, by AEP detected a squirrel glider on Camera trap during seasonal surveys. Therefore, all forested areas within the Subject Site represent the species polygon for this development site and species credits apply to this species	Y (Camera Trap)	N	Y	Y

Species	Survey Technique Adhere to Guidelines in Table 11 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Details of BioNet Record	Geographical Restrictions	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Endangered population Koala, Hawks Nest and Tea Gardens population *Phascolarctos cinereus*	Y	Y	3264	The records are spread throughout the 10km area.	N/A	The site supports koala use trees; habitat trees are provided. Targeted survey efforts including spotlighting, camera trapping, SATs and songmeter were undertaken within the Subject Site. Survey efforts by AEP failed to detect this species during recommended seasonal surveys. However, given the local records and using the precautionary principle species credits have been applied for this species in forest areas (refer **Section 1.5.7** for detailed assessment).	N	N	N	Y
Brush-tailed Phascogale *Phascogale tapoatafa*	Y	Y	2	One (1) record is located 3km to the north west and the other approx. 2km to south west. Both are located on western bank of the Myall River.	N/A	Foraging habitat is present within the Subject Site. Targeted survey efforts including camera traps and spotlighting by AEP failed to detect this species during recommended seasonal surveys.	N	N	N	N
Masked Owl *Tyto novaehollandiae*	Y	Y	5	The records are spread throughout the 10km area, one (1) record is located within the adjoining land the record is from 1998.	N/A	Foraging and suitable hollows are present within the Subject Site. Targeted survey efforts including call playback and stagwatching of suitable hollows within the Subject Site, and 16 nights of songmeter, by AEP failed to detect this species during recommended seasonal surveys within the site.	N	N	N	N

1.5.7 Koala Assessment

The results above indicate that the site is classed as core koala habitat due to the number of recent records in the general locale and because the site is considered highly suitable koala habitat with koala feed trees present on site. Based on the number of koala records in the vicinity of the Subject Site, it is likely that koalas could pass through the Subject Site on occasion. It is not anticipated however, that koalas would use the proposed Site regularly for foraging or breeding. Additionally, koalas and evidence of koalas were not observed on site during the survey period and the site was deemed as not being used by koalas at the time of survey. **Appendix G** provides a detailed Koala Plan of Management in accordance with *Environmental Protection Biodiversity Conservation Act, 1999* (EPBC, Act) and the *State Environmental Planning Policy (Biodiversity Conservation) 2021* (BC SEPP).

1.5.7.1 Summary Assessment

Desktop and field surveys have identified the habitat as being Core Koala habitat. *Corymbia Gummifera, Angophora Costata* and *Eucalyptus pilularis* (Blackbutt) were identified on site. Under the *State Environmental Planning Proposal (Biodiversity Conservation) 2021* (BC SEPP), these tree species are listed as koala use trees. The preferred food trees of the Hawks Nest and Tea Gardens endangered koala population are *Eucalyptus Robusta* (Swamp Mahogany) and *Eucalyptus Microcorys* (Tallowwood), however, other local native tree species used by Koalas include *Melaleuca Quinquenervia* (Broad-leaved Paperbark), *Eucalyptus Pilularis* (Blackbutt), *Corymbia Gummifera* (Red Bloodwood), *Eucalyptus Grandis* (Flooded Gum) and *Angophora Costata* (Smooth-barked Apple).

The Great Lakes DCP (Development Control Plans) Tree and Vegetation Preservation, *Koala habitat or food tree located in Tea Gardens or Hawks Nest* and *BC SEPP Schedule 1 Feed Trees* does not list *Corymbia Gummifera, Angophora Costata* and *Eucalyptus pilularis* as primary feed trees.

A further DCP stipulation is that for each 'habitat' and 'home range' secondary food or significant shelter tree (i.e., trees which are known to be shared by two or more koalas in the population or which are known to have been visited on more than one occasion by an individual Koala) regardless of the species, should be retained. Koala faecal pellet surveys may be used as an alternative to radio tracking, for the purpose of identifying 'home range' trees.

As such an AEPs Ecologists completed the following surveys to establish if Koalas were present within the Study Area:

- Habitat Assessment - 26/07/2021, 27/07/2021; 02/05/2023;
- Camera Trapping (x30) - 01/12/2021 deployed 15/12/2021 Rebaited 29/12/2021 Collected;
- Spotlighting - 24/11/2021 25/11/2021;
- SATs (x6) - 26/07/2021 27/07/2021;
- Songmeter (x1) - 26/07/2021 27/07/2021; and
- Incidental surveys - July 2021 – March 2024.

No koalas or evidence of koalas were detected on site, however, the number of koala records in the immediate vicinity of the site and the presence of koala feed trees on site means that the site is classed as Core Koala Habitat as per the assessment above.

The koala has been readily reported as occurring in Hawks Nest and Tea Gardens and in the immediate vicinity of the Subject Site and surrounding towns in the Great Lakes Local Government Area. The greatest density of koala records appears to occur within the Hawks Nest suburb with occasional sightings being made in the surrounding suburbs including Tea Gardens.

Population History

- In 1989 the population contained at least 21 individuals according to the NSW Scientific Committee final determination investigations.;

- In 1998 the population had fallen to about 12, with 2 – 3 koalas in the vicinity of Tea Gardens and the remainder in Hawks Nest and environs.
- The decline of the koala population has been attributed to continuing sub-division and associated clearing of food and habitat trees, road mortality and attacks by dogs/dingoes.
- At least 10 Koalas were killed in 1997 and 1998.
- Historical bushfires in 2019 -2020 had a significant impact on koala populations, feed tree availability and habitat connectivity.
- There is evidence that koala populations in the Lower Hunter are small and continuing to decline due to pressures of clearing, habitat fragmentation, sand-mining, development (particularly urban development and the use of fences) and, in the past, hunting.

The Hawks Nest and Tea Gardens population of koala is of significant conservation value due to its disjunction from other populations in the area and its occurrence within a coastal urban area. Attacks by domestic and wild dogs, mortalities with vehicles, Chlamydial disease, improper fire regimes and occasionally drowning in swimming pools is also considered a threat to koalas.

The NSW Scientific Committee, as established by the Threatened Species Conservation Act has made the Final Determination that the numbers of *Phascolarctos cinereus* in the Hawks Nest and Tea Gardens population have been reduced to such a critical level that the population is in immediate danger of extinction.

Recovery strategies and management actions have been implemented to assist in the conservation of the koala and the endangered population in the Hawks Nest and Tea Gardens area and include;

- Species sightings and management sites (SoS strategy) that have been put in place to aid in monitoring of the population. This has included the formation of a koala working group consisting of members of local government and the community.
- Identifying and mapping koala habitat in the Hawks Nest and Tea Gardens area with active habitat management and monitoring/conservation and assessment;
- Identifying traffic blackspots for koalas in order to minimise incidents of death or injury on roads; and
- Developing and implementing a broad scale education and awareness strategies to make the local community and surrounds aware of the issues surrounding the koala population the area.

These are a few of proactive approaches being taken to conserve the species and BioNet records show that these management strategies appear to be assisting with the conservation of the species in this area.

Koalas in this population are found in a range of Eucalypt Forest and woodland communities, including coastal forests, rainforest, riparian areas, swamp sclerophyll forests, heathland and shrubland habitat. Additionally, koalas home range is known to be between 1km and 135kms.

The Great Lakes Local Environmental Plan 2014 Section 7.9 Protection of wildlife corridors is mapped and the Subject Site is located approx. 5km to the North South of the Subject Site.

Considering the range of habitats koalas utilise in this area, the availability of contiguous habitat surrounding the residential areas of Hawks Nest and Tea Gardens and the home range movements, the Subject Site would not be considered a primary corridor due to the lack of suitable Feed Trees. With the proposed removal of approx. 7.15ha of heath vegetation and the proposed regeneration (including planting of koala feed trees it is highly unlikely that that the site has significant values that are likely to serve an important ecological function for koalas.

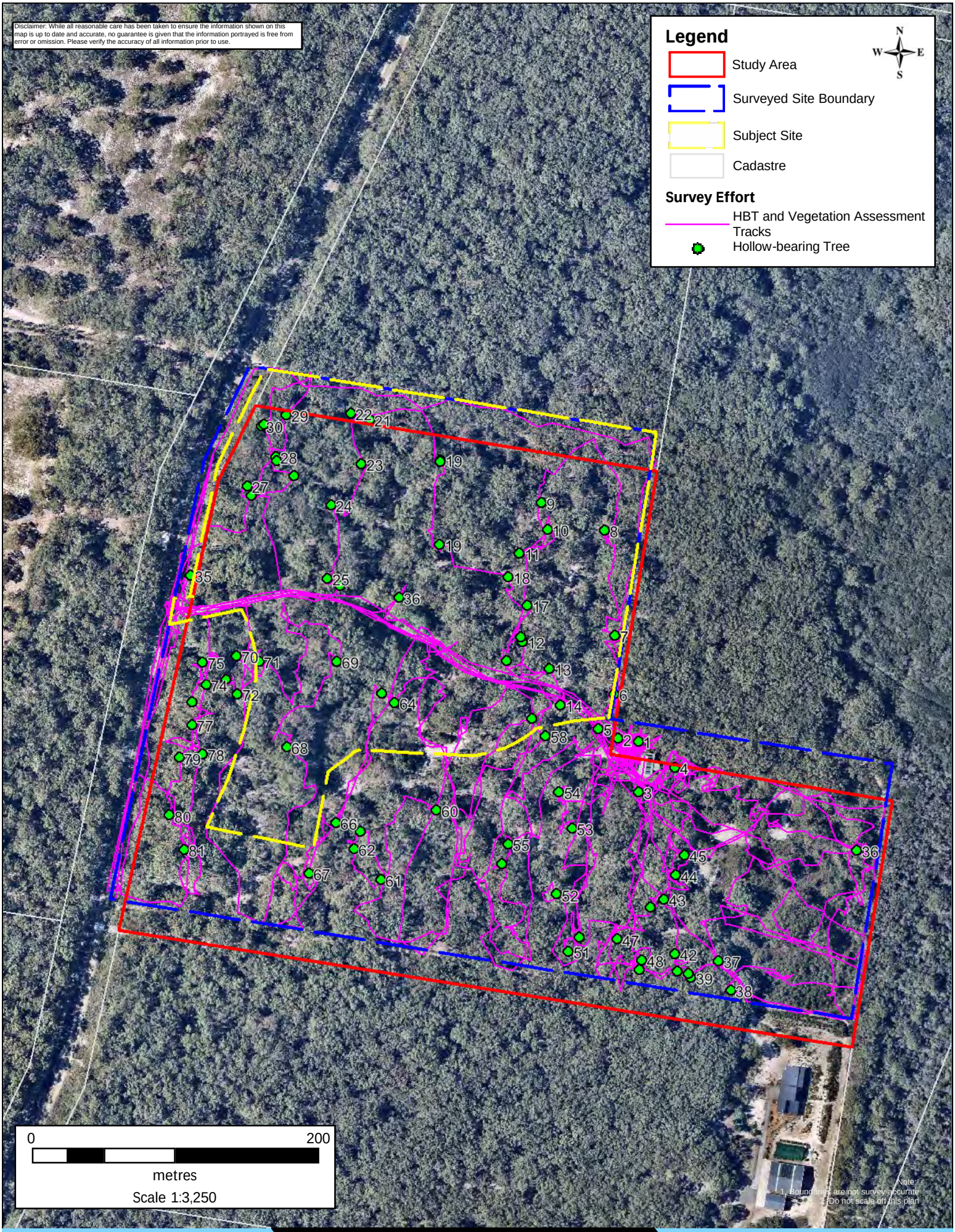
However, given the local records and using the precautionary principle species credits have been applied for this species in forest areas

Considering the range of habitats koalas utilise in this area, the availability of contiguous habitat surrounding the residential areas of Hawks Nest and Tea Gardens and the home range movements, the Subject Site would not be considered a primary corridor due to the lack of primary listed feed trees The proposed regeneration of 6.69ha of retained land would include the planting of listed feed trees within the corridor to provide safe passage and food resources. The BMP will provide an individual Koala Plan of Management for the retained lands outlining fencing, traffic management, flora species, improving the corridor and food resources for the local population.

Management associated with the development will implement a number of practices to ensure that ongoing, indirect impacts on koalas as a result of the development are mitigated or minimised. These include:

- Planting of koala feed trees will be undertaken within the 7.35ha of retained lands;
- Fencing surrounding properties should be designed to allow for koala movement with access and egress points; and
- If future developments install a pool, then pool fencing is to be of a variety that either excludes koala from pool areas and where this is not possible suitable access and egress points in and out of pools and pool areas should be provided for koalas to avoid koalas drowning in pools or becoming stuck inside fenced areas.
- No domestic dogs are permitted within the Study Area fencing should be adequate to prevent dogs from entry and being able to access native vegetation where koalas exist.

Indirect impacts during construction will be mitigated by site biosecurity protocols, wildlife fencing and clearing protocols.

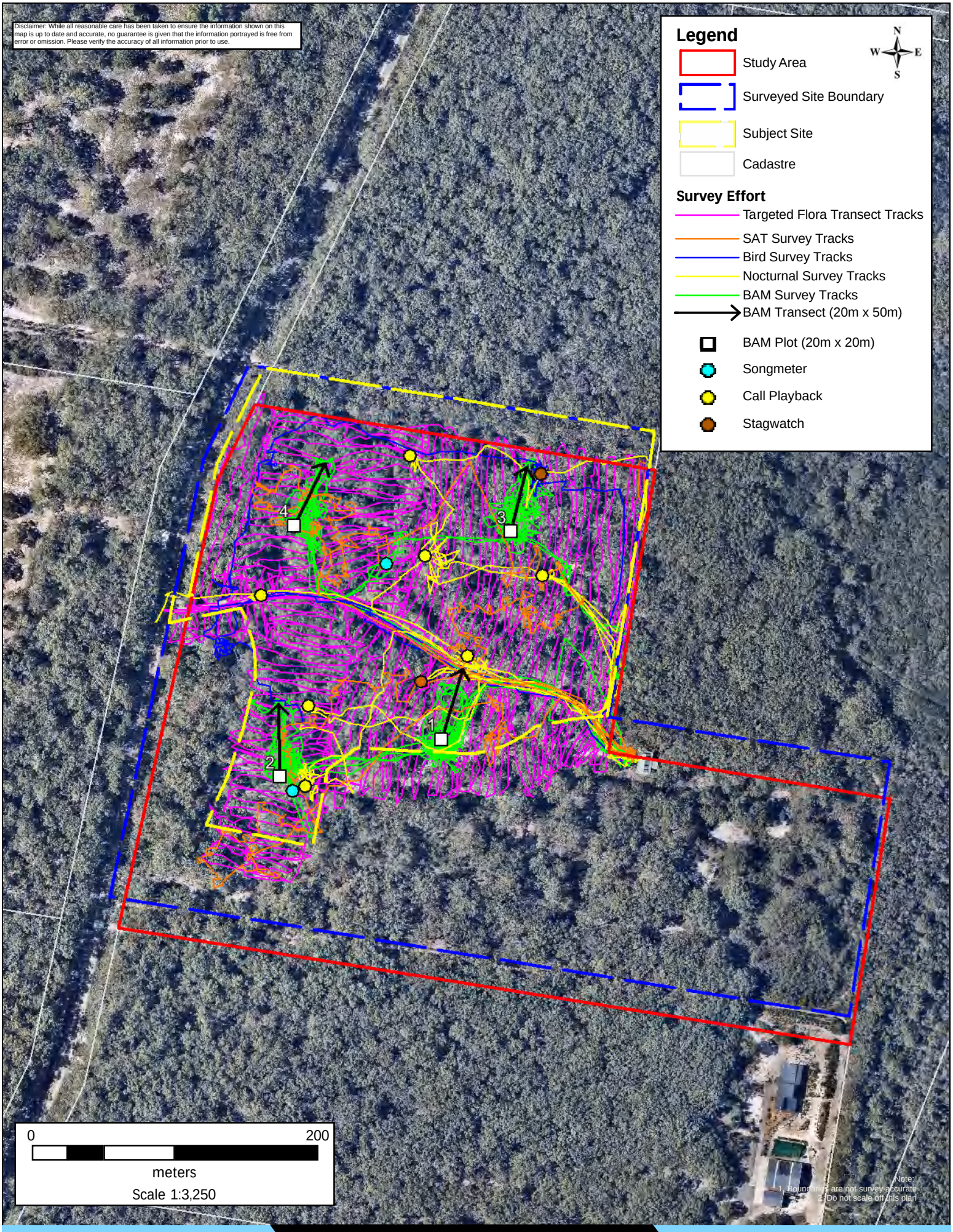


AEP

Figure 5 - Survey Effort February 2021 | Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW | BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd | AEP Ref: 2397.01



AEP

Figure 6 - Survey Effort July 2021

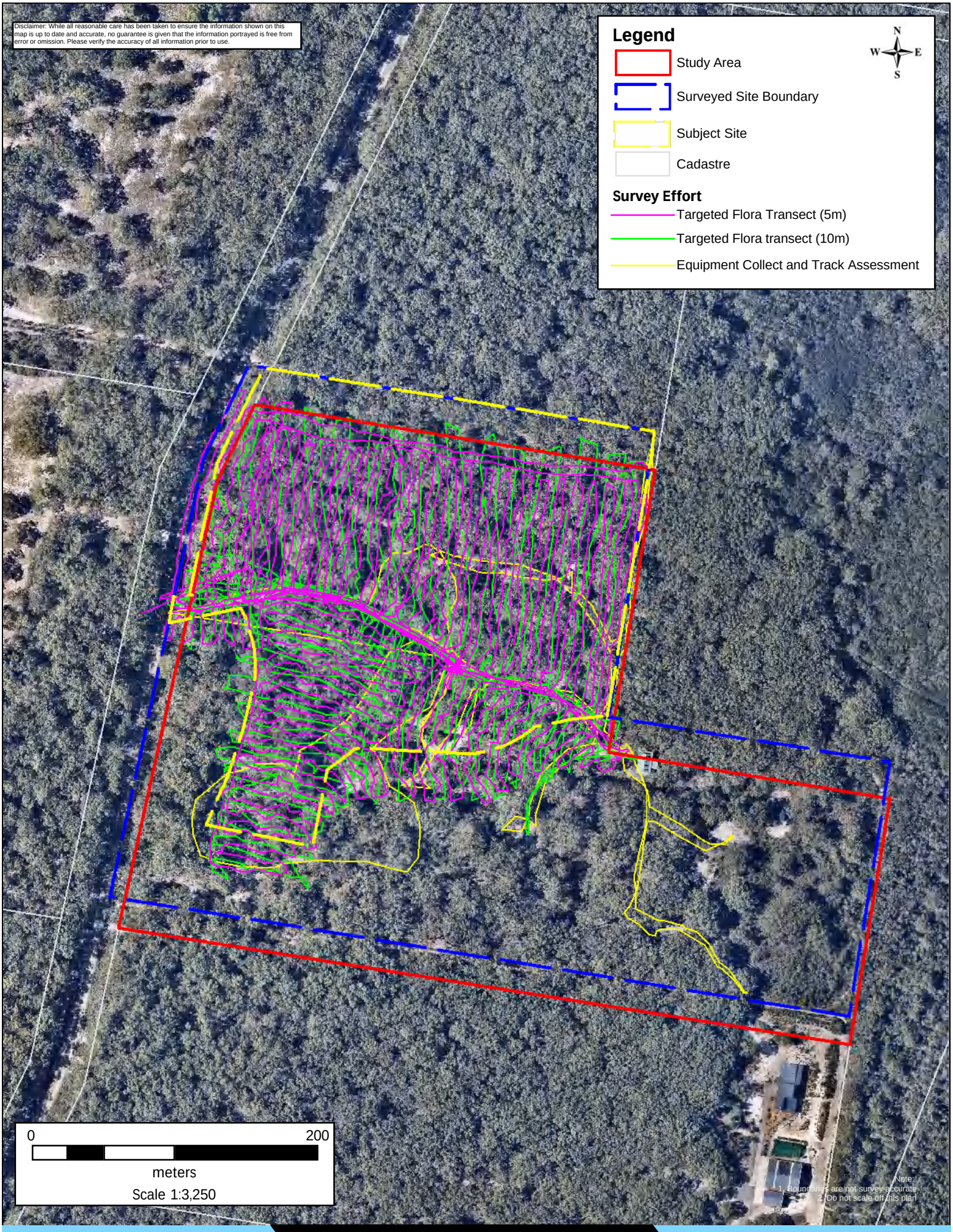
Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01



AEP

Figure 7 - Survey Effort August 2021

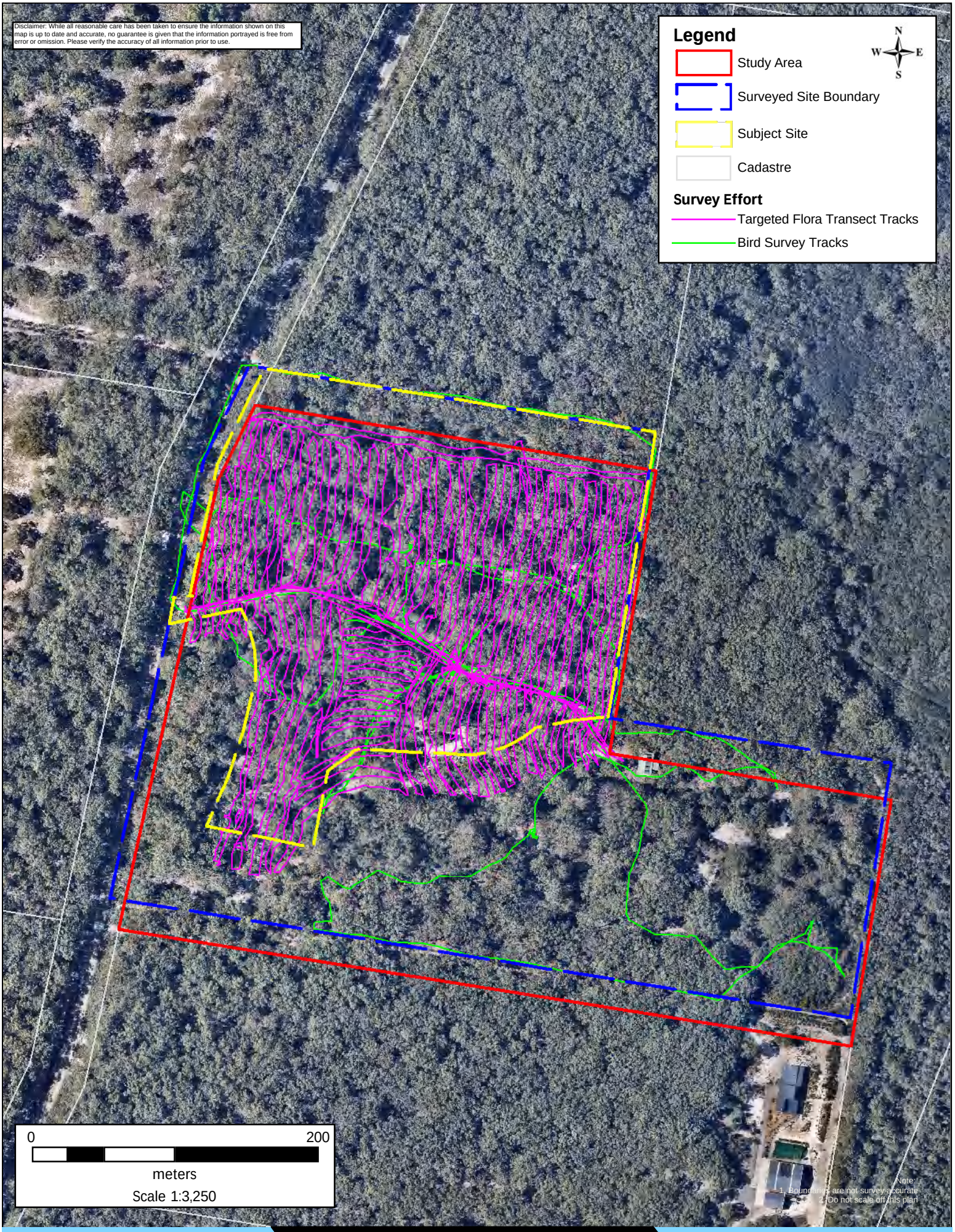
Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01

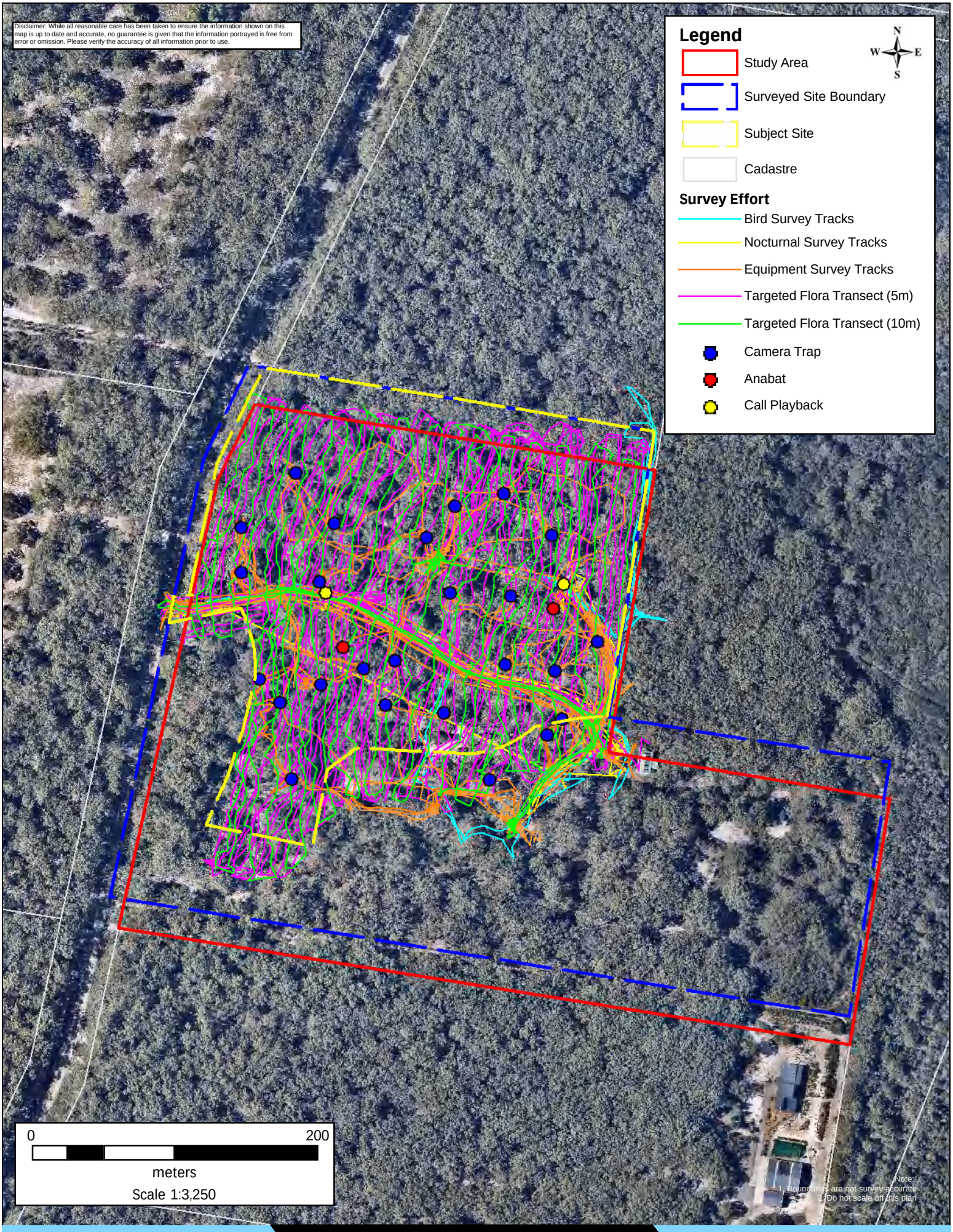


AEP

Figure 8 - Survey Effort September 2021 | Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW | BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd | AEP Ref: 2397.01



AEP

Figure 9 - Survey Effort November 2021

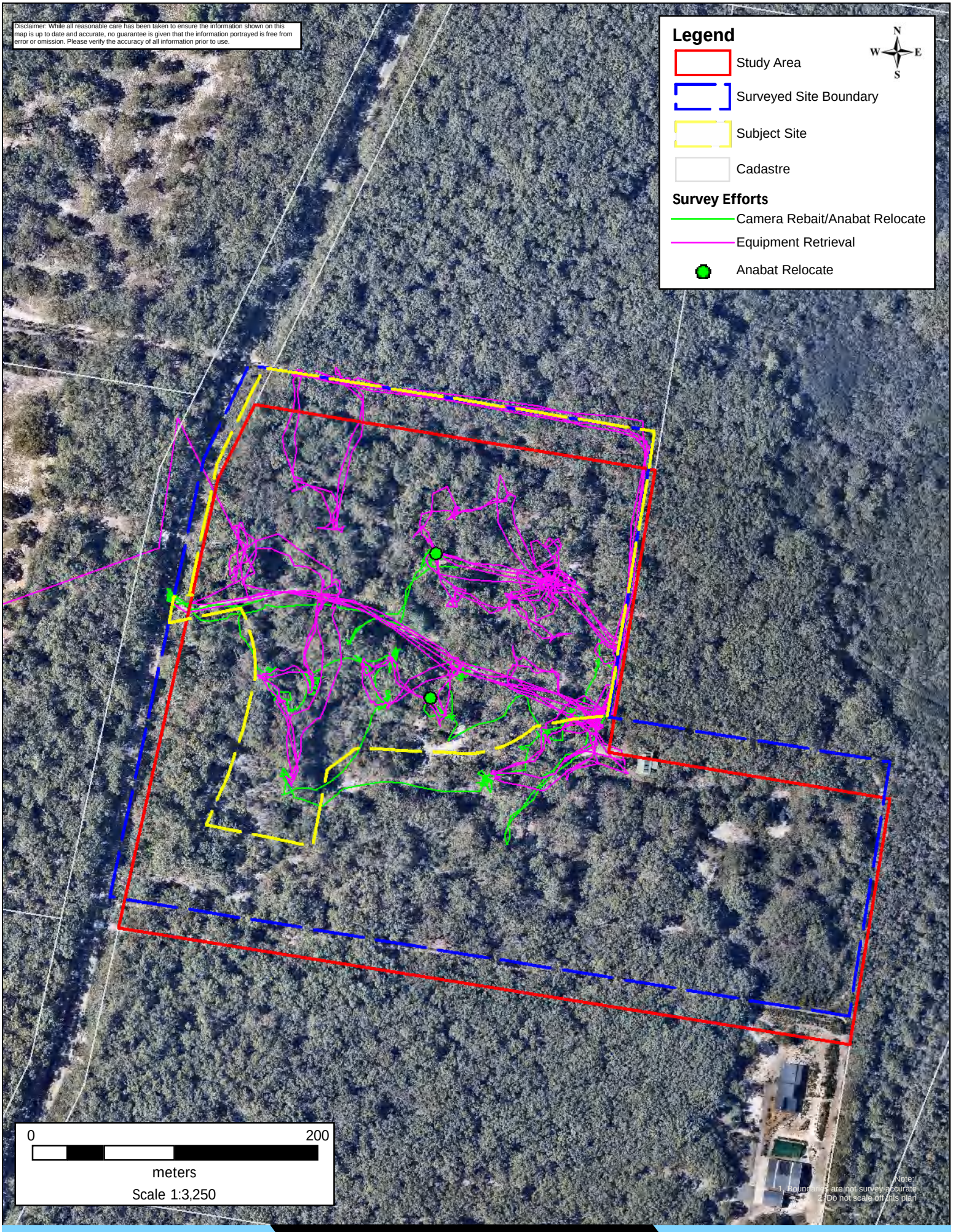
Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01

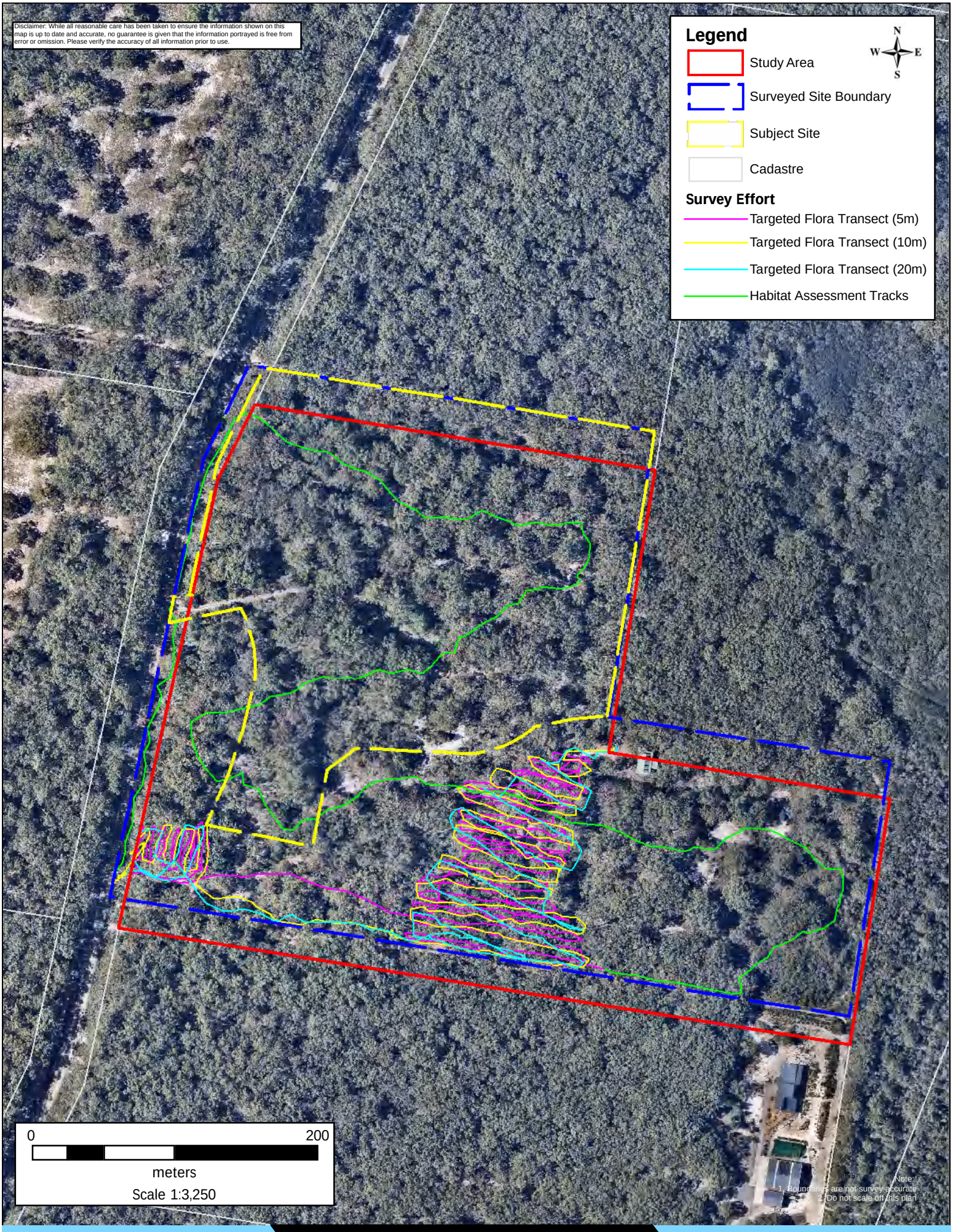


AEP

Figure 10 - Survey Effort December 2021 | Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW | BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd | AEP Ref: 2397.01



AEP

Figure 11 - Survey Effort May 2023

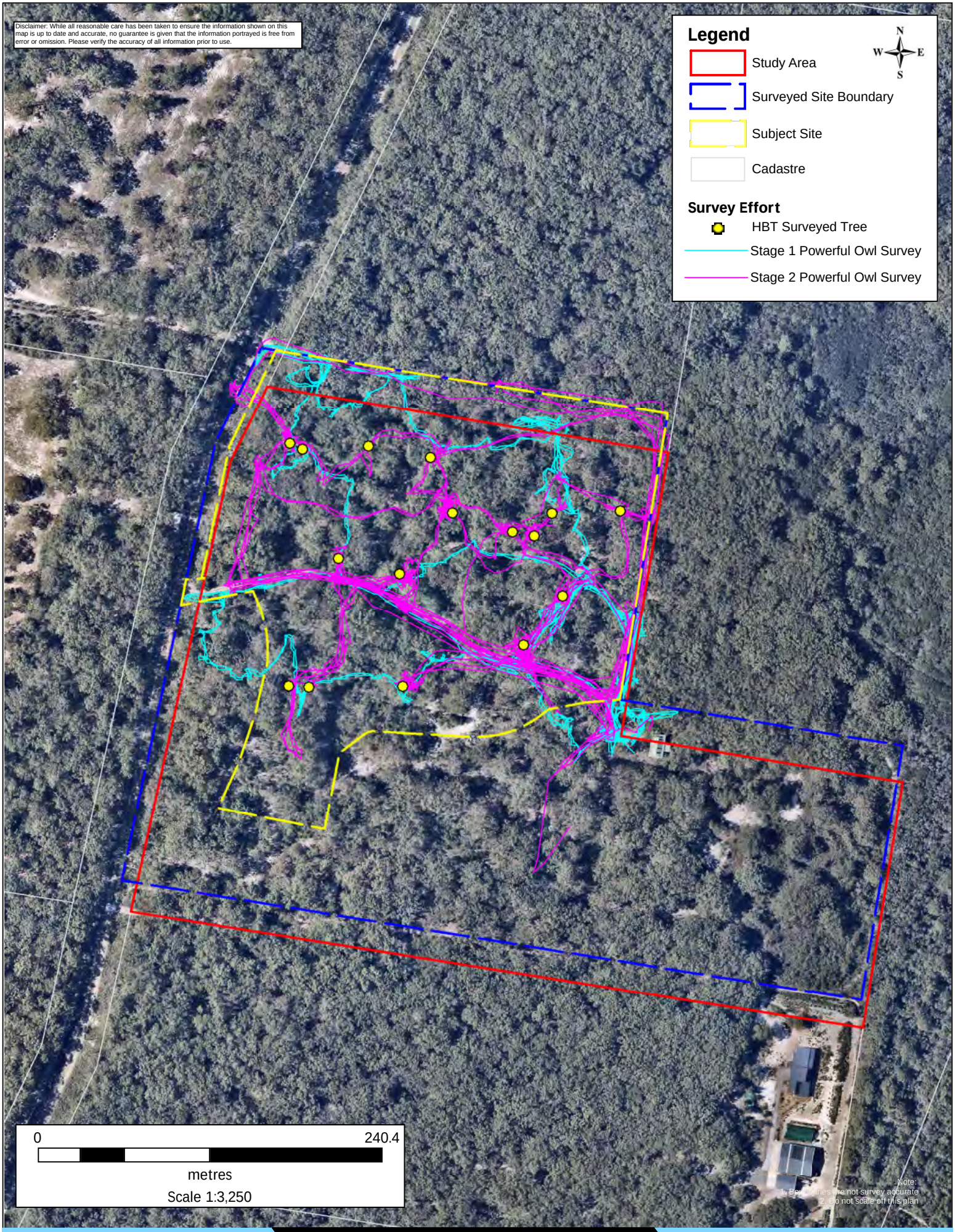
Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01



AEP

Figure 12 - Survey Effort March 2024

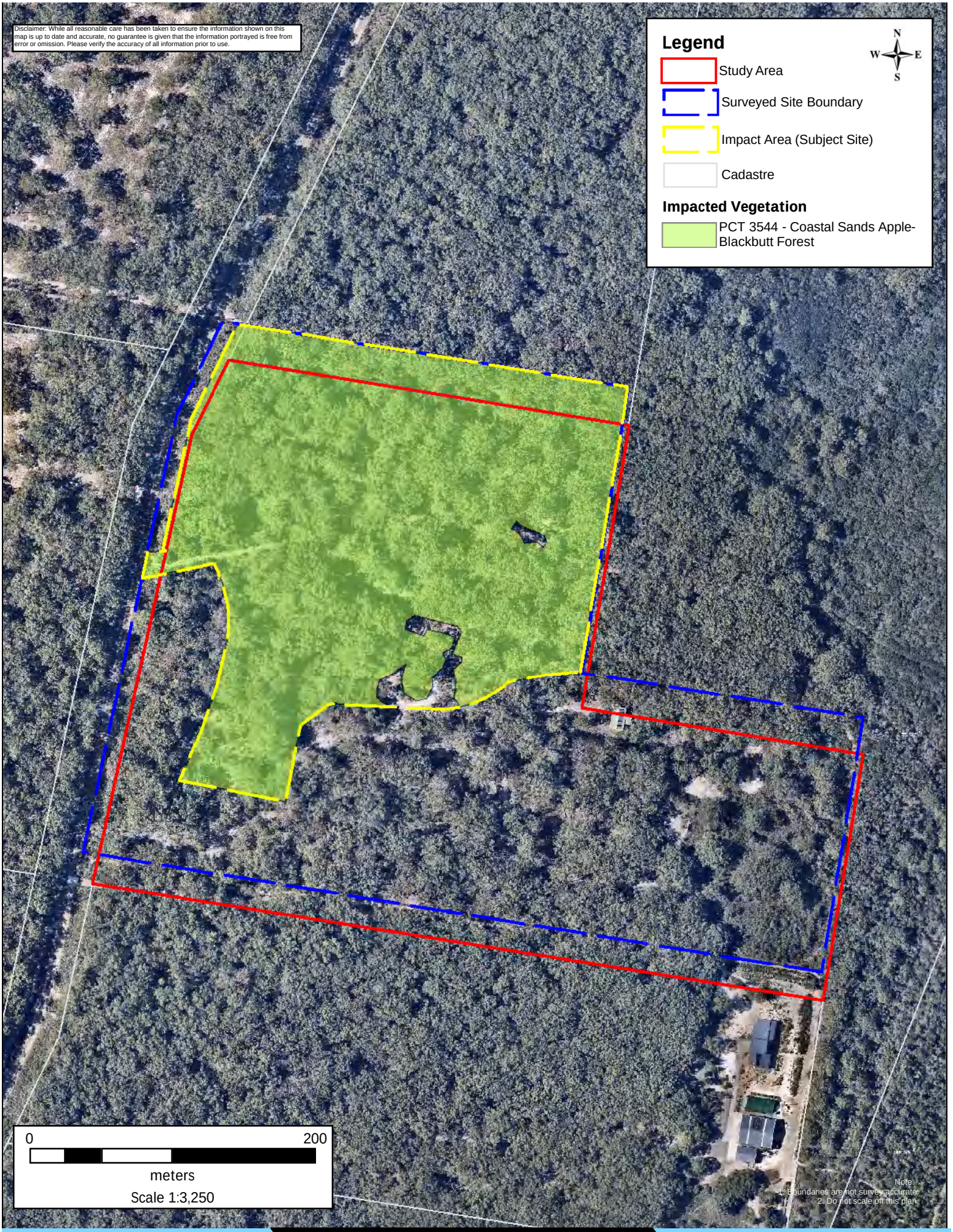
Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01



AEP

Figure 13 - Impact Area

Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest

BOAM Ref: 40952

NSW Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01

2.0 Stage 2 – Impact Assessment (Biodiversity Values)

2.1 Avoid and Minimise Summary

Section 7 of the BAM provides a list of measures that need to be taken into consideration during project planning and design to minimise impacts upon native vegetation, habitat and other prescribed biodiversity values. Applicable measures taken as part of this project to minimise impacts are provided below.

The avoid and minimise strategy for the development (in accordance with Section 7 of the BAM), is discussed in greater detail in **Table 12** below.

The prescribed impact risk assessment and mitigation measures (in accordance with Section 9 of the BAM) are included in **Tables 12** to **19** below.

The following measures in **Section 2.2** have been provided to help mitigate the impacts of construction and the ongoing operation of the proposed development on the biodiversity values identified within the Subject Site and surrounds.

Figure 13 above depicts the impact area from the proposed development footprint.

2.2 Project Design Avoidance Measures

The Subject Site is located within a semi-rural landscape north of the village of Hawks Nest which lies east of the M1 Motorway within the MidCoast Council LGA.

The design phase considered the location of high-quality vegetation and habitat while maintaining corridors for fauna to traverse. The corridor provided in the southern proportion of the Study Area ensures the retention of the existing north south corridor and only has a minimal impact on the east west corridor.

To address the principles outlined in BAM 2020 for Avoidance and Minimisation AEP has undertaken desktop and fields surveys in accordance with the BAM 2020, assessing all listed species and communities within the Subject Site. It has been determined that the proposed development will require the removal of 7.15ha of native vegetation, including Asset Protection Zones, noting that individual HBTs have been identified for retention within the footprint. The proposal also includes the regeneration of 8.58ha of land within the Study Area consisting of 7.92ha of PCT 3544 and 0.66ha of cleared land.

The proposed amendments to the development include retention of an additional 64 HBTs which will provide for nesting opportunities for listed species, provide foraging opportunities for listed species, including Koalas and Squirrel Gliders and assist with connectivity through the region. The Arborist assessment provided further clarity of tree retention, showing the proposed development could retain HBTs supporting continual for mobile fauna.

The amended proposal also includes the opportunity to regenerate an area of important habitat, reducing weed loads, creating a natural regenerating community which seed loads can be spread throughout the region by mobile fauna, wind and water. The Biodiversity Management Plan (BMP), aims to not only allow for regeneration it also aims to promote education of the plant community and fauna that inhabit the Study Area, through the installation of educational signage, the informative signs will include information on weeds and pests that pose threats to the community and information on the species present and what people can do to protect and conserve these species. *Crowley, Flood, Caffrey, Dunford, Fitzpatrick, Hamilton and O'Gorman, 2020, Engaging and empowering People in Biodiversity -and Conservation: Lessons from Practice, Biology and Environment Vol 120, Pages 175-185*, shows that such interactive engagement with members of the public is one of the most effective methods to empowering people to improve and protect our environment. Walking them through regenerated areas, with educational signage identifying key species by name, explaining the need for

hollows, connecting trees, spelling out bird calls, etc, as they are looking and hearing has been shown to be one of the most effective ways to for our memories to retain and connect.

The proposal to retain habitat trees, regenerate the Study Area will educate the wider public in the values of land and the to assist with conservation. Allowing the public to tread lightly through this site as is now proposed should empower conservation.

AEP has undertaken an Arborist Assessment to identify where HBTS can be retained and what measures need to be put in place to ensure protection of the trees during construction. The operation of the facility is intended to function with limited impact, with the feature of the Facility being Tread Lightly.

With the implementation of the CEMP and Operation Procedures which will be reviewed and approved by the Project Ecologist the direct impacts are being addressed through retirement of credits and the indirect impacts are being addressed through measures to reduce or completely avoid. The measure that have been recommended in **Tables 14 to 16** include:

- Procedures both for construction and operational.
- Hygiene controls throughout the facility;
- Fencing for protection and control of people, that will also allow for fauna movement,
- Installation of fauna proof bins;
- Installation of education signs providing information of local species but also informing the users how to treat and look after them, such as no feeding wildlife for these reasons, no petting for these reasons, no picking flowers for these reasons, etc.
- A light Plan will be prepared and reviewed / approved by Project Ecologist to ensure there is no light spill from the development that will impact corridors, HBTs, key foraging and nesting tree both within the site and adjoining retained land.

The facility proposes to encourage and educate the visitors to use the above measures in their own lives.

The option of do nothing to the Study Area will reduce Biodiversity Values and condition of the PCT as there are both invasive weeds and pests within the Study Area. The Department of Planning and Environment lists both invasive weeds and pests as Key Threatening Process, that if left unmanaged will continue to degrade communities and impact the survival of listed species by: reducing regeneration of feed trees for both Koala's and Squirrel Gliders and reducing population through predation.

The development proposes manage and reduce both invasive weeds and pest through a Biodiversity Management Plan and Individual Koala Plan of Management for the Subject Site. Both mechanisms will reduce the if not eliminate the Key Threatening Process within the Study Area, addressing the principles of minimisation within the BAM – C.

The retained vegetation is proposed to be managed under a Biodiversity Management Plan (BMP) for a period of five years to improve its condition and biodiversity value as per **Section 2.2.2** of this report.

2.2.1 Project Design, Construction & Operation

The following measures have been incorporated into the design to ensure impacts are minimised during the construction and ongoing operation of the proposed development, recommended BMP, water quality and hydrologic measures, protection measures for retained vegetation, tree management, fencing and other general measures.

2.2.2 Biodiversity Management Plan

The BMP will be prepared prior to the issue of a Construction Certificate.

The intent of the BMP is to improve the overall quality of the vegetation and the enhancement of Koala habitat and food resources by undertaking activities such as supplementary planting and weed removal. It will also remove activities such as grazing. The BMP Lands (approx. 7.92ha), are proposed to be actively regenerated to ensure:

- Regeneration of retained lands;
- Fencing to reduce movements of pest species and allowing moment of Koala's
- Weed management;
- Planting of Squirrel Glider and Koala foraging species;
- Installation of nest boxes and ground habitat;
- Clearance procedures;
- Wildlife management;
- Habitat regeneration; and
- Individual Koala Plan of Management.

2.2.3 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; and
- Erosion and sedimentation controls should be checked daily and maintained in working order especially after rain events.

2.2.4 Fencing

No barb wire is to be used within the Subject Site. All fencing within the Subject Site must allow for movement of fauna with a focus on the potential movement of Koala and Squirrel Glider.

2.2.5 General Construction & Operation

Site specific Avoid and Minimise measures are discussed in **Table 12** and **Table 13**, while **Table 14** and **Table 15** outline the direct and indirect impacts associated with the development and how they are to be mitigated. The development's 'Avoid and Minimise' strategy (in accordance with Section 8 of the BAM), is discussed in greater detail in **Table 12** below.

The following measures are provided 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 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. Trees should focus on species suitable for Swift Parrot foraging;
- 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;
- All clearing works to be undertaken under the supervision of the Project Ecologist;
- 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 1:1 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 resource to assist rehabilitation of conservation lands;
- Production of a CEMP for Construction that the Project Ecologist will review for waste management, fencing, hygiene, dust, noise.
- Operational Plan for the facility for the future operation Project Ecologist will review for waste management, fencing, hygiene, dust, noise.
- Project Ecologist will review and provide letter of compliance for lighting plan to ensure there is no direct and spill of light into areas of significant habitat.

- 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.

2.2.5.1 Management of Vegetation for Bush Fire Protection

The APZs space are included in the Impact Area and contain periphery road against the adjoining lands.

2.2.5.2 Landscaping

Where possible landscaping is to occur in conjunction with the proposed development and provide some future resources for native fauna in the area. Landscaping areas are to incorporate plantings with species that occur within the vegetation community that is currently present on site PCT 3455 (Good):

- **Canopy Species:** *Banksia serrata, Angophora costata, Eucalyptus pilularis, Corymbia gummifera;*
- **Mid-Stratum:** *Monotoca elliptica, Acacia ulicifolia, Acacia suaveolens, Ricinocarpos pinifolius, Acacia longifolia, Dillwynia retorta, Aotus ericoides, Tetratheca thymifolia, Platysace lanceolata, Leptomeria acida, Hibbertia obtusifolia, Conospermum taxifolium, Epacris pulchella, Persoonia lanceolata, Astroloma pinifolium, Styphelia viridis, Leucopogon parviflorus;* and
- **Ground-Stratum:** *Lomandra longifolia, Imperata cylindrica.*

Table 12 – Avoid and Minimise Impacts on Biodiversity Values

Objectives/Requirements	Evidence of compliance
Locating a Project to Avoid and Minimise Impacts on Native Vegetation and Habitat	
Knowledge of biodiversity values should inform decisions about the location of the proposal. The initial assessment of biodiversity values from Stage 1 may be used to inform the early planning of the route or location of a proposal.	The Subject Site is located within a semi-rural landscape north of the village of Hawks Nest which lies east of the M1 Motorway within the MidCoast Council LGA. The design phase considered the location of high-quality vegetation and habitat while maintaining corridors for fauna to traverse. The corridor provided in the southern proportion of the Study Area ensures the retention of the existing north south corridor and only has a minimal impact on the east west corridor. After extensive consultation, additional surveys and several iterations has allowed for 64 additional HBTs are being avoided through a more passive design, allowing more vegetation to be retained ensure connectivity is improved from previous iterations. To minimise impacts further the cabins are tiny homes are proposed to be elevated on piers to all for tree retention and ground dwelling fauna to move throughout the Subject Site. The design iterations considered the Asset Protection Zones (APZs), roads and construction footprint were located outside of the retained vegetation area, demonstrating Avoidance and Minimise principles. All APZ are located within the development footprint with no APZ controls within the retained vegetation. The retained vegetation is proposed to be managed under a Biodiversity Management Plan (BMP) for a period of five years to improve its condition and biodiversity value as per **Section 2.2.2** of this report.
Selecting a final proposal location may be an iterative process. Decisions may need to be revisited after all field surveys have been completed.	As discussed above, the direct impacts to the remnant vegetation present will be approximately 7.15ha of PCT 3544 (Good). The surrounding area is well vegetated to the east and south with good landscape connectivity, the proposed development is considered to have minimal impacts to the biodiversity of the area in the context of the broader locality. The retained vegetation (7.92ha) is proposed to be managed under a BMP for a period of five years to improve its condition and biodiversity value and to improve connectivity.

Objectives/Requirements	Evidence of compliance
Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas: *a) lacking biodiversity values* *b) where the native vegetation or threatened species, habitat is in the poorest condition (i.e., areas that have a low vegetation integrity score)* *c) that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT.* d) *outside of the buffer area around breeding habitat features such as nest trees or caves.*	A) As reflected in the Biodiversity Values Map, the Site does not contain biodiversity values (not mapped). B) The proposed development is designed to be located with minor impacts proposed to native vegetation. Comprising approx. 7.15ha of native vegetation and 0.16ha of cleared / exotic species is proposed to be cleared for the establishment of a caravan park. Avoiding 7.92ha. PCT 3544 (Good). C) The remnant vegetation present within the Subject Site has no associated TEC. The site is situated within a well vegetated landscape to the north and south with this in mind, impacts from the proposed development are minimal in regards to the broader locality. D) Given the location of the retained land provisions for wildlife movement such as Squirrel Glider and Koalas can be maintained with surrounding vegetation, therefore the impacts to connectivity are considered to be minimal to no impact.
When selecting a proposal's location, all of the following should be analysed. Justification for the decisions in determining the final location must be based on consideration of: *a. alternative modes or technologies that would avoid or minimise impacts on biodiversity values* *b. alternative routes that would avoid or minimise impacts on biodiversity values* *c. alternative locations that would avoid or minimise impacts on biodiversity values* *d. alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.*	A) The proposed development will utilise the existing road available as an access route which minimises the requirement for additional clearing outside of the property boundary. B) The Subject Site was considered an appropriate location as determined by the zoning of the land. Within the current context of the development, the site has been chosen within a lot that consists of predominantly of PCT 3544 in good condition. The surrounding locality has excellent landscape connectivity and the proposed development would have minimal impact on the biodiversity within the region. C) The current location is the result of adopting the principles of avoidance and minimisation of impacts. D) No alternative locations were considered; the proposed site location will have minimal impacts to the surrounding area.

Objectives/Requirements	Evidence of compliance
The proposal may also list and map site constraints, such as: *a. bushfire protection requirements, including clearing for asset protection zones* *b. flood planning levels* *c. servicing constraints.*	The impacts to native vegetation expected as a result of the proposed works is 7.15ha, all mitigation measures for fire, floods and services have been factored into the impact area while meeting the required standards.
In the BDAR or BCAR, the assessor must document and justify any actions taken to avoid or minimise impacts through careful location of the proposal.	The Subject Site's location is the most feasible option to enable the project to progress. Considering the location of the project in the context of the locality, the proposed DA footprint has the least impact to biodiversity values, native vegetation, connectivity routes and fauna movements whilst still being located in an appropriate location with regards to access.
Designing a Project to Avoid and Minimise Impacts on Native Vegetation and Habitat	
The BDAR or BCAR must document the reasonable measures taken by the proponent to avoid or minimise clearing of native vegetation and threatened species habitat during proposal design, including placement of temporary and permanent ancillary construction and maintenance facilities. The types of measures that can be used to demonstrate this include: *a. reducing the proposal's clearing footprint by minimising the number and type of facilities* *b. locating ancillary facilities in areas that have no biodiversity values* *c. locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e., areas with the lowest vegetation integrity scores)* *d. locating ancillary facilities in areas that avoid habitat for species and vegetation that has a high threat status (e.g., an endangered ecological community (EEC) or critically endangered ecological community (CEEC) or is an entity at risk of a serious and irreversible impact (SAII)* *e. actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.*	A-D). The proposal includes the removal of 7.15ha of remnant vegetation which is commensurate with PCT 3544 (Good). The APZ requirements are included within the development footprint of 7.15ha, ensuring the 7.85ha can be regenerated without further disturbance. The quality of this habitat and the investigations made to limit impact for access it is considered that the proposed impact area should be deemed suitable for development. E-F) The proposed impacts will not affect larger ecosystem connectivity and have a relatively minor impact on local connectivity as the majority of the development adjoins existing cleared areas. Consideration should be given to utilising endemic native species in any landscaping associated with the development, to provide future supplementary resources and connectivity for mobile fauna.

Objectives/Requirements	Evidence of compliance
The BDAR or BCAR must document and justify efforts to avoid or minimise impacts through design.	As discussed above, the development and its subsequent impacts were deemed unavoidable to meet the development standards. Section 2 of the BDAR explains in detail how the 'avoid and minimise principles' have been implemented as part of the biodiversity impact assessment for the project. Measures include fencing and erosion and sedimentation controls to limit indirect impacts on adjacent lands, and clearing under the supervision of a Project Ecologist, conducted in such a way as to reduce harm to fauna and facilitate dispersal into retained vegetation zones.

Table 13 – Prescribed Impact Avoidance and Minimisation

Objectives/Requirements	Evidence of compliance
Avoiding and Minimising Prescribed Biodiversity Impacts during Project Planning	
The timing and extent of a prescribed impact on the habitat of threatened entities can be difficult to assess and adequately offset through the provision of biodiversity credits. Prescribed impacts may occur on habitat features that are not native vegetation, e.g., caves, rocky outcrops and flyways. Because these types of features cannot be readily replaced or offset, it is important that measures to avoid or minimise impacts are undertaken and are clearly documented in the BDAR or BCAR.	No biodiversity values in addition to those noted in this BDAR i.e., direct and indirect impacts to biodiversity were identified for the Subject Site. Direct and indirect impacts are considered in **Section 2** of this BDAR in relation to Residual Impacts.
Locating a Project to Avoid and Minimise Prescribed Biodiversity Impacts	
To avoid or minimise prescribed biodiversity impacts, the proponent must consider how to: *a. locate surface works to avoid direct impacts on the habitat features identified in Chapter 6* *b. locate subsurface works, in both the horizontal and vertical planes, to avoid and minimise operations beneath the habitat features identified in Chapter 6. For example, locating longwall panels away from geological features of significance, groundwater-dependent plant communities and their supporting aquifers* *c. locate the proposal to avoid severing or interfering with corridors connecting different areas of habitat and migratory flight paths, to important habitat or local movement pathways* *d) optimise the proposal layout to minimise interactions with threatened entities; for example, design a wind farm that has:* *ii. 100 m turbine-free buffers around features that attract and support aerial species, such as forest edges, riparian corridors, wetlands, ridgetops and gullies* *iii. turbine-free corridors in zones of regular movement for species of concern, to avoid a barrier effect* *e) locate the proposal to avoid impacts on water bodies or hydrological processes*	a) The Subject Site: (i) Does not contain karsts, caves, crevices, cliffs, rocks and other features of geological significance supporting threatened species and ecological communities; (ii) Does not contain rocks supporting habitat for threatened species and ecological communities; (iii) Contains human made structures containing habitat for threatened species and ecological communities; (iv) Does not contain non-native vegetation supporting threatened species and ecological communities; As described in 8.2.1.2 (b) above, 7.15ha amount of remnant vegetation occurs on site and connectivity for threatened species is proposed for removal. It is reiterated that there is a substantial amount of remnant vegetation within the Study Area being retained that would provide suitable habitat for species to utilise. As described in 8.2.1.2 (c) above, the project envelope will not significantly affect the movement of threatened species critical to their life cycle. As described in 8.2.1.2 (d) above, the project is not expected to impact any waterbodies. As described in 8.2.1.2 (e) above, wind turbines are not a feature of the development proposed. As described in 8.2.1.2 (f) above, the project incorporates low speed local roads, to avoid and minimise the potential for fauna vehicle strike. b) As discussed previously 7.35ha of retained land will be managed under a BMP ensuring connectivity is maintained. c) As discussed previously, the proposed impact area constitutes only 7.15ha of native vegetation. There is a substantial tract of land to the east and south of the Subject Site that

<table>
<tr><th>Objectives/Requirements</th><th>Evidence of compliance</th></tr>
<tr><td></td><td>
is connected to a broader area of vegetation. It is therefore considered unlikely that movement throughout the landscape will be hindered by the proposed development. The proposed impact mitigation measures and native landscape plantings will aid in creating movement pathways for these species.
d) The location and the proposed layout have been selected to avoid impacting large tracts of remnant / connected vegetation. Thus, it is avoiding areas of high habitat value. Additionally, with landscaping utilising native vegetation from the area the site can assist in providing foraging and future habitat for species in the area.
e) The Water Cycle Management Plan prepared by Tattersall Lander Pty Ltd, 2022, demonstrates the proposed development will achieve a significant reduction pollutant loads hence improving the water quality throughout the catchment area. The modelling in the Water Management Plan shows:
Table 3: Comparison of Pre and Post-Development Pollutant Loads
<table>
<tr><th></th><th>Pre-Developed</th><th>Post-Developed</th><th>Treatment Train % Reduction Achieved</th><th>NorBE Compliant</th></tr>
<tr><td>TSS (kg/yr)</td><td>908</td><td>709</td><td>96.2%</td><td>Yes</td></tr>
<tr><td>TP (kg/yr)</td><td>5.04</td><td>5.18</td><td>82.1%</td><td>No</td></tr>
<tr><td>TN (kg/yr)</td><td>35.5</td><td>42.7</td><td>72.0%</td><td>No</td></tr>
<tr><td>GP (kg/yr)</td><td>0</td><td>0.517</td><td>100%</td><td>-</td></tr>
</table>
* NorBE = Neutral or Beneficial Effect
</td></tr>
</table>

Objectives/Requirements	Evidence of compliance
When locating a proposal, the following need to be analysed and justification should be provided for each alternative selected: *a. alternative modes or technologies that would avoid or minimise prescribed impacts* *b. alternative routes that would avoid or minimise prescribed impacts* *c. alternative locations that would avoid or minimise prescribed impacts* *d. alternative sites within a property on which the proposal is located that would avoid or minimise prescribed impacts.*	a) The proposed impact area (7.15ha) was not considered practical to assess alternative modes or technologies to avoid and minimise impacts to biodiversity on site. b) The proposed development will be utilising existing routes into the site and does not propose to impact any additional native vegetation. c) Given the degraded nature of the proposed impact area, it was considered that development of the site would minimise impacts on areas of higher biodiversity value within the region. d) As per section c).
Justifications for a proposal's location should identify any other site constraints that the proponent has considered in determining the location and design of the proposal, such as: *a. bushfire protection requirements, including clearing for asset protection zones* *b. flood planning levels* *c. servicing constraints.*	The impacts to native vegetation expected as a result of the proposed works is 7.15ha, all mitigation measures for fire, floods and services have been factored into the impact area while meeting the required standards.
The assessor must document and justify in the BDAR or BCAR all efforts to avoid, or the reasonable measures proposed to minimise, prescribed impacts when choosing the proposal's location.	As discussed above,7.58ha of retained vegetation proposed to managed under a BMP will achieve a significant wildlife corridor for Squirrel Gliders and Koalas. The remaining R2 land is proposed to be developed and its subsequent impacts were deemed unavoidable to meet the development standards. Section 2 of the BDAR explains in detail how the 'avoid and minimise principles' have been implemented as part of the biodiversity impact assessment for the project. Measures include fencing and erosion and sedimentation controls to limit indirect impacts on adjacent lands, and clearing under the supervision of a Project Ecologist, conducted in such a way as to reduce harm to fauna and facilitate dispersal into retained vegetation zones.

<table>
<tr><th>Objectives/Requirements</th><th>Evidence of compliance</th></tr>
<tr><td colspan="2">Designing a Project to Avoid and Minimise Prescribed Biodiversity Impacts</td></tr>
<tr><td>Design measures that can avoid or minimise prescribed impacts include:
a. engineering solutions, such as proven techniques to:
i. minimise fracturing of bedrock underlying features of geological significance, or groundwater-dependent communities and their supporting aquifers
ii. restore connectivity and movement corridors

b. design elements that minimise interactions with threatened entities, such as:
i. designing turbines to dissuade perching and minimise the diameter of the rotor swept area
ii. designing fencing to prevent animal entry to transport corridors
ii. providing vegetated buffers rehabilitated with native species

b. maintaining environmental processes that are critical to the formation and persistence of habitat features not associated with native vegetation

c. maintaining hydrological processes that sustain threatened entities

d. controlling the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities.</td><td>a) The proposed water management strategies will not have an impact on bedrock or groundwater and as there are no identified stream within the site restoration of corridors was not applicable to this proposal.
b) No turbines proposed, all fencing will meet the requirements outline in a Biodiversity Management Plan.
f) c-d) The Water Cycle Management Plan prepared by Tattersall Lander Pty Ltd, 2022, the proposed development will achieve a significant reduction pollutant loads hence improving the water quality throughout the catchment area. The modelling in the Water Management Plan shows:

Table 3: Comparison of Pre and Post-Development Pollutant Loads
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<tr><td>The proposed measures must be evidence-based and directed towards the threatened entities identified in Chapter 6. The BDAR or BCAR must document the designs that are proposed to avoid or minimise prescribed impacts</td><td>Refer to Section 2.1of the BDAR.</td></tr>
</table>

2.3 Assessment of Impacts

Section 8 of the BAM states that the BDAR "must assess the impacts of the project on native vegetation and habitat". In addition to this, Sections 9.1.4 and 9.2 require that further assessment be produced for any impact, including biodiversity impacts, expected in land surrounding the Subject Site. **Table 14** to **17** provide a summary of measures proposed to avoid and minimise direct, indirect and residual impacts on biodiversity.

Table 14 – Direct Impact Assessment

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Native vegetation	Construction and Operation	Removal of ~7.15ha of native vegetation including potential habitat for 202 Ecosystem Credits.	Landscaping within the development will utilise endemic native species suitable for future fauna use.	Post-development	Council Project coordinator Ecologists	MR	LR
Threatened native vegetation	Pre-Construction and Construction	No threatened flora species have been identified on site, hence no impact.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Habitat in the form of tree hollows	Pre-construction and Construction	17 HBTs are proposed to be removed.	The hollows bearing trees are proposed to be removed during the clearing process will be replaced at a ratio of 2:1 with a salvaged hollow or nest box in order to ensure no net loss of hollow resources – according to the Habisure System (Franks & Franks 2006). The nest boxes are to be installed 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.	Not applicable	Project coordinator Ecologists	Not applicable	Not applicable
Fauna home range and connectivity	Pre-Construction and Construction	Disturbance to fauna habitat during clearing and construction operations	Installation of a fauna-protecting fence, including relevant signage, to create a fauna protection zone.	Pre-, during and post-development	Project coordinator Construction staff Site manager Project Ecologist	MR	LR
Fauna home range and connectivity	Operation	Reduction in connectivity by removal of 8.39ha of native vegetation.	Reduction in connectivity will be 7.15ha of native vegetation will be impacted. Retention of 8.26ha will ensure connectivity will not be significantly impeded.	Post-development	Council Project coordinator Ecologists	LR	LR

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Reduction of biodiversity values	Operation and Post Operation	Removal of remnant vegetation present on site	Landscaping within the development will utilise endemic native species suitable for future fauna use.	Pre-construction and during-development	Project coordinator Construction staff Site manager Project Ecologist	HR	LR
	Construction	Sediment run-off into retained vegetation area	Best practice erosion and sedimentation (ERSED) control methods to be adopted, enforced and maintained throughout vegetation works, so as to avoid any movement of sediment resulting from clearing and construction into the retained vegetation lands.	During development	Project coordinator Construction staff Site manager Project Ecologist	HR	LR
		Changes to stormwater evacuation	Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise hydrology changes.	During development and Operational	Project coordinator Construction staff Site manager Project Ecologist	HR	LR

Table 15 – Prescribed Impact Assessment

Subject of Prescribed Impact	Project Phase	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Habitat of threatened species or ecological communities associated with: (i) Karst, caves, crevices, cliffs and other geological features of significance or (ii) (ii) rocks, or (iii) (iii) human made structures, or (iv) (iv) non-native vegetation	Not applicable	No such impacts are expected on site.	Not applicable	Not applicable	Not applicable	Not applicable
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Construction and operation	Reduction in connectivity will be 7.15ha of native vegetation will be impacted. Retention of 8.26ha will ensure connectivity will not be significantly impeded.	Not applicable	Not applicable	Not applicable	Not applicable
Movement of threatened species that maintains their lifecycle	Pre-operational	Threatened species identified within the proposed impact area are to be offset by ecosystem and species credits.	Not applicable	Council Project coordinator Ecologists	Not applicable	Not applicable
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	Not applicable	There are no waterbodies within the Subject Site. All construction and post construction works must be undertaken in accordance with the CEMP and approved Stormwater Management Plan provided in **Appendix H**.	During development	Project coordinator Ecologists	MR	MR
Wind turbine strikes on protected animals	Not applicable	No wind turbines will be installed on site.	Not applicable	Not applicable	Not applicable	Not applicable
Vehicle strikes on threatened species or on animals that are part of a TEC	Construction, operation	Civil Construction staff to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection. During operation, such impacts will be mitigated through the introduction of low-speed limits as well as speed limiting devices on the facilities' roads.	Pre- and during development	Project coordinator Construction staff Site manager Project Ecologist	HR	MR

Table 16 – Indirect Impact Assessment

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Noise	Construction	Noise during construction due to construction works and construction traffic. Potential disturbance to threatened species or reduced viability of adjacent retained habitat zone.	Timing of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP) which will include a Noise Mitigation Plan.	During development	Project coordinator Construction staff Site manager	HR	MR
	Operation	Noise due to traffic. Potential disturbance to threatened species within the surrounding area.	The proposal is unlikely to significantly increase the noise currently present at the Subject Site, due to its proximity to the adjacent residential area.	During operations and Operational	Civil Contractor	MR	MR
Vibration	Construction	Disturbance to fauna which may lead to displacement to adjacent areas.	Conditions of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP).	During construction	Project coordinator Site manager Construction staff	HR	MR
Dust	Construction	Dust deposits on native flora and fauna habitat, resulting in disturbance to and reduced viability of adjacent habitat.	Dust levels during operations managed according to an approved CEMP: • Daily monitoring of dust generated by construction activities; and • Dust suppression measures (setting maximum speed limits and application of dust suppressants) will be implemented during construction works to limit dust on site.	During construction	Project coordinator Site manager Construction staff	LR	LR
Light spill	Construction	Disturbance to nocturnal fauna, thus reducing viability of the adjacent habitat.	Optimal construction methods as per an approved CEMP will reduce instances of light spill. Such measures will include limiting use of lights where necessary and directing lights in such a way as to	During construction	Project coordinator Site manager Construction staff	LR	LR

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
			limit impact on adjacent vegetated lands.				
	Operation	Disturbance to nocturnal fauna, thus reducing viability of adjacent retained habitat zone.	Provision of lighting will be in accordance with an approved CEMP. Permanent lighting shall be designed to minimise light spill into surrounding vegetation.	During operations	Civil Contractor	LR	LR
Non-native vegetation	Construction	Soil disturbance may lead to proliferation of exotic flora (including invasive weeds) through seeds and vegetation fragments.	As per an approved CEMP including a Biodiversity Management Plan: • Appropriate handling of mulch created from the removal of exotic vegetation; • Appropriate cleaning of all construction equipment to limit the risk of weed seed and fragments to adjacent retained areas; and • Chemical and manual treatment of weeds where applicable. • Appropriate management of weeds within landscaping areas.	During construction	Project coordinator Site manager Construction staff	MR	LR
Visual amenity	Construction	Rubbish and waste retained onsite attracting native fauna.	Activities on the Site will be managed in accordance with an approved CEMP and designed to limit the amount of rubbish and waste onsite through good housekeeping practices.	During construction	Project coordinator Site manager Construction staff	LR	LR
	Operation	Rubbish and waste retained onsite attracting native fauna.	Suitable fencing to be installed and maintained between development and surrounding natural areas to prevent access and degradation of surrounding vegetation.	During operations	Civil Contractor	LR	LR
Human disturbance	Construction	Disturbance to fauna which may lead to displacement to adjacent areas.	• The CEMP will be developed and review by Project Ecologist to ensure training and protections measure are provided for fauna during construction.	During construction	Project coordinator Site manager Construction staff	LR	LR

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
		Rubbish and waste retained onsite attracting native fauna. Weeds and pathogens	• Suitable fencing to be installed and maintained between development and surrounding natural areas to prevent access and degradation of surrounding vegetation. • Fauna proof bins will be placed throughout the construction place to ensure rubbish is secure and not able to enter surrounding retained lands. • CEMP will include a hygiene procedure, which will be signed off by the Project Ecologist to ensure appropriate measure are in place to prevent weed seeds and pathogens from surrounding site entering the property such as grids at entry, wash down, foot baths.				
	Operation	Disturbance to fauna which may lead to displacement to adjacent areas. Rubbish and waste retained onsite attracting native fauna. Weeds and pathogens	• The Operational Plan for the facility will be developed and review by Project Ecologist to ensure training and protections measure are provided for fauna during the operation of the facility. • Educational and informative signs will be erected at all entry points and throughout the facility outlining fauna management within the facility, such as no feeding wildlife, etc. • Suitable fencing to be installed and maintained between development and surrounding natural areas to prevent access and degradation of surrounding vegetation.	During operations	Operational Contractor	LR	LR

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
			• Fauna proof bins will be placed throughout the construction place to ensure rubbish is secure and not able to enter surrounding retained lands. • Operational procedure will include a hygiene procedure, which will be signed off by the Project Ecologist to ensure appropriate measure are in place to prevent weed seeds and pathogens from surrounding site entering the property such as grids at entry, wash down, foot baths at all entry points to the facility.				

Table 17 – Residual Impact Assessment

Aspect	Project Phase	Potential Impact	Mitigation / Minimisation	Residual Impact Description	Impact to be offset (see Section 2.3.2)
Reduction of biodiversity values	Construction Operation	Clearing of 7.58ha ha of native vegetation	Landscaping within the development will utilise endemic native species suitable for future fauna usage and providing supplementary connectivity through residential areas.	~8.39ha of PCT 3544 (Good), Koala and Squirrel Glider habitat.	Yes
Noise, dust, light spill	Construction	Disturbance to local fauna	Application of CEMP / BMP as mentioned above	Noise, dust and light spill will still occur but a low magnitude, thus keeping the impact on local fauna to a low level	No

Table 18 – Risk Matrix

Maximum reasonable consequence	Probability A	B	C	D	E
1	CR	CR	HR	HR	MR
2	CR	HR	HR	MR	LR
3	HR	HR	MR	LR	LR
4	HR	MR	LR	LR	LR
5	MR	LR	LR	LR	LR

CRITICAL	CR
HIGH RISK	HR
MEDIUM RISK	MR
LOW RISK	LR

Table 19 – Assessment Criteria

Consequence criteria: Impacts on threatened species and/or threatened species habitat
1. CRITICAL Impact – Severe; Spatial scale – Widespread; Time scale – Long-term. Requires consideration of whether impacts may result in a Serious and Irreversible Impact that may lead to local extinction. **2. MAJOR** Impact – Moderate; Spatial scale – Moderate to widespread; Time scale – Mid- to long-term. May result in temporary or long-term damage. **3. MODERATE** Impact – Moderate; Spatial scale – Local to moderate; Time scale – Short- to mid-term. May result in a moderate, temporary impact. However, it may be difficult to rehabilitate impact and may have negative implications on the ecosystem **4. MINOR** Impact – Minor; Spatial scale – Local; Time scale – Short-term. May result in minor impacts that are relatively easily rehabilitated. Not likely to have negative implications on the ecosystem. **5. NEGLIGIBLE** Impact – Minor; Time scale – Short-term with no lasting effect.
Likelihood criteria
A. ALMOST CERTAIN Very high or certain probability that impact will occur, or event is of a continuous nature. **B. LIKELY** Likely probability that impact will occur, or event is frequent (frequency 1-5 years). **C. MODERATE** Moderate probability that impact will occur, or event is infrequent (frequency 5-20 years). **D. UNLIKELY** Low probability that impact will occur, or event is very infrequent (frequency 100 years). **E. REMOTE** Very low probability that impact will occur or may occur under extenuating circumstances. Event is very rare or stochastic in nature (frequency 1000 years)

2.4 Impact Summary

Credit offsets are required due to the VISs for the remnant vegetation present on site being above threshold limits. Serious and Irreversible Impacts were surveyed and assessed but not found to be present.

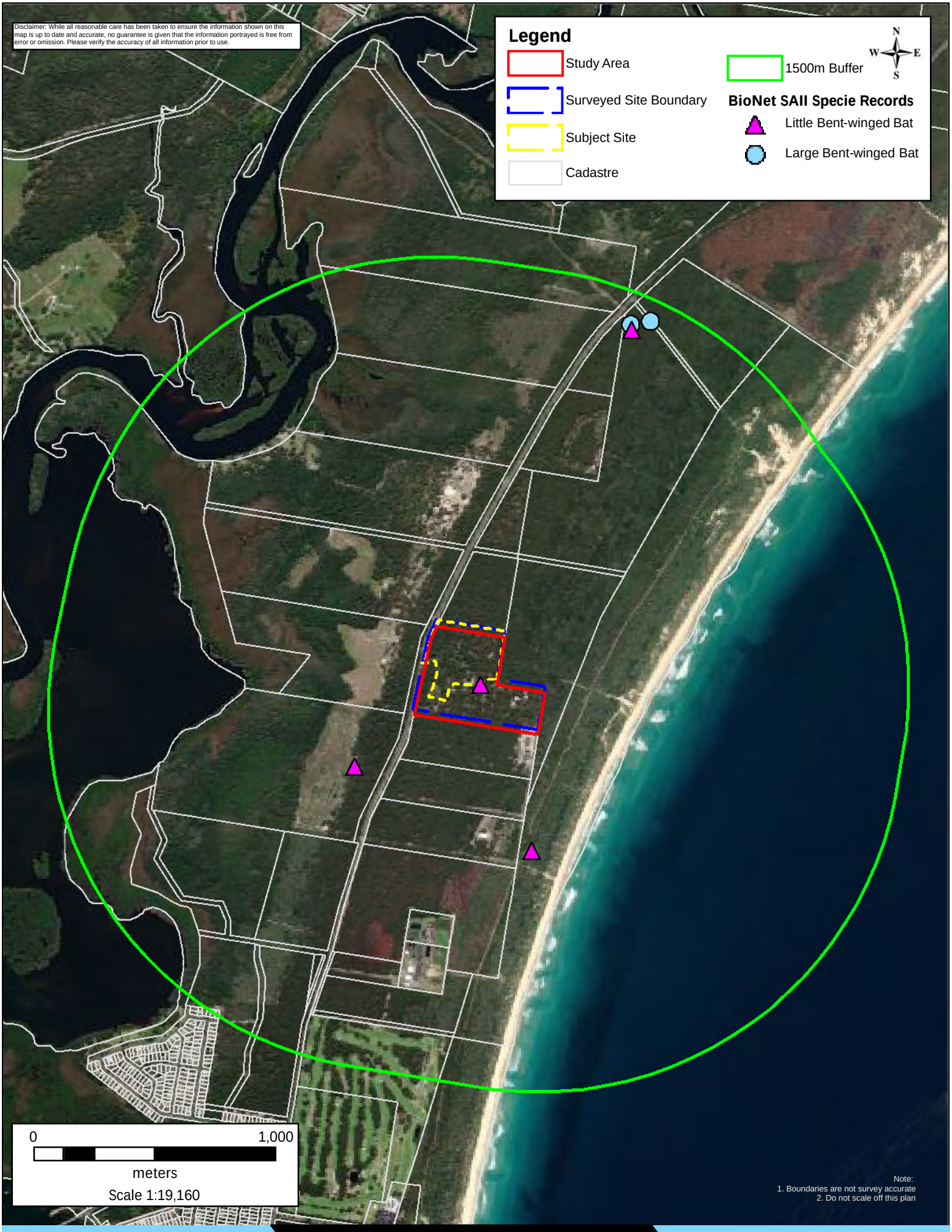
2.4.1 Serious and Irreversible Impacts (SAIIs)

Candidate SAIIs 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 2020).

The following candidate SAIIs were predicted as potentially occurring within the Subject Site. The potential for these species to occur within the Subject Site was based on both the candidate species predicted by the BAM-C for the PCT present on site as well as BioNet Atlas records from the locality and where potential habitat was present within or near the Subject Site.

Swift Parrot, Regent Honeyeater, Little Bent-winged Bat, Large Bent-winged Bat, Large-eared Pied Bat Brush-tailed Rock-wallaby, *Allocasuarina simulans, Diuris arenaria* and *Rhizanthella slateri* were all listed as candidate species in the BAM-C however as per **Section 1.5.2** of this report they were able to be removed from the assessment due to various constraints and / or sufficient survey has been undertaken to conclude that the species were not present within Subject Site and hence, no further assessment of these species was required.

Figure 15 shows the listed SAII records within 1500m.
Figure 16 shows the Avoidance and Minimise measures undertaken.

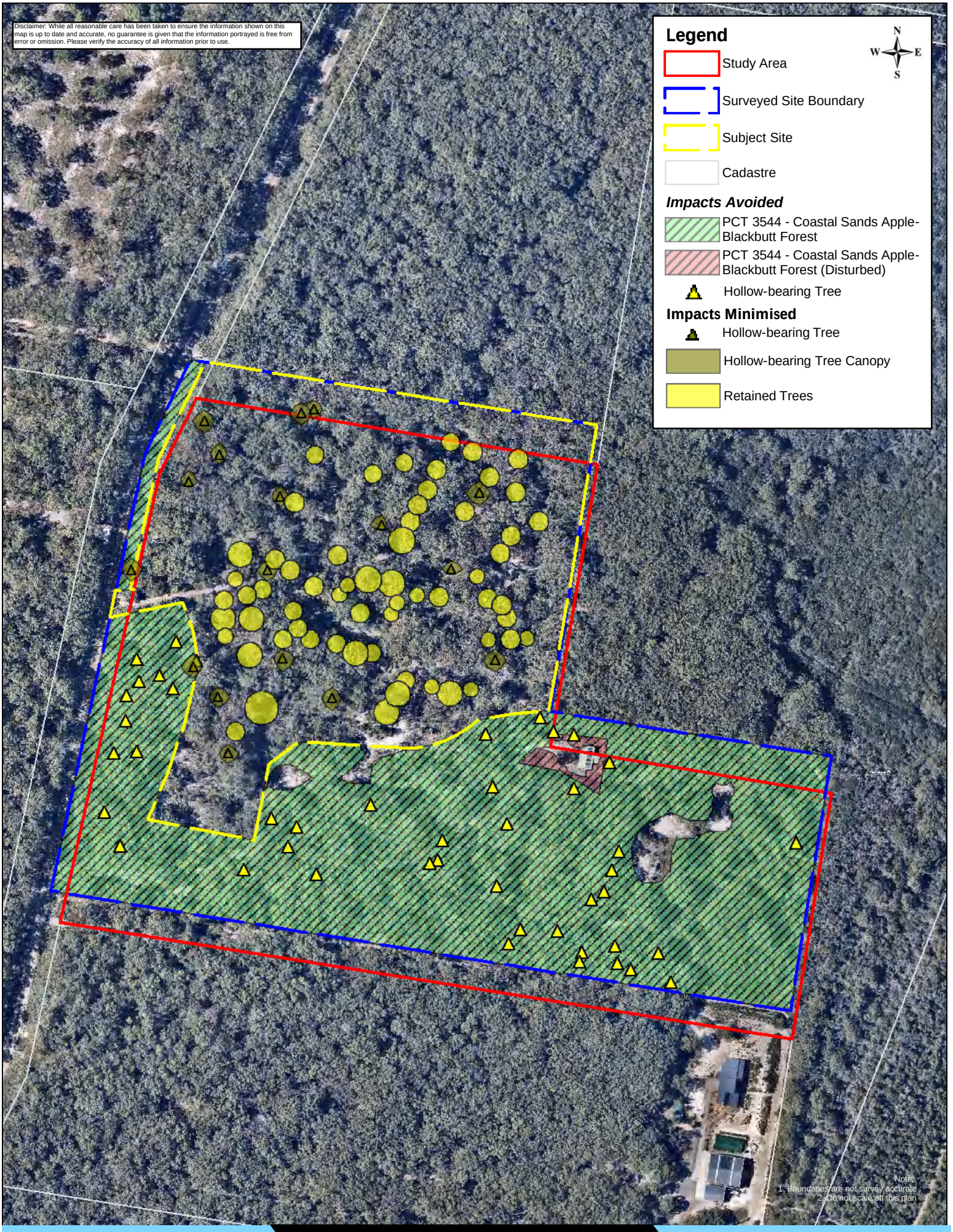


AEP

Figure 14 - BioNet SAII Species | Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW | BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd | AEP Ref: 2397.01



AEP

Figure 15 - Avoid and Minimise

Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

Client: LandAdvisory Services Pty Ltd

AEP Ref: 2397.01

2.4.2 Impacts requiring offset

2.4.2.1 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 each along with the required credit outputs is provided in **Table 20**. A total of 202 ecosystem credits are required to offset the proposed development.

Table 20 – Ecosystem credit requirements

Remnant Vegetation (PCT)	Impact Area (ha)	Future VIS	Vegetation Integrity Score Loss	Biodiversity Risk Weighting	Credit Requirements
3544 (Good)	7.2	0	75.3	1.5	202

2.4.2.2 Species Credits

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 21** outlines the credits and **Figure 16** shows the polygons. 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 21 – Ecosystem credit requirements

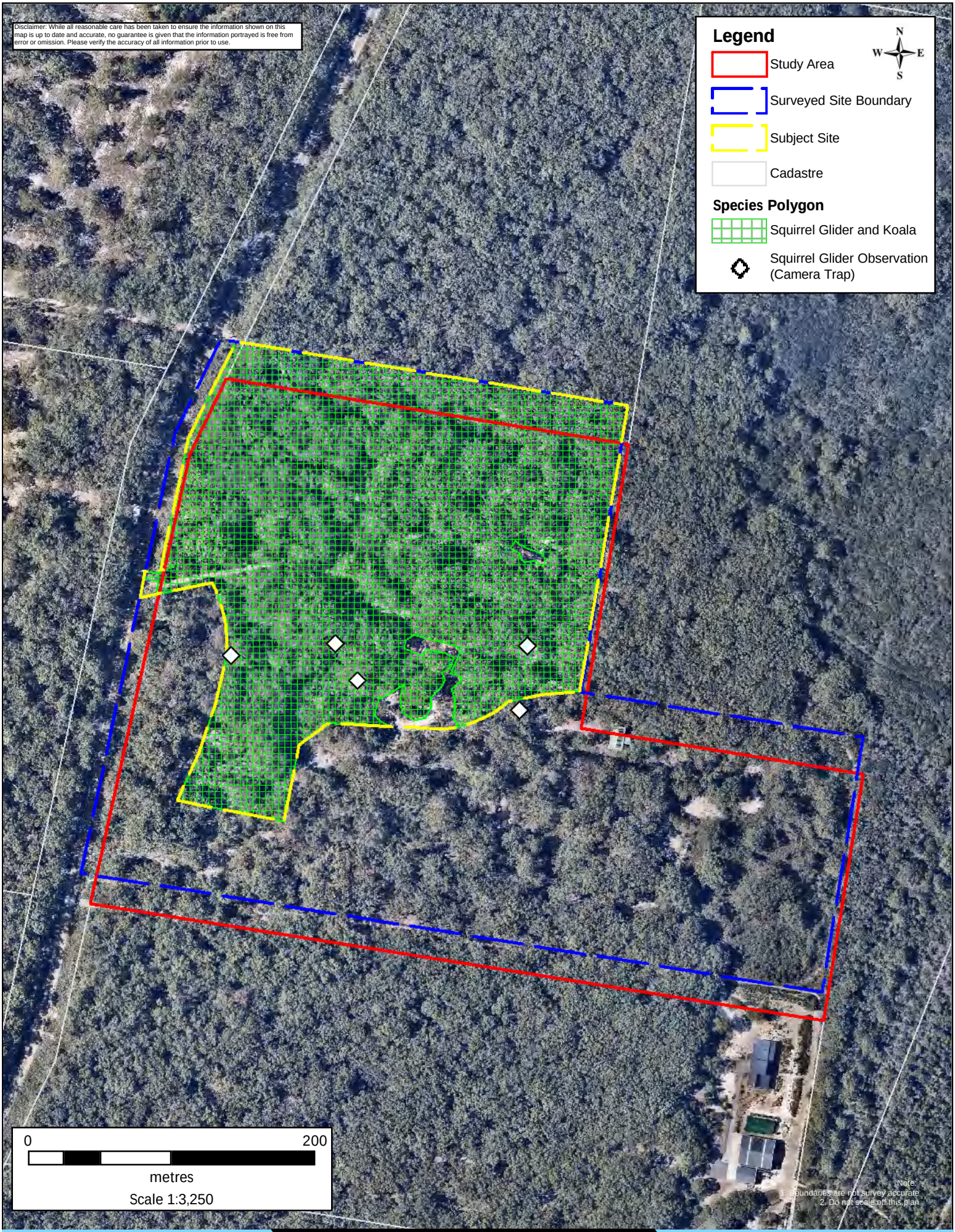
Remnant Vegetation (PCT)	Impact Area (ha) or Count	Vegetation Integrity Score Loss	Biodiversity Risk Weighting	Species Credit Requirements
Squirrel Glider				
3544 (Good)	7.2	75.3	2	269
Koala, Hawks Nest and Tea Gardens population				
3544 (Good)	7.2	75.3	2	269

2.4.3 Areas not requiring assessment

The total Subject Site is 15.57ha, of which only approx. 7.15ha of native vegetation is proposed to be impacted. As per Section 9.3 of the BAM, areas outside of the proposed impact area do not require assessment for credits. These are indicated in **Figures12**.

2.5 Biodiversity Credit Report

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



AEP

Figure 15 - Species Polygon

Date: April 2024

Location: 288 Mungo Brush Road, Hawks Nest NSW

BOAM Ref: 40952

Client: Land Advisory Services Pty Ltd

AEP Ref: 2397.01

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 vegetation within the proposed impact area was found to be commensurate with PCT 3544 (Good). The remainder of the site predominantly comprised non-native / cleared areas.

The proposal will require impact to 7.15ha of native vegetation PCT 3544 (Good). As a result, the following credit requirements were calculated within the BAM Calculator to offset the residual impacts of vegetation impact and achieve a no net loss standard.

Table 22 – Credit Requirements

Remnant Vegetation (PCT)	Impact Area (ha) or Count	Total Credit Requirements
Ecosystem Credits		
3544 (Good)	7.2	202
Koala, Hawks Nest and Tea Gardens population		
3544 (Good)	7.2	269
Squirrel Glider		
3544 (Good)	7.2	269

The full biodiversity credit report is attached as **Appendix E**.

4.0 References

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Appendix A – Development Plan

PROPOSED CARAVAN PARK

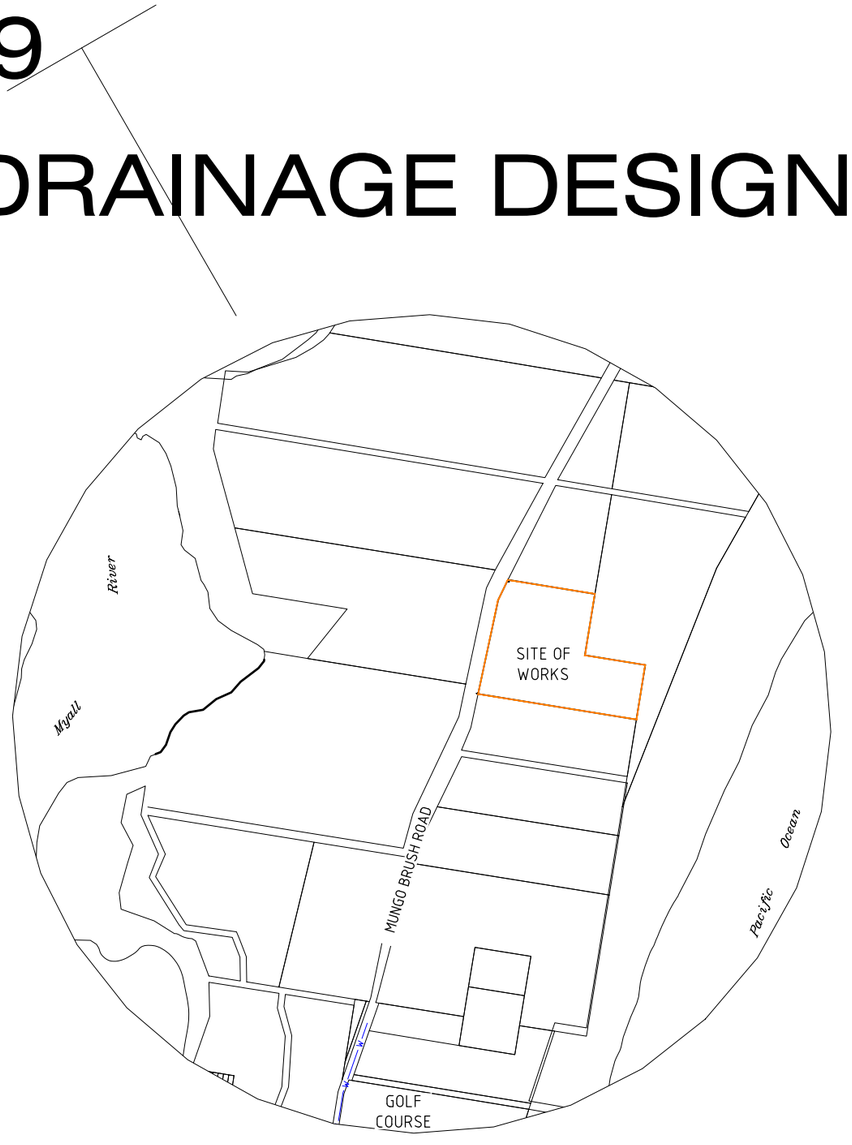
288 MUNGO BRUSH ROAD, HAWKS NEST

LOT 2 DP 1015609

CONCEPT APPLICATION ROAD & DRAINAGE DESIGN

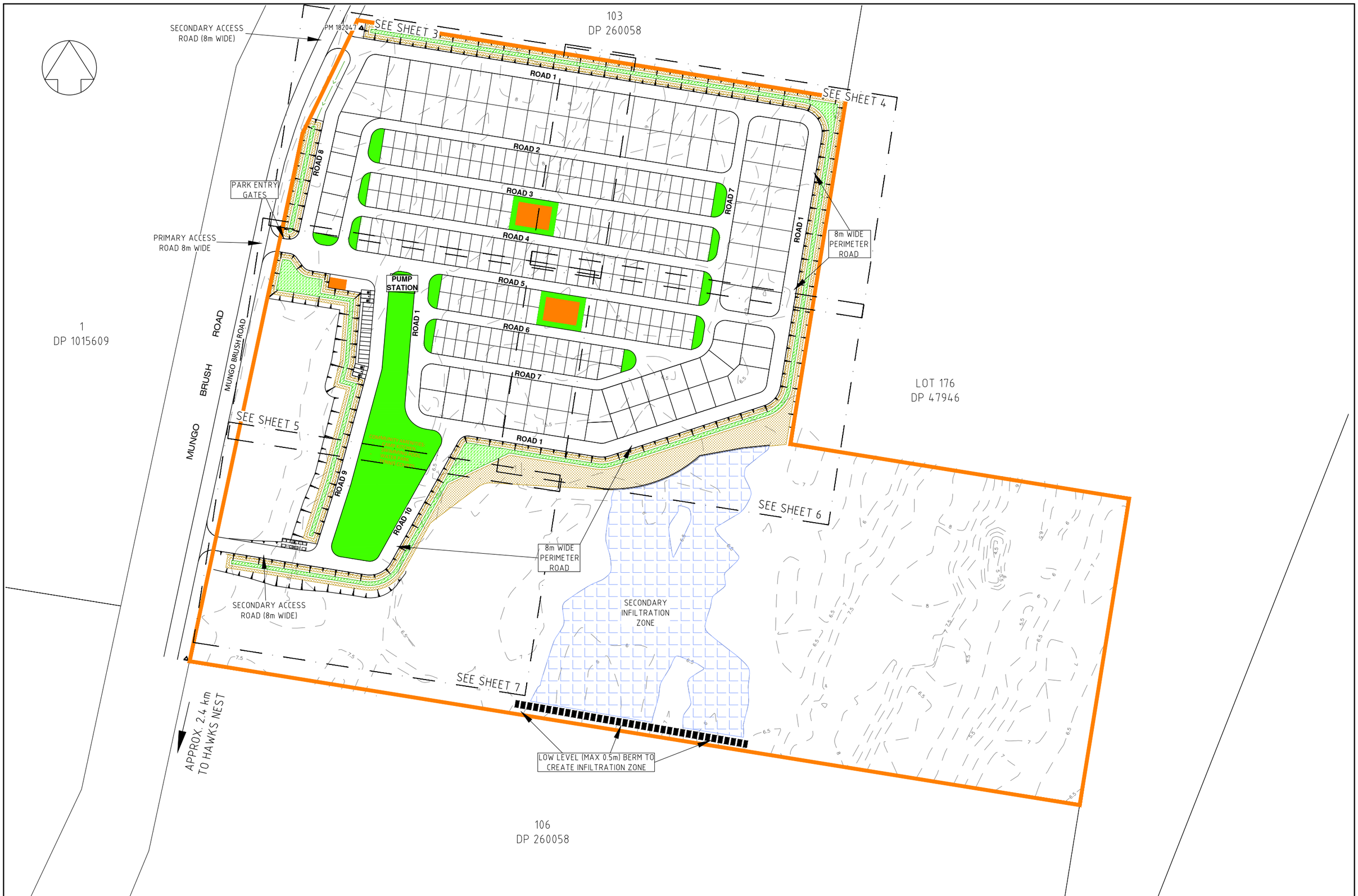
Sheet List Table

Sheet Number	File Number	Sheet Description	Revision
1	2220001	Cover Sheet, Locality Sketch & Drawing Schedule	A
2	2220002	Overall Site Plan	A
3	2220003	Detail Plan 1	A
4	2220004	Detail Plan 2	A
5	2220005	Detail Plan 3	A
6	2220006	Detail Plan 4	A
7	2220007	Detail Plan 5	A
8	2220008	Stormwater Concept Plan	A
9	2220009	Internal Roads Typical Arrangement	A
10	2220010	Perimeter Rd Typical Section	A
11	2220011	Raingarden / Infiltration Basin Typical Sections	A
12	2220012	Turning Paths	A
13	2220020	Earthworks Plan	A



LOCALITY SKETCH
1:20,000

Designed By TATTERSALL LANDER PTY LTD
DEVELOPMENT CONSULTANTS IN ENGINEERING, SURVEYING & PLANNING
PO Box 580 RAYMOND TERRACE Phone (02) 4987 1500



ORIGIN OF LEVELS
SPATIAL SERVICES
NSW GOVERNMENT (S.C.I.M.S)
PM 182047
RL 6.617 AHD

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

TATTERSALL LANDER PTY LTD
DEVELOPMENT CONSULTANTS
ENGINEERING, SURVEYING & PLANNING
2 Bourke St. P.O.Box 580
RAYMOND TERRACE 2324
Fax (02) 49871733 Phone (02) 49871500

OVERALL SITE PLAN
PROPOSED CARAVAN PARK
LOT 2 DP 1015609
288 MUNGO BRUSH ROAD, HAWKS NEST

COUNCIL: Midcoast	REFERENCE: 2220002
PARISH	SHEET SIZE: A3
SCALE: 1:2000 on A3	SHEET No.: 2 of 12
DATE: Plotted 1/4/22 3:22PM	
CLIENT:	JOB No.: 221375
COMPUTER FILE : S:\Clients\2021\221375\Dwg\221375 DA Design Plans.dwg	

Xref: OVERALL BASE PLAN [OVERALL BASE PLAN.dwg]

LEGEND

- PROPOSED DRAINAGE LINE
- SURFACE INLET PIT
- HEADWALL
- BIOFILTRATION
- PROPOSED PRIVATE WATER SUPPLY (NOM. ø100mm, WITH FIRE HOSE REELS, 36m RADIUS COVERAGE)
- PROPOSED BOOSTED FIRE SERVICE (NOM. ø100mm WITH DOUBLE HEADED ABOVE GROUND HYDRANTS, 90m RADIUS COVERAGE)
- PROPOSED PRIVATE SHARED SERVICES TRENCH - POWER, COMMS & GAS SERVICES
- PROPOSED PRIVATE GRAVITY SEWER LINE
- PROPOSED PRIVATE SEWER RISING MAIN
- DESIGN CONTOURS
- EXISTING CONTOURS
- 150mm CONC. EDGE STRIP

PM 182047

1.5m HIGH 3-RAIL HORSE FENCE

ROAD 1

JOINS SHEET 4

PARK ENTRY GATES

ROAD 2

ROAD 3

ROAD 4

ROAD 8

MUNGO BRUSH ROAD

JOINS SHEET 5

DETAILED LAYOUT PLAN 1

Detail Plan 1

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

TATTERSALL LANDER Pty Ltd
DEVELOPMENT CONSULTANTS

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JOINS SHEET 3

1.5m HIGH 3-RAIL HORSE FENCE

ROAD 1

ROAD 2

ROAD 3

ROAD 4

ROAD 7

ROAD 1

1.5m HIGH 3-RAIL HORSE FENCE

JOINS SHEET 6

LEGEND

- PROPOSED DRAINAGE LINE
- SURFACE INLET PIT
- HEADWALL
- BIOFILTRATION
- PROPOSED PRIVATE WATER SUPPLY (NOM. Φ100mm, WITH FIRE HOSE REELS, 36m RADIUS COVERAGE)
- PROPOSED BOOSTED FIRE SERVICE (NOM. Φ100mm WITH DOUBLE HEADED ABOVE GROUND HYDRANTS, 90m RADIUS COVERAGE)
- PROPOSED PRIVATE SHARED SERVICES TRENCH - POWER, COMMS & GAS SERVICES
- PROPOSED PRIVATE GRAVITY SEWER LINE
- PROPOSED PRIVATE SEWER RISING MAIN
- DESIGN CONTOURS
- EXISTING CONTOURS
- 150mm CONC. EDGE STRIP

Detail Plan 2

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

TATTERSALL LANDER Pty Ltd
DEVELOPMENT CONSULTANTS

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JOINS SHEET 3

JOINS SHEET 6

ROAD 5

ROAD 6

ROAD 7

ROAD 1

FORECOURT

SEWER PUMP STATION

ROAD 9

MUNGO BRUSH ROAD

MUNGO BRUSH ROAD

REMOVE AND REHABILITATE EXISTING ACCESS TRACK

COMMUNITY AMENITIES:
- CAMP KITCHEN
- SWIMMING POOL
- WATER PARK

JOINS SHEET 7

Detail Plan 3

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue		AV			DRAFT

TATTERSALL LANDER Pty Ltd
DEVELOPMENT CONSULTANTS

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JOINS SHEET 4

JOINS SHEET 3

ROAD 5

ROAD 6

ROAD 7

ROAD 1

1.5m HIGH 3-RAIL HORSE FENCE

1.5m HIGH 3-RAIL HORSE FENCE

REMOVE AND REHABILITATE EXISTING ACCESS TRACK

LIMIT OF PROPOSED CLEARING

LEGEND

- PROPOSED DRAINAGE LINE
- SURFACE INLET PIT
- HEADWALL
- BIOFILTRATION
- PROPOSED PRIVATE WATER SUPPLY (NOM. Ø100mm, WITH FIRE HOSE REELS, 36m RADIUS COVERAGE)
- PROPOSED BOOSTED FIRE SERVICE (NOM. Ø100mm WITH DOUBLE HEADED ABOVE GROUND HYDRANTS, 90m RADIUS COVERAGE)
- PROPOSED PRIVATE SHARED SERVICES TRENCH - POWER, COMMS & GAS SERVICES
- PROPOSED PRIVATE GRAVITY SEWER LINE
- PROPOSED PRIVATE SEWER RISING MAIN
- DESIGN CONTOURS
- EXISTING CONTOURS
- 150mm CONC. EDGE STRIP

Detail Plan 4

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

TATTERSALL LANDER Pty Ltd
DEVELOPMENT CONSULTANTS

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JOINS SHEET 5

MUNGO BRUSH ROAD

ROAD 9

ROAD 10

- SWIMMING POOL
- WATER PARK
- TENNIS COURTS

1.5m HIGH 3-RAIL HORSE FENCE

1.5m HIGH 3-RAIL HORSE FENCE

BIN STORAGE

EXISTING SHED TO BE REMOVED

LEGEND

- PROPOSED DRAINAGE LINE
- SURFACE INLET PIT
- HEADWALL
- BIOFILTRATION
- PROPOSED PRIVATE WATER SUPPLY (NOM. Φ100mm, WITH FIRE HOSE REELS, 36m RADIUS COVERAGE)
- PROPOSED BOOSTED FIRE SERVICE (NOM. Φ100mm WITH DOUBLE HEADED ABOVE GROUND HYDRANTS, 90m RADIUS COVERAGE)
- PROPOSED PRIVATE SHARED SERVICES TRENCH - POWER, COMMS & GAS SERVICES
- PROPOSED PRIVATE GRAVITY SEWER LINE
- PROPOSED PRIVATE SEWER RISING MAIN
- DESIGN CONTOURS
- EXISTING CONTOURS
- 150mm CONC. EDGE STRIP

Detail Plan 5

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

TATTERSALL LANDER Pty Ltd
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SCALE : 0 2.5 5m (1:500 for A3 Size Plot)

SHEET No. : 7 | FILE : 2220007 | SHEET SIZE A3

JOB No.: 221375 | DATE:Plotted 1/4/22 3:22PM

COMPUTER FILE : S:\Clients\2021\221375\Dwg\221375 DA Design Plans.dwg

Xref: OVERALL BASE PLAN [OVERALL BASE PLAN.dwg]

MUNGO BRUSH ROAD

COMMUNITY AMENITIES
- CAMP KITCHEN
- SWIMMING POOL
- WATER PARK
- TENNIS COURTS

LEGEND

- DENOTES EMERGENCY OVERFLOW WEIR
- DENOTES DISCHARGE 10%+ OVERFLOW WEIR TO SECONDARY INFILTRATION AREA
- DENOTES FLOW DIRECTION
- DENOTES CATCHMENT BOUNDARIES
- DENOTES BIOFILTRATION SWALES
- DENOTES PRIMARY INFILTRATION AREA
- DENOTES SECONDARY INFILTRATION AREA 5.5-6.4m AHD APPROX 1.2ha

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

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RAYMOND TERRACE 2324
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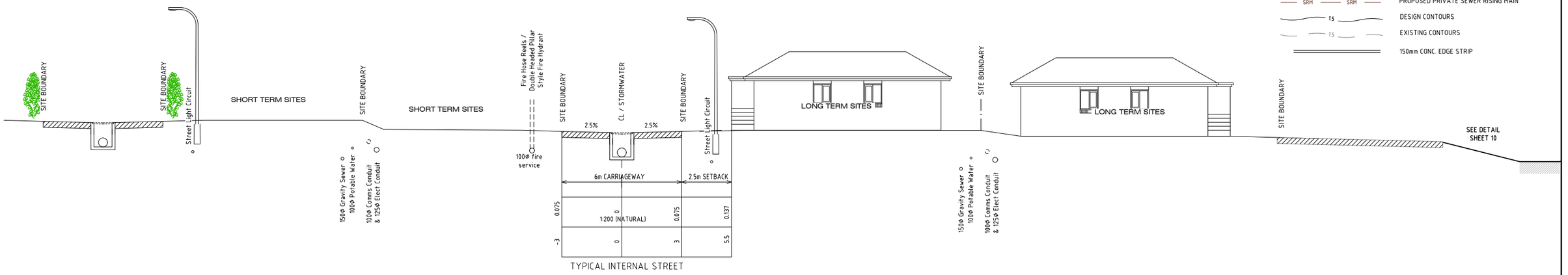
STORMWATER CONCEPT PLAN
PROPOSED CARAVAN PARK
LOT 2 DP 1015609
288 MUNGO BRUSH ROAD, HAWKS NEST

COUNCIL: Midcoast	REFERENCE: 2220008
PARISH	SHEET SIZE: A3
SCALE: 1:1,200 on A3	SHEET No.: 8 of 12
DATE: Plotted 1/4/22 3:22PM	
CLIENT:	JOB No.: 221375
COMPUTER FILE : S:\Clients\2021\221375\Dwg\221375 DA Design Plans.dwg	

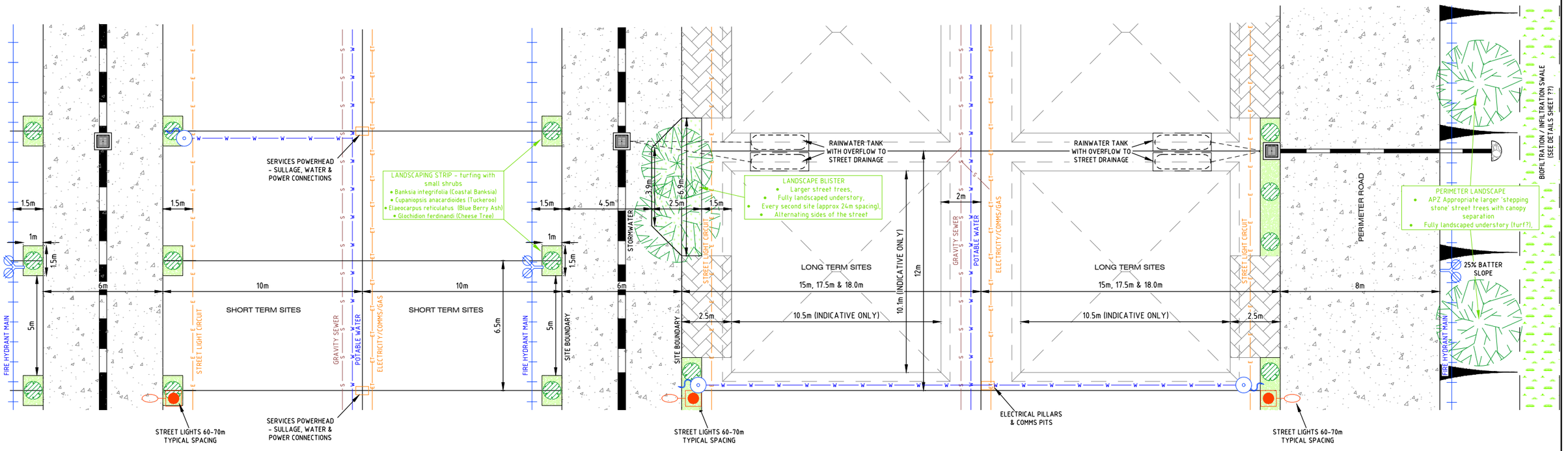
Xref: OVERALL BASE PLAN [OVERALL BASE PLAN.dwg]

LEGEND

- PROPOSED DRAINAGE LINE
- SURFACE INLET PIT
- HEADWALL
- BIOFILTRATION
- PROPOSED PRIVATE WATER SUPPLY (NOM. Ø100mm, WITH FIRE HOSE REELS, 36m RADIUS COVERAGE)
- PROPOSED BOOSTED FIRE SERVICE (NOM. Ø100mm WITH DOUBLE HEADED ABOVE GROUND HYDRANTS, 90m RADIUS COVERAGE)
- PROPOSED PRIVATE SHARED SERVICES TRENCH - POWER, COMMS & GAS SERVICES
- PROPOSED PRIVATE GRAVITY SEWER LINE
- PROPOSED PRIVATE SEWER RISING MAIN
- DESIGN CONTOURS
- EXISTING CONTOURS
- 150mm CONC. EDGE STRIP



TYPICAL INTERNAL STREET



INDICATIVE HOUSE / SERVICING LAYOUT

Internal Roads Typical Arrangement

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

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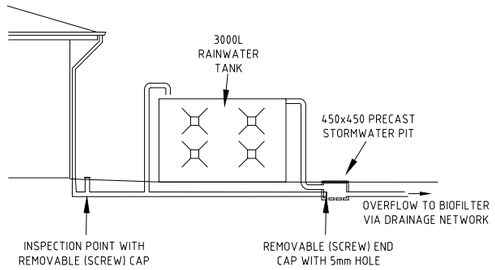
SCALE : 0 2.5 5m (1:500 for A3 Size Plot)
SHEET No. : 9
FILE : 2220009
JOB No.: 221375
DATE:Plotted 1/4/22 3:22PM
SHEET SIZE: A3
COMPUTER FILE : S:\Clients\2021\221375\Dwg\221375 DA Design Plans.dwg

Xref: OVERALL BASE PLAN [OVERALL BASE PLAN.dwg]

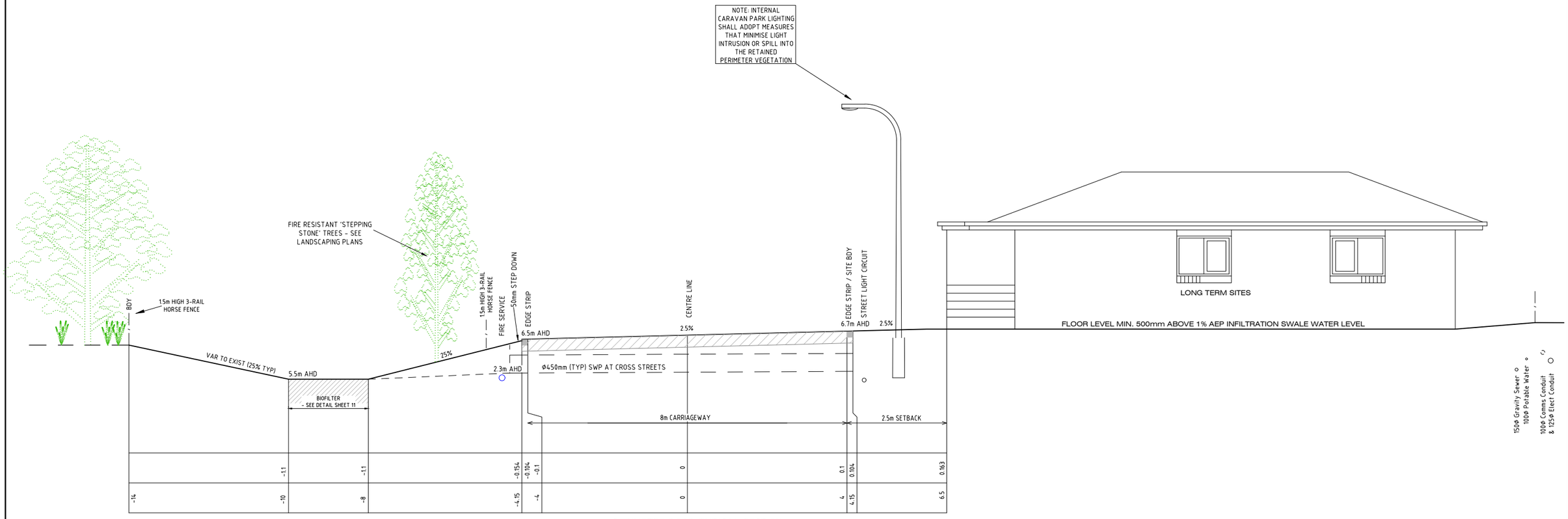


TYPICAL TANK / CHARGED STORMWATER LINE / LOW FLOW DETAIL

NOT TO SCALE

STORMWATER NOTES:

1. ALL WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPROVED PLANS, SUBJECT TO AS3500.3 & COUNCIL'S STANDARD DRAWINGS FOR INFILTRATING BIOFILTERS.
2. SITE LEVELS SHALL BE ADJUSTED WHERE REQUIRED TO DIVERT OVERLAND FLOWS AWAY FROM PROPOSED BUILDING FOUNDATIONS AND TO ENSURE UNCONTROLLED FLOWS DO NOT ESCAPE ACROSS THE BOUNDARY TO ADJACENT PROPERTIES.
3. ALL UPVC PIPES ARE TO BE SOLVENT WELDED.
4. MINIMUM GRADE PIPES ARE TO BE CONSTRUCTED CAREFULLY TO DESIGN LEVELS. LEVELS ARE TO BE VERIFIED PRIOR TO BACKFILL OF PIPES. ANY LINES FOUND TO BE SUBSTANDARD SHALL BE RE-LAID.
5. DESIGN BASED ON SITE SOILS BEING OF SANDY TEXTURE. UPON EXCAVATION OF BIOFILTRATION & INFILTRATION SYSTEM, IF EXISTING SOILS ARE NOT SAND, CONTRACTOR IS TO CONTACT THE DESIGNER TO HAVE THE DESIGN REVISED.
6. CONTRACTOR TO ENSURE SAND AT BASE OF BIOFILTRATION & INFILTRATION SYSTEMS IS NOT COMPACTED DURING CONSTRUCTION. IF BASE IS SANDY BUT NOT FREE DRAINING, IT SHOULD BE OVER-EXCAVATED BY 0.3m AND ONLY LOOSELY COMPACTED WHEN REPLACED.
7. ENSURE THE BIOFILTRATION & INFILTRATION SYSTEMS REMAIN BLOCKED OFF AND OFFLINE UNTIL BUILDING ACTIVITIES ARE COMPLETE AND THE SITE IS STABLE.
8. ALL DOWNPIPES TO BE CONNECTED TO RAINWATER TANKS VIA A SEALED CHARGED PIPE SYSTEM.
9. A FIRST FLUSH DEVICE IS TO BE INSTALLED ON ALL DOWNPIPES BEFORE FLOW ENTERS THE RAINWATER TANKS. THIS CAN BE A LOW FLOW BYPASS PER THE DETAIL BELOW, OR OTHER EQUIVALENT LOW FLOW DEVICE(S) COMPATIBLE WITH A CHARGED PIPE SYSTEM.
10. PROVIDE SMALL GABION OR CONCRETE SCOUR PROTECTION AT DIRECT OUTLETS INTO THE BIOFILTER.
11. FILTER MEDIA MUST BE A UNIFORM SANDY LOAM CONSISTENT WITH THE SPECIFICATIONS IN THE "ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS" (FAWB 2009). MATERIAL MUST BE TESTED BY A NATA REGISTERED LABORATORY TO CONFIRM ORTHOPHOSPHATE CONTENT IS A MAXIMUM 40mg/kg.



PERIMETER ROAD TYPICAL SECTION

SCALE 1:100

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

Perimeter Rd Typical Section

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SCALE : 0 2.5 5m (1:500 for A3 Size Plot)
SHEET No. : 10
FILE : 2220010
JOB No.: 221375
DATE:Plotted 1/4/22 3:22PM
SHEET SIZE A3
COMPUTER FILE : S:\Clients\2021\221375\Dwg\221375 DA Design Plans.dwg

Xref: OVERALL BASE PLAN (OVERALL BASE PLAN.dwg)

RAINGARDEN SUMMARY

FILTER MEDIA SURFACE RL	= 5.5 m
EXTENDED DETENTION DEPTH	= 0.3 m
FILTER MEDIA DEPTH	= 0.6 m
FILTER MEDIA AREA	= 2,600 m^2
SURFACE AREA (@ ½ DETENTION DEPTH)	= 4,580 m^2
OVERALL FOOTPRINT (INCLUDING INFILTRATION SWALE)	= 14,000 m^2
OVERALL DEVELOPMENT FOOTPRINT	= 76,850m^2
FILTER AREA AS % OF DEVELOPMENT AREA	= 3.4%

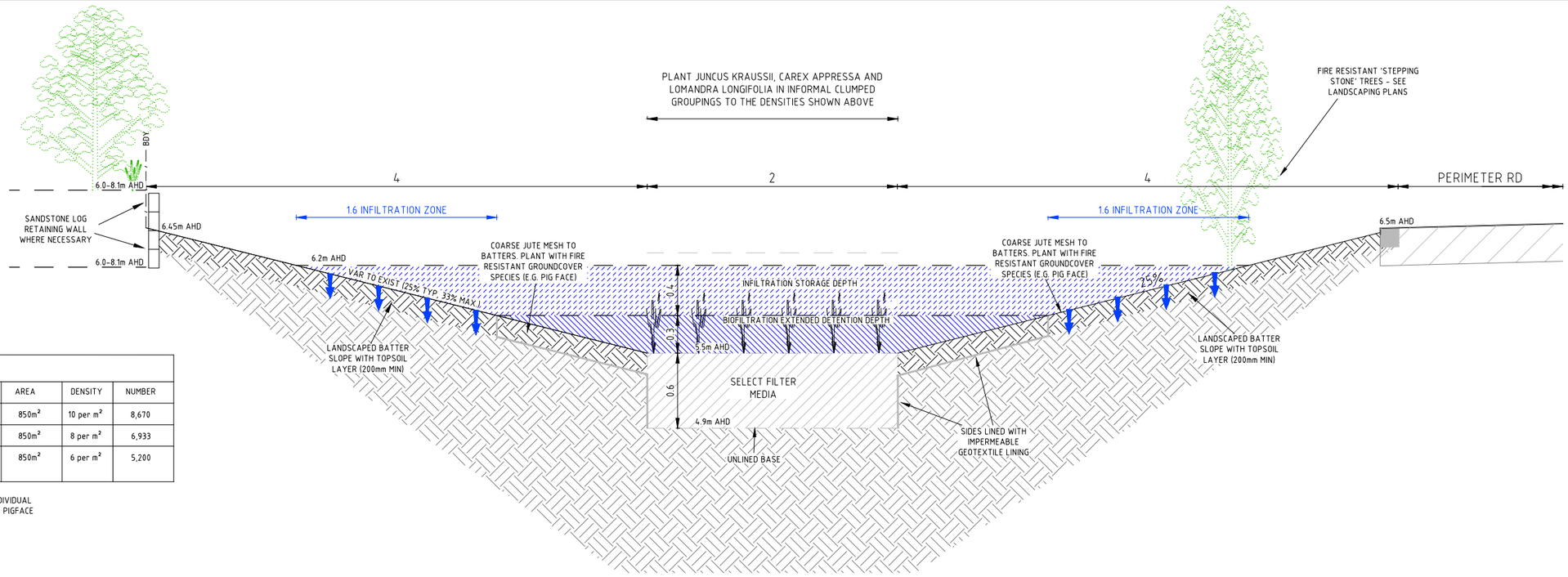
INFILTRATION BASIN SUMMARY

FILTER MEDIA AREA	= 2,600 m^2
BASIN PRIMARY INFILTRATION ZONE	= 6,050 m^2
BASIN SECONDARY INFILTRATION ZONE	= 12,100 m^2
ASSUMED FILTER MEDIA INFILTRATION RATE	= 100mm/hr
ASSUMED PRIMARY / SECONDARY INFILTRATION RATE	= 180mm/hr

BIOFILTER PLANTING SCHEDULE - 2,600sq.m FILTER AREA

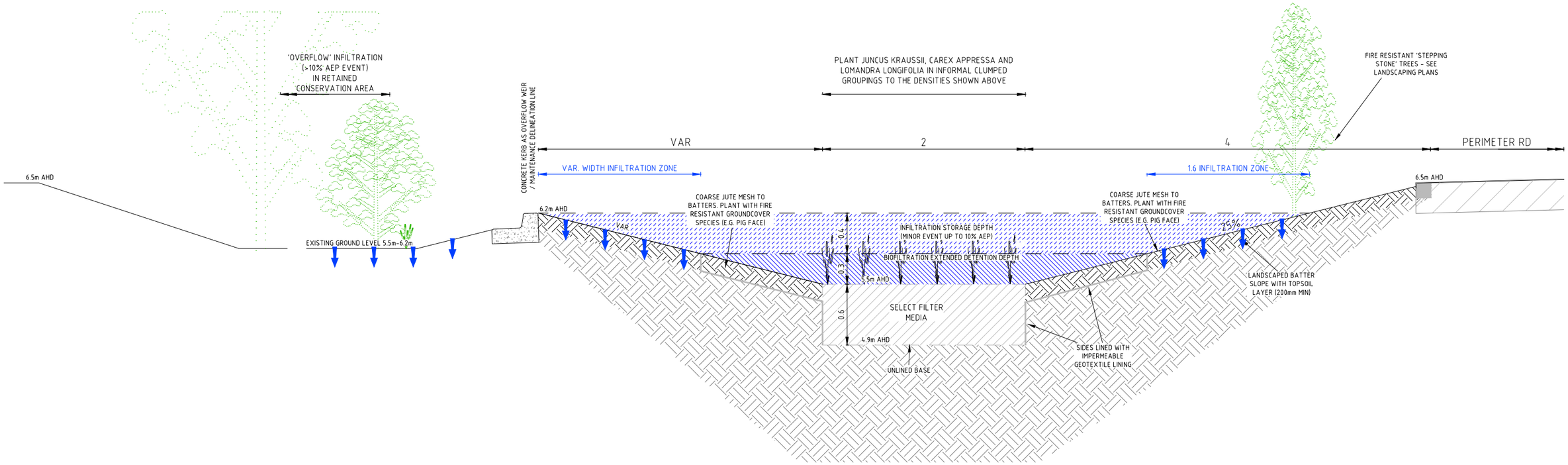
BOTANICAL NAME	COMMON NAME	MATURE HEIGHT	STOCK SIZE	AREA	DENSITY	NUMBER
CAREX APPRESSA	TALL SEDGE	0.8m	TUBESTOCK	850m^2	10 per m^2	8,670
JUNCUS KRAUSSII	SEA RUSH	0.4m	TUBESTOCK	850m^2	8 per m^2	6,933
LOMANDRA LONGIFOLIA x CONFERTIFOLIA SUBP PALLIDA	LIME TUFF	0.4m	TUBESTOCK	850m^2	6 per m^2	5,200

NOTE: BATTER PLANTINGS TO BE COMPATIBLE WITH BUSHFIRE APZ - INDIVIDUAL 'STEPPING STONE' TREES AND FIRE RETARDANT GROUNDCOVER SUCH AS PIGFACE



TYPICAL BIO-FILTER / INFILTRATION SWALE DETAIL

SCALE 1:40



TYPICAL BIO-FILTER / INFILTRATION SWALE DETAIL - ADJACENT TO MAJOR EVENT OVERFLOW AREA

SCALE 1:40

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

Raingarden / Infiltration Basin Typical Sections

TATTERSALL LANDER Pty Ltd DEVELOPMENT CONSULTANTS

SCALE : 0 2.5 5m (1:50 for A3 Size Plot)

SHEET No. : 11

FILE : 2220011

JOB No.: 221375

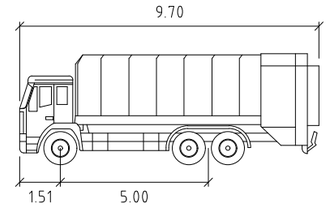
DATE:Plotted 1/4/22 3:22PM

SHEET SIZE A3

COMPUTER FILE : S:\Clients\2021\221375\Dwg\221375 DA Design Plans.dwg

Xref: OVERALL BASE PLAN [OVERALL BASE PLAN.dwg]

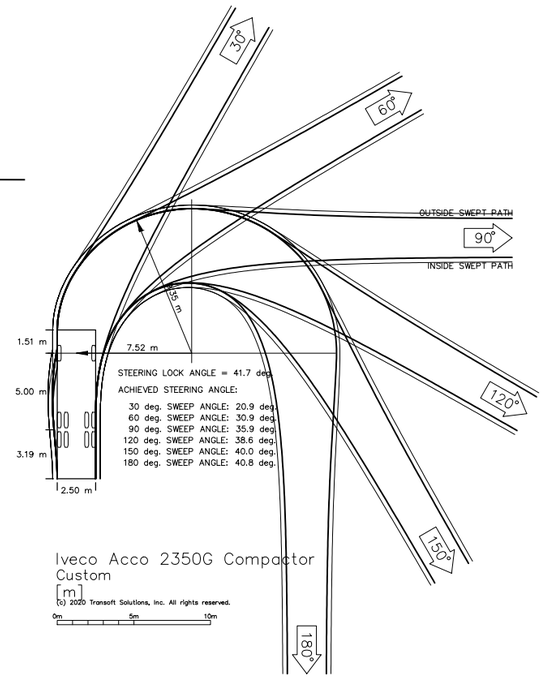
MUNGO BRUSH ROAD



Iveco Acco 2350G Compactor

meters

Width	:	2.50
Track	:	2.50
Lock to Lock Time	:	6.0
Steering Angle	:	41.7



REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV				DRAFT

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TURNING PATHS PLAN
PROPOSED CARAVAN PARK
LOT 2 DP 1015609
288 MUNGO BRUSH ROAD, HAWKS NEST

COUNCIL: Midcoast		REFERENCE: 2220012	
PARISH		SHEET SIZE	A3
SCALE: 1:1,200 on A3		SHEET No.: 12 of 12	
DATE: Plotted 1/4/22 3:22PM			
CLIENT:	JOB No.: 221375	COMPUTER FILE : S:\Clients\2021\221375\Dwg\221375 DA Design Plans.dwg	

Xref: OVERALL BASE PLAN [OVERALL BASE PLAN.dwg]

MUNGO BRUSH ROAD

-3m to -2m
-2m to -1.5m
-1.5m to -1m
-1m to -0.5m
-0.5m to 0m
0m to 0.5m
0.5m to 1m
1m to 1.5m
1.5m to 2m
2m to 2.5m

VOLUME SUMMARY

CUT	=	23,000 m³
FILL	=	28,000 m³
SELECT IMPORT	=	7,500 m³
NET	=	2,500 m³ EXCESS

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV	AV			DRAFT

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BULK EARTHWORKS PLAN
PROPOSED CARAVAN PARK
LOT 2 DP 1015609
288 MUNGO BRUSH ROAD, HAWKS NEST

COUNCIL: Midcoast	REFERENCE:
PARISH:	SHEET SIZE: A3
SCALE: 1:1,200 on A3	SHEET No.: of 4
DATE: Plotted 1/4/22 3:22PM	
CLIENT: Lands Advisory Service Pty Ltd	JOB No.:
COMPUTER FILE : S:\Clients\2021\221375\Dwg\221375 DA Design Plans.dwg	

Xref: OVERALL BASE PLAN [OVERALL BASE PLAN.dwg]

Appendix B – Flora Species List

Family	Scientific Name	Common Name
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Pteridaceae	*Cheilanthes sieberi*	Rock Fern
Apiaceae	*Actinotus helianthi*	Flannel Flower
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wandering Jew
Euphorbiaceae	*Poranthera microphylla*	Small Poranthera
Haloragaceae	*Gonocarpus teucrioides*	Raspwort
Lobeliaceae	*Lobelia purpurascens*	Whiteroot
Orchidaceae	*Acianthus fornicatus*	Pixie Caps
Orchidaceae	*Caladenia catenata*	White Finger Orchid
Phormiaceae	*Dianella caerulea var. producta*	Blue Flax Lily
Phormiaceae	*Dianella longifolia*	Blue Flax Lily
Rubiaceae	*Pomax umbellata*	Pomax
Ericaceae	*Astroloma pinifolium*	Pine Heath
Ericaceae	*Brachyloma daphnoides*	Daphne Heath
Ericaceae	*Epacris pulchella*	Wallum Heath
Ericaceae	*Leucopogon muticus*	Blunt Beard-heath
Ericaceae	*Leucopogon parviflorus*	Coastal Beard-heath
Ericaceae	*Monotoca elliptica*	Tree Broom-heath
Ericaceae	*Styphelia viridis subsp. viridis*	Green Five-corners
Agavaceae	*Yucca spp.**	
Apiaceae	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort
Asphodelaceae	*Aloe spp.**	
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Chrysanthemoides monilifera subsp. rotundata** Bitou Bush	
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane
Asteraceae	*Conyza sumatrensis**	Tall Fleabane
Asteraceae	*Hypochaeris radicata**	Flatweed
Asteraceae	*Senecio madagascariensis**	Fireweed
Fabaceae	*Crotalaria lanceolata subsp. lanceolata**	
Fabaceae	*Trifolium spp.**	A Clover
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Pinaceae	*Pinus radiata**	Radiata or Monterey Pine
Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Andropogon virginicus**	Whisky Grass
Poaceae	*Briza maxima**	Quaking Grass
Poaceae	*Eragrostis curvula**	African Lovegrass

Family	Scientific Name	Common Name
Poaceae	*Megathyrsus maximus**	Guinea Grass
Poaceae	*Melinus repens**	Red Natal Grass
Poaceae	*Paspalum dilatatum**	Paspalum
Poaceae	*Sporobolus spp.**	Rat's Tail Couch
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Rubiaceae	*Richardia humistrata**	
Verbenaceae	*Lantana camara**	Lantana
Verbenaceae	*Verbena spp.**	
Arecaceae	*Livistona australis*	Cabbage Tree Palm
Lomandraceae	*Lomandra filiformis*	Wattle Matt-rush
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Restionaceae	*Hypolaena fastigiata*	Tassel Rope-rush
Cyperaceae	*Cyperus spp.*	
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge
Cyperaceae	*Lepidosperma spp.*	
Cyperaceae	*Schoenus ericetorum*	Heath Bog-rush
Apiaceae	*Platysace lanceolata*	Lance-leaf Platysace
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower
Dilleniaceae	*Hibbertia fasciculata*	
Dilleniaceae	*Hibbertia linearis*	
Dilleniaceae	*Hibbertia obtusifolia*	Grey Guinea Flower
Euphorbiaceae	*Ricinocarpos pinifolius*	Wedding Bush
Fabaceae	*Acacia longifolia*	
Fabaceae	*Acacia suaveolens*	Sweet Scented Wattle
Fabaceae	*Acacia ulicifolia*	Prickly Moses
Fabaceae	*Aotus ericoides*	
Fabaceae	*Dillwynia retorta*	Eggs and Bacon
Myrtaceae	*Leptospermum laevigatum*	Coast Tea-tree
Polygalaceae	*Comesperma ericinum*	Pyramid Flower
Proteaceae	*Conospermum taxifolium*	Variable Smoke-bush, Coneseed
Proteaceae	*Isopogon anemonifolius*	Flat-leaved Drumsticks
Proteaceae	*Persoonia lanceolata*	Lance-leaved Geebung
Proteaceae	*Persoonia levis*	Broad-leaved Geebung
Rutaceae	*Zieria laxiflora*	Wallum Zieria
Rutaceae	*Zieria smithii*	Low growing form of Z. smithii, Diggers Head
Santalaceae	*Leptomeria acida*	Native Currant

Family	Scientific Name	Common Name
Sapindaceae	*Dodonaea triquetra*	Hop-bush
Tremandraceae	*Tetratheca thymifolia*	Black-eyed Susan
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak
Myrtaceae	*Angophora costata*	Smooth-barked Apple
Myrtaceae	*Corymbia gummifera*	Red Bloodwood
Myrtaceae	*Eucalyptus pilularis*	Blackbutt
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree
Proteaceae	*Banksia serrata*	Old Man Banksia
Rhamnaceae	*Alphitonia excelsa*	Red Ash
Poaceae	*Bothriochloa macra*	Red Grass
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Themeda triandra*	Kangaroo Grass
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Bignoniaceae	*Pandorea pandorana subsp. pandorana*	Wonga Wonga Vine
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower
Fabaceae	*Hardenbergia violacea*	False Sarsparilla
Fabaceae	*Kennedia rubicunda*	Dusky Coral Pea
Lauraceae	*Cassytha glabella*	
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry
Xanthorrhoeaceae	*Xanthorrhoea spp.*	
Ericaceae	*Leucopogon margarodes*	
Oxalidaceae	*Oxalis spp.*	

Appendix C – Fauna Species List

Family	Scientific Name	Common Name	Surveyed	Survey Equipment
			Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratchings (F), Nest (E), Burrow (FB)	**Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N).**
Reptilia				
Pygopodidae	*Lialis burtonis*	Burton's Snake-lizard		
Scincidae	*Anomalopus swansoni*	Punctate Worm-skink		
Scincidae	*Bellatorias major*	Land Mullet		
Scincidae	*Ctenotus taeniolatus*	Copper-tailed Skink		
Scincidae	*Eulamprus quoyii*	Eastern Water-skink		
Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink		
Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink		
Scincidae	*Tiliqua scincoides*	Eastern Blue-tongue	O	
Agamidae	*Amphibolurus muricatus*	Jacky Lizard		
Agamidae	*Intellagama lesueurii*	Eastern Water Dragon		
Agamidae	*Pogona barbata*	Bearded Dragon		
Varanidae	*Varanus varius*	Lace Monitor		
Pythonidae	*Morelia spilota spilota*	Diamond Python		
Colubridae	*Dendrelaphis punctulatus*	Common Tree Snake		
Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake	O	
Elapidae	*Pseudonaja textilis*	Eastern Brown Snake		
Aves				
Megapodiidae	*Alectura lathami*	Australian Brush-turkey		
Phasianidae	*Synoicus ypsilophora*	Brown Quail		
Columbidae	*Columba livia*	Rock Dove		

Family	Scientific Name	Common Name	Surveyed	Survey Equipment
			Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratchings (F), Nest (E), Burrow (FB)	**Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N).**
Columbidae	*Lopholaimus antarcticus*	Topknot Pigeon		
Columbidae	*Macropygia phasianella*	Brown Cuckoo-Dove		
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	O, W	
Columbidae	*Phaps chalcoptera*	Common Bronzewing		
Columbidae	*Spilopelia chinensis*	Spotted Turtle-Dove		
Podargidae	*Podargus strigoides*	Tawny Frogmouth	W	
Caprimulgidae	*Eurostopodus mystacalis*	White-throated Nightjar		
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar		
Ardeidae	*Ardea pacifica*	White-necked Heron	O	
Threskiornithidae	*Threskiornis moluccus*	Australian White Ibis		
Charadriidae	*Vanellus miles*	Masked Lapwing	O, W	
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	O, W	
Cacatuidae	*Cacatua sanguinea*	Little Corella		
Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella		
Cacatuidae	*Eolophus roseicapilla*	Galah	O	
Psittacidae	*Alisterus scapularis*	Australian King-Parrot		
Psittacidae	*Glossopsitta concinna*	Musk Lorikeet		
Psittacidae	*Platycercus elegans*	Crimson Rosella		
Psittacidae	*Platycercus eximius*	Eastern Rosella	O	
Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet		
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	O, W	

Family	Scientific Name	Common Name	Surveyed	Survey Equipment
			Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratchings (F), Nest (E), Burrow (FB)	**Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N).**
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo		
Cuculidae	*Centropus phasianinus*	Pheasant Coucal		
Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo		
Cuculidae	*Eudynamys orientalis*	Eastern Koel	W	
Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	W	
Tytonidae	*Tyto javanica*	Eastern Barn Owl		
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	W	
Coraciidae	*Eurystomus orientalis*	Dollarbird		
Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper		
Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird		
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	O, W	SM
Maluridae	*Malurus lamberti*	Variegated Fairy-wren		
Acanthizidae	*Acanthiza lineata*	Striated Thornbill		
Acanthizidae	*Gerygone olivacea*	White-throated Gerygone		
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren		
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote		
Pardalotidae	*Pardalotus striatus*	Striated Pardalote		
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill		
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird		
Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	W	

Family	Scientific Name	Common Name	Surveyed	Survey Equipment
			Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratchings (F), Nest (E), Burrow (FB)	**Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N).**
Meliphagidae	*Caligavis chrysops*	Yellow-faced Honeyeater	O, W	
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater		
Meliphagidae	*Manorina melanocephala*	Noisy Miner	O, W	CT, SM
Meliphagidae	*Manorina melanophrys*	Bell Miner	W	
Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater	W	
Meliphagidae	*Melithreptus brevirostris*	Brown-headed Honeyeater		
Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater		
Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater		
Meliphagidae	*Plectorhyncha lanceolata*	Striped Honeyeater		
Psophodidae	*Psophodes olivaceus*	Eastern Whipbird	W	SM
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike		
Campephagidae	*Lalage sueurii*	White-winged Triller		
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush		
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler		
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler		
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole		
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird		
Artamidae	*Cracticus torquatus*	Grey Butcherbird	O, W	SM
Artamidae	*Gymnorhina tibicen*	Australian Magpie	O, W	SM
Artamidae	*Strepera graculina*	Pied Currawong		
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo		

Family	Scientific Name	Common Name	Surveyed	Survey Equipment
			Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratchings (F), Nest (E), Burrow (FB)	**Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N).**
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail		
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	O, W	
Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail		
Corvidae	*Corvus coronoides*	Australian Raven	O	
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	O	
Monarchidae	*Monarcha melanopsis*	Black-faced Monarch		
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin		
Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola		
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	O	
Sturnidae	*Acridotheres tristis*	Common Myna	O, W	CT, SM
Estrildidae	*Neochmia temporalis*	Red-browed Finch		
Mammalia				
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna		
Dasyuridae	*Antechinus stuartii*	Brown Antechinus		CT
Peramelidae	*Isoodon macrourus*	Northern Brown Bandicoot		
Peramelidae	*Perameles nasuta*	Long-nosed Bandicoot		
Petauridae	*Petaurus breviceps*	Sugar Glider		
Petauridae	***Petaurus norfolcensis***	**Squirrel Glider**		CT
Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	O	CT
Acrobatidae	*Acrobates pygmaeus*	Feathertail Glider		
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	O	CT, SM
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo		

Family	Scientific Name	Common Name	Surveyed	Survey Equipment
			Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratchings (F), Nest (E), Burrow (FB)	**Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N).**
Macropodidae	*Notamacropus rufogriseus*	Red-necked Wallaby		
Rhinolophidae	*Rhinolophus megaphyllus*	Eastern Horseshoe-bat		
Molossidae	*Austronomus australis*	White-striped Freetail-bat		
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	D	A
Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat		
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat	P	A
Vespertilionidae	*Nyctophilus gouldi*	Gould's Long-eared Bat		
Vespertilionidae	*Nyctophilus sp.*	Long-eared bat	P	A
Vespertilionidae	*Scotorepens orion*	Eastern Broad-nosed Bat	P	A
Vespertilionidae	*Vespadelus darlingtoni*	Large Forest Bat		
Muridae	*Hydromys chrysogaster*	Water-rat		
Muridae	*Mus musculus*	House Mouse	O	CT
Muridae	*Rattus fuscipes*	Bush Rat		
Muridae	*Rattus lutreolus*	Swamp Rat		
Muridae	*Rattus norvegicus*	Brown Rat		
Muridae	*Rattus rattus*	Black Rat	O	
Canidae	*Canis familiaris*	Dog	O	
Canidae	*Vulpes vulpes*	Fox	O	CT
Felidae	*Felis catus*	Cat	O	
Leporidae	*Oryctolagus cuniculus*	Rabbit	O	CT

Appendix D – BAM Field Sheets

Appendix E– Biodiversity Credit Report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00027081/BAAS19076/21/00027082

Proposal Name
2397_Mungo Brush Road

BAM data last updated *
14/03/2024

Assessor Name
Ian Douglas Benson

Assessor Number
BAAS18147

BAM Data version *
67

Proponent Names

Report Created
08/05/2024

BAM Case Status
Open

Assessment Revision
4

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

BOS entry trigger
BOS Threshold: Area clearing threshold

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

Potential Serious and Irreversible Impacts

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

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

PCT
3544-Coastal Sands Apple-Blackbutt Forest

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
3544-Coastal Sands Apple-Blackbutt Forest	Not a TEC	7.2	202	0	202

BAM Biodiversity Credit Report (Like for like)

3544-Coastal Sands Apple-Blackbutt Forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Coastal Dune Dry Sclerophyll Forests This includes PCT's: 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	3544_Good	Yes	202	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. 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
Petaurus norfolcensis / Squirrel Glider	**3544_Good**	7.2	269.00
Phascolarctos cinereus / Koala	**3544_Good**	7.2	269.00

Credit Retirement Options

Like-for-like credit retirement options

Petaurus norfolcensis / Squirrel Glider

Spp	IBRA subregion
Petaurus norfolcensis / Squirrel Glider	Any in NSW

Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW

Appendix F – Site Photographs

Above: Feathertail Glider - Camera 1Z
Above: Squirrel Glider – Camera 1W

Above: Large hollow present across the site.
Below: PCT 3544 mid site with minor weed incursion.

Above: PCT 3544 North east corner looking south west
Above: Ground habitat present throughout site

Above: Bitou Bush central site beside access road
Above: Large log pile present

Above: Cleared track mid site looking north west near BAM 4
Above: Main track mid east of site looking west

Appendix G – Other Legislation

EPBC Act Assessment

A Protected Matters Search of an area of 5km radius of the Study Area was conducted in February 2022 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 has no Internationally or Nationally important Wetlands in the Vicinity.

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 a search of the EPBC Protected Matters website (12/02/2022), two (2) listed Threatened Ecological Communities (TECs) were considered likely to occur within a 5km radius of the Study Area.

One (1) Endangered Ecological Community

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

Desktop assessment and ground-truthing during field surveys found that the vegetation communities present on site are not commensurate with the aforementioned Threatened Ecological Communities.

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 within a 10km search radius to the Study Area with most recent records assessed, no threatened species were identified within the Subject Site.

It should be noted that the surrounding area has significant number of records for Koala, as stated above in **Section 2** of the BDAR, species credits still apply, however, given the lack of records following the extensive surveys undertaken within the site, it is considered that the proposed development is not of highly significant importance to the species.

EPBC Koala Assessment Tool

On 12 February 2022 the koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) was listed as endangered. The koala was previously listed as vulnerable, which is a lower degree of threatened status. Following this listing event, the 'EPBC Act referral guidelines for the vulnerable koala' and associated policy documents are no longer current. As such a significant impact assessment has been undertaken to determine if the proposal is likely to have a significant impact on koalas in the area.

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of a population

Hawks Nest Koala population history:

- In 1989 the population contained at least 21 individuals according to the NSW Scientific Committee final determination investigations.;
- In 1998 the population had fallen to about 12, with 2 – 3 koalas in the vicinity of Tea Gardens and the remainder in Hawks Nest and environs.
- The decline of the koala population has been attributed to continuing sub-division and associated clearing of food and habitat trees, road mortality and attacks by dogs/dingoes.
- At least 10 Koalas were killed in 1997 and 1998.
- Historical bushfires in 2019 -2020 had a significant impact on koala populations, feed tree availability and habitat connectivity.
- There is evidence that koala populations in the Lower Hunter are small and continuing to decline due to pressures of clearing, habitat fragmentation, sand-mining, development (particularly urban development and the use of fences) and, in the past, hunting.

The Hawks Nest and Tea Gardens population of koala is of significant conservation value due to its disjunction from other populations in the area and its occurrence within a coastal urban area. Attacks by domestic and wild dogs, mortalities with vehicles, Chlamydial disease, improper fire regimes and occasionally drowning in swimming pools is also considered a threat to koalas.

The NSW Scientific Committee, as established by the Threatened Species Conservation Act has made the Final Determination that the numbers of *Phascolarctos cinereus* in the Hawks Nest and Tea Gardens population have been reduced to such a critical level that the population is in immediate danger of extinction.

Recovery strategies and management actions have been implemented to assist in the conservation of the koala and the endangered population in the Hawks Nest and Tea Gardens area and include;

- Species sightings and management sites (SoS strategy) that have been put in place to aid in monitoring of the population. This has included the formation of a koala working group consisting of members of local government and the community.
- Identifying and mapping koala habitat in the Hawks Nest and Tea Gardens area with active habitat management and monitoring/conservation and assessment;
- Identifying traffic blackspots for koalas in order to minimise incidents of death or injury on roads; and
- Developing and implementing a broad scale education and awareness strategies to make the local community and surrounds aware of the issues surrounding the koala population in the area.

These are a few of proactive approaches being taken to conserve the species and BioNet records show that these management strategies appear to be assisting with the conservation of the species in this area.

Koalas in this population are found in a range of Eucalypt Forest and woodland communities, including coastal forests, rainforest, riparian areas, swamp sclerophyll forests, heathland and shrubland habitat. Additionally, koalas home range is known to be between 1km and 135kms.

The Great Lakes Local Environmental Plan 2014 Section 7.9 Protection of wildlife corridors is mapped and the Subject Site is located approx. 5km to the North South of the Subject Site.

Koalas have been recorded in adjoining land; AEP undertook extensive surveys of the Subject Site as stated in the BDAR to determine presence within the Study Area. It was determined that Koalas may infrequently traverse the Study Area to get between resources, however there are no signs of the species utilising the Subject Site. Detailed Flora surveys did not locate any primary feed trees within the Study Area, as listed in BC SEPP (*Eucalyptus tereticornis Eucalyptus microcorys, Eucalyptus punctata, Eucalyptus viminalis, Eucalyptus camaldulensis, Eucalyptus haemastoma, Eucalyptus signata, Eucalyptus albens, Eucalyptus populnea,* and *Eucalyptus robusta*), However, koala use trees and secondary feed trees as listed under the State Environmental Planning Proposal (Biodiversity Conservation) 2021 (BC SEPP) were identified within the study area

The proposed regeneration of 8.26ha of retained land would include the planting of listed feed trees within the corridor to provide safe passage and food resources. The BMP will provide an individual Koala Plan of Management for the retained lands outlining fencing, traffic management, flora species, improving the corridor and food resources for the local population.

Considering the range of habitats koalas utilise in this area, the availability of contiguous habitat surrounding the residential areas of Hawks Nest and Tea Gardens and the home range movements, the Subject Site would not be considered a primary corridor due to the lack of suitable Feed Trees. With the proposed removal of approx. 7.15ha of heath vegetation and the proposed regeneration (including planting of koala feed trees it is highly unlikely that that the site has significant values that are likely to serve an important ecological function for koalas.

Reduce the area of occupancy of the species

As previously stated, there are records of Koalas in adjoining lands with significant number of records located approx. 1-2km to the south the proposed development will remove 7.15ha of heath, the retention and regeneration of 8.26ha will provide feed trees within a corridor. This should assist in the providing resources for the and safe passage within the local area.

Fragment an existing population into two or more populations

The proposal is unlikely to fragment the population with the retained land being connected in all directions.

Adversely affect habitat critical to the survival of a species

As previously stated, the Subject Site provides a corridor, however detailed flora surveys showed there are no listed feed trees within the Subject Site. The proposal will reduce areas of native vegetation, however will increase the resources through the management and planting of the retained 7.58ha of native vegetation.

Disrupt the breeding cycle of a population

AEP undertook extensive surveys of the Subject Site as stated in the BDAR to determine presence within the Study Area, there were no signs of Koalas within the Subject Site and as such it can be determined that the proposed development will not disrupt the breeding cycle.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposed regeneration (6.69ha) and planting of Koala feed trees should assist in improving the quality of habitat for Koalas. The proposed development is not likely to place the species into a decline as the site lacks food resources to support the species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposed development will provide for a higher condition of native vegetation within the retained land, proposing to significantly reduce the weeds loads. This along with planting of native species should allow for natural regeneration of species within the area to provide a higher quality corridor.

Introduce disease that may cause the species to decline, or Interfere with the recovery of the species.

The proposed development will require a Construction Environmental Management Plan (CEMP) outlining hygiene protocol for the development and the BMP will provide measure for pest and diseases within the retained lands. Both of these plans should provide a high level of protection for the species.

The proposed regeneration of the retained lands should assist in providing a greater area of food resources for Koalas within the Hawks Nest region, assisting with the recovery of the species.

No other matters of note relating to koala impact are considered relevant to the proposal, and as such it is not considered that a referral is required under the EPBC Act for the Koala.

Migratory Species

A number of EPBC listed migratory species have some potential to visit the site on an irregular basis. However, it is not considered that the development of this land as proposed is likely to significantly impact the potential habitat of such species or disrupt migratory patterns.

EPBC Act Assessment Conclusion

The retained vegetation is to be restored to provide habitat which includes feed trees while enhancing the corridor for the species to move freely on site within the remnant vegetation. The development will not impact connectivity to the broader tracts of vegetation to the east of the Study Area. As such, referral for threatened species and EECs under the EPBC Act is not required for this development proposal.

Water Management Act 2000

There are no watercourse located within the Subject Site, hence, no further assessment is required under the Water Management Act 2000.

Fisheries Management Act 1994

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

The Biodiversity and Conservation SEPP commenced on 1 March 2022. This SEPP consolidated 11 other SEPPs within this SEPP on the 1st March 2022. The State Environment Planning Policy (Koala Habitat Protection) 2021 (BC SEPP) was one SEPP that was consolidated within the Biodiversity and Conservation SEPP 2021 under Chapter 4 – Koala Habitat Protection 2021. 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*.

Chapter 4 Koala habitat protection 2021

As assessment of the vegetation and BioNet Altas records shows that the site is likely to be Core Koala Habitat as listed under the State Environmental Planning Policy (Biodiversity and Conservation) 2021 (BC SEPP). As a result, an Individual Koala Plan of Management (IKPOM) has been prepared for the site.

Individual Koala Plan of Management – 288 Mungo Brush Road, Hawks Nest NSW (Lot 2 DP 1015609) in the Mid-Coast Local Government Area.

Site:	**288 Mungo Brush Road, Hawks Nest NSW (Lot 2 DP 1015609)**
Local Government Area	**Mid-Coast Council**
Total Area of land IKPOM Applies:	**8.26ha of Retained**
An estimate of population size;	Review of Midcoast Councils Draft Koala Plan of Management (2024) shows the population within Hawks nest is not known
Identification of preferred feed tree species for the locality and extent of resource available;	Trees identified under the State Environmental Planning Proposal (Biodiversity Conservation) 2021 (BC SEPP) preferred species located within the Subject Site is *Eucalyptus pilularis.* The preferred food trees of the Hawks Nest and Tea Gardens endangered koala population are *Angophora Costata* and *Corymbia Gummifera*.
Aims of IKPOM	
The Aims of the IKPOM are: • Improve Koala movement through the site reducing human impacts of the proposed caravan park by encouraging movement to north, east and south; • Provide more feed trees species; • Weed management to encourage natural regeneration of native vegetation; and • Protection from domestic animals.	
Existing Condition	
Population Estimation: Review of Midcoast Councils Draft Koala Plan of Management (2024) shows the population within Hawks nest is not known **Feed Tree Species:**	

Trees identified under the State Environmental Planning Proposal (Biodiversity Conservation) 2021 (BC SEPP) preferred species located within the Subject Site is *Eucalyptus pilularis.* The preferred food trees of the Hawks Nest and Tea Gardens endangered koala population are *Angophora Costata* and *Corymbia Gummifera*.

Proposed Measure to amelioration of Impacts on koala populations:

The following must be undertaken within the VMP lands (retained vegetation):

- Areas that require planting must contain listed schedule 2 feed tree species.
- Enhancement of the corridors that direct movement away from the proposed facility through planting of feed tree within the identified corridors.
- Weed eradication to improve natural regeneration of feed trees.
- Installation of signage: koalas present and domestic animals must be on leash.
- All fencing must support koala movement throughout the site (30cm gap at base and no barbed wire).

Identification of linkages existing corridors:

- Refer Figure 1.
- Given the proposed caravan park is located in the north-west of the lot, the rehabilitation within the retained lands (approx. 8.26ha) must aim to:
- Enhance corridors in a north-east, south and west directions.
- All fences constructed on the site must have a 30cm gap between ground and fence.
- No barbed wire.
- Signs at the entrance and within the carpark stating koalas present.

Targets

Over the 3 years of Management the following targets should be achieved:

- 100% eradication of all Priority listed weed;
- 60% eradication of all other listed weed;
- 20% increase in Koala Feed trees;
- All fencing allows for koala movement; and
- Signs are erected and maintained.

Management Tasks

To implement the IKPOM the following must be undertaken by a suitability qualified Bush Regeneration Contractor and Project Ecologist and cost are to be paid for by the developer:

- Collection of baseline data for native vegetation and weeds;
- Establishment of monitoring points;
- Establishment of preferred corridor (refer Figure 1 for indicative options);
- Removal of rubbish and barbed wire;
- Weed Management;
- Planting (where required) with a focus on preferred corridor;
- Installation of Koala friendly fencing ;(e.g. 30cm gap at base of fence and ground level); and
- Installation of Koala signs and domestic pets on leads (refer Figure 1 for indicative options).

Monitoring and Reporting

Monitoring of the Subject Site will be undertaken bi-annually with reports to RVC annually for period of management of the VMP.

State Environmental Planning Policy (Resilience and Hazards) 2021

The State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) commenced on 1 March 2022. The State Environment Planning Policy (Coastal Management) 2018 (Coastal Management SEPP) was one SEPP that was consolidated within the Resilience and Hazards SEPP 2021 under Chapter 2 Coastal Management. 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*.

Chapter 2 Coastal Management

The Subject Site is not mapped as having any Coastal Wetlands in accordance with the *State Environmental Planning Policy (Resilience and Hazards) 2021*, it is mapped Coastal Environmental Area and Coastal Use Area refer to **Table** below for assessment.

Development on land within the coastal use area

Clause Number	Clause	Assessment
Clause 2.10		
1(a)	Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following	
1(a)	The integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment	The Stormwater Management provides water quality requirements to protect surface and groundwater. The plan is provided in **Appendix H.**
1(b)	Coastal environmental values and natural coastal processes	The Stormwater Management Plan provides modelling of the post water conditions which ensures protection of the coastal process.
1(c)	The water quality of the marine estate (within the meaning of the *Marine Estate Management Act 2014*), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,	N/A
1(d)	Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms	N/A
1(e)	Existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability	N/A
1(f)	Aboriginal cultural heritage, practices and places	Refer SEE
1(g)	The use of the surf zone	N/A
2	Development consent must not be granted to development on land to which this section applies unless the consent authority is satisfied that	
2(a)	The development is designed, sited and will be managed to avoid an adverse impact referred to in subsection (1),	The Stormwater Management provides water quality requirements to protect surface and groundwater.
2(b)	If that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact,	As discussed, the proposal will maintain water quality for both surface and groundwater.

Clause Number	Clause	Assessment
2(c)	If that impact cannot be minimised—the development will be managed to mitigate that impact	As discussed, the proposal will maintain water quality for both surface and groundwater.
3	This section does not apply to land within the Foreshores and Waterways Area within the meaning of *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*	N/A
Clause 2.11		
1	Development consent must not be granted to development on land that is within the coastal use area unless the consent authority	
1(a)	Has considered whether the proposed development is likely to cause an adverse impact on the following:	
1(a)(i)	Existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	The proposed development will not impact safe access to foreshore, beach, headland or rock platform, as the development is not located within this section of the coastline.
1(a)(ii)	Overshadowing, wind funnelling and the loss of views from public places to foreshores	Due to the location of the proposed development, there will be no overshadowing of or wind funnelling of public foreshore places.
1(a)(iii)	The visual amenity and scenic qualities of the coast, including coastal headlands	Due to the location of the proposed development will not impact on the visual amenity and scenic qualities of the coast.
1(a)(iv)	Aboriginal cultural heritage, practices and places	The proposed development will not impact Aboriginal cultural heritage, practices and places. Refer to Statement of Environmental Effects (SEE) for more detailed assessment.
1(a)(v)	Cultural and built environment heritage	The proposed development will not impact Cultural and built environment heritage. Refer to SEE for more detailed assessment.
1(b)	Is satisfied that:	
1(b)(i)	The development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or	As outlined in this application the proposed development will impact three PCTs, however the development is avoiding areas of higher condition and retaining HBTs. Therefore, it has been determined that the Proposal address the Avoid and Minimise principals in the BC Act.
1(b)(ii)	If that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or	As outlined in this application the proposed development will impact three PCTs, however the development is avoiding areas of higher condition and retaining HBTs. Therefore, it has been determined that the Proposal address the Avoid and Minimise principals in the BC Act.
1(b)(iii)	If that impact cannot be minimised—the development will be managed to mitigate that impact,	As outlined in this application the proposed development will impact three PCTs, however the development is avoiding areas of higher condition and retaining HBTs. Therefore, it has been determined that the Proposal address the Avoid and Minimise principals in the BC Act.

Clause Number	Clause	Assessment
1(c)	Has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development	The Proposal meets the DCP controls for built environment, and the bulk, scale and size. Refer SEE for more detail.
2	This section does not apply to land within the Foreshores and Waterways Area within the meaning of *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*.	N/A

North Hawks Local Environment Study and Environmental Considerations

A variety of biodiversity information in reference to the broader North Hawks Nest locality has been collated since 2002 (North Hawks Nest Locality Public Inquiry, 2002), and offers insight into protection and mitigation measures for local populations of threatened species and other biodiversity and ecological matters within the region. Table below addresses the Mid-Coast Council's DCP environmental considerations of ecological impacts in relevance to the Subject Site.

Midcoast DCP Planning rules and controls surrounding ecological impacts		
Control number	Control	Assessment
4.1.1	the avoidance (where possible) or minimisation of loss and harm to remnant native vegetation and trees and the habitat of wildlife populations, and	It has been determined that the proposed development will require the removal of 7.15ha of native vegetation, including Asset Protection Zones, noting that individual HBTs have been identified for retention within the footprint. The proposal also includes the regeneration of 8.26ha of land within the Study Area consisting of 7.58ha of PCT 3544 and 0.66ha of cleared land. The proposed amendments to the development include retention of an additional 17 HBTs which will provide for nesting opportunities for listed species, provide foraging opportunities for listed species, including Koalas and Squirrel Gliders and assist with connectivity through the region. The amended proposal also includes the opportunity to regenerate an area of important habitat, reducing weed loads, creating a natural regenerating community which seed loads can be spread throughout the region by mobile fauna, wind and water. The Biodiversity Management Plan (BMP), aims to not only allow for regeneration it also aims to promote education of the plant community and fauna that inhabit the Study Area, through the installation of educational signage, the informative signs will include information on weeds and pests that pose threats to the community and information on the species present and what people can do to protect and conserve these species. *Crowley, Flood, Caffrey, Dunford, Fitzpatrick, Hamilton and O'Gorman, 2020, Engaging and empowering People in Biodiversity -and Conservation:*

Midcoast DCP Planning rules and controls surrounding ecological impacts		
Control number	Control	Assessment
		Lessons from Practice, Biology and Environment Vol 120, Pages 175-185, shows that such interactive engagement with members of the public is one of the most effective methods to empowering people to improve and protect our environment. Walking them through regenerated areas, with educational signage identifying key species by name, explaining the need for hollows, connecting trees, spelling out bird calls, etc, as they are looking and hearing has been shown to be one of the most effective ways to for our memories to retain and connect. The proposal to retain habitat trees, regenerate the Study Area will educate the wider public in the values of land and the to assist with conservation. Allowing the public to tread lightly through this site as is now proposed should empower conservation. The option of do nothing to the Study Area will reduce Biodiversity Values and condition of the PCT as there are both invasive weeds and pests within the Study Area. The Department of Planning and Environment lists both invasive weeds and pests as Key Threatening Process, that if left unmanaged will continue to degrade communities and impact the survival of listed species by: reducing regeneration of feed trees for both Koala's and Squirrel Gliders and reducing population through predation. The development proposes manage and reduce both invasive weeds and pest through a Biodiversity Management Plan and Individual Koala Plan of Management for the Subject Site. Both mechanisms will reduce the if not eliminate the Key Threatening Process within the Study Area, addressing the principles of minimisation within the BAM – C.
4.1.2	the protection of natural biodiversity, including native vegetation and wildlife, their habitats and biological processes and functions.	As stated above in 4.1.1the proposal retains connectivity through the retention of key HBTs and the regeneration of 8.26ha, which will

Midcoast DCP Planning rules and controls surrounding ecological impacts		
Control number	Control	Assessment
		improve biodiversity and biological process within the locality and the region.
4.1.3	The protection of all ecological values of the natural landscape including scenic, recreational, aesthetic and cultural heritage values.	Integrated bushland design, maintains some bushland connectivity, and seeks to encourage public engagement with local environment and biodiversity, as stated above in 4.1.1
4.1.4	The design and siting of the development (including the footprints of all built structures, access, services, bushfire asset protection zones, water management structures, and other ancillary features of that development) in the area of the land that is of least ecological or biodiversity constraint and where the siting of that development results in the least possible ecological or biodiversity-related impact.	As stated above in 4.1.1 connectivity to surrounding bushland for all mobile fauna species and flora species has been maintained by retaining HBTs and the regeneration of the 7.58ha of PCT 3544. It has also provided protection through the installation of fencing which will reduce predators while allowing Koalas and other listed species to move freely. m.
4.1.5	The appropriate siting and design of a development (including lot boundaries) with regards to the protection of agricultural sustainability, ecological integrity, topography, landform, native vegetation, wildlife habitat, wetlands and watercourses, and	The proposal has been situated in the north of the Subject Site to reduce the need for cut and fill reducing impacts to native vegetation.
4.1.6	The adoption of suitable and effective protective safeguards that avoids, minimises, or compensates for the clearing of habitat and native vegetation within any development.	Refer 4.1.1
4.1.7	The capability of the land to accommodate the development without impairment or harm to important ecosystem services functions and the condition, ecological value and significance of fauna and flora.	Refer 4.1.1
4.1.8	The avoidance of fragmentation or disturbance of wildlife habitats and the protection, maintenance and (where possible) enhancement of ecological	As stated in 4.1.1 above habitat connectivity will be preserved with the maintenance of Hollow Bearing Trees, appropriate fencing, and the regeneration within the retained lands.

Midcoast DCP Planning rules and controls surrounding ecological impacts		
Control number	Control	Assessment
	linkages and wildlife corridors in a local, sub-regional and regional context.	
4.1.9	The avoidance (where possible) and minimisation of negative impacts on natural landscapes that provide key ecological services provisions, including but not limited to, rainforests, wetlands, riparian zones, vegetated steep lands, rare, regionally significant or poorly conserved ecological communities, threatened species habitats, endangered ecological communities and protected land.	As stated in 4.1.1, the proposal has been modified to reduce impacts through the retention of connectivity and Hollow Bearing Trees, appropriate fencing, and the regeneration within the retained lands.
4.1.10	The identification and active protection of natural landscapes that provide key ecological services provisions, including but not limited to, rainforests, wetlands, riparian zones, vegetated steep lands, rare, regionally significant or poorly conserved ecological communities, threatened species habitats, endangered ecological communities and protected land, including the need to adopt buffers of adequate width and configuration to such areas to protect them from the overt direct or indirect effects of that development.	As stated in 4.1.1 the proposal includes protection measures such as fending and also an integrated stormwater treatment plan.
4.1.11	The compensating or offsetting of unavoidable impacts of a development such that the natural environment and native biodiversity is maintained or improved. The provision of any offsets should be located on the development site or as close as possible to the area of impact, and not beyond the bounds of the Great Lakes Local Government Area, and	As stated in 4.1.1, HBTs removed will be compensated for, with the implementation of nest boxes at a ratio of 1:2. While 8.26ha of BMP land will be managed to enhance overall habitat and vegetation quality.
4.1.12	Where primary koala food tree species occur, the means with which the development would avoid such trees and where, if impacts on such trees are unavoidable, the means with which there would be a long-term net gain in	15% of canopy cover will be maintained within the proposed development footprint and these trees have been selected as they are HBTs and koala use trees. The retained land is to be managed under a BMP which includes an

Midcoast DCP Planning rules and controls surrounding ecological impacts		
Control number	Control	Assessment
	the representation of primary koala food tree species as a consequence of that development.	Individual Koala Plan of Management for the Study Area
4.1.13	Where hollow-bearing trees (comprising trees with cavities, hollows, splits or decorticating bark capable of providing roosting, denning or refuge sites for native vertebrate fauna) occur, the means with which the development would avoid such trees and where, if impacts on such trees are unavoidable, the means with which there would be a long-term net gain in the representation of denning opportunities for hollow-dependent native wildlife as a consequence of that development.	As stated in 4.11 the proposed Biodiversity Management Plan intends to actively improve vegetation quality and fauna habitat over approximately 8.26ha via the installation of nest boxes, regeneration of habitat, and planting of endemic foraging vegetation.
4.1.14	The adequate, effective and active conservation management of areas of high biodiversity conservation value of the land of a development site and/ or a restoration or an offset area through a permanent, executed legal mechanism and the preparation, funding and implementation of a habitat or restoration management plan.	Refer to 4.1.1 as it details the offset proposed.
4.1.15	The management of risks associated with bush fire in a manner that does not unreasonably compromise and minimises or avoids impacts on native vegetation, wildlife and wildlife habitats.	Mitigation measures for fire, floods and services have been factored into the impact area while meeting the required standards.
4.1.16	The containment, within a single lot, of the area of a holding that comprises land that is zoned E2 Environmental Conservation.	NA
4.1.17	The encouragement of conservation and recovery of populations of threatened biodiversity within a development and/ or any offset areas.	Refer to 4.1.1.
4.1.18	The adoption of suitable and effective protective safeguards that avoids impacts to areas of high conservation	Habitat connectivity has been maintained with canopy and hollow bearing trees, pets will not be admitted onsite to protect local species and

Midcoast DCP Planning rules and controls surrounding ecological impacts		
Control number	Control	Assessment
	value native vegetation and native wildlife populations and their habitats from any harm or impact associated with the introduction or encouragement of domestic pets, invasive exotic plants and animals and grazing animals.	the Subject Site will manage the immediate and surrounding bushland to minimise exotic vegetation. Conservation and management of further bushland is to occur in proposed 8.26ha of BMP lands. Refer 4.1.1 for further details
4.1.19	The means with which priority invasive environmental weeds would be effectively and actively controlled and suppressed on the development site for the life of the development.	Hygiene protocols will be implemented during construction and ongoing operation of proposed development to prevent the spread of weeds outside the Subject Site. The BMP proposed a weed management plan to eradicate invasive weeds.
4.1.20	Consideration of the location and style of fencing on the land on the development site to enclose and/ or protect areas of high conservation value native vegetation and native wildlife populations and their habitats.	The BMP proposed fencing to reduce predation but allow for koala movement through the Subject Site.

Commissioners of Inquiry Annual Report (2001 – 2002)

Dr Mark Carleton Report, 2002, Conservation Value of Land, Hawks Nest

In 2001 the Great Lakes Council requested the services of a Commissioner to conduct a Public Inquiry and report on the ecological significances of land covered by the *north Hawks Nest Draft Local Environmental Study.* The Commission considered all the information including submissions received to conclude the following findings:

- *Nearly all of the native vegetation of the study area is significant for threatened species, much of it regionally significant.*
- *The study area is important for the survival of the local koala population, which has recently been listed as endangered and in immediate danger of extinction. Substantial portions of the study area are important koala habitat. Large portions of the study area also have regional and local habitat value for threatened fauna species. These include a mix of wetlands, swamp forests, heath and dry sclerophyll forests. The study area has high biodiversity at a regional as well as local level.*

To address the above findings AEP has undertaken desktop and fields surveys in accordance with the BAM 2020, assessing all listed species and communities within the Subject Site. It has been determined that the proposed development will require the removal of 8.39ha of native vegetation, including Asset Protection Zones, noting that individual HBTs have been identified for retention within the footprint. The proposal also includes the regeneration of 8.26ha of land within the Study Area consisting of 7.58ha of PCT 3544 and 0.66ha of cleared land.

The proposed amendments to the development include retention of an additional 13 HBTs which will provide for nesting opportunities for listed species, provide foraging opportunities for listed species, including Koalas and Squirrel Gliders and assist with connectivity through the region.

The amended proposal also includes the opportunity to regenerate an area of important habitat, reducing weed loads, creating a natural regenerating community which seed loads can be spread throughout the region by mobile fauna, wind and water. The Biodiversity Management Plan (BMP), aims to not only allow for regeneration it also aims to promote education of the plant community and fauna that inhabit the Study Area, through the installation of educational signage, the informative signs will include information on weeds and pests that pose threats to the community and information on the species present and what people can do to protect and conserve these species. *Crowley, Flood, Caffrey, Dunford, Fitzpatrick, Hamilton and O'Gorman, 2020, Engaging and empowering People in Biodiversity -and Conservation: Lessons from Practice, Biology and Environment Vol 120, Pages 175-185*, shows that such interactive engagement with members of the public is one of the most effective methods to empowering people to improve and protect our environment. Walking them through regenerated areas, with educational signage identifying key species by name, explaining the need for hollows, connecting trees, spelling out bird calls, etc, as they are looking and hearing has been shown to be one of the most effective ways to for our memories to retain and connect.

The proposal to retain habitat trees, regenerate the Study Area will educate the wider public in the values of land and the to assist with conservation. Allowing the public to tread lightly through this site as is now proposed should empower conservation.

The option of do nothing to the Study Area will reduce Biodiversity Values and condition of the PCT as there are both invasive weeds and pests within the Study Area. The Department of Planning and Environment lists both invasive weeds and pests as Key Threatening Process, that if left unmanaged will continue to degrade communities and impact the survival of listed species by: reducing regeneration of feed trees for both Koala's and Squirrel Gliders and reducing population through predation.

The development proposes manage and reduce both invasive weeds and pest through a Biodiversity Management Plan and Individual Koala Plan of Management for the Subject Site. Both mechanisms will reduce the if not eliminate the Key Threatening Process within the Study Area, addressing the principles of minimisation within the BAM – C.

Appendix H – Stormwater Management Plan

CONCEPT STORMWATER MANAGEMENT REPORT

for

PROPOSED HOLIDAY PARK DEVELOPMENT

288 MUNGO BRUSH ROAD
HAWKS NEST

LOT 2 IN DP 1015609

Prepared by
TATTERSALL LANDER PTY LTD
Development Consultants
May 2023

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LIST OF TABLES

1.0 INTRODUCTION

This report has been prepared to support a Concept Application for a holiday park development proposed for 288 Mungo Brush Rd, Hawks Nest (Lot 2 in DP 1015609).

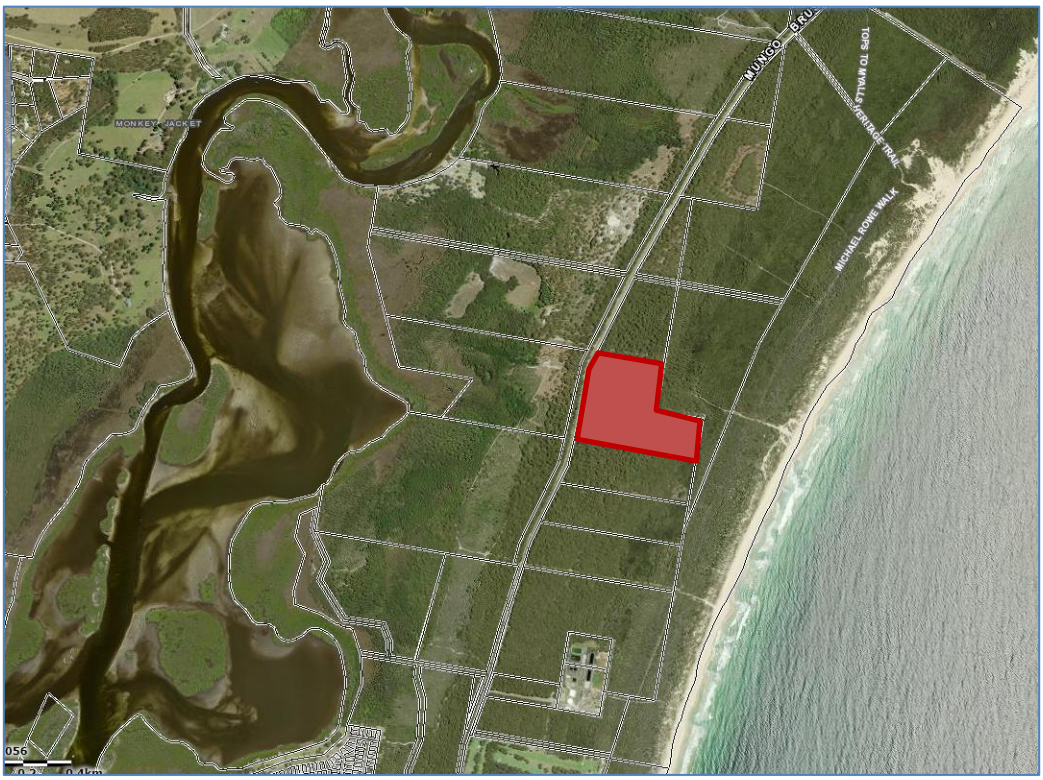


Figure 1: Locality Diagram

2.0 BACKGROUND INFORMATION

The site has a history of use as a rural property. The majority of the site is vegetated in some form, with various areas of clearing for access tracks, sheds and other vegetation disturbances associated with the use of the property.

3.0 SITE CONTEXT

The site is zoned RU2 Rural Landscape, and has frontage to Mungo Brush Road for its full western boundary.

The topography within the development footprint is best described as gently sloping and undulating. Consistent with much of the Hawks Nest / Mungo Brush area, there are no well-defined drainage flow paths and it is expected that all rainfall generally leaves the site via infiltration to groundwater.

Levels generally range from 6.0m-8.0m AHD. The development area is mostly vegetated, with mature forest trees and native understorey. Some areas of clearing exist for access tracks, plus there are two reasonable sized sheds and a small cabin on the property.

Figure 2: Site Aerial Image

Photo 1: Existing Site

4.0 PROPOSED DEVELOPMENT

It is proposed to construct a holiday park primarily on the north-western portion of the site. The proposal will include: -

1. Minor bulk earthworks,
2. 50 2-storey cabin sites,
3. 42 1-storey cabins
4. 94 short term camping sites,
5. 43 'tiny homes'
6. Community facilities,
7. Roads and drainage,
8. Other associated infrastructure,
9. Ecological preservation area.

A proposed layout plan can be seen below.

Figure 3: Proposed Development

5.0 WATER QUALITY TARGETS

As a site >2,500sq.m with less than 10% existing impervious surface, the Water Sensitive Design section of the Great Lakes Council Development Control Plan states that a water quality treatment train for this development should meet the pollution reduction targets in Table 1 below:

Table 1: Stormwater Quality Targets

Gross Pollutants (GP)	90%
Total Suspended Solids (TSS)	Neutral or Beneficial Effect (NorBE)
Total Phosphorus (TP)	Neutral or Beneficial Effect (NorBE)
Total Nitrogen (TN)	Neutral or Beneficial Effect (NorBE)

6.0 CONSTRAINTS AND OPPORTUNITIES / BEST PLANNING PRACTICES

Drainage and water quality considerations have been key considerations in the planning process, with large biofiltration areas (Council's preferred device) included through the concept design process.

The existing sandy soils onsite present some significant challenges to achieving compliance with the NorBE water quality DCP targets, as high infiltration sand sites result in very low existing pollutant levels. Similarly, the existing mostly undisturbed vegetated nature of the site will further reduce the target pre-development pollutant levels.

Council has previously advised the 1% AEP 2100 Flood Level at the site is 2.3m AHD, and the resulting Flood Planning Level is 2.8m AHD. With existing levels well above this, there are no regional flooding constraints associated with the site. Similarly, with the high permeability sand soils and close proximity to the ocean to the east and river to the west, it is expected that the existing site levels should be well clear of the water table. This is supported by the site geotechnical assessment, which found groundwater to be at a depth of about 6.5m below ground level at Borehole 3.2.

The lack of any existing drainage paths, high permeability sandy soils and generally elevated terrain present opportunities for large scale regrading to effect proper and efficient WSUD and drainage design, and disposal via infiltration. The original concept for this site included a higher density, higher impact layout that included large scale site regrading to effect traditional minor/major stormwater drainage in accordance with Council's AUSSPEC guidelines. In this revision, and additional constraint to retain significant portions of existing vegetation has been introduced, and the design concept revised to a 'light touch' layout what will require a more small-scale distributed approach to treatment / detention / infiltration disposal.

7.0 SOIL AND WATER MANAGEMENT

A critical time for increase pollutant loads is during construction, and with this in mind, current practice recommends guidelines from Landcom's "Blue Book". Erosion and sediment control measures should be designed and specified in accordance with the "Blue Book" guidelines, and to Council's satisfaction, and be inspected and maintained during the construction phase. This will assist in ensuring adherence to pollutant prevention measures, particularly the removal of suspended solids (sediment).

As the construction footprint will be in excess of 2,500sq.m, typically it would be expected that a detailed Soil and Water Management Plan would need to be prepared for construction prior to release of the Subdivision Works Certificate. This would normally include calculations of likely soil loss during construction, instructions on preferred construction sequence and limiting land disturbance, and calculations for the provision and sizing of any temporary sedimentation basin to cover the period of civil works.

As a general comment on this site, the combination of flat grades and high permeability sandy soils are likely to limit any significant risk of erosion and sedimentation issues. The following RUSLE calculation illustrates this (references are to "The Blue Book" – Managing Urban Stormwater, Landcom, 2004);

2-year 6hour Intensity = 11.5mm/hr	(former GLC Engineering Dept)
R = 2860	(Eq 2 App A)
K = 0.005	(Tab 14 App C)
LS = 0.19 (1% Slope for 80m)	(Tab A1 App A)
P = 1.3	(Tab A2 App A)
C = 1.0 (bare earth during construction)	

The resulting computed soil loss is therefore calculated as 2.72m^3/ha/yr, or 20.9m^3/yr on this site. As this is far less than 150 m^3/yr trigger in The Blue Book, no sedimentation basin would be required (S6.3.2 (d)), and the erosion risk should be able to be adequately addressed with standard construction erosion control measures such as silt fencing and sandbagging.

8.0 INTEGRATED WATER CYCLE MANAGEMENT

All community facilities and cabins / tiny houses will be serviced with reticulated water and sewer connected to the MidCoast Water Services network.

BASIX is not technically applicable to moveable dwellings on short term sites in a tourist park. However, to decrease the development's demand on potable water and also in line with WSUD principles, roof water runoff from proposed cabins / tiny houses and community buildings is to be directed into rainwater tanks for reuse within the dwellings (toilet & laundry), and external uses.

There is currently no recycled water service to the site. However, there is a recycled water service running from the sewer treatment plant and back into Hawks Nest to a reservoir between the Myall Park sporting fields and the North Coast Holiday Camp.

This reservoir is over 3km from the site, and given this distance it is not expected that MidCoast Council would require connection to this service. However, the supply main leaving the treatment plant is only 1.1km from the development site and could potentially be branched off and extended to the site (to a new reservoir and pump reticulation) if requested by the development, for use on external landscape areas associated with the proposed development.

9.0 STORMWATER MANAGEMENT - HYDROLOGY

9.1 FLOODING

Council have advised the 1% AEP 2100 Flood Level at the site is 2.3m AHD, and the resulting Flood Planning Level is 2.8m AHD. The entire site is well clear of this level.

9.2 DRAINAGE

The nature of urban development is that it increases the amount of impervious surface in a catchment, which in turn can decrease runoff times and create higher peak flow rates. It is important with new developments that measures are put in place to prevent increases in runoff from the site that may impact on surrounding properties.

In this instance, there is no obvious defined drainage paths from the site and flowing onto Mungo Brush Rd or adjacent properties. With significantly high infiltration rates available in the in-situ sand soils and desire to limit site disturbances, the proposal will aim to collect stormwater runoff from impervious surfaces for it to be treated and then infiltrated. The infiltration areas will need to be sized so that no overflow is expected from the site in any rainfall event up to and including the 1% AEP event.

A hydrological model of the development site and surrounding areas has been prepared utilising the DRAINS computer modelling software to confirm the sizing of the proposed infiltration areas. IFD, temporal data and loss data was downloaded from the BOM and ARR Data Hub for the site (Latitude,-32.649 Longitude,152.188) and used to create a 1D hydrologic and hydraulic model.

The complete model will be made available to Council with the submission of this report, so model inputs and setup can be reviewed in detail. A general summary of various model inputs, including various assumptions and interpretations from ARR19 is provided below.

9.2.1 LOSSES

Sandy soil conditions exist on the site, consistent with the Hawks Nest area. A Horton ILSAX hydrological model has been set up using;

- Type 1 (high infiltration) soil,
- Paved (impervious) area depression storage = 1mm
- Grassed (pervious) are depression storage = 5mm
- Supplementary areas – not used, per Council's stormwater guidelines

It is noted that the ILSAX model assumes an initial rate of around 250mm/hr and continuing rate around 30mm/hr for Type 1 soils. The geotechnical report found extremely high infiltration rates on the site (average hydraulic conductivity in the order of 4,000-20,000mm/hr) - while this does not account for factors such as tree roots, or the impacts of organics or compaction in the topsoil layer, it is expected that the ILSAX model is still significantly conservative with relation to runoff generated from pervious areas of this site. The BOM rainfall data indicates the maximum 1% 5min rainfall intensity is 336mm/hr, so it is not expected that there will be any notable runoff from any permeable surfaces in any rainfall events.

9.2.2 IMPERVIOUS AREA

While previous ARR87 hydrologic methods utilised Total Impervious Area inputs, the new ARR19 guidelines make a clear and deliberate distinction in terminology, and recommend the use of Effective Impervious Area rather than TIA, to more accurately represent real observed catchment runoff conditions.

Following this lead, DRAINS also recommends breaking catchment areas up into Effective Impervious Area, Remaining Impervious area and Pervious Area (or Paved, Supplementary and Grassed). DRAINS routes the RIA / Supplementary area through the Pervious Area to reflect the intention of the ARR19 guidelines.

However, Council's recently released Stormwater Guidelines require the use of Total Impervious Area only and no use of Supplementary areas, a conservative position more in line with the old ARR87 guidelines. For this assessment, a TIA of

1.965Ha was measured directly of the architectural plans (being 1.100ha of pavement and 0.865Ha of roof area). This equates to 27% of the 7.260ha proposed development area.

Note that the APZ / perimeter road area around the site has not been included in the development catchment areas above as this area is intended to be “a semi formal gravel walking track that guests can access and kids ride bikes etc, over a 8m wide Reinforced Grid Cell fire trail”. Basically, this will be a managed grassland area that includes a gravel walking track. The area won’t have vehicular traffic, there will be minimal changes to existing ground levels, and it won’t have any formal drainage – it will in effect act as an undeveloped area from a hydraulic perspective, and retain existing runoff behaviour.

9.2.3 PRE-BURST

Transformational Pre-burst rainfall data was sourced from the ARR data hub, which is determined from the Initial Loss value minus the Probability Neutral Burst Initial Losses. As this model adopts a Horton ILSAX hydrological method, the pre-burst data is not applied.

9.2.4 AREAL REDUCTION FACTOR

The total catchment area is less than 1km^2 so the ARF was set to 1.

9.2.5 TAILWATER CONDITIONS

With the proposed development located above the reach of any regional flood impacts, the modelling has been done with a free outfall condition. Given the aim of the design is to ensure zero surface discharge from the site, this assumption is not particularly relevant to the results.

9.2.6 PRE-CONDITION MODEL

The assessment of the existing site has concluded there are no existing natural waterways or discharge points, and it appears the sandy soils provide sufficient infiltration capacity to infiltrate all rainfall. In smaller events, rainfall on the site will infiltrate where it lands, and in larger events it may collect at the various depressions and low points across the site until it soaks away.

There is some possibility that water would build up to a point where it flows across the boundaries onto the adjacent properties or the road reserve, and a 2D Rainfall-on-Grid model could be used to assess this. However, with no legal easements to permit such discharge post-development, a target of zero off-site discharge has been adopted for the purposes of this assessment. The reported hydraulic conductivity values in the geotechnical report mean any surface runoff from the existing site is highly unlikely.

A detail survey plan can be seen in Appendix A.

9.2.7 DESIGN STATE MODEL

A simple 1D node and link model was created to reflect the proposed development site, and its various sub-catchments. Lumped nodes have been used for each catchment, including lumped detention nodes for the total biofiltration raingardens and infiltration areas.

A proposed pipe network has not been included in the model at this Concept design point, but given the relatively small size of the development site catchment, there would be limited routing impacts expected from the pipe network that would have any impacts on the modelled infiltration basin behaviour.

9.2.7.1 INFILTRATION DISPERSION AREAS

The stormwater concept design looks to take advantage of the existing central depression through the centre of the site to deal with most of the stormwater

treatment and disposal. For smaller separate catchments that fall east and west, smaller more localised treatment / disposal areas will be required, some of which would be linked to the larger central infiltration areas via a piped stormwater system. Given the lack of natural drainage paths, some areas will need to be regraded to a degree to create effective drainage paths, but this needs to be limited to areas that will not impact on the Tree Protection Zones of trees being retained.

Detailed design of the raingarden and infiltration area will be completed at a later stage in the project, but a concept design can be seen in the DA design plans in Appendix B.

The infiltration areas main features include;

- Regular distributed inflows from the adjacent road and sites to support plant health,
- Pre-treatment in sediment forebays at locations of concentrated pipe inflows,
- Potential use of slotted pipes where a piped system is required for stormwater conveyance, to assist in promoting infiltration across the site,
- Integral raingarden in the base of the basin to capture and treat all low-flows (nominally up to the 4EY event),
- Infiltration for regular rainfall events (nominally up to the 20% AEP event) through the batters above the raingarden liner,
- Overflow to large areas of retained vegetation onsite, for irregular major event storage and infiltration (nominally events between 20% and 1%)
- Side slopes generally <10% per the existing landform, with localised areas up to 4(H):1(V) batter slopes adjacent to fill area. All areas with a storage depth greater than 300mm will be required to be fenced for public safety, in accordance with Council's Stormwater Design Guideline.

Modelling the discharge behaviour of this sort of drainage arrangement is obviously highly dependent on the in-situ infiltration rates. Sandy soils can exhibit a large range in rates for saturated hydraulic conductivity. The initial version of this report adopted a value of 180mm/hr as no geotechnical data was available at that time. Since then, the Geotechnical Assessment by Regional Geotechnical Solutions has

found on-site saturated hydraulic conductivity to be in the range of (4,000-20,000mm/hr).

For the purposes of this assessment, a value of 1,000mm/hr has been adopted, being the lower of the end of the observed range and including a Sandy Soil moderation factor = 0.5 (per ARQ S11.3.2, Engineers Australian 2003) to account possible site variability, and an additional factor of safety of 2 to account for possible long term reductions due to sedimentation / compaction. It is considered that long term siltation of the infiltration areas is not a significant concern in this proposal, as restorative maintenance is possible being an open infiltration system (as opposed to below infiltration ground tanks).

It is noted that maintenance of the infiltration area will be required from both amenity and bushfire perspectives, but mowing / slashing with heavy machinery should not be permitted, as this will compact the surface and result in a reduction in available infiltration capacity.

While the potential option for the use of slotted pipes for any trunk drainage is noted, the scope of any pipe network has not been investigated at this Concept design stage, and the effect infiltration discharge from any slotted pipes has not been included into this assessment.

9.2.8 RESULTS

The following tables and figures illustrate that the modelled ensemble median peak water levels stay within the nominated infiltration areas for all storms up to the 1% AEP storm event. The simplest way to interpret the results in Figure 4 is the zero discharge (in red) to the south west (to Mungo Brush Rd), and south east (to adjacent property), demonstrating all runoff is captured and infiltrated onsite.

The reported water elevations in the figures below are indicative only, as the nodes are lumped nodes representing multiple biofiltration / infiltration storage structures – more detail can be added to this in future phases of the project design. All habitable building floor levels should be set with a minimum freeboard of 0.5m applied above the 1% storage level – provisionally this would be around 6.65m

AHD in the central/eastern catchments, and around 7.15m AHD in the western catchment. It is noted that the available infiltration surface area gets exponentially larger as flows spill across the secondary infiltration zone, and in the western catchment flows would also spill out onto Mungo Brush Road before consuming the freeboard and reaching these floor levels.

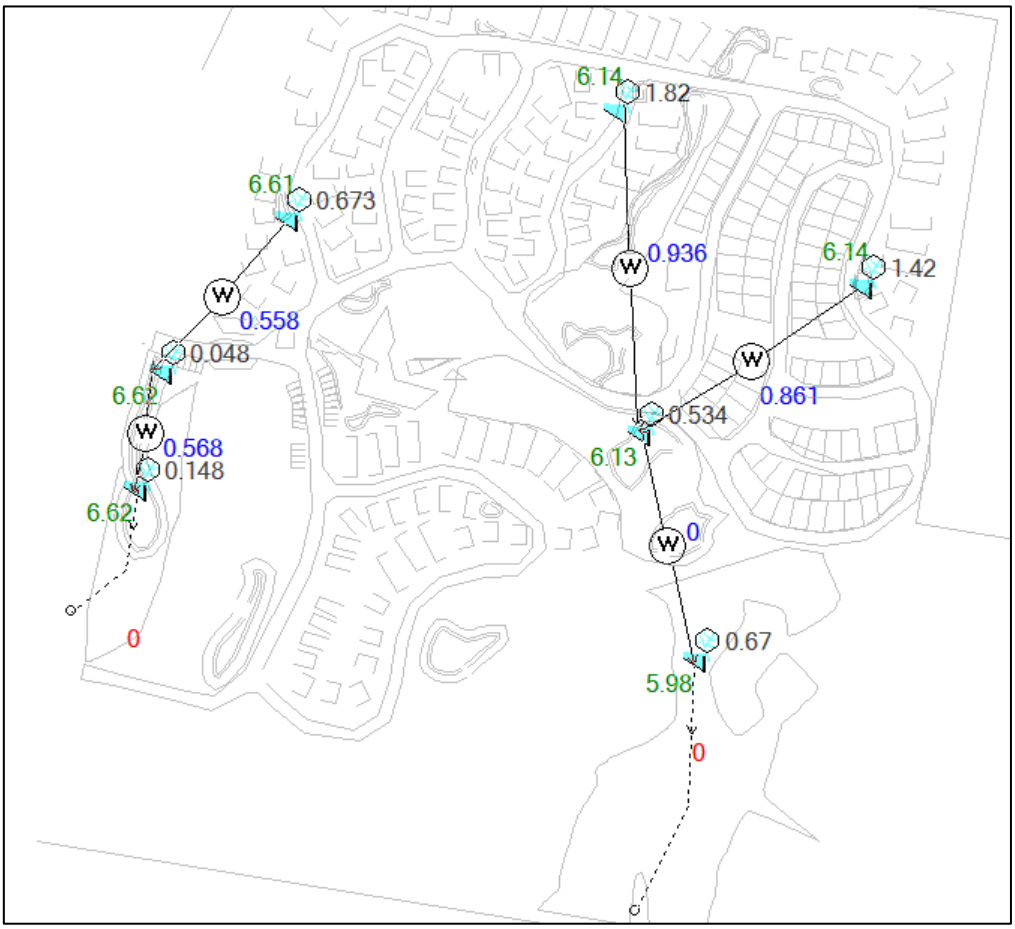


Figure 4: 1% AEP Ensemble Median Peak Water Levels and Flow Rates

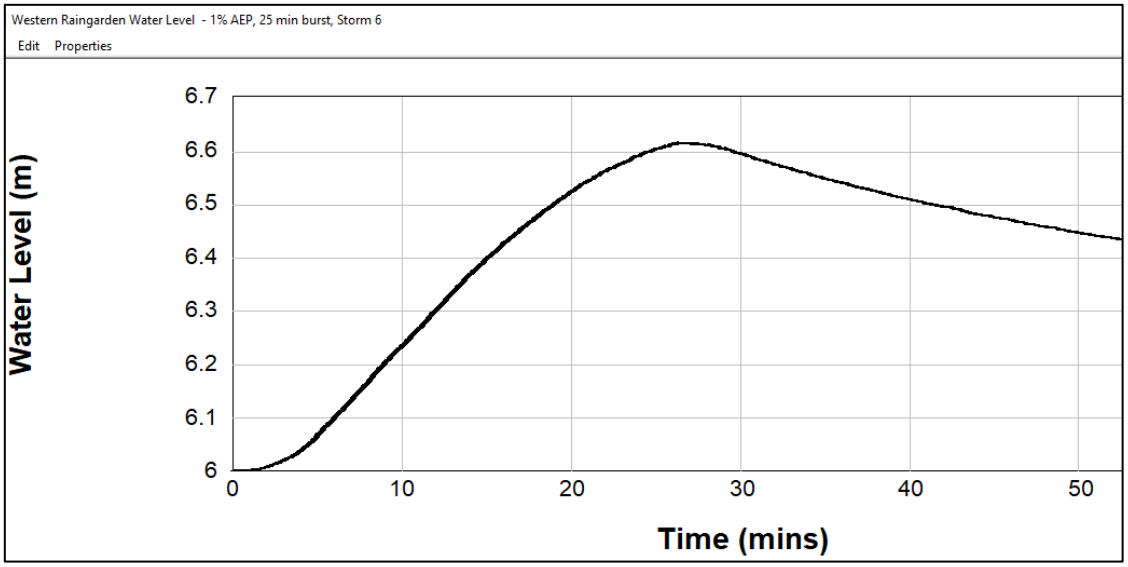


Figure 5: 1% AEP Ensemble Median Storage Level (Western Catchment)

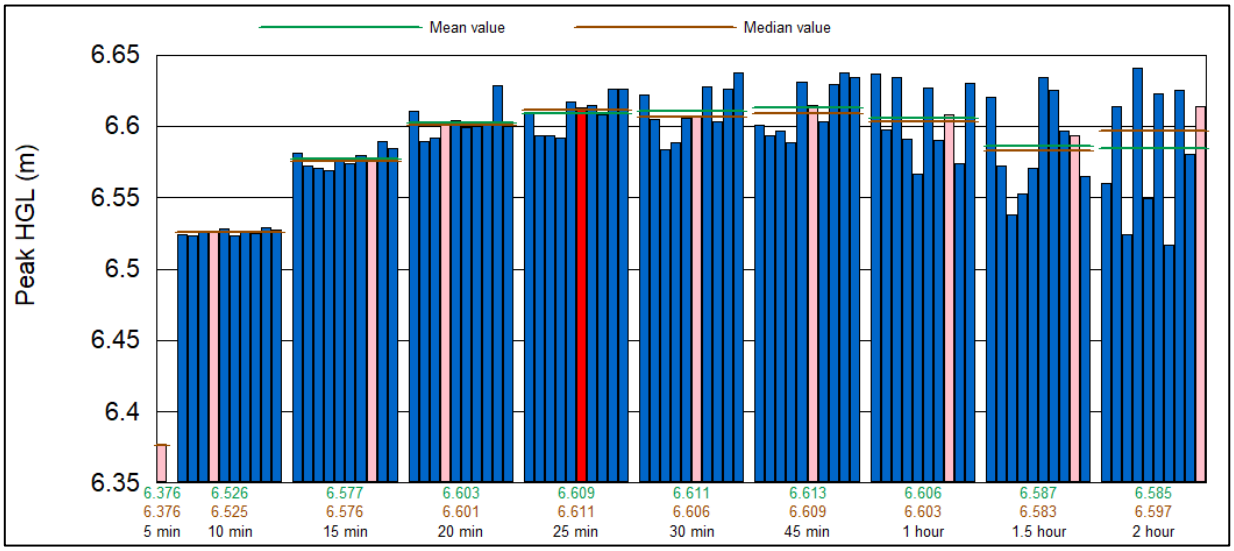


Figure 6: 1% AEP Ensemble Median Storage Level (Western Catchment)

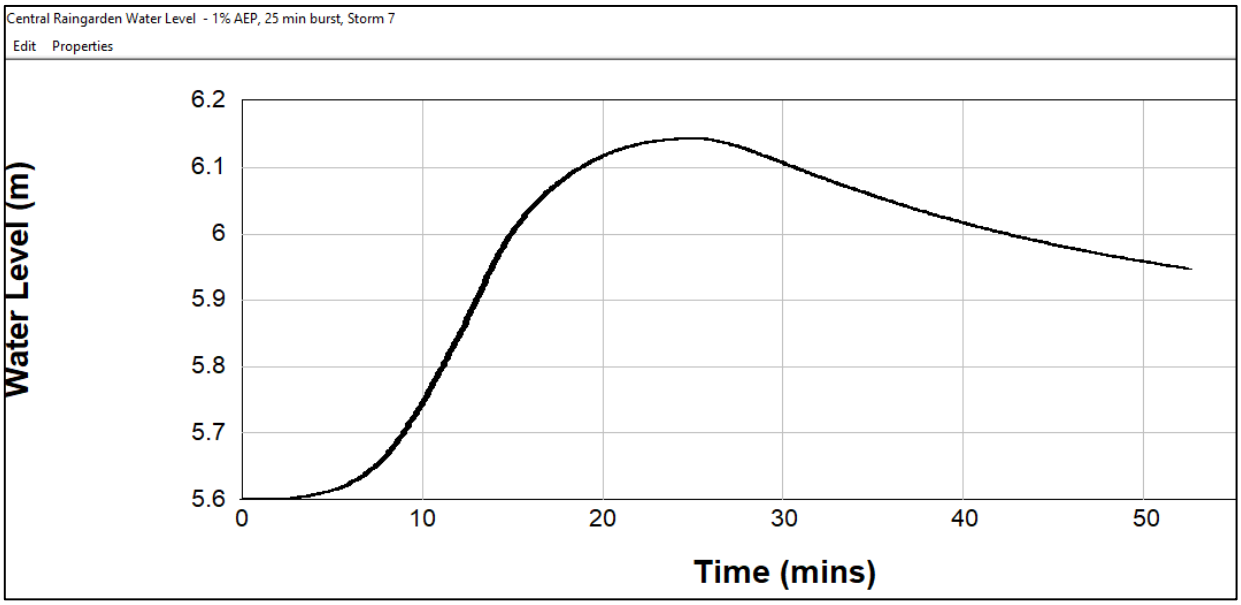


Figure 7: 1% AEP Ensemble Median Storage Level (Central/Eastern Catchment)

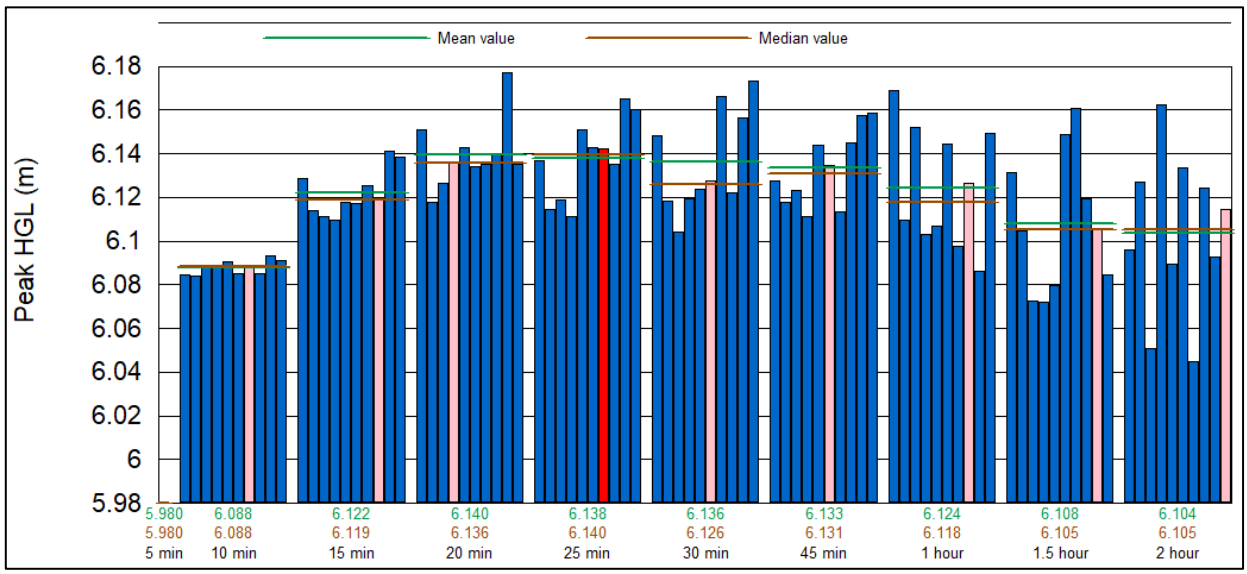


Figure 8: 1% AEP Ensemble Median Storage Level (Central/Eastern Catchment)

10.0 STORMWATER MANAGEMENT – WATER QUALITY MODEL

10.1 BACKGROUND

The quality of runoff generated by the site is important to ensure the preservation of the downstream environments as an increased proportion of impervious area can lead to a subsequent increase in the quantities of suspended solids, phosphorus and nitrogen exiting the site in stormwater runoff. While this site will discharge exclusively via infiltration, the water quality of the water being infiltrated from the site may still be important for the receiving groundwater. The aim of this section of the study is to determine what measures need to be undertaken as part of this development to meet the water quality objectives set out in Table 1 in Section 5 of this report.

10.2 MUSIC MODELLING

MUSIC is the Model for Urban Stormwater Improvement Conceptualisation, developed by the Cooperative Research Centre for Catchment Hydrology. MUSIC provides the ability to model both quality and quantity of runoff generated by catchments. Therefore MUSIC can simulate annual stormwater volumes, and expected annual pollutant loadings.

MUSIC is designed to model stormwater runoff systems in urban catchments. It is used to simulate a range of temporal and spatial scales. Catchment modelling can be performed for areas up to 100 km^2, with times steps from 6 minutes to 24 hours to match the range of spatial scale. This enables long term modelling of continuous historical rainfall data from pluviograph sources, and reflects the ability to account for temporal variation in data for an annual rainfall series directly.

MUSIC also has the ability to model a number of treatment devices, and measure their effectiveness in terms of the quantity and quality of runoff downstream. This allows determination of the degree of reduction in annual pollutant loadings.

It is important to note that the MUSIC simulation relies heavily on input variables and MUSIC models can be calibrated to local conditions. However, for the scale of most urban development projects, it is generally considered unreasonable to perform a calibration and input parameters can be sourced from various guidelines, such as Council's WSD Guideline or the current NSW MUSIC Modelling Guidelines.

10.2.1 CLIMATE / RAINFALL

To accurately model a site of this size, continuous rainfall record spanning at least five years with a six minute timestep is required. MidCoast Council have prepared a template for use across the LGA and this template has been utilised to create the model for this report.

The rainfall record in the template is ten years of data between the dates of 1/1/1969 and 31/12/1978. This data produced a mean annual rainfall of 1234mm. It is noted that the long term average rainfall (obtained from the Bureau of Meteorology) for Nelson Bay (approximately 13km from the site) is 1348mm.

10.2.2 EVAPORATION

To accurately model the outcome of water quality treatment measures, potential evapotranspiration (PET) data is required. Again, this data has been taken from the MidCoast Council template which has a mean annual value of 1367mm.

It is noted that the previous approach of determining monthly average areal potential evapotranspiration values from maps in the 'Climate Atlas of Australia, Evapotranspiration' (BoM, 2001) resulted in an annual average of 1335mm.

10.2.3 NODE PARAMETERS

The MUSIC model was used to simulate the pollutant export generated during a ten year period of average rainfall. Rainfall-runoff parameters for Sand soils were adopted from Section 4.6.5 of the Midcoast Council Guidelines for Water Sensitive Design Strategies (2019). Typical pollutant concentrations were derived from the NSW MUSIC Modelling Guidelines (2015). The adopted parameters can be seen below.

Note that a Rainfall Threshold of 1.5mm/day was adopted for the “Sealed Road” node and 0.3mm/day was adopted for the “Roof” node per Table 5-4 in the NSW MUSIC Modelling Guidelines (2015). A Rainfall Threshold of 1.0mm/day adopted for all other nodes.

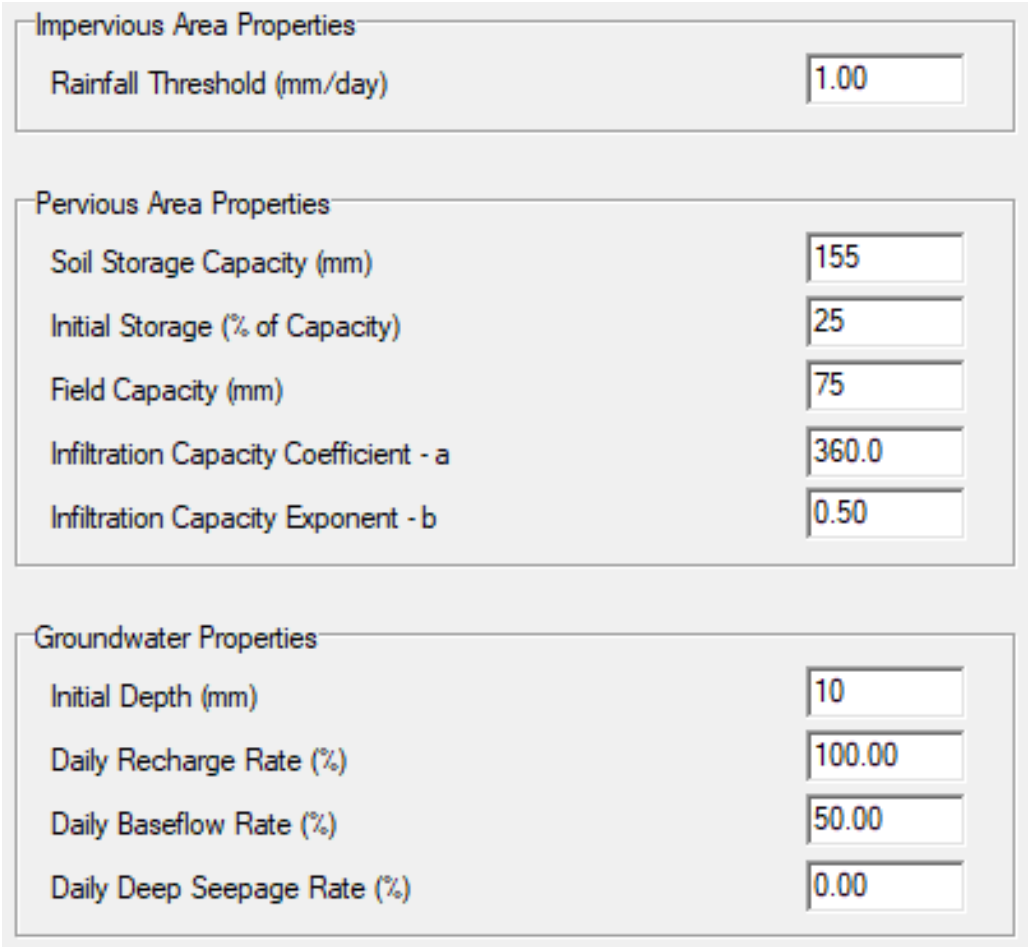


Figure 9: Adopted Rainfall-Runoff MUSIC Parameters

Table 2: Adopted MUSIC Pollutant Generation Parameters

	Rural	Forest	Residential	Roof	Road
Baseflow TSS Mean (mg/L)	14	6	15.8	-	16
Stormflow TSS Mean (mg/L)	90	40	140	20	270
Baseflow TP Mean (mg/L)	0.06	0.06	0.14	-	0.14
Stormflow TP Mean (mg/L)	0.22	0.08	0.25	0.13	0.5
Baseflow TN Mean (mg/L)	0.9	0.3	1.3	-	1.3
Stormflow TN Mean (mg/L)	2	0.9	2	2	2.2

10.2.4 EXISTING FLOW & POLLUTANT ANALYSIS

The existing site was modelled to simulate the current pollutant loads from the site. The vegetated portions of the site have been modelled as a Forest node with zero percentage impervious, which best represents the existing landuse. The portions of the site that have been cleared / disturbed have been modelled as a rural landuse with zero percent impervious.

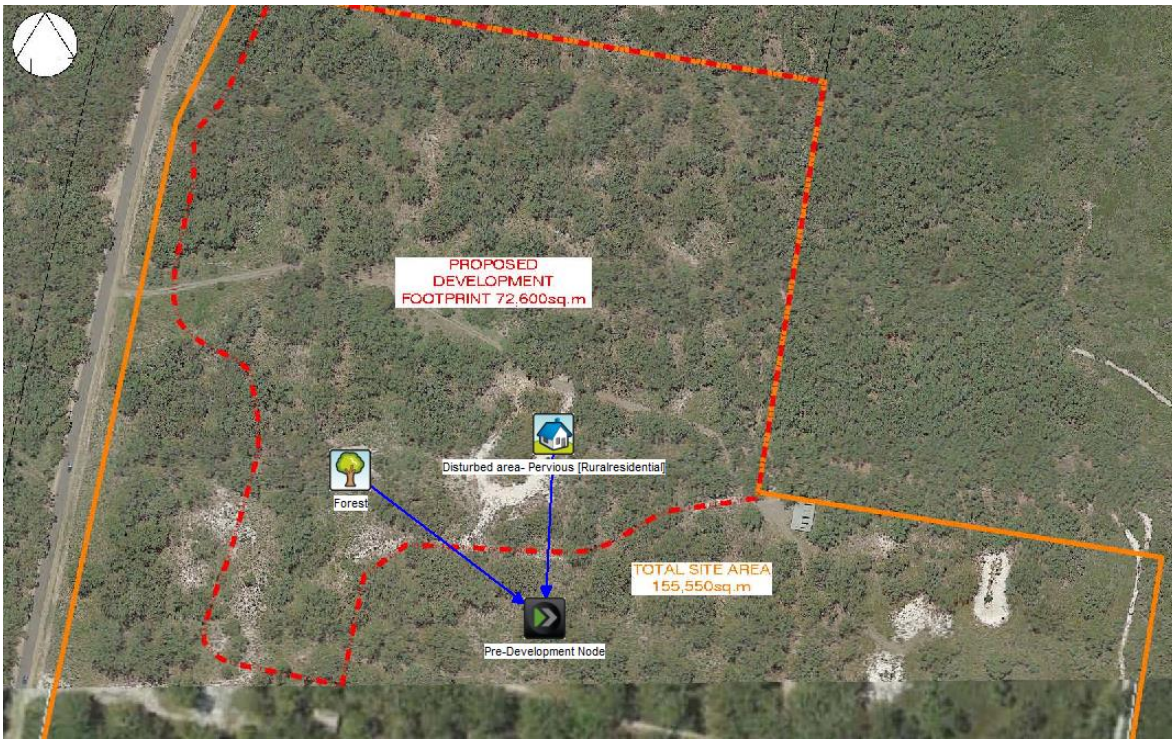


Figure 10: Existing State MUSIC Model

10.2.5 PROPOSED DEVELOPMENT FLOW & POLLUTANT ANALYSIS

The proposed development was modelled to determine expected pollutant loads and the effectiveness of the proposed water treatment measures. The catchment was broken up into different areas depending on the surface type, including;

- Roof areas of the proposed cabins, tiny houses and community buildings (measured directly off the architectural plans), modelled as “Roof” nodes with 100% impervious area;
- All access road areas (measured directly off the architectural plans) were modelled as a “Sealed Road” landuse with 100% impervious area;
- Due to the significant areas of biofiltration in the concept design, these areas (including the landscaped batters into the biofilters) have been included as a separate source node with a “forest’ landuse as it is not accurate to include them as an urban landuse. These areas are 100% pervious, have complete native vegetation coverage, and would experience none of the pollutant generating activities typical of urban lands (lawn clippings, fertilisation, dog droppings, deciduous leaf-fall etc).
- Conservation area modelled as a Forest node,
- Perimeter bushfire APZ maintenance buffer area modelled as a ‘rural’ landuse,
- Remaining urban pervious areas were modelled as a residential node with 0% imperviousness. This area represents the cabin site areas not covered by a dwelling roof, the camping sites, the open spaces around the various community facilities and grassed areas in that aren’t within the raingarden / infiltration zones.

Modelled treatment nodes include;

- Rainwater tanks - 3kl for each cabin site & 2x3kl tanks on each community building. Captured water from these tanks has been modelled for reuse in toilet, laundry and external uses only. Being smaller than a standard dwelling, tank water internal reuse rates were adopted for a dwelling with 2 occupants from Table 6-1 in the 2015 NSW MUSIC Modelling Guidelines (0.115kl/day/dwelling) rather than the Council WSD guidelines (0.15kL/day/dwelling). External reuse rate of 36kL/yr/dwelling (distributed by PET minus Rain) was adopted as the

lower value from the two guidelines. It has been assumed that 100% of the roof areas will be connected to the tanks;

- Biofiltration systems – biofiltration areas have been designed into the central depression area, and other available areas around the site. Features include sediment forebays for concentrated pipe inflows, 0.25m detention depth, total filter area of 1,980sq.m and a 0.6m filter depth. The orthophosphate content of the filter media has been modelled at 40mg/kg.

  The base will be unlined to allow filtered water to infiltrate, mimicking existing hydrological processes onsite. Overflow will either directly enter the adjacent infiltration areas (central swale), or have piped overflow to infiltration areas (smaller dispersed systems).

  The RGS geotechnical report found groundwater at the site was around 6.5m below existing ground level, which will be well clear of the base of the proposed biofilter media and infiltration zones.

  Note: Following direction from Council staff on previous similar project sites, the sizing of the raingarden areas has been limited to a ‘rule-of-thumb’ filter media area = 3% of the development footprint, despite there being space for larger systems, and the fact that larger systems would result in better modelled results. The premise of this limit is that it will help ensure adequate water is supplied to the entire raingarden to keep it alive, especially through dry periods. It is noted that there is no reference for a 3% target (or any other target) in Council’s WSD Guidelines, or any other locally adopted WSD guidelines.

  It is also noted that a sensitivity check on the model showed the raingardens would need to be made at least 10x larger in order to meet the NorBE targets.

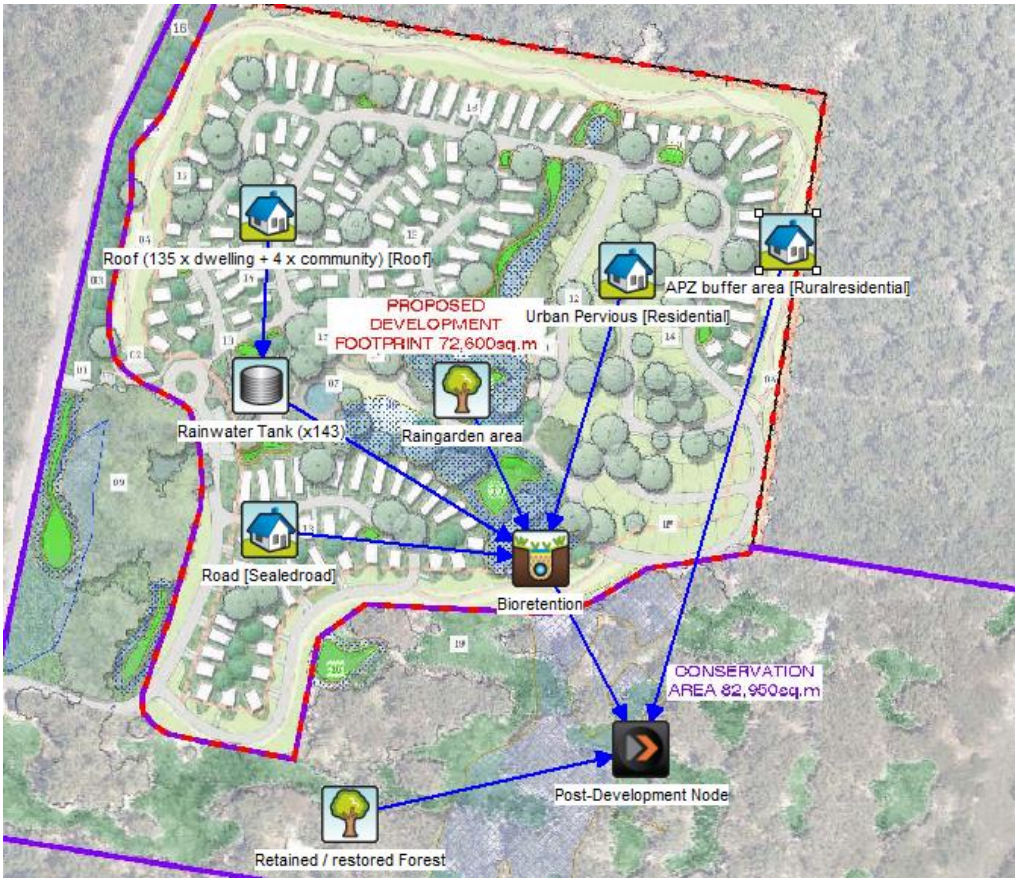


Figure 11: Proposed Development MUSIC Model

10.2.6 COMPARISON OF POLLUTANT RESULTS

Pre and post development pollutant loads are presented in the table below, to compare results to the required targets.

Table 3: Comparison of Pre and Post-Development Pollutant Loads

	Pre-Developed	Post-Developed	Treatment Train % Reduction Achieved	NorBE Compliant
TSS (kg/yr)	908	709	96.2%	Yes
TP (kg/yr)	5.04	5.18	82.1%	No
TN (kg/yr)	35.5	42.7	72.0%	No
GP (kg/yr)	0	0.517	100%	-

* NorBE = Neutral or Beneficial Effect

Despite showing good stripping performance, it can be seen that the NorBE target is not met for Total Phosphorus or Total Nitrogen. This is primarily due to the very low TP and TN modelled from the existing site. As noted, Council have previously advised that they do not wish to see biofiltration oversized chasing an unobtainable target, and have directed the biofilters be limited in size to 3% of the development footprint.

In instances like this where the targets cannot be practically met onsite, Council have indicated they will consider off-site works elsewhere in the catchment to offset the additional pollutant load being generated by the development. It is recommended that the developer enter a conversation with Council staff about the requirement for offsite offset works, and identifying potential offset sites for further analysis.

11.0 COSTS

All stormwater infrastructure will be installed by the developer and will remain in private ownership for the life of the development. As no costs are to be incurred by Council, a detailed analysis has not been provided in this report.

12.0 OPERATION AND MAINTENANCE PLAN

Regular minor maintenance is required to ensure water treatment measures continue to operate in an effective way. These tasks should be performed every three months or after heavy storm events, but the flat nature of the site and sandy soil type means minimal sedimentation of the biofilter area is expected once the site is finalised.

Many of these tasks would be considered ‘instinctive’ every-day maintenance activities for park maintenance staff with minimal associated costs, such as watering the plants during dry periods, weeding and clearing blockages of inlet and outlet structures.

The maintenance schedule in Appendix C has been prepared as a typical template to direct grounds maintenance staff undertaking routine maintenance, and is based on Raingardens and Bioretention Tree Pits Maintenance Plan Example prepared by the Facility for Advancing Water Biofiltration, Monash University. Relevant sections have been reproduced and/or modified for the specific site conditions.

All biofilter maintenance activities will need to commence as soon as biofilters are planted and brought online and continue for the life of the development.

13.0 CONCLUSIONS

The tourist park has been designed with drainage and water quality constraints in mind, and the current proposal represents a design that balances the constraints of the site and the development outcome.

There will be no flooding impacts on the proposed development, with the entire proposal well clear of the 2.8m FPL.

In keeping with the existing site hydrology and with the fact there is no formal public drainage available in Mungo Brush Road, the site has been designed with infiltration as the primary discharge method. The system has been sized to ensure that all runoff up to the 1% AEP is contained and infiltrated on the site.

Stormwater runoff quality has been addressed on-site via a treatment train that includes the construction of a dispersed biofiltration raingardens across the site, and the installation of a 3kL rainwater tanks with all dwellings. The results derived from modelling procedures indicate that long term water quality Neutral or Beneficial targets are met for Total Suspended Solids and Gross Pollutants. While Total Phosphorus and Total Nitrogen results would pass a Percentage Reduction criteria, the NorBE targets cannot be practically addressed within the proposed development alone, and the option of off-site offsets may be pursued with the co-operation of Council.

14.0 REFERENCES

Guidelines for Water Sensitive Design Strategies, 2019, Midcoast Council

MUSIC Version 6.0 User Manual, 2011, eWater

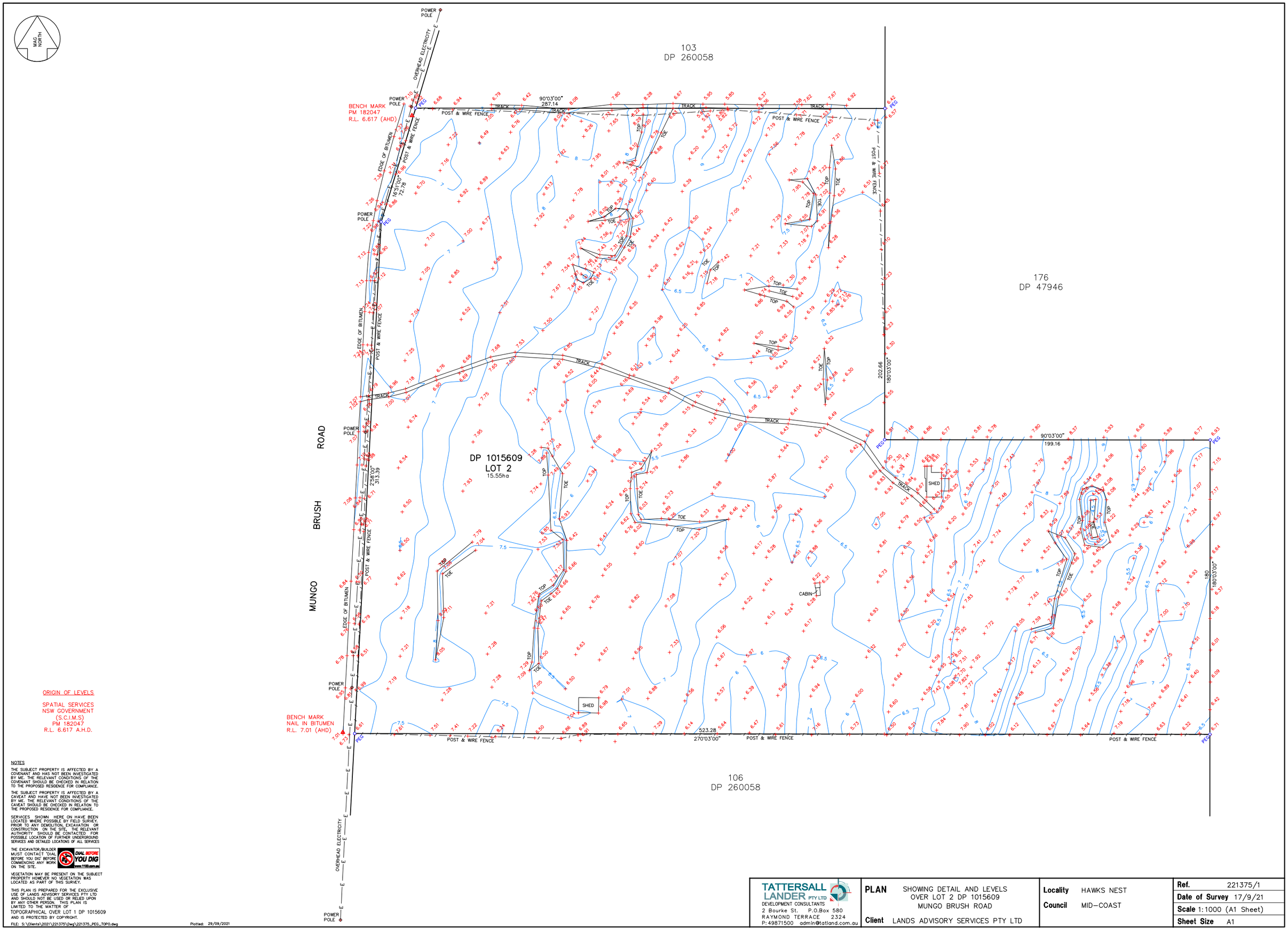
MUSIC Modelling Guidelines, 2018, Healthy Land and Water Limited & Water By Design

NSW MUSIC Modelling Guidelines, 2015, BMT WBM

Geotechnical Assessment – Lot 2 DP1015609 (288) Mungo Brush Road Hawks Nest, RGS50057.1-AB, 21 March 2023, Regional Geotechnical Solutions

WSUD Engineering Procedures: Stormwater, 2005, Melbourne Water

APPENDIX A: SITE DETAIL SURVEY



ORIGIN OF LEVELS

SPATIAL SERVICES
NSW GOVERNMENT
(S.C.I.M.S)
PM 182047
R.L. 6.617 A.H.D.

NOTES

THE SUBJECT PROPERTY IS AFFECTED BY A COVENANT AND HAS NOT BEEN INVESTIGATED BY ME. THE RELEVANT CONDITIONS OF THE COVENANT SHOULD BE CHECKED IN RELATION TO THE PROPOSED RESIDENCE FOR COMPLIANCE.

THE SUBJECT PROPERTY IS AFFECTED BY A CAVEAT AND HAVE NOT BEEN INVESTIGATED BY ME. THE RELEVANT CONDITIONS OF THE CAVEAT SHOULD BE CHECKED IN RELATION TO THE PROPOSED RESIDENCE FOR COMPLIANCE.

SERVICES SHOWN HERE ON HAVE BEEN LOCATED WHERE POSSIBLE BY FIELD SURVEY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR POSSIBLE LOCATION OF FURTHER UNDERGROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES

THE EXCAVATOR/BUILDER MUST CONTACT "DIAL BEFORE YOU DIG" BEFORE COMMENCING ANY WORK ON THE SITE.

DIAL BEFORE YOU DIG www.1100.com.au

VEGETATION MAY BE PRESENT ON THE SUBJECT PROPERTY HOWEVER NO VEGETATION WAS LOCATED AS PART OF THIS SURVEY.

THIS PLAN IS PREPARED FOR THE EXCLUSIVE USE OF LANDS ADVISORY SERVICES PTY LTD AND SHOULD NOT BE USED OR RELIED UPON BY ANY OTHER PERSON. THIS PLAN IS LIMITED TO THE MATTER OF

TOPOGRAPHICAL OVER LOT 1 DP 1015609

AND IS PROTECTED BY COPYRIGHT.

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TATTERSALL LANDER PTY LTD
DEVELOPMENT CONSULTANTS
2 Bourke St. P.O.Box 580
RAYMOND TERRACE 2324
P: 49871500 admin@tatland.com.au

PLAN SHOWING DETAIL AND LEVELS OVER LOT 2 DP 1015609 MUNGO BRUSH ROAD

Client LANDS ADVISORY SERVICES PTY LTD

Locality HAWKS NEST

Council MID-COAST

Ref.	221375/1
Date of Survey	17/9/21
Scale	1:1000 (A1 Sheet)
Sheet Size	A1

APPENDIX B: PROPOSED LAYOUT & DETAIL PLANS

LEGEND

- DENOTES FLOW DIRECTION
- DENOTES CATCHMENT BOUNDARIES
- DENOTES BIOFILTRATION AREA
- DENOTES PRIMARY INFILTRATION AREA
- DENOTES SECONDARY INFILTRATION AREA 5.5-6.4m AHD APPROX 1.2ha

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
B	Revised Layout Concept	AV	AV			draft
A	Original Issue	AV	AV	DS	BL	6/5/22

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ENGINEERING, SURVEYING & PLANNING
2 Bourke St. P.O.Box 580
RAYMOND TERRACE 2324
Fax (02) 49871733 Phone (02) 49871500

STORMWATER CONCEPT PLAN
PROPOSED TOURIST PARK
LOT 2 DP 1015609
288 MUNGO BRUSH ROAD, HAWKS NEST

COUNCIL: Midcoast		REFERENCE: 2220008	
PARISH		SHEET SIZE	A3
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DATE: Plotted 19/5/23 3:32PM			
CLIENT:	JOB No.: 221375	COMPUTER FILE : S:\Clients\2021\221375\Dwg\221375 Concept Design Plans.dwg	

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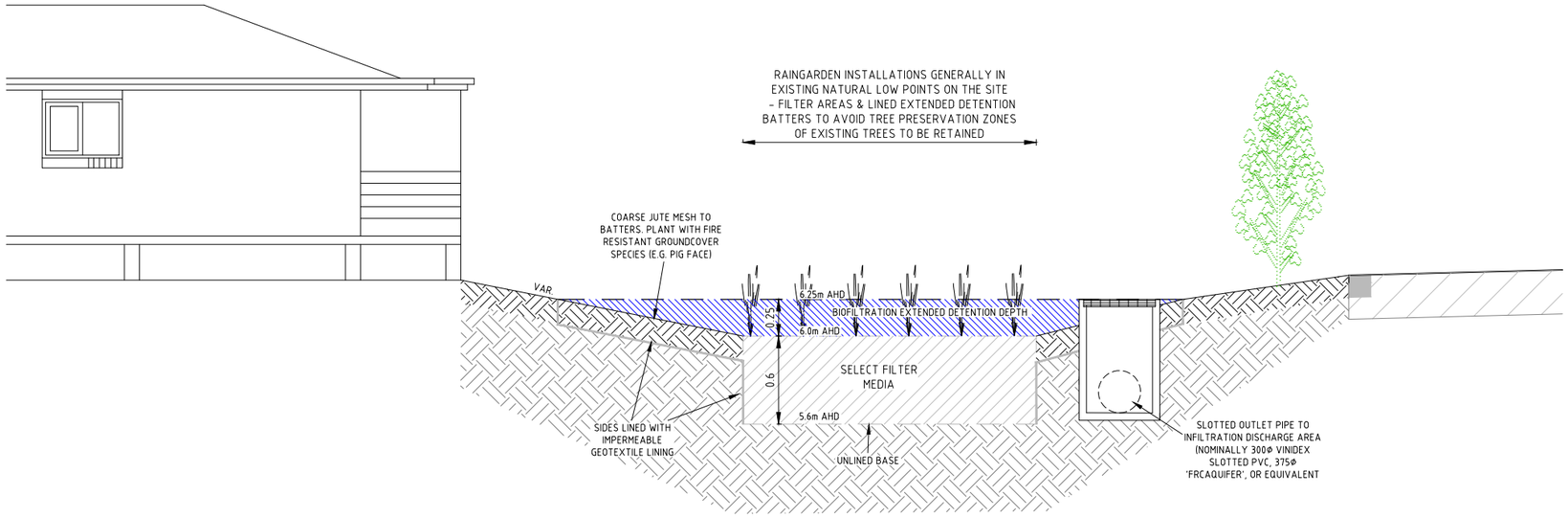
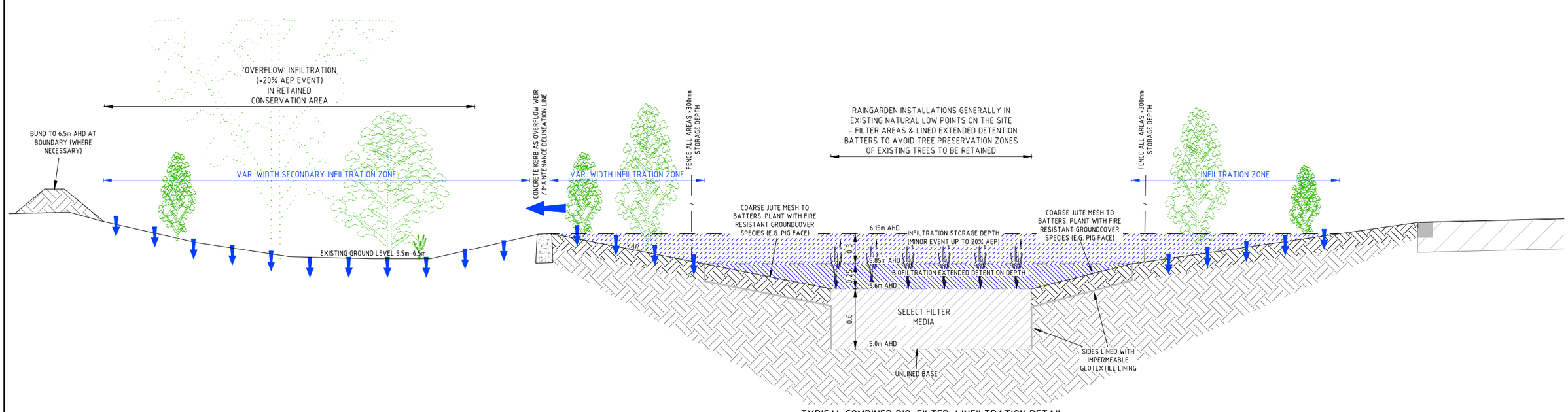


TYPICAL BIO-FILTER DETAIL

SCALE 1:40



TYPICAL COMBINED BIO-FILTER / INFILTRATION DETAIL

SCALE 1:40

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
B	Revised Layout Concept	AV	AV			draft
A	Original Issue	AV	AV	DS	BL	6/5/22

TATTERSALL LANDER Pty Ltd
DEVELOPMENT CONSULTANTS

SCALE : 0 2.5 5m (1:500 for A3 Size Plot)

SHEET No. : 1

FILE : 2220011

JOB No.: 221375

DATE:Plotted 19/5/23 3:31PM

SHEET SIZE A3

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APPENDIX C: BIOFILTER MAINTENANCE TASKS

A. Filter Media Tasks

Sediment Deposition	Remove sediment build up from the surface of bioretention swales Frequency – 3 monthly after rain
Holes or scour	Infill any holes in the filter media. Check for erosion or scour and repair, provide energy dissipation (rocks & pebbles etc) if necessary Frequency – 3 monthly after rain
Filter media surface porosity	Inspect for the accumulation of an impermeable layer (such as oily or clayey sediment) that may have formed on the surface of the filter media. A symptom may be that water remains ponded in the swale for more than a few hours after a rain event. Repair minor accumulations by raking away any mulch on the surface and scarifying the surface of the filter media between plants Frequency – 3 monthly after rain
Litter Control	Check for litter (including organic litter) in and around bioretention swales. Remove both organic and anthropogenic litter to ensure flow paths and infiltration through the filter media are not hindered. Frequency – 3 monthly after rain

B. Horticultural Tasks

Pests and Diseases	Assess plants for disease, pest infection, stunted growth or senescent plants. Treat or replace as necessary. Reduced plant density reduces pollutant removal and infiltration performance Frequency – 3 monthly after rain
Maintain original plant densities	Inspect condition of all plants. Replace and dead plants immediately to maintain a minimum density of 4 plants per square metre Frequency – 3 monthly after rain
Drought / Extreme Heat	In periods of prolonged drought or extreme heat, the condition of plantings and site lawn coverage should to be monitored for signs of stress. Watering may be required to ensure plant survival Frequency – As required

Weeds	It is important to identify the presence of any rapidly spreading weeds as they occur. The presence of such weeds can reduce dominate species distributions and diminish aesthetics. Weed species can also compromise the systems long term performance. Inspect for and manually remove weed species. Application of herbicide should be limited to a wand or restrictive spot spraying due to the fact that the swales are directly connected to the stormwater system Frequency – 3 monthly after rain
Grassed buffer strip	Grassed buffer strips treat runoff as it flows off the roads, before it enters the bioretention swales. Maintaining a healthy grass cover is important, but the use of fertilisers should be kept to a minimum given their proximity to the drainage network
Lawn Fertiliser	Healthy site grass coverage is important for pollutant treatment, topsoil erosion control and aesthetics. However, if not correctly used, fertilisers can damage the downstream environment. A low Phosphorus fertiliser with restricted leaching properties such as a Fused Calcium Magnesium Phosphate or TNN Industries 'Formula 1', or equivalent is ideal. The application of fertiliser should be restricted to a maximum of twice a year

C. Drainage Tasks

Perforated Pipe	Ensure that perforated pipes are not blocked to prevent filter media and plants from becoming waterlogged. A small steady clear flow of water may be observed discharging from the perforated pipe at its connection into the downstream pit some hours after rainfall. Note that smaller rainfall events after dry weather may be completely absorbed by the filter media and not result in flow. Remote camera (eg CCTV) inspection of pipelines for blockage and structural integrity could be useful. Flushing of lines from the flushing points may be required. Frequency – 6 monthly after rain
High flow inlet pits, overflow pits and other stormwater junction pits	Ensure inflow areas and grates over pits are clear of litter and debris and in good and safe condition. A blocked grate would cause nuisance flooding of adjoining areas. Inspect for dislodged or damaged pit covers and ensure general structural integrity. Remove sediment from pits and entry sites (likely to be an irregular occurrence in mature catchment). Frequency – monthly and occasionally after rain

Appendix I – BDAR Checklist

Stage 1: Biodiversity assessment checklist

BAM Reference	Information	BDAR Section	Completed
Report			
Introduction - Chapters 2 and 3	Introduction to the biodiversity assessment including: • brief description of proposed development	1.1 – Introduction; 1.1.3 – The Proposal	Yes
	• identification of subject land boundary, including: operational footprint (if BDAR), construction	Figure 1 Site Map	Yes
	• footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR), land proposed for biodiversity certification (if BDAR)	1.1.3 – The Proposal 2.2.1 - Project Design, Construction & Operation	Yes
	• general description of the subject land	1.1.4 - Site Particulars	Yes
	• sources of information used in the assessment, including reports and spatial data	1.1.5 - Information Sources	Yes
	• Sources of information used in the assessment, including reports and spatial data	1.1.5 - Information Sources	Yes
	• Identification of assessment method applied (i.e. linear or site-based)	1.1.2 – Assessment Scope	Yes
Landscape - Section 3.1, 3.2 and Appendix E	General description of subject land topographic and hydrological setting, geology and soils	Figure 2; 1.2 Landscape Features	Yes
	• Percent native vegetation cover in the assessment area (as described in BAM Subsection 3.2).	1.3.1 - Landscape Native Vegetation Cover	Yes
	• IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	1.2.1 - Regional Landscapes	Yes
	• Rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	Figure 2; 1.2.2 - Identified Landscape Features	Yes
	• Wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	1.2.2 - Identified Landscape Features	Yes
	• Connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	1.2.2 - Identified Landscape Features	Yes

BAM Reference	Information	BDAR Section	Completed
	• Karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.)	1.2.2 - Identified Landscape Features	Yes
	• Areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(8-9.))	1.2.2 - Identified Landscape Features	Yes
	• Any additional landscape features identified in any SEARs for the proposal	1.2.2 - Identified Landscape Features	Yes
	• NSW (Mitchell) landscape on which the subject land occurs	1.2.2 - Regional Landscapes; Figure 2	Yes
Native vegetation, Chapter 4, Appendix A and Appendix H	Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	1.2.2 - Identified Landscape Features; 1.3.1 - Landscape Native Vegetation Cover; Figure 2	Yes
	Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	1.4 – Native Vegetation	Yes
	Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	1.4.1 - Regional Mapping; Figure 3	Yes
	Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	1.5.4.2 Flora Field Survey; 1.5.3 – Species Credit Species	Yes
	Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	1.4 – Native Vegetation	Yes
	For each PCT within the subject land, describe: • vegetation class	Table 4 – PCT Determination	Yes
	• extent (ha) within subject land	Table 5 – Summary of Vegetation Zones Areas	Yes
	• evidence used to identify a PCT including any analyses undertaken, references/sources,	1.4.1 - Regional Mapping; Table 4 - PCT Selection Justification; Table 2	Yes

BAM Reference	Information	BDAR Section	Completed
	• existing vegetation maps (BAM Section 4.2(1–3.))	1.4.1 - Regional Mapping; Figure 4 – Groundtruthed Mapping	Yes
	• plant species relied upon for identification of the PCT and relative abundance of each species	Table 4 – PCT Determination	Yes
	• if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	Table 4 – PCT Determination	Yes
	• estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.))	Table 4 – PCT Determination	Yes
	Describe the vegetation integrity assessment of the subject land, including: • identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	1.4.4 – Vegetation Integrity Assessment; Table 6 – Vegetation Integrity Scores; Figure 4 – Groundtruthed Vegetation	Yes
	• assessment of patch size (as described in BAM Subsection 4.3.2)	Table 6 – Vegetation Integrity Assessment	Yes
	• survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	1.4.4 – Vegetation Integrity Assessment;	Yes
	• use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	Table 6 – Vegetation Integrity Scores; Figure 4 – Groundtruthed Vegetation	Yes
	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 • provide written confirmation from the decision-maker that they support the use of local benchmark data	1.4.4 – Vegetation Integrity Assessment; Table 6 – Vegetation Integrity Scores; Figure 4 – Groundtruthed Vegetation	Yes
	Identify ecosystem credit species likely to occur on the subject land, including:	1.5 – Threatened Species;	Yes

BAM Reference	Information	BDAR Section	Completed
Threatened Species, Chapter 5	• list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.)) • justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification for addition of any ecosystem credit species to the list	Table 7 – Predicted Ecosystem Credit Species; 1.5.3 – Threatened Species Survey Efforts Table 9	
	Identify species credit species likely to occur on the subject land, including: • list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1) • justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) • justification for addition of any species credit species to the list	Table 8 – Species Credit Species and SAII Species 1.5.4.4 – Incidental Observations	Yes
	From the list of candidate species credit species, identify: • species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) • species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) • species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.)) • species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.))	Table 8 – Candidate Species Credit Species	Yes
	Present the outcomes of species credit species assessments from: • threatened species survey (as described in BAM Section 5.2.4) • expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Section 5.2.4 and 5.3, Box 3)	Table 8 – Candidate Species Credit Species; Appendix C; Table 10 – Species Credit Species	Yes
	Where survey has been undertaken include detailed information on: • survey method and effort, (as described in BAM Section 5.3) • justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published	Table 8 – Candidate Species Credit Species; 1.5.4.4 – Incidental Observations	Yes

BAM Reference	Information	BDAR Section	Completed
	• timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys • survey personnel and relevant experience • describe any limitations to surveys and how these were addressed/overcome		
	Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include: • justification of the use of an expert report • identify the expert, provide evidence of their expert credentials and Departmental approval of expert status • all requirements of Box 3 have been addressed in the expert report	N/A	N/A
	Where use of local data is proposed (BAM Subsection 1.4.2): • identify relevant species • identify data to be amended • identify source of information for local data, e.g. published literature, additional survey data, etc. • justify use of local data in preference to VIS Classification or TBDC data • provide written confirmation from the decision-maker that they support the use of local data	N/A	N/A
	Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that: • the unit of measure for each species is documented for species assessed by area: • the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5) • a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied for species assessed by counts of individuals: • the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.)) • the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken • the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	Table 8 – Candidate Species Credit Species page 43; Figure 15; 2.4.2.2 Species Credits	Yes

BAM Reference	Information	BDAR Section	Completed
	Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)		
Prescribed impacts - Chapter 6	Identify potential prescribed biodiversity impacts on threatened entities, including: • karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) • occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) • corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) • water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4) • protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5) • where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	1.2.2 - Identified Landscape Features; Table 13 – Prescribed Impact Assessment Avoidance and Minimisation; Table 14 – Direct Impact Assessment; Table 15 – Prescribed Impact Assessment	Yes
	Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Table 15 – Prescribed Impact Assessment	Yes
	Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3)	Table 15 – Prescribed Impact Assessment	Yes
	Where the proposed development is for a wind farm: • identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5) • provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.) • predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	Table 15 – Prescribed Impact Assessment	Yes

BAM Reference	Information	BDAR Section	Completed
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)	Figure 1 – Site Map	Yes
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	Figure 1 – Site Map	Yes
	Location Map • digital aerial photography at 1:1,000 scale or finer • boundary of subject land • assessment area (i.e. the subject land and either 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	Figure 2 – Location Map	Yes
	Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or r Location map include: • IBRA bioregions and subregions • rivers, streams and estuaries • wetlands and important wetlands • connectivity of different areas of habitat • karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features • areas of outstanding biodiversity value occurring on the subject land and assessment area • any additional landscape features identified in any SEARs for the proposal • NSW (Mitchell) landscape on which the subject land occurs	Figure 2 – Location Map	Yes
Native vegetation, Chapter 4, Appendix A and Appendix H	Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 4 – Groundtruthed Vegetation Mapping	Yes
	Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 4 – Groundtruthed Vegetation Mapping	Yes

BAM Reference	Information	BDAR Section	Completed
	Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries	Figure 4 – Groundtruthed Vegetation Mapping	Yes
	Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 4 – Groundtruthed Vegetation Mapping	Yes
	Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figure 4 – Groundtruthed Vegetation Mapping Table 5 – Summary of Vegetation Zone Areas	Yes
Prescribed impacts Chapter 6	Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	n/a	
	Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	n/a	
Tables			
Native vegetation, Chapter 4, Appendix A and Appendix H	Table of current vegetation integrity scores for each vegetation zone within the site and including: • composition condition score • structure condition score • function condition score • presence of hollow bearing trees	Table 6 - Vegetation Integrity Score Table	Yes
Threatened Species, Chapter 5	Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and identifying: • the ecosystem credit species removed from the list • the sensitivity to gain class of each species	Table 7 – Predicted Ecosystem Credit Species	Yes
	Table detailing species credit species in accordance with BAM section 5.2 and identifying: • the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present	Table 8 – Candidate Species Credit Species	Yes

BAM Reference	Information	BDAR Section	Completed
	• the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map		
	Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	Table 8 – Candidate Species Credit Species	Yes
Prescribed impacts Chapter 6	Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	Table 8 – Candidate Species Credit Species	Yes
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., subject land and 1500 m buffer area) boundary • cadastral boundary of subject land • areas of native vegetation cover • landscape features	Attached files	Yes
Native vegetation, Chapter 4, Appendix A and Appendix H	All report maps as separate jpeg files • Plot field data (MS Excel format) • Plot field data sheets		
	Digital shape files of: • PCT boundaries within subject land • TEC boundaries within subject land • vegetation zone boundaries within subject land • floristic vegetation survey and vegetation integrity plot locations		
Threatened Species, Chapter 5	Digital shape files of suitable habitat identified for survey for each candidate species credit species		
	Survey locations including GPS coordinates of any plots, transects, grids		
	Digital shape files of each species polygon including GPS coordinates of located individual		

BAM Reference	Information	BDAR Section	Completed
	Species polygon map in jpeg format		
	Expert reports and any supporting data used to support conclusions of the expert report		
	Field data sheets detailing survey information including prevailing conditions, date, time, equipment used, etc		
Prescribed impacts Chapter 6	• Digital shape files of prescribed impact feature locations • Prescribed impact features map in jpeg format		

Stage 2 Checklist

BAM Reference	Information	BDAR Section	Completed
Report			
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 • routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route • 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	2.1 Avoid & Minimise Impacts; Table 12 – Avoid and Minimise Impacts on Biodiversity Values; Table 13 – Prescribed Impact Avoidance and Minimisation; Table 15 – Prescribed Impact Assessment 1.5.5.1 Habitat Trees	Yes
	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)	2.1 Avoid and Minimise Impacts; Table 13 – Avoid and Minimise Impacts on Biodiversity Values; Table 13 Impact Avoidance and Minimisation;	Yes

BAM Reference	Information	BDAR Section	Completed
		Table 14 Prescribed Impact Avoidance and Minimisation	
	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.))	2.1 Avoid and Minimise Impacts; Table 12 – Avoid and Minimise Impacts on Biodiversity Values; Table 13 – Prescribed Impact Avoidance and Minimisation; Table 15 – Prescribed Impact Assessment	Yes
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	2.3 Assessment of Impacts; Table 13 – Prescribed Impact Avoidance and Minimisation Table 14 Direct Impact Assessment; Table 15 – Prescribed Impact Assessment	Yes
	Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2): ● description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal ● documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications ● reporting any limitations or assumptions, etc. made during the assessment ● identification of the threatened entities and their habitat likely to be affected	2.3 Assessment of Impacts Table 13 – Prescribed Impact Avoidance and Minimisation; Table 16 Indirect Impact Assessment	Yes
	Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including: assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with: ● karst, caves, crevices, cliffs, rocks and other features of geological significance ● human-made structures ● non-native vegetation ● connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range ● movement of threatened species that maintains their life cycle	1.2.2 - Identified Landscape Features; Table 8 – Species Credit Species and SAII Species; Table 13 – Prescribed Impact Avoidance and Minimisation; Table 14 Direct Impact Assessment; Table 15 – Prescribed Impact Assessment	Yes

BAM Reference	Information	BDAR Section	Completed
	• water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities assessment of the impacts of wind turbine strikes on protected animals assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC		
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 Sections 8.4 and 8.5, including: • 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	2.1 Avoid and Minimise Impacts; 2.2.1 Project Design, Construction & Operation; Table 13 Prescribed Impact Avoidance and Minimisation Table 14 Direct Impact Assessment Table 15 Prescribed Impact Assessment Table 16 Indirect Impact Assessment Table 17 Residual Impact Assessment	Yes
	Identification of measures for mitigating impacts related to: • displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) • 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)	2.1 Avoid and Minimise Impacts Tables 12-21	Yes
	Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	2.1 Avoid and Minimise Impacts Tables 12-17	Yes
Impact Summary - Chapter 9	Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including: • addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land • addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	2.4 Impact Summary 2.4.1 Serious and Irreversible Impacts (SAIIs)	Yes

BAM Reference	Information	BDAR Section	Completed
	• documenting assumptions made and/or limitations to information • documenting all sources of data, information, references used or consulted • clearly justifying why any criteria could not be addressed		
	Identification of impacts requiring offset in accordance with BAM Section 9.2	2.4.2.2 Species Credits	Yes
	Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	2.4.3 Areas not requiring assessment	Yes
	Identification of areas not requiring assessment in accordance with BAM Section 9.3	2.4.3 Areas not requiring assessment	Yes
Biodiversity credit report – Chapter 10	Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	2.4.2.2 Species Credits 2.5 Biodiversity Credit Report Appendix E - Biodiversity Credit Report	Yes
Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J	Land-based conservation measures including (strategic biodiversity certification only): • identification of parcels subject to land-based conservation measures • identification of land-based conservation measures proposed for each parcel • supporting information to demonstrate suitability of land-based conservation measures (Appendix J) • credit score of land-based conservation measures (Appendix J)	2.5 Biodiversity Credit Report Appendix G Other Legislation	Yes
	Biodiversity certification strategy including: • land proposed for biodiversity certification • land proposed for biodiversity conservation • proposed conservation measures • legal mechanisms for securing delivery of proposed conservation measures • parties to the biodiversity certification and responsibilities, noting where biodiversity certification agreements are proposed • timing for delivery of conservation measures • funding sources for delivery of conservation measures • framework for monitoring, reporting or auditing implementation of conservation measures	N/A	

BAM Reference	Information	BDAR Section	Completed
Maps			
Avoid and minimise impacts – Chapter 7	Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	N/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		
Impact Summary – Chapter 9	Map showing the extent of TECs at risk of an SAII within the subject land	N/A	Yes
	Map showing location of threatened species at risk of an SAII within the subject land	N/A	
	Map showing location of: ● impacts requiring offset ● impacts not requiring offset ● areas not requiring assessment	Figure 3 Regional Vegetation Figure 4 Ground truthed Vegetation and BAM Plots	Yes
Impact Summary - Chapter 10	No Maps		
Biodiversity credit report – Chapter 10	No Maps		
Biodiversity certification offsets and strategy (Biodiversity Certification only) - Chapter 12 and Appendix J	Maps of parcels of land proposed for land-based conservation measures	N/A	
	Maps as per Appendix M as required in relation to any land-based conservation measures	N/A	

BAM Reference	Information	BDAR Section	Completed
Tables			
Avoid and minimise impacts – Chapter 7	Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Tables 12 - 17	Yes
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	Table 6 - Vegetation Integrity Score; Table 12 Impact Avoidance and Minimisation; Table 21 Ecosystem Credit Requirements	Yes
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	Table of measures to be implemented to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Tables 12 - 17	Yes
Impact Summary - Chapter 9	No Tables		
Impact Summary - Chapter 10	Table of PCTs requiring offset and the number of ecosystem credits required	Table 20 - Ecosystem Credit Requirements	Yes
	Table of threatened species requiring offset and the number of species credits required	Table 21 - Species Credit Requirements	Yes
Biodiversity credit report – Chapter 10	Table of credit class and matching credit profile	Appendix E -	
Biodiversity certification offsets and strategy (biodiversity certification only)	Tables as per Appendix M as required in relation to any land-based conservation measures	N/A	
	Table of credit scores for land-based conservation measures, including scores produced by BAM and weighting adjusted scores as per Appendix J	N/A	
Data			
Avoid and minimise impacts – Chapter 7	Digital shape files of: ● final proposal footprint ● direct and indirect impact zones	Attached files	Yes

BAM Reference	Information	BDAR Section	Completed
	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		
Impact Summary - Chapter 9	Digital shape files of: ● extent of TECs at risk of an SAII within the subject land ● location of 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		Yes
	Maps in jpeg format		
Impact Summary - Chapter 10	Submitted proposal in the BAM Calculator		Yes
Biodiversity credit report – Chapter 10	BAM credit report in pdf format		Yes
Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J	Digital shape files of parcels of land proposed for land-based conservation measures		N/A
	Maps in jpeg format		N/A

Appendix J – 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

- 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).

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**

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)

SARAH CURRIE

Curriculum Vitae

Sarah works with AEP in the role of Ecologist. She is a graduate of environmental science and management, she conducted ecological field studies as a requirement of her degree courses gaining experience in the field. Her ecological knowledge and experience is utilised in a diverse array of applications in her current role.

Qualifications

- Bachelor Environmental Science & Management (Marine) University of Newcastle (2020)

Further Education & Training

- NSW Class C Driver's Licence

Fields of Competence

- Ecological field survey, covering terrestrial flora and fauna
- Growing proficiency at botanical surveys

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, planning services, advices, strategy and representation. Expanding knowledge of field survey methodology, report writing, mapping and data manipulation.

STEVIE KAY
Curriculum Vitae

Stevie works with AEP in the role of Ecologist. Whilst studying at the University of Newcastle he conducted ecological field studies as a requirement of his degree courses. Working for NSW Department of Primary Industries (NSW DPI) at Port Stephens Fisheries Institute he gained further experience in ecological field surveys as a field technician and project officer. He has experience in targeted fauna and flora surveys, Koala Spot Assessment Technique (SAT) surveys and tree surveys.

Qualifications

- Bachelor of Science (Marine Science), University of Newcastle (2003)

Further Education & Training

- Senior First Aid
- Class C NSW Drivers Licence
- Work at Heights
- 4WD Safe Driving
- Construction White Card

Fields of Competence

- Aquatic vegetation and fish survey
- Terrestrial fauna survey, including koala SAT surveys and spotlighting

Relevant Employment History

Feb 2020 – Current	**Ecologist**
	Anderson Environment & Planning, Newcastle
Nov 2016 – May 2017	**Observer**
	NSW DPI Fisheries
Jan 2002 – Feb 2009	**Technician/Project Officer**
	NSW DPI Fisheries
Sept 2010 – Feb 2020	**Facilitator**
	Pinnacle Team Events

Relevant Volunteer Experience

- Bush Regeneration Volunteer, Hunter Indigenous Plants
- Permaculture Design, various locations

ANGELA METCALFE

Curriculum Vitae

Angela works with AEP in the role of Ecologist. She graduated with a Bachelor of Environmental Science and Management (Honours), majoring in Ecosystems and Biodiversity. Angela has previously worked in bush regeneration before coming to AEP. Angela has experience in a variety of environmental work, both paid and unpaid in, flora and fauna terrestrial and aquatic field surveys, reporting, GIS and mapping and habitat restoration. Her background in ecological surveying projects and growing flora knowledge and experience is utilised in a diverse array of applications in her current role.

Qualifications

- Bachelor of Environmental Science and Management (Honours) (Ecosystems and Biodiversity) – University of Newcastle (2020)

Further Education & Training

- Class C NSW Driver's Licence
- NSW Construction White Card
- First Aid (Provide first aid HLTAID003)
- Chemcert and EPA ground applicator licence

Fields of Competence

- GIS and remote sensing
- Ecological field survey, covering terrestrial fauna and flora
- Experience in reptile handling and fauna trapping
- Growing proficiency in botanical surveys
- Adept experience in operating 4x4 vehicles

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. Expanding knowledge of field survey methodology, report writing, mapping and data manipulation.

2020 **Conservation Field Officer**
SkyLand Management, Bolwarra Heights

2019 **Research Assistant**
University of Newcastle, Callaghan

THOMAS STEPHENS

Curriculum Vitae

Thomas works with AEP in the role of Ecologist. He is a graduate of environmental science and management, and has industry experience 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 and Management (Sustainability), The University of Newcastle (2021)

Further Education & Training

- Class C NSW Driver's License
- Work Health & Safety General Construction Induction
- Senior First Aid
- Work Safely at Heights
- Tree Access Systems Level 1

Fields of Competence

- Ecological field surveys
- Fauna surveys and trapping
- Natural resource management
- Nest box installation
- Adept experience in operating 4x4 vehicles

Relevant Employment History

March 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.

January 2022 – April 2022 — **Ecologist**
Active Green Services, NSW

August 2021 – January 2022 — **Ecologist and Bushfire Consultant**
Firebird ecoSultants, Newcastle

Relevant Volunteer Experience

- Industry Placement (National Parks and Wildlife Service, 2020-2021)

SEBASTIEN DOLEAC

Curriculum Vitae

Sebastien works with AEP in the role of Ecologist. Whilst studying at Macquarie University, he conducted research in restoration ecology as a requirement of his degree courses and graduated with a Master of Conservation Biology and Master of Research. Working as a volunteer for the Hunter Region Landcare Network in the greater Hunter, he gained further experience in ecological field surveys, scientific communication, project management, environmental education and mapping as a volunteer project officer. He has experience in targeted flora and fauna surveys, mapping, project management and data analysis.

Qualifications

- B. Science (Biology), University of La Rochelle, FRANCE (2020)
- M. Conservation Biology, Macquarie University (2022)
- M. Research (Restoration Ecology), Macquarie University (2023)

Further Education & Training

- Master of Research, Macquarie University, 2023
- Master of Conservation Biology, 2022

  Global Leadership program, Macquarie University, 2020-2022.
- Master of Environment, Macquarie University, 2020-2021
- Study Abroad, University of Newcastle, 2019-2020
- Bachelor of Science (Biology), La Rochelle University, FRANCE, 2017 – 2020

Ecological Field Experience

- Vegetation Assessment
- Water quality assessment
- Scientific communication
- Project management and budgeting
- Mapping (Esri, QGIS, MapInfo)
- Data management

Relevant Employment History

2022-Present	**Ecologist** Anderson Environment and Planning
Feb 2022 – Feb 2023	**Researcher** Macquarie University

- Investigated the efficiency of microbial amendments on three Australian native plant species to improve direct-seeding restoration work.
- Conducted a glasshouse experiment; extracted and analysed data.
- Managed, directed and budgeted the project from start to end.
- Adapted project to research challenges.

Jun 2021 – Nov 2021 **Research Intern**
Macquarie University

- Assisted researchers with data collection and data analysis.
- Composed a scientific report formatted for publication.
- Conferenced on diverse aspects of the projects.

Nov 2020 – Current **Volunteer Project Officer**
Hunter Region Landcare Network

- Advised and Counselled on major regional projects across the public and private sectors including regenerative farming projects and Aboriginal culture
- Collaborated with farmers, landcarers and local Aboriginal Land Councils on cross-cultural projects.
- Led and wrote Fauna Features to communicate scientific facts about Hunter Region native fauna to the general public.
- Conceptualised riparian vegetation maps on GIS software to identify vegetation communities of the Hunter Region
- Analysed bushfire impacts on the Hunter vegetation using NDVI and NBR on GIS software.
- Guided local communities on local endemic plant selection during the TOCAL Field Day.
- Extracted information on the past vegetation ecology and Aboriginal livelihood of the Hunter Region by reviewing archives and Aboriginal Dreaming Stories.
- Interviewed members of the Wollotuka Institute on their connections to the land for a major project.
- Participated to bush regeneration workshops

Volunteer Experience

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

Kathleen Bushell

Curriculum Vitae

Kathleen works with AEP in the role of Ecologist. She Graduated with a Bachelor of Science (Hons) majoring in Marine biology, terrestrial ecology, and conservation. Kathleen was a research assistant and involved with threatened species and Indigenous conservation management research at Newcastle University and an educator for Take 3. These experiences have provided experience in flora and fauna survey requirements, spatial surveying, mapping, research and reporting that contribute to the AEP team.

Qualifications

- Bachelor of Science (Hons), University of Newcastle, NSW. Marine Biology, terrestrial ecology, and conservation.

Further Education & Training

- Geographic Information Systems ArcGIS, QGIS various providers
- Class C NSW Driver's Licence
- NSW Construction White Card
- First Aid (Provide first aid HLTAID003)
- SSI Open Water Scuba Licence

Fields of Competence

- Experience operating 4x4 vehicles
- GIS and remote sensing
- Ecological field surveys
- Handling of fauna, fauna trapping, and microchipping fauna, including threatened species
- Marine and terrestrial quality surveys, sampling and analysis

Relevant Employment History

2022 – Present	**Ecologist** Anderson Environment & Planning, Newcastle
2022	**Casual Academic** The University of Newcastle, Newcastle
2017 – 2021	**Research Assistant** The University of Newcastle, Newcastle
2020 - 2021	**LiDAR Data Quality Analyst** Anditi, Newcastle
2018 - 2021	**Educator** Take 3 for the Sea, Central Coast

Volunteer Experience

- Educator – Irukandji Shark and Ray Centre, Nelson Bay
- GIS Analyst – Work placement, National Parks and Wildlife Services, Newcastle

BIODIVERSITY | BUSHFIRE | ARBORICULTURE

NEWCASTLE SYDNEY

Lands Advisory Services Pty Ltd

Attention: Brett Phillips

Date: 08 May 2024

Via Email: brett.phillips@landsas.com.au

Our Ref: 2397

Dear Brett,

Response to Request for Further Information for the Proposed Caravan Park to LOT: 2 DP: 1015609, 288 Mungo Brush Road Hawks Nest.

As requested, AEP has addressed the Request for Further Information (RFI) regarding the submitted Biodiversity Development Assessment Report (BDAR) for the above site, refer **Table 1**.

Table 1: Assessment of RFI

MidCoast Council Request	AEP Assessment
Core Koala Habitat / Individual Koala Plan of Management: Where core koala habitat has been identified, an Individual Koala Plan of Management must be provided as part of the Development Application. No IKPOM has been provided with this DA.	A Koala assessment was completed in the BDAR lodged in June 2023 (Section 1.5.7). During surveys undertaken by AEP, there were no sightings of the species within the Subject Site. Due to local records and using the precautionary principle the Subject Site has been assessed as core Koala Habitat. Refer to **Appendix G**. It is noted that during the additional surveys for forest owls AEP deployed our Conservation Detection Dog, Dash is trained on Koala and Owl Pellets. It should be noted that there was no koala detected, by the conservation detection dog.
Field survey adequacy: There is limited detail on the methods and specific results of the fauna field surveys. Fauna field survey surveys conducted on the land were not adequate in respect to the requirements of the BAM or other relevant references for the following species: Koala: song-meter surveys were undertaken outside the accepted koala calling season and other survey methods, such as detection dogs or thermal drones were not deployed.	As stated previously, survey completed by AEP did not find any use of the species within or using the area of the Subject Site. The proposal is positioned in core Koala habitat and has multiple sightings in the locality, the species have been assumed present. No additional surveys are required for this species. As such an AEPs Ecologists completed the following surveys to establish if Koalas were present within the Study Area: • Habitat Assessment - 26/07/2021, 27/07/2021; 02/05/2023; • Camera Trapping (x30) - 01/12/2021 deployed 15/12/2021 Rebaited 29/12/2021 Collected; • Spotlighting - 24/11/2021 25/11/2021; • SATs (x6) - 26/07/2021 27/07/2021; • Songmeter (x1) - 26/07/2021 27/07/2021; • Incidental surveys - July 2021 – March 2024; and • Conservation Dog deployment – March 2024.

MidCoast Council Request	AEP Assessment
Powerful owl: There is a recent record of a powerful owl reported within 350-metres of the site and a range of large sized hollows suitable for nesting. The BDAR unreasonably discounts the species as a subject species. There were inadequate call playback and stag-watching undertaken. There were also inadequate call playback surveys for masked owl and barking owl.	AEPs survey effort for Powerful Owl consisted of : • Foraging habitat and hollows are present. Targeted survey efforts including call playback and stagwatching of suitable hollows within the Subject Site, • 16 nights of songmeter was undertaken on site. AEP located a call of this species on the songmeter approx. 350m from Subject Site. • Targeted stagwaching and nocturnal surveys including call playback over two nights AEP failed to detect this species during recommended seasonality surveys within the site. In March, 2024 AEP undertook the following additional surveys for Forest Owls: • Ian Benson, undertook inspection via a camera on a pole of all suitable hollows looking for use / activity and suitability of hollows within the Subject Site. The results are within Table 10 of the BDAR. • The hollows that could not be surveyed using camera pole due to height or angle of hollow were inspected by two (2) of AEPs climbing Ecologist. . The results are within Table 10 of the BDAR. • AEP also deployed Conservation Detection Dog - Dash for both Owl and Koala, the results of the scent dog detection did not result in the detection of wither species within the Subject Site. • Therefore, it has been concluded there are no Forest Owls utilising the hollows within the subject Site.
Squirrel glider: There was inadequate stag-watching effort for this species. The location of the recorded observation is not shown on any figure.	The species was detected on Camera traps, hence presence on site was determined, no further effort was required as the species is present. Location of camera traps that detected the species is **Figure 15** within the BDAR.
Long-nosed potoroo: This species is a candidate species-credit species and there are local records and suitable habitat; but this species was not surveyed for or discussed.	AEP have added the species to the BAM – C and updated the BDAR. AEP undertook nocturnal surveys and deployed 30 Camera Traps, 10 of these were approx. 30 – 50cm from ground. AEP conclude that the species does not inhabit or utilise the Subject Site.
The flora and fauna field surveys did not detect the range of threatened species which have been identified in the proximal lands in equivalent habitats, including greater broad-nosed bat, eastern pygmy possum and eastern blossom bat; which are known from the locality and which the Public Inquiry made some detailed assessments of their local population significance. The surveys do not reliably inform the biodiversity values and significance of the area to be cleared and modified for the proposed development.	AEP has completed the required surveys as per the Survey Guidelines for Eastern Pygmy Possum. The results did not show that the site is being used by the species. Further hollow assessment was also conducted by AEP, refer Table 10 in the BDAR, the results of which did not show use by the species. The overall results of the required surveys within the required seasonal period by suitable qualified Ecologist did not result in the observation of these species. The Public inquiry was review by AEP staff and used to assist with species location and preferred habitat within the region. As stated above the Subject Site was surveyed in season and as per the guidelines and these species were not observed. Therefore, at the time of the surveys the biodiversity values for the Subject Site were assessed correctly and impacts from

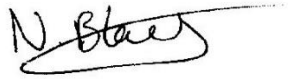
MidCoast Council Request	AEP Assessment
	the development have been assessed in accordance with the BAM and guidelines. As the BAM is applied these species were not detected hence, no species credits for these species can be applied to the proposal. Eastern Blossom Bat and Greater Broad-nosed Bat are associated with ecosystem credits. This is in relation to the habitat for the species that can occur within the Plant Community Type (PCTs). PCT 3544 – Coastal Sands Apple – Blackbutt Forest does not commensurate with either of the species requested. Anabat deployment was undertaken at the Subject Site and did not detect the species.
The DA cannot be positively determined from a biodiversity perspective because Part 7 of the BC Act and the Koala SEPP have not been adequately addressed. A Koala Plan of Management needs to be provided with the DA for consideration and the biodiversity surveys and assessments and the BDAR need to be revised and updated. When a IKPOM and a revised and updated BDAR is received, the DA can be further considered.	A Koala assessment was completed in the BDAR lodged in June 2023 (Section 1.5.7). During surveys undertaken by AEP, there were no sightings of the species within the Subject Site. Due to local records and using the precautionary principle the Subject Site has been assessed as core Koala Habitat. Refer to **Appendix G** for IKPOM.
Impact identification and evaluation: The full range of indirect impacts of this proposal were not identified or properly evaluated (including the effects of human activity, disturbance, pollution, etc). There is no adequate certainty or scientific evidence base that the habitats that surround the direct development footprint will be adequately protected from all direct and indirect biodiversity impacts, particularly those associated with noise / light / disturbance, edge-effects, etc).	Section 2.2.5 General Construction & Operation has been amended to include: • Production of a CEMP for Construction that the Project Ecologist will review for waste management, fencing, hygiene, dust, noise. • Operational Plan for the facility for the future operation Project Ecologist will review for waste management, fencing, hygiene, dust, noise. • Project Ecologist will review and provide letter of compliance for lighting plan to ensure there is no direct and spill of light into areas of significant habitat. Table 16 has been amended to include: Human distance and light spill effects has been amended. AEP has undertaken an Arborist Assessment to identify where HBTS can be retained and what measures need to be put in place to ensure protection of the trees during construction. The operation of the facility is intended to function with limited impact, with the feature of the Facility being Tread Lightly. With the implementation of the CEMP and Operation Procedures which will be reviewed and approved by the Project Ecologist the direct impacts are being addressed through retirement of credits and the indirect impacts are being addressed through measures to reduce or completely avoid. The measure that have been recommended in Tables 14 to 16 include:

MidCoast Council Request	AEP Assessment
	• Procedures both for construction and operational. • Hygiene controls throughout the facility; • Fencing for protection and control of people, that will also allow for fauna movement, • Installation of fauna proof bins; • Installation of education signs providing information of local species but also informing the users how to treat and look after them, such as no feeding wildlife for these reasons, no petting for these reasons, no picking flowers for these reasons, etc. • A light Plan will be prepared and reviewed / approved by Project Ecologist to ensure there is no light spill from the development that will impact corridors, HBTs, key foraging and nesting tree both within the site and adjoining retained land. The facility proposes to encourage and educate the visitors to use the above measures in their own lives.
The proposal considers that the design provides for the retention of all but 3 hollow-bearing trees, but there is no arboricultural evidence provided that the proposed tree retention of hollow-bearing trees within the development footprint is a) safe, in terms of the considerations for future occupiers of the development, and b) viable – given the likely proximity of works within tree protection zones. Additional investigations and details are required to prove that these hollow-bearing trees in the development footprint can be safely retained and that they won't be harmed by works associated with the development. Further detail is required to demonstrate that the native tree retention shown on the plans can be safely and viably achieved in the development. This requires an arboricultural assessment.	An Arboriculture Impact Assessment has been prepared.
Great Lakes DCP matters: An assessment of the matters identified in s4.1 of the Great Lakes DCP, comprising an evaluation of the development proposal and its impacts on the twenty (20) controls in that DCP was provided, but there are key limitations and deficiencies. For example: For s4.1.11, there is no explanation as to how the required biodiversity offsets will be secured as close as possible to the site not outside the bounds of the MidCoast LGA;	An assessment of the Great Lakes DCP Matters will be included in Appendix G – Other Legislation. This will outline the 20 controls in the DCP. From the examples listed: S4.1.11 The proposed development triggering the BOS. The BDAR has assessed the vegetation and listed species within the Subject Site to allow for the BAM -C to allocate the required credits for both Ecosystem Credits and Species Credit Species. The proponent will determine whether to purchase credits from the open market or pay into the Trust. The biodiversity offsetting scheme and calculations seeks to ensure that development and clearing in New South Wales proceeds in an environmentally sustainable manner and prevent unacceptable impacts on native ecosystems and species. Offsetting also provides an incentive to protect biodiversity on private land by providing an income to landholders with stewardship sites, enabling in-perpetuity biodiversity conservation outcomes to be achieved through private land conservation. The Study Area within the Lot is not sufficient t support a Stewardship Site.

MidCoast Council Request	AEP Assessment
	The scheme assesses impacts to biodiversity from development and gains at stewardship sites to a no net loss of standard, which is calculated using the Biodiversity Assessment Method. The Biodiversity Assessment Method provides a consistent method to assess impacts on biodiversity values from a proposed development, activity, clearing or biodiversity certification improvements in biodiversity values from management actions undertaken at a stewardship site. Biodiversity credit obligations are created at project impact sites. Credit obligations are generated when projects that have unavoidable impacts on biodiversity are approved. The credit obligation will set out the number and class of biodiversity credits that the developer or other proponent must retire to offset their proposal, generally before any impacts can commence. The proponents can meet their credit obligations by purchasing and retiring like-for-like credits, transferring their obligation to the Biodiversity Conservation Trust by paying into the Biodiversity Conservation Fund, or using variation rules or funding biodiversity conservation actions in certain circumstances. The like-for-like offset rules establish the types of biodiversity that may be used to offset impacted biodiversity in a 'like-for-like' manner. The like-for-like rules seek to ensure that biodiversity impacts are offset with very similar biodiversity to those impacted. Like-for-like rules for native vegetation (ecosystem credits). Impacts on native vegetation must be offset with vegetation in the same local area as the impact based on near or adjacent IBRA subregions within 100 kilometres of the outer edge of the impacted site and for threatened ecological communities, the offset must be for the same threatened ecological community for native vegetation not a threatened ecological community, the offset must be vegetation that is the same vegetation class and in the same or higher offset trading group. As describe above the BAM ensures offsets are like for like and within the IBRA Subregional.
For s4.1.13, there is no information provided that confirms that the development can preserve the hollow-bearing trees located within the development footprint and that such preservation is safe for the future occupiers of the park. Arboricultural details are required in relation to SULE ratings and Tree Protection Zones.	s4.1.13, As stated above, an Arboriculture Impact Assessment is proposed to be completed by AEP. This will determine the impact of the retained trees by the proposed development footprint.

Should you require any further clarification on this matter, please contact the writer or Craig Anderson (AEP Director – 0418 681 581).

Regards



Natalie Black

Senior Environmental Manager

BAAS: 19076

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