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Ecological Assessment Report

Proposed upgrade and realignment of Sewer Services along Brolga Way, Hue Hue Road, and Alison Road in Wyong NSW



Prepared for:

Ampol Australia Petroleum Pty Ltd

c/- Mostyn Copper

7 November 2024

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EXECUTIVE SUMMARY

Anderson Environment and Planning (AEP) was commissioned by Ampol Australia Petroleum Pty Ltd c/- Mostyn Copper to undertake an Ecological Assessment Report (EAR) for proposed upgrades and realignment of sewer services along several main roads in Wyong.

The works will incorporate minimal-impact; trenchless Horizontal Directional Drilling (HDD), referred to as 'Underboring' in this report. This technique is used to minimise impacts on native vegetation, retain the trees in the path of the alignment, and to allow all intersections with biodiversity values (BV) mapped land to be avoided. Where trenching is required, an Arborist Assessment Report (AAR, AEP 2024) has provided the locations required for soft excavation and advice to enable the retention of all trees along the alignment.

The linear area proposed for the alignment spans 4.5kms from Northwest to Southeast. Applying the precautionary principal, this has been buffered by 2.5m either side, and 5.5m where existing pits are located, being wider than the maximum width of impacts as indicated by the hydro engineers. Starting at Lot 41/-/DP814963, the alignment follows the road reserve along the south side of Brolga Way, west side of Hue Hue Road, and south side of Alison Way, Wyong NSW.

This report is specifically intended to indicate the likelihood of the proposed upgrades to have a significant impact on potentially occurring threatened species or ecological communities. In this regard, the report aims to recognise the relevant requirements of the *Environmental Planning & Assessment Act 1979*, the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Study Area consists of the entire alignment area, which totals approximately 2.43ha, of which only 0.06ha of remnant native vegetation is expected to be removed via trenching works, and at the location of access pits enabling underboring works to occur. The majority of the Study Area was determined to be disturbed road reserve vegetation, and areas with existing servicing and road infrastructure, which are subject to ongoing management and disturbance.

Ground-truthing of the vegetation present within the linear Study Area confirmed that it is most likely associated with the following PCTs:

- PCT 3250 - *Northern Foothills Blackbutt Grassy Forest*; and
- PCT 3433 - *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*. This vegetation community is associated, but, unlikely to be commensurate with the Endangered Ecological Community (EEC) *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*.

Fauna species recorded were typical of those expected in this locality and in this type of degraded remnant habitat with minimal existing connection to larger patches of habitat offsite. No threatened fauna species were recorded within the Study Area. As a result, it is anticipated that no significant impacts are likely to occur as a result of the proposal.

The Study Area contains two mapped areas of Biodiversity Values Land (BV Mapped) within the northern and southern portions of the proposed alignment areas; however as above, all intersections will be avoided with the use of underboring, therefore no impacts to BV mapped lands are proposed as a result of the development.

Assessment under the 5-part test determined that no significant impacts upon threatened entities listed under the BC Act are likely to occur if mitigation measures are implemented, and consideration of the EPBC Act revealed that impacts on Matters of National Environmental Significance are unlikely occur, and a referral to the Commonwealth is not required.

Assessment under the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (BC SEPP) revealed that the Subject Site contains preferred Koala Feed Trees, as listed within Schedule 2 of SEPP 2021. Spot Assessment Technique (SAT) and nocturnal survey did not observe Koala activity on site and the paucity of local records concludes that the site is not considered to be "Core Koala Habitat" as defined within the policy and no further assessment or management is required for koalas.

Assessments under the *Biodiversity Conservation Act 2016* (BC Act), *Environmental Protection Biodiversity Conservation Act 1999* (EPBC Act), *State Environmental Planning Policy (Biodiversity and*

Conservation) 2021 (BC SEPP) and *State Environmental Planning Policy (Resilience and Hazards) 2021* (R&H SEPP) revealed that impacts on Threatened Species and Matters of National Environmental Significance are considered unlikely to occur from the proposed alignment upgrades.

General recommendations and mitigation measures have been included in the report to minimise environmental impacts of the proposal. These measures should provide adequate protection during the construction phase for native flora and fauna in the locality, and ongoing, following potential future construction.

Study Certification and Licensing

The project work was undertaken by staff identified as below. This report was written by Eamon McEntee and reviewed / approved by Naomi Stackhouse and Simon Purcell of Anderson Environment & Planning (AEP).

Staff	Title/Qualification	Tasks
Simon Purcell	Senior Ecologist/Works Coordinator BAppSc (Wildlife Science) Cert III Animal Care and Management	Project management, mapping, principal report author, and reviewer.
Tim Mouton	Senior Ecologist / Project Manager BEnvSc, MEnvSc BAAS: 19083	Threatened flora searches, BAM plots, Fauna surveys, Habitat assessment
Naomi Stackhouse	Ecologist BScAdv – Ecol,Cons&Biod	Project management, works co-ordinator, report co-author and review
Ben Graham	Ecologist BEnvSc – Ecol&Biod	Threatened flora searches, BAM plots, Fauna surveys, Habitat assessment
Byron De Jager	Ecologist BSc – Nat Resource Mgmt	Threatened flora searches, BAM plots
Kara Dunn	Ecologist BSc – Zoo	Fieldwork
Eamon McEntee	Ecologist BEnvSc – Sus	Data analysis, report author

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:

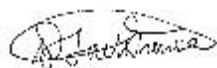
As the principal author, I, Naomi Stackhouse, make the following certification:

The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the Survey Area.

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; and

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, National Parks and Wildlife Act 1974 and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Principal Author and Certifier:



Naomi Stackhouse
Ecology Project Lead
Anderson Environment & Planning
 7 November 2024

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1.0 Introduction

Anderson Environment and Planning (AEP) was commissioned by Mostyn Copper to undertake an Ecological Assessment Report (EAR) for proposed upgrades and realignment of sewer services along Brolga Way, Hue Hue Road, and Alison Road in Wyong NSW. A portion of the works will be undertaken by minimal-impact; trenchless Horizontal Directional Drilling (HDD), referred to as 'Underboring' in this report. The linear area proposed for the alignment spans 4.5kms from Northwest to Southeast, beginning at Lot 41, DP814963; following Brolga Way, Hue Hue Road and Alison Way, within the Central Coast Council (CCC) local government area.

This report is specifically intended to indicate the likelihood of the proposed upgrades to have a significant impact on potentially occurring threatened species or ecological communities. In this regard, the report aims to recognise the relevant requirements of the *Environmental Planning & Assessment Act 1979*, the *Biodiversity Conservation Act, 2016* (NSW) (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

The purpose of this report is to:

- Describe the ecological values of the Subject Site;
- Explore the potential for threatened species to utilise the area; and
- Assess ecological impacts associated with the proposal against relevant legislation.

Potential ecological impacts on native species in general are also considered, as are recommendations for minimising any impacts within the scope of the development.

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

Anderson Environment & Planning (2024). *Proposed upgrades and realignment of Sewer Services along Brolga Way, Hue Hue Road, and Alison Road in Wyong NSW*. Unpublished report for Ampol Australia Petroleum Pty Ltd , November 2024.

2.0 Site Particulars

Detailed summary of the site characteristics and surrounding land uses are provided in **Table 1**.

Table 1 – Site Particulars

Detail	Comments
Client	Ampol Australia Petroleum Pty Ltd c/- Mostyn Copper
Address/Location	North of Brolga Way, East and West of Hue Hue Road, and South of Alison Road, Wyong NSW
Title(s)	The land proposed for development is located as part of proposed upgrades and realignment of sewer services along several main roads in Wyong. The linear area proposed for the alignment spans approx. 4.5kms from Northwest to Southeast, beginning at Lot 41, DP814963; following Brolga Way, Hue Hue Road and Alison Road.
LGA	Central Coast Council
Zoning	As per Central Coast Local Environmental Plan 2022, the start of the Study Area is zoned as follows: Lot 41/-/DP814963: SP2 – Infrastructure; (pub. 21-7-2023).
Study Area	The Study Area comprises the entire alignment area, including the areas which have no direct impacts to vegetation (underboring works). To ensure a comprehensive assessment, the alignment has been buffered by 2.5m either side, with all existing entry and exit pits buffered with a 5m radius. These areas total approx. 2.43ha, and they including native, non-native vegetation and infrastructure. There is a total of 0.32ha of native vegetation in the Study Area, and the remaining 2.11ha comprises infrastructure, exotic vegetation, and landscaped areas.
Subject Site/Trenching Impact Area	The Subject Site comprises the land proposed to be impacted directly by the upgrade works for the proposed sewer alignment, which includes use of the existing entry and exit pits, and trenching along the identified road verges in Wyong. This area excludes the areas of under boring where no impacts will occur above ground. Approximately 0.06ha of native vegetation proposed for impact exists in the Subject Site, determined to be PCT 3433 and PCT 3250. Following the production of an Arborist Assessment Report (AEP, 2024), all trees have been identified for retention. As such, the exact impact area of native vegetation has been calculated via aerial overlay, but no impacts to trees are proposed to occur. The remainder of the Subject Site consists of exotic road reserves, or existing infrastructure.
Current Land Use	The site is a linear area that occupies a stretch of road reserve of approximately 4.5km along Brolga Way, Hue Hue Road and Alison Road in the Wyong area. Lot 41, DP814963, at the northern end of the alignment, is a service centre and associated infrastructure. The majority of works will be located within the road reserve, zoned SP2 – Infrastructure.
Surrounding Land Use	Surrounding areas are diverse due to the length of the site, with land uses including a mix of rural enterprise, private recreation areas, golf course and permanent residential dwellings. Surrounding lands have a variety of zoning, including RU1 – Primary Production, C2 - Environmental Conservation, C3 – Environmental Management, and RE1 – Public Recreation.

Figure 1 depicts the extent of the Subject Site overlain on an aerial photograph of the locality.

3.0 Proposed Development

The proposed development is for the upgrade and realignment of sewer services along several main roads in Wyong, NSW. The linear area proposed for the alignment spans 4.5kms from Northwest to Southeast, starting at the Wyong Northbound M1 service station at Lot 41, DP814963, and following the road reserve along Brolga Way, Hue Hue Road, and Alison Way, where it ends.

The works will incorporate minimal-impact; trenchless Horizontal Directional Drilling (HDD), to minimise impacts to native vegetation, retain the trees in the path of the alignment, and to allow all intersections with biodiversity values (BV) mapped land to be avoided. The area of works comprise the alignment, which has been buffered by 2.5m either side, and the use of the existing entry and exit pits, buffered by a 5.5m radius. Applying the precautionary principal, this is wider than the maximum width of impacts as indicated by the hydro engineers. Where trenching is required along the identified road verges in Wyong, an Arborist Assessment Report (AAR, AEP 2024) has provided the locations required for soft excavation and advice to enable the retention of all trees along the alignment. Approximately 0.06ha of native vegetation is proposed for impact in these areas, determined to be PCT 3433 and PCT 3250. This has, however, been calculated via aerial overlay, but no impacts to trees are proposed to occur.

Figure 2 depicts the proposed development plan within the Subject Site.

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

- Study Area
- Cadastre
- Hydroline
- Hydroarea



0 250 500 m

Note:
1. Boundaries are not survey accurate.
2. Do not scale off the plan



AEP

Figure 1 - Site Location

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Figure 2 - Proposed Development Plans*

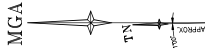
**It is to be noted that these plans dated 17/11/2023, are provided for reference but not as a final design. Figures 17-21 show the relevant areas of impact and under boring (HDD), taking precedent over the engineering or survey plans attached (as discussed with the client).*

LEGEND	
BENCH MARK	▲
TELESTRA PIT	TEL
COMMS PIT	COM
OPTUS PIT	OP
TELESTRA PILLAR	TP
ELECTRIC LIGHT POLE	ELP
ELECTRIC LIGHT BOLLARD	ELB
ELECTRICITY PIT	EPT
ELECTRICITY BOX	EL
POWER POLE	PP
DOWNSPIPE	DP
GRATED INLET PIT	GP
KEB INLET PIT	KIP
DRAINAGE PIT	DP
GRATED DRAIN	GD
SEWER INSPECTION POINT	SIP
SEWER VENT	SEV
SEWER MANHOLE	SMH
STOP VALVE	SV
HYDRANT	HYD
WATER METER	WM
WATER TAP	WT
WATER VALVE	WV
GAS VALVE	GV
GAS METER	GM
SERVICE PIT	SP
PIT WITH CONCRETE LID	CLID
PIT WITH METAL LID	CLMLD
TRAFFIC LIGHT	TL
ROADS & MARITIME SERVICES	RMS
STREET SIGN	SS
BOLLARD	BL
GATE	GT
VEHICLE CROSSING	VLC
FRAM CROSSING	FC
WINDOW	W
DOOR	D
HEADSILL	HS
COMMUNICATIONS (DBYD)	C
ELECTRICITY (GROUND DBYD)	E
ELECTRICITY (OVERHEAD)	P
SEWER (DBYD)	S
WATER (DBYD)	W
GAS (DBYD)	G
ROADS & MARITIME (DBYD)	R
GAS DETECTED	GD
COMMUNICATIONS DETECTED	CD
WATER DETECTED	WD
STORMWATER DETECTED	SD
SEWER DETECTED	SD
ELECTRICITY DETECTED	ED
UNKNOWN SERVICE DETECTED	UD

- NOTES**
- BOUNDARIES HAVE NOT BEEN MARKED ON GROUND
 - BOUNDARIES WITHIN THIS FILE HAVE BEEN ADDED FROM DCOB DATA OBTAINED FROM NSW LAND REGISTRY SERVICES AND ARE APPROXIMATE ONLY
 - ORIGIN OF LEVELS IN THIS FILE IS TAKEN FROM PM 8275 - E359451890, N637221766 IN THE MIDDLE OF MCG2000 COORDINATES
 - ORIGIN OF LEVELS IN THIS FILE IS TAKEN FROM PM 8275 R.L. 31136 (A.H.D.) IN HUE RUE ROAD
 - CONTOUR INTERVAL 0.5 m
 - ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
 - KEB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
 - AN INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE OVER SEWER RISING MAIN & ALL SERVICES IN CLOSE VICINITY. UNDERGROUND SERVICES HAVE BEEN DETECTED BY "DOWN UNDER DETECTION SERVICES" AND ARE APPROXIMATE TO THE DETECTION POINTS. DETECTION POINTS ARE NOT TO BE USED FOR EXACT LOCATIONS OF SERVICES. DETECTION POINTS ARE NOT TO BE USED FOR EXACT LOCATIONS OF SERVICES. DETECTION POINTS ARE NOT TO BE USED FOR EXACT LOCATIONS OF SERVICES.
 - WHIRLS OR METAL PIPES AND MAY NOT HAVE BEEN DETECTED. SERVICES HAVE ALSO BEEN PLOTTED FROM RELEVANT AUTHORITIES RECORDS AS SUPPLIED BY BEFORE YOU DIG AUSTRALIA.
 - THESE SERVICES ARE NOT TO BE USED FOR EXACT LOCATIONS OF SERVICES. DETECTION POINTS ARE NOT TO BE USED FOR EXACT LOCATIONS OF SERVICES.
 - BOUNDARIES SHOWN ARE MCG MAP GRID OF AUSTRALIA AND APPROX. 1100' FOR TRUE NORTH



SCALE 1:5000 @ A1



Revision	Date	Description	Reference
H	05/05/2021		00
G	05/05/2021		00
F	05/05/2021		00
E	05/05/2021		00
D	05/05/2021		00
C	05/05/2021		00
B	05/05/2021		00
A	05/05/2021		00



DATE THE FILE WAS GENERATED TO DATE LETTER
DATE: 17/11/2023
REGISTERED SURVEYOR NSW

Client: AMPOL AUSTRALIA PETROLEUM PTY LTD
PLAN OF DETAIL AND LEVELS OVER HUE RUE ROAD & AUSON ROAD, JILIBY

datum: AHD
site Area: N/A
scale: 1:5000 @ A1
reference number: 52160 001DT
sheet: 1 of 1
CENTRAL COAST

4.0 Scope and Purpose

Investigations were carried out at the site and via literature / database searches to gather information required to adequately address the requirements of the *Environmental Planning & Assessment Act 1979*, the *Biodiversity Conservation Regulation 2017* (BCR), as well as *Section 7.3* of the BC Act (known as the “5-part test”). Also afforded consideration were the Commonwealth EPBC Act, and relevant State Environmental Planning Policies (SEPPs).

The assessment approach was tailored to ensure that legislative requirements were met relating to threatened species and native species in general for the proposed specific development. This was achieved by background research and literature review, database searches, consultation, targeted ecological fieldwork and mapping, detailed habitat assessment, and ultimately impact assessment consideration against the type and form of development proposed.

Impact assessment was undertaken with due reference to the “*Threatened Species Assessment Guidelines*” (OEH, 2018).

Specifically, the scope of this study is to:

- Identify vascular plant species occurring within the site, including any threatened species listed under the BC Act or EPBC Act;
- Identify and map the extent of vegetation communities within the site, including any Endangered Ecological Communities (EECs) listed under the BC Act or EPBC Act;
- Identify any fauna species, including threatened and migratory species, and populations or their habitats, which occur within the site and are known to occur in the wider locality;
- Assess the potential of the proposed development to have a significant impact on any threatened species, populations or ecological communities (or their habitats) identified from the site; and
- Describe measures to be implemented to avoid, minimise, manage or monitor potential impacts of the proposal.

In addition to the survey work conducted within the site boundary and its immediate surrounds, consideration has been afforded to the wider locality, via database searches within 10km of the site and via appreciation of habitat areas that may be linked ecologically to the site.

5.0 Methodology

The field surveys for the site have been prepared and performed with due recognition of the State survey guidelines (DEC 2004; DECC 2009; DPIE 2020, OEH 2016a, OEH 2018, OEH 2020).

The size of the site, the type of native vegetation and habitats remaining, the status of existing and proposed surrounding land use, and the level and type of habitat linkages to proximate bushland areas were considered in formulating the methodology employed and described below.

The assessment approach was tailored to undertake sufficient works to ensure that legislative requirements were met relating to threatened species and native species in general for the proposed specific development.

5.1 Information Sources

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

- Aerial Photograph Interpretation (API) of the site and surrounding locality;
- NSW Biodiversity Values Map (accessed 2023);
- Review of regional mapping for the site utilised 'State Vegetation Type Mapping 2022' (SVTM 2022): Survey, Classification & Mapping;
- State survey guidelines (DEC 2004, DECC 2009, OEH 2016, DPIE 2020);
- Federal survey guidelines (DSEWPC 2011);
- OEH Threatened Species, Populations and Ecological Communities website (https://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_Default.aspx?a=1) (accessed 2023); and
- Collective knowledge gained from previous ecological survey and assessment in the Hunter region over the past 25 years.

In addition, database searches were carried out, namely:

- Review of flora and fauna records held by the NSW Office of Environment & Heritage (OEH) BioNet Atlas of NSW Wildlife within a 10km radius of the Subject Site (December 2023); and
- Review of flora and fauna records held by the Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search within a 5km radius of the Subject Site (December 2023).

5.1.1 Considerations of Biodiversity Offsets Scheme

There are three criteria that require assessment under the Biodiversity Offsets Scheme to determine whether or not an accredited assessor is required to assess the impacts of the proposal. The three criteria include;

- Assessing whether or not the site contains Biodiversity Values Mapped land;
- Whether or not it exceeds the Area Clearing Threshold applicable to the minimum lot size; and / or
- Whether or not a 5-part Test of Significance determines that a significant impact on threatened biodiversity is likely to occur.

The criteria are addressed below.

5.1.1.1 Biodiversity Values Map

The Biodiversity Values Map (BV Map) identifies land with high biodiversity value, as defined by the Biodiversity Conservation Regulation 2017. The Biodiversity Offsets Scheme (BOS) applies to all local developments, major projects or the clearing of native vegetation where the SEPP (Vegetation in Non-Rural Areas) 2017 applies. Any of these will require entry into the BOS if they occur on land mapped on the BV Map. Exempt and complying development or private native forestry are not subject to the Biodiversity Offsets Scheme.

The alignment (Study Area) intersects with land that is BV Mapped within the northern and southern portion of the areas proposed for upgrade (refer **Figure 3** and **Appendix A**); however, all intersections with these areas will be avoided with the use of directional boring. As such impact to BV mapped land will not occur as part of this development, entry into the BOS will not be triggered by impacting BV Mapped Land nor the requirement for a Biodiversity Development Assessment Report (BDAR) under these criteria.

5.1.1.2 Area Clearing Threshold

“The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP). The area threshold applies to all proposed native vegetation clearing associated with a development proposal”.

Table 2 – Area Clearing Thresholds (BC Act)

Minimum lot size	Threshold for clearing, above which the BAM and offsets scheme apply
< 1ha	>0.25ha
1ha to <40ha	>0.5ha
40ha to <1000ha	>1.0ha
>1000ha	>2ha

In this case, adopting the precautionary principal a minimum lot size of approximately ‘<1ha’ is applicable and the area clearing threshold of >0.25ha applies (refer **Table 2**). Due to the length of the alignment area, the proposal spans across several lots with different minimum lot sizes. The removal of 0.06ha of native vegetation is under the 0.25ha clearing threshold, and therefore, the BOS is not triggered under this criterion and as such the preparation of a BDAR is not required based on the clearing threshold.

5.1.2 Test of Significance

Following the above assessments, it is a requirement to determine whether or not the development is likely to significantly affect threatened species or ecological communities or their habitats using a Test of Significance. The Test of Significance is used to undertake qualitative analysis of the likely impacts and determine whether further assessment is required in association with the development. As part of this Ecological Assessment Report, a Five-part Test of Significance has been undertaken in Section 10.

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

-  Study Area
-  Proposed Underboring (No impacts)
-  Cadastre
- Biodiversity Values Map**
-  Biodiversity Values (Added in the last 90 days)
-  Biodiversity Values (Older than 90 days)



AEP

Figure 3 - Biodiversity Values Map
Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

Date: November 2024

AEP ref: 2634.03

5.2 Field Survey

The field surveys for the site have been prepared and performed with due recognition of the State survey guidelines (DEC 2014 & DPIE 2020).

The size of the site, the type of native vegetation and habitats remaining, the status of existing and proposed surrounding land use and the level and type of habitat linkages to proximate bushland areas were considered in formulating the methodology employed and described below.

The assessment approach was tailored to undertake sufficient works to ensure that legislative requirements were met relating to threatened species and native species in general for the proposed specific development. Where any potential doubt remained over species impact, presence within the site was assumed to ensure that a conservative approach was employed.

All fieldwork was conducted within the Subject Site as shown in **Figures 8, 9, 10 & 11**.

5.2.1 Vegetation Communities

Vegetation was surveyed utilising a variety of methods, as outlined below:

- Regional mapping for the site under 'State Vegetation Type Mapping 2022' (SVTM 2022);
- Aerial Photo interpretation (API) to identify any notable variations within the site;
- Consultation of 1:25,000 topographic map series for the area;
- Inspection of the site to ground truth the unit(s) identified; and
- Identification of the vegetation map unit occurred via identification of required dominant species in community structural layers.

The final derived vegetation map was based on dominant species present in the canopy, shrub and ground layers. The dominant species composition, structural and physical attributes were all considered when assigning the best fit ecological communities.

Consideration was given to the potential for the derived vegetation communities to constitute EECs as listed under the BC Act and/or EPBC Act. The floristic composition, geomorphological characteristics and geographical extent were important considerations in this process. The type and location of the relevant vegetation communities can be seen in **Figures 12, 13, 14, 15 & 16**.

5.2.2 Flora

A flora survey was undertaken to produce a flora species list for the Subject Site (**Appendix B**), to search specifically for threatened flora species known from the wider locality, and to gather data necessary to both derive vegetation community type(s) and to meet relevant survey guidelines. Such works included:

- Identification of all vascular plant species encountered during fieldwork;
- Survey involved systematic coverage of the Subject Site. The Random Meander Technique (Cropper 1993) was utilised to maximise species encountered. All vascular plant species encountered during fieldwork were recorded;
- Six (6) BAM Plots were carried out within the Subject Site; and,
- A systematic approach to target threatened plant species at the site as per DPIE guidelines (2020).

5.2.3 Habitat

An assessment of the relative habitat values present within the Subject Site was carried out. This assessment focused primarily on the identification of specific habitat types and resources within the Subject Site favoured by known threatened species from the region. 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. Vertebrate and invertebrate species use hollows as diurnal or nocturnal shelter sites, for rearing young, feeding, thermoregulation, and to facilitate ranging behaviour and dispersal.

Tree hollows were surveyed within the Detailed Study Area utilising the methodology of tree hollow identification set by OEH in the BioBanking field plot methodology (2009), namely:

“A hollow is only recorded if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm across; (c) the hollow appears to have depth (i.e., you cannot see solid wood beyond the entrance); and (d) the hollow is at least 1 m above the ground (this omits hollows in cut stumps or at the base of trees)”.

Field surveys undertaken on the 5th December 2023 identified habitat features in the alignment

5.2.4 Fauna

Fauna surveys have been carried out utilising techniques as outlined below. Fauna survey work was undertaken with reference to relevant guidelines and to add further information to the generated Expected Fauna Species List (**Appendix C**).

Avifauna Surveys

The presence of avifauna within the site was assessed via targeted diurnal and nocturnal surveys and incidental observations during all other phases of fieldwork.

For diurnal surveys, birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers etc. For nocturnal surveys, birds were direct observation or by recognition of calls and call-playback.

Mammals

The occurrence of mammals within the site was assessed by utilising habitat assessment as an analogue for presence in combination with diurnal and nocturnal survey including spotlighting and stag watching. Habitat assessment included survey for foraging resources (blossom, herbaceous, prey etc), hollows and roosting opportunity, connectivity and water as outlined in **Section 6.2.3** above. Searches for Koala scats using the *Spot Assessment Technique* (SAT) (Phillips & Callaghan 2011) were undertaken under suitable koala feed trees within the Study Site. Remote monitoring including Anabats and baited wildlife cameras was also utilised due to the length and scope of the Subject Site.

Incidental Observations & Secondary Indications

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 remains from Owls, chewed (*Allo*) *Casuarina* cones from Black-Cockatoos, chewed fruit remains from frugivorous birds etc.

5.2.5 Field Surveys

A summary of the survey effort is below in **Table 3** and shown in **Figures 8, 9, 10 & 11**.

Table 3 – Field Survey Periods

Date	Time	Field Activity	No. of Persons on Site
15/11/2023	10:00 – 16:00	General botanical survey using Rapid Data Points – ground truthing vegetation. 1 x (50m x 20m) BAM plot	2

Date	Time	Field Activity	No. of Persons on Site
		Incidental Flora and Fauna observations	
21/11/2023	8:30 – 15:00	Targeted flora survey along alignment for <i>Melaleuca biconvexa</i> , <i>Rhodamnia rubescens</i> , <i>Grevillea parviflora</i> subsp. <i>Parviflora</i> , <i>Rhodomyrtus psidioides</i> , and <i>Callistemon linearifolius</i> . Targeted flora survey along alignment for <i>Cryptostylis hunteriana</i> and <i>Prostanthera askania</i> . Incidental Flora and Fauna observations	1
22/11/2023	08:30 – 15:00	1 x modified (10m x 100m) BAM plot 2 x (50m x 20m) BAM plot Incidental Flora and Fauna observations	2
5/12/2023	12:45 – 18:45	Habitat Assessment Equipment deployment (6 x camera traps, 2 x Anabat detectors) 2 x Koala SATs HBT assessment Diurnal bird survey Incidental Flora and Fauna observations	1
7/12/2023	5:30 – 07:00	Equipment maintenance	1
11/12/2023	10:00 – 14:00	Targeted flora survey along alignment for <i>Cryptostylis hunteriana</i> , <i>Corunastylis</i> sp. <i>Charmhaven</i> (1 of 3) and <i>Prostanthera askania</i> . Equipment collection (Anabat detectors)	2
11/12/2023	21:00 – 22:30	Targeted nocturnal survey (Koala) including call playback Incidental Flora and Fauna observations	1
12/12/2023	07:30 – 12:00	Targeted flora survey along alignment for <i>Angophora inopina</i> , <i>Eucalyptus camfieldii</i> and <i>Eucalyptus parramattensis</i> subsp. <i>Parramattensis</i> . Targeted flora survey along alignment for <i>Melaleuca biconvexa</i> , <i>Rhodamnia rubescens</i> , <i>Grevillea parviflora</i> subsp. <i>Parviflora</i> , <i>Rhodomyrtus psidioides</i> and <i>Callistemon linearifolius</i> .	1
12/12/2023	21:00 – 22:30	Targeted nocturnal survey (Koala) including call playback	1
24/01/2024	07:30 – 10:15	Targeted 5m parallel transects for <i>Corunastylis</i> sp. <i>Charmhaven</i> (2 of 3)	2
19/02/2024	21:00 – 22:45	Targeted nocturnal survey (Amphibia) including spotlighting	1
21/02/2024	21:00 – 22:00	Targeted nocturnal survey (Amphibia) including spotlighting	2
30/04/2024	15:30 – 17:15	Targeted 5m parallel transects for <i>Corunastylis</i> sp. <i>Charmhaven</i> (3 of 3)	1
6/06/2024	12:00 – 14:45	Targeted search for <i>Syzygium paniculatum</i>	1
6/09/2024	07:45 – 10:30	Targeted 5m parallel transect for <i>Genoplesium insigne</i> , <i>Caladenia tessellata</i> , <i>Tetratheca juncea</i> , <i>Rutidosis heterogama</i>	1
23/09/2024	07:45 – 10:30 16:00 – 16:30	Targeted 5m parallel transect for <i>Thelymitra adorata</i> Afternoon check of flowers (While sunny) to confirm <i>T.pauciflora</i>	1

The above survey methodology is considered to provide sufficient understanding of the biodiversity of the Subject Site.

In addition, by applying rigorous habitat assessment to more mobile species identified in BioNet Atlas records within the locality, it was ensured that all possible use of the Subject Site by notable species

was considered, and accommodated within subsequent ecological assessment and management recommendations.

AEP has deemed the survey effort undertaken for the Subject Site sufficient given the highly disturbed nature of the site, the lack of habitat features and resources therein, the narrow area of vegetation present in the roadside reserve, the small area of vegetation proposed for removal and the large areas of high-quality vegetation present off site.

6.0 Results

6.1 Regional Vegetation Mapping

Regional vegetation mapping utilised for the site was NSW State Vegetation Type Map (SVTM) (DPE, 2022). The vegetation communities mapped within the area, and their extent, are provided in **Table 4** and **Figures 4, 5, 6 & 7**.

Regional vegetation mapping served as a basis for preliminary site assessment. Ground-truthing of vegetation by AEP (2023) was the prime source of data to inform Plant Community Type determination in the present assessment:

Table 4 - State Vegetation Mapping Results

Vegetation Community	Area (ha)
	(SVTM, 2022)
PCT 3074 – Hunter Coast Lowland Grey Myrtle Wet Forest	0.018
PCT 3244 – Lower Spotted Gum-Mahogany-Ironbark Sheltered Forest	0.0015
PCT 3250 – Northern Foothills Blackbutt Grassy Forest	0.0084
PCT 3432 – Hunter Coast Foothills Apple-Ironbark Grassy Forest	0.0227
PCT 3433 – Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest	0.3161
PCT 4042 – Lower North Riverflat Eucalypt-Paperbark Forest	0.0326
No native vegetation	2.0345
Total	2.43ha

Due to the narrow nature of the Subject Site being along the road reserve, mapping at this scale is anticipated to primarily indicate disturbed (overhanging) canopy. Detailed PCT analysis and ground-truthing of vegetation is provided further below.

Regional vegetation models and community profiles developed by DPE inform our survey design and Plant Community Type determination, as well as subsequent Endangered Ecological Community (EEC) designations.

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.



AEP

Figure 4 - Regional Vegetation Map (SVTM) (North)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

-  Study Area
-  Sewer Alignment
-  Lot



SVTM (2023)

-  Hunter Coast Foothills Apple-Ironbark Grassy Forest
-  Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
-  Hunter Coast Lowland Grey Myrtle Wet Forest
-  Lower North Riverflat Eucalypt-Paperbark Forest
-  Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest
-  Northern Foothills Blackbutt Grassy Forest
-  Not native vegetation

0 75 150 m

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



Figure 5 - Regional Vegetation Map (SVTM) (Centre) Date: November 2024
Location: Wyong Service Centre Sewer Connection
Client: Mostyn Copper
AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

-  Study Area
-  Sewer Alignment
-  Lot



SVTM (2023)

-  Hunter Coast Foothills Apple-Ironbark Grassy Forest
-  Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
-  Hunter Coast Lowland Grey Myrtle Wet Forest
-  Lower North Riverflat Eucalypt-Paperbark Forest
-  Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest
-  Northern Foothills Blackbutt Grassy Forest
-  Not native vegetation



AEP

Figure 6 - Regional Vegetation Map (SVTM) (South) Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

- Study Area
- Sewer Alignment
- Lot

SVTM (2023)

- Hunter Coast Foothills Apple-Ironbark Grassy Forest
- Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
- Hunter Coast Lowland Grey Myrtle Wet Forest
- Lower North Riverflat Eucalypt-Paperbark Forest
- Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest
- Northern Foothills Blackbutt Grassy Forest
- Not native vegetation

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan

0 75 150 m



Figure 7 - Regional Vegetation Map (SVTM) (East)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

6.2 Vegetation Communities

The Study Area comprises approx. 2.43ha of which approx. 0.32ha comprises sparse patches of remnant native vegetation, most of which occurs along the disturbed roadside reserve.

State mapped vegetation occurring in the area comprises;

- PCT 3074 – *Hunter Coast Lowland Grey Myrtle Wet Forest*;
- PCT 3171 – *Northern Lowland Viney Wet Forest*;
- PCT 3244 – *Lower Spotted Gum-Mahogany-Ironbark Sheltered Forest*;
- PCT 3250 – *Northern Foothills Blackbutt Grassy Forest*;
- PCT 3432 – *Hunter Coast Foothills Apple-Ironbark Grassy Forest*;
- PCT 4042 – *Lower North Riverflat Eucalypt-Paperbark Forest*; and
- Exotic / non-native vegetation.

AEP notes that due to the long and narrow nature of the Study Area, only those PCTs mapped as overlapping the road reserve or immediately adjacent to it have been included above. The vegetation communities listed above were more indicative of what the site was historically prior to clearing. Additionally, discrepancies in placement of the alignment meant that floristic data is representative of the likely PCT in the Study Area, and not all flora in these areas are proposed for removal. The current community within the Subject Site is best described as being cleared with an open forest on the boundary of the site with a canopy dominated by *Corymbia maculata* (Spotted Gum), *Eucalyptus pilularis* (Blackbutt), and *Eucalyptus siderophloia* (Northern Grey Ironbark), with an extremely fragmented and disturbed shrub and ground layer.

As the site has been cleared historically and there is significant disturbance in both the canopy and shrub layer, BAM plots were completed to determine the coverage of native vegetation in the roadside reserve.

BAM Plot 1 was dominated by a canopy of *Corymbia maculata* (Spotted Gum), *Eucalyptus pilularis* (Blackbutt), with a disturbed shrub layer and a ground layer dominated by *Entolasia stricta* (Wiry Panic). BAM Plot 2 had more significant numbers of *Corymbia maculata* (Spotted Gum), but with a shrub and ground layer dominated by exotics including *Ehrhata erecta* (Panic Veldtgrass). Some *Melaleuca biconvexa* (Biconvex Paperbark) specimens were recorded in BAM Plot 3, however overall this plot had significantly fewer dominant native species and higher exotic cover, with a shrub layer dominated by exotic weeds *Ligustrum lucidum* (Large-leaved Privet) and *Ligustrum sinense* (Small-leaved Privet), and *Ehrhata erecta* (Panic Veldtgrass) in the ground layer. BAM Plot 4 also contained a dominant native canopy of *Corymbia maculata* (Spotted Gum), a shrub layer with high exotic coverage of *Ligustrum lucidum* (Large-leaved Privet) and *Ligustrum sinense* (Small-leaved Privet), and a disturbed ground layer dominated by *Themeda triandra* (Kangaroo Grass). Although native species were present across all four (4) plots in varying densities, the numbers were small when assessing the VIS, indicating the managed/exotic portion of the Subject Site.

The remnant native vegetation within the Subject Site consists of;

- Upper Stratum: fragmented patches of predominantly *Corymbia Maculata* (Spotted Gum), with some *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus siderophloia* (Northern Grey Ironbark). No threatened species were identified in this stratum.
- Mid Stratum: significantly disturbed and dominated by *Ligustrum lucidum* (Large-leaved Privet) and *Ligustrum sinense* (Small-leaved Privet). Native species include *Callistemon salignus* (Willow Bottlebrush), *Leucopogon juniperinus* (Prickly Beard-heath), *Melaleuca linariifolia* (Snow in Summer), *Syzygium austral* (Brush Cherry) and one threatened species, *Melaleuca biconvexa* (Biconvex Paperbark). We note that coverage of this threatened species was very low, approximately 2%, and located outside of the Study Area and Subject Site.
- Ground stratum species included native grasses; *Themeda triandra* (Kangaroo Grass), *Oplismenus aemulus* (Basket Grass), and *Entolasia stricta* (Wiry Panic) noted elsewhere. While some native species were noted in the ground layer, mostly these are also known to inhabit and populate disturbed sites.

- Several high threat exotic and environmental weed species are present, which are typical of disturbed areas and include; *Lantana camara* (Lantana), *Ehrhata erecta* (Panic Veldtgrass), *Ligustrum lucidum* (Large-leaved Privet) and *Ligustrum sinense* (Small-leaved Privet).

The results of the BAM plots undertaken on site indicated that the Subject Site is highly degraded with a low Vegetation Integrity Score's (VIS's) and confirmed the extent of the exotic/cleared areas.

Regional mapping requires ground-truthing at a Subject Site level to refine the vegetation assessment herein. In determining the PCT as a best fit to the Subject Site, a number of PCT's were considered as it is difficult to determine PCTs when investigating disturbed, highly disturbed / managed sites.

The field surveys carried out by AEP in November and December 2023 identified two (2) best fit PCTs within the Subject Site, being;

- Approx. 0.04ha of **PCT 3250 - Northern Foothills Blackbutt Grassy Forest;**
 - Canopy species present: *Eucalyptus pilularis*, *Glochidion ferdinandi*, *Alphitonia excelsa*, *Eucalyptus siderophloia*, *Notelaea longifolia*, *Angophora floribunda*, *Acmena smithii*, *Corymbia maculata*, *Guioa semiglaucula*, *Acacia decurrens*, *Cryptocarya microneura*, *Cupaniopsis anacardioides*, *Eucalyptus saligna*, and *Eucalyptus fibrosa*;
 - Mid-storey present: *Breynia oblongifolia*, *Persoonia linearis*, *Ozothamnus diosmifolius*, *Leucopogon juniperinus*, *Acacia longifolia*, *Callistemon salignus*, *Elaeocarpus reticulatus*, *Acacia irrorata*, *Pittosporum revolutum*, *Pittosporum undulatum*, *Acacia fimbriata*, *Daviesia ulicifolia*, *Myrsine variabilis*, *Melaleuca linariifolia*, *Exocarpos cupressiformis*, *Leptospermum trinervium*, *Melaleuca nodosa*, *Wilkiea huegeliana*, *Ficus coronata*, *Hibbertia pedunculata*, *Hymenosporum flavum* and *Syzygium australe*;
 - Ground Stratum present: *Imperata cylindrica*, *Lomandra longifolia*, *Entolasia stricta*, *Themeda triandra*, *Entolasia marginata*, *Lomandra filiformis*, *Microlaena stipoides*, *Oplismenus aemulus*, *Lomandra multiflora* subsp. *multiflora*, *Gahnia clarkei*, *Dichelachne micrantha*, *Dianella caerulea*, *Lobelia purpurascens*, *Goodenia heterophylla*, *Centella asiatica*, *Dichondra repens*, *Opercularia diphylla*, *Gonocarpus teucrioides*, and *Gymnostachys anceps*; and
 - Other species present: *Billardiera scandens*, *Glycine clandestina*, *Kennedia rubicunda*, *Hardenbergia violacea*, *Geitonoplesium cymosum*, *Smilax australis*, *Parsonsia straminea*, *Clematis aristata*, *Cassytha glabella* and *Cissus antarctica*.
- Approx 0.01ha of **PCT 3433 - Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest.**

This vegetation community is associated, but, unlikely to be commensurate with the Endangered Ecological Community (EEC) Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions (refer 6.2.1 below).

 - Canopy species present: *Corymbia maculata*, *Eucalyptus fibrosa*, *Notelaea longifolia*, *Eucalyptus siderophloia*, *Glochidion ferdinandi*, *Alphitonia excelsa*, *Angophora floribunda*, *Eucalyptus pilularis* and *Acacia decurrens*;
 - Mid-storey species present: *Daviesia ulicifolia*, *Persoonia linearis*, *Leucopogon juniperinus*, *Breynia oblongifolia*, *Melaleuca nodosa*, *Exocarpos cupressiformis*, *Ozothamnus diosmifolius*, *Acacia irrorata*, *Acacia longifolia*, *Hibbertia pedunculata*, *Callistemon salignus*, *Acacia fimbriata*, *Pittosporum revolutum*, *Pittosporum undulatum*, *Leptospermum trinervium*, *Melaleuca linariifolia*, *Pittosporum multiflorum*, and *Myrsine variabilis*;
 - Ground Stratum species present: *Entolasia stricta*, *Microlaena stipoides*, *Themeda triandra*, *Lomandra multiflora* subsp. *multiflora*, *Lomandra filiformis*, *Imperata cylindrica*, *Lomandra longifolia*, *Dichelachne micrantha*, *Entolasia marginata*, *Oplismenus aemulus*, *Gahnia clarkei*, *Lobelia purpurascens*, *Dianella caerulea*, *Opercularia diphylla*, *Goodenia heterophylla*, *Dichondra repens*, *Centella asiatica*, and *Gonocarpus teucrioides*; and

- Other species present: *Glycine clandestina*, *Hardenbergia violacea*, *Billardiera scandens*, *Geitonoplesium cymosum*, *Parsonsia straminea*, *Cassytha glabella*, *Kennedia rubicunda*, *Clematis aristata*, *Cissus antarctica* and *Smilax australis*.

6.2.1 Endangered Ecological Community (EEC) Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions

The associated EEC is known to occur within the Cessnock-Beresfield area and is strongly associated with yellow podsolic and solodic soils of the Lower Hunter soil landscapes of Aberdare, Branxton and Neath. The Subject Site occurs on the Wyong Soil Landscape and is not located between Cessnock and Branxton which indicates the Subject Site is not located within the appropriate region and soil / landscape type to be associated with the EEC.

This EEC is characterised by the following assemblage of species (species recorded on site are in bold): *Acacia parvipinnula*, *Aristida vagans*, *Billardiera scandens*, *Bursaria spinosa*, *Callistemon linearifolius*, *Cheilanthes sieberi* subsp. *sieberi*, *Correa reflexa*, *Corymbia maculata*, *Daviesia ulicifolia*, *Denhamia silvestris*, *Dianella revoluta* var. *revoluta*, *Dichelachne micrantha*, *Entolasia stricta*, *Eragrostis brownii*, *Eucalyptus fibrosa*, *Eucalyptus punctata*, *Glycine clandestina*, *Goodenia rotundifolia*, *Grevillea montana*, *Grevillea parviflora* subsp. *parviflora*, *Hardenbergia violacea*, *Lepidosperma laterale*, *Leptospermum parvifolium*, *Lissanthe strigosa*, *Lomandra filiformis*, *Lomandra multiflora*, *Macrozamia flexuosa*, *Melaleuca decora*, *Melaleuca nodosa*, *Microlaena stipoides*, *Opercularia diphylla*, *Ozothamnus diosmifolius*, *Panicum simile*, *Paspalidium distans*, *Persoonia linearis*, *Phyllanthus hirtellus*, *Platysace ericoides*, *Podolobium ilicifolium*, *Pomax umbellata*, *Pratia purpurascens*, *Pultenaea spinosa*, *Rytidosperma pallidum*, *Themeda triandra*, and *Vernonia cinerea* var. *cinerea*.

Although the PCT on site is associated with the EEC listed above; the geographic and geological characteristics, the species composition, and the disturbed shrub and ground layer indicate that it is extremely unlikely for the PCT on site to be commensurate with the EEC. Further to this, the Subject Site condition was considered to be highly disturbed / fragmented and historically cleared and managed under infrastructure maintenance practices. As such it is highly unlikely for the highly disturbed community on site to be representative of the EEC and the impacts to the community are considered minimal based on the minimal amount of clearing required for the development.



Plate 1 – BAM Plot 1



Plate 2 – BAM Plot 2



Plate 3 – BAM Plot 3



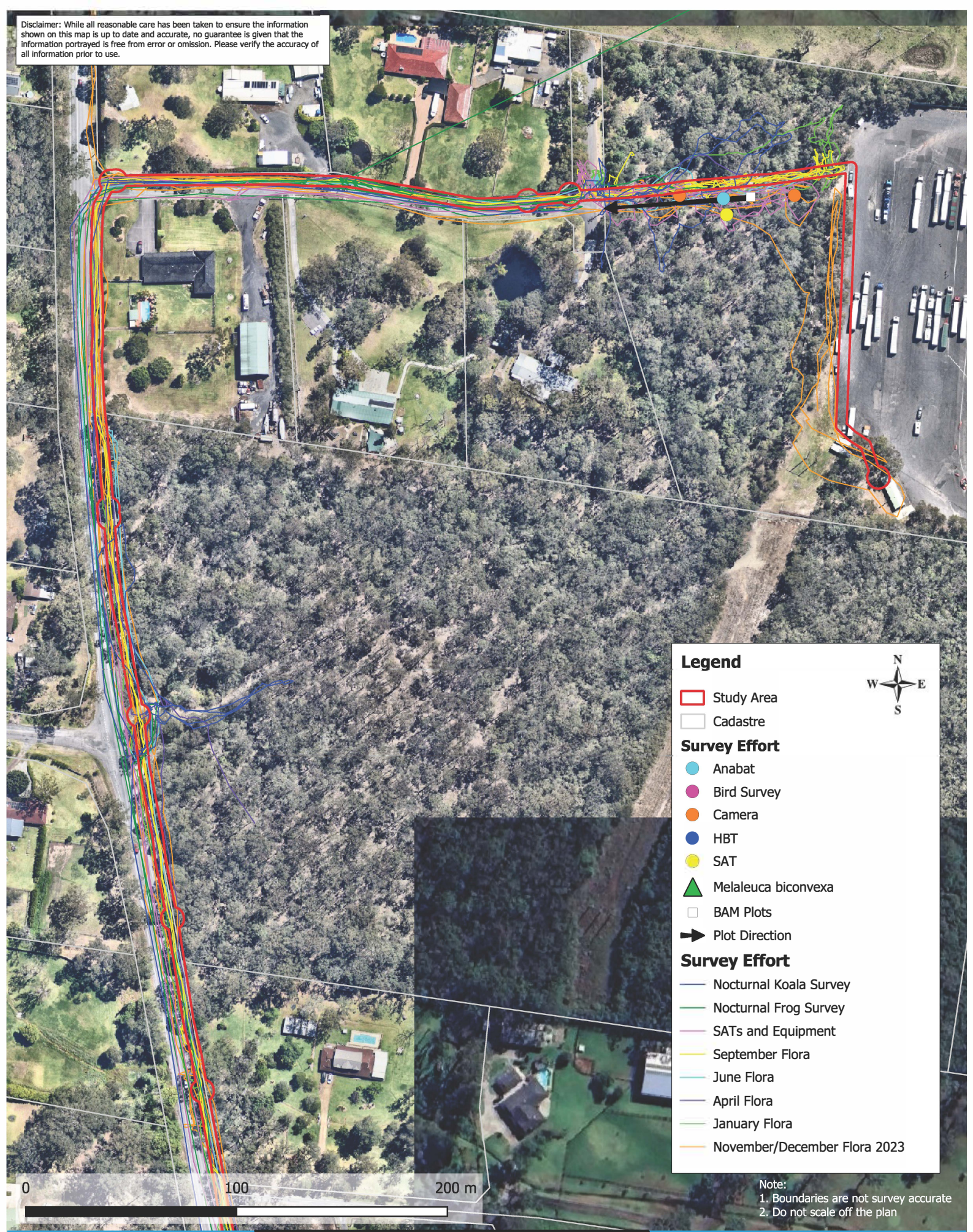
Plate 4 – BAM Plot 4

Impacted and retained areas are indicated in **Figures 17-21**. Further site photos are located in **Appendix D**

6.2.2 Exotic Species

Under the *Biosecurity Act 2015*, all plants in NSW are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Eighteen (18) exotic species of plants have been identified within the Subject Site. Notably one (1) exotic species is listed as a Weed of National Significance (WoNS); *Lantana camara* (Lantana). Significant amounts of Lantana are across the Subject Site and it is also listed as a Regional Priority Weed in the *Greater Sydney Regional Strategic Weed Management Plan 2017-2022*.

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.



AEP

Figure 8 - Survey Effort (North)

Date: November 2024

Location: Wyong Service Centre Sewer Alignment

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

Study Area

Cadastre

Survey Effort

Anabat

Bird Survey

Camera

HBT

SAT

Melaleuca biconvexa

BAM Plots

Plot Direction

Survey Effort

Nocturnal Koala Survey

Nocturnal Frog Survey

SATs and Equipment

September Flora

June Flora

April Flora

January Flora

November/December Flora 2023

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan

0 100 200 m



AEP

Figure 9 - Survey Effort (Centre)

Date: November 2024

Location: Wyong Service Centre Sewer Alignment

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

 Study Area

 Cadastre

Survey Effort

 Anabat

 Bird Survey

 Camera

 HBT

 SAT

 Melaleuca biconvexa

 BAM Plots

 Plot Direction

Survey Effort

 Nocturnal Koala Survey

 Nocturnal Frog Survey

 SATs and Equipment

 September Flora

 June Flora

 April Flora

 January Flora

 November/December Flora 2023

0 100 200 m

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 10 - Survey Effort (South)

Date: November 2024

Location: Wyong Service Centre Sewer Alignment

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

Study Area

Cadastre

Survey Effort

Anabat

Bird Survey

Camera

HBT

SAT

Melaleuca biconvexa

BAM Plots

Plot Direction

Survey Effort

Nocturnal Koala Survey

Nocturnal Frog Survey

SATs and Equipment

September Flora

June Flora

April Flora

January Flora

November/December Flora 2023

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan

0 100 200 m



AEP

Figure 11 - Survey Effort (East)

Date: November 2024

Location: Wyong Service Centre Sewer Alignment

Client: Mostyn Copper

AEP ref: 2634.03

6.3 Threatened Species

One threatened flora species as listed under the *Biodiversity Conservation Act 2016*, *Melaleuca biconvexa* (Biconvex Paperbark) were identified during surveys, however this was located outside of both the Subject Site and Study Area. No threatened fauna species recorded within the Subject Site.

Surveys identified that the Subject Site would offer limited foraging habitat for more mobile species, such as birds and bats as the site is highly managed and with no hollow bearing trees, and minimal to none understorey habitat.

6.4 Habitat Assessment

Table 5 provides the results from the detailed habitat assessment within the Subject Site.

Table 5 – Habitat Assessment

Habitat Features	Assessment
Native vegetation	As above, the Subject Site/Impact Area comprises 0.06ha of native vegetation, which consists of fragmented and disturbed patches of roadside vegetation in varying conditions. While some high-quality canopy coverage exists in places, all trees have been identified for retention.
Hollow-bearing trees	Despite thorough surveying, no Hollow-Bearing Trees (HBT) were identified within the direct alignment area/Subject Site. Several HBTs were marked adjacent to the alignment, but none of these showed evidence of use by arboreal fauna. Very small hollows may also have gone unnoticed that would be suitable for small species such as microbats. Others may have gone unobserved due to the height and orientation of potential hollows but as the species were mostly Ironbark species, hollows are less likely. No trees or habitat features are proposed to be impacted by the proposed sewer upgrades.
Water features	Several mapped water bodies and mapped hydrolines exist within the close proximity to the Study Area, with the alignment spanning over a bridge which crosses a 4 th Order Stream, Porters Creek, which flows into Wyong River. This crossing is BV mapped, and as such, no impacts will occur along this section. Fieldwork in the mapped BV vegetation to the north indicates that a potential drainage line runs north to south, however this is unmapped and all impacts will be avoided via underboring.
Patch size / connectivity	Given the nature of the development being a long, linear strip, the native vegetation in the Study Area has varying degrees of connectivity. The majority of the proposal intersects with road reserve and landscaped vegetation, which is moderately fragmented from any continuous patches. Disturbed farmland provides a fragmented landscape to the north and south, and the Pacific Motorway (M1) runs parallel to the site to the east. A larger contiguous patch exists to the south/southwest of the Subject Site, in the corridor surrounding the adjoining Wyong River. The development is not expected to have any significant impact to the connectivity of the Subject Site.
Other habitat features	There are no caves, crevices or rocky outcrops present within the Study Area. The Wyong River runs close to the southern end of the Subject Site, but given the raised road reserve it is not considered that this represents usable habitat within the Subject Site.

6.5 Fauna

Fauna surveys and incidental observations undertaken have identified 38 species within the Subject Site, including two (2) frogs, seven (7) mammals, two (2) reptiles, and 29 birds (refer to **Appendix C**). The Subject Site provides suitable habitat for a range of different species. The lack of large hollows, abundance of exotic species and fragmented nature of the Subject Site suggests it is not an area of high value habitat value. It is not expected that the Subject Site would be utilised by threatened fauna species to any significant degree. The species recorded are commensurate with a site located in a residential area within a rural setting located on a road near a highway. The risk of vehicle strike significantly detracts from habitat suitability within the Subject Site.

The site may contain marginal foraging opportunities for other species, including mobile (flying) threatened species. They are considered to potentially utilise the site on an intermittent basis as part of a larger home range.

A list of fauna species present onsite has been generated for the site and is included within the Expected Fauna List in **Appendix C**.

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

- Study Area
- Sewer Alignment
- BAM Plot Locations
- BAM Direction Arrows
- Lot



Ground-Truthed Vegetation

- PCT 3250 - Northern Foothills Blackbutt Grassy Forest
- PCT 3433 - Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest

0 75 150 m

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 12 - Ground-truthed Vegetation (North)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

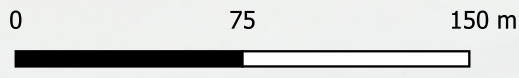
Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

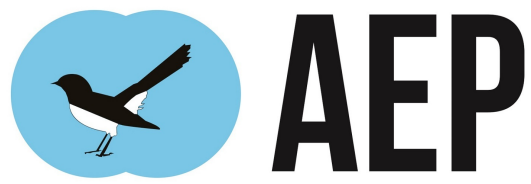
- Study Area
- Sewer Alignment
- BAM Plot Locations
- BAM Direction Arrows
- Lot

Ground-Truthed Vegetation

- PCT 3250 - Northern Foothills
Blackbutt Grassy Forest
- PCT 3433 - Hunter Coast Foothills
Spotted Gum-Ironbark Grassy Forest



Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



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Legend

-  Study Area
-  Sewer Alignment
-  BAM Plot Locations
-  BAM Direction Arrows
-  Lot

Ground-Truthed Vegetation

-  PCT 3250 - Northern Foothills Blackbutt Grassy Forest
-  PCT 3433 - Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest



0 75 150 m

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 14 - Ground-truthed Vegetation (Centre)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

-  Study Area
-  Sewer Alignment
-  BAM Plot Locations
-  BAM Direction Arrows
-  Lot

Ground-Truthed Vegetation

-  PCT 3250 - Northern Foothills
Blackbutt Grassy Forest
-  PCT 3433 - Hunter Coast Foothills
Spotted Gum-Ironbark Grassy Forest



Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



Figure 15 - Ground-truthed Vegetation (South)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

- Study Area
- Sewer Alignment
- BAM Plot Locations
- BAM Direction Arrows
- Lot

Ground-Truthed Vegetation

- PCT 3250 - Northern Foothills
Blackbutt Grassy Forest
- PCT 3433 - Hunter Coast Foothills
Spotted Gum-Ironbark Grassy Forest



Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



Figure 16 - Ground-truthed Vegetation (East)

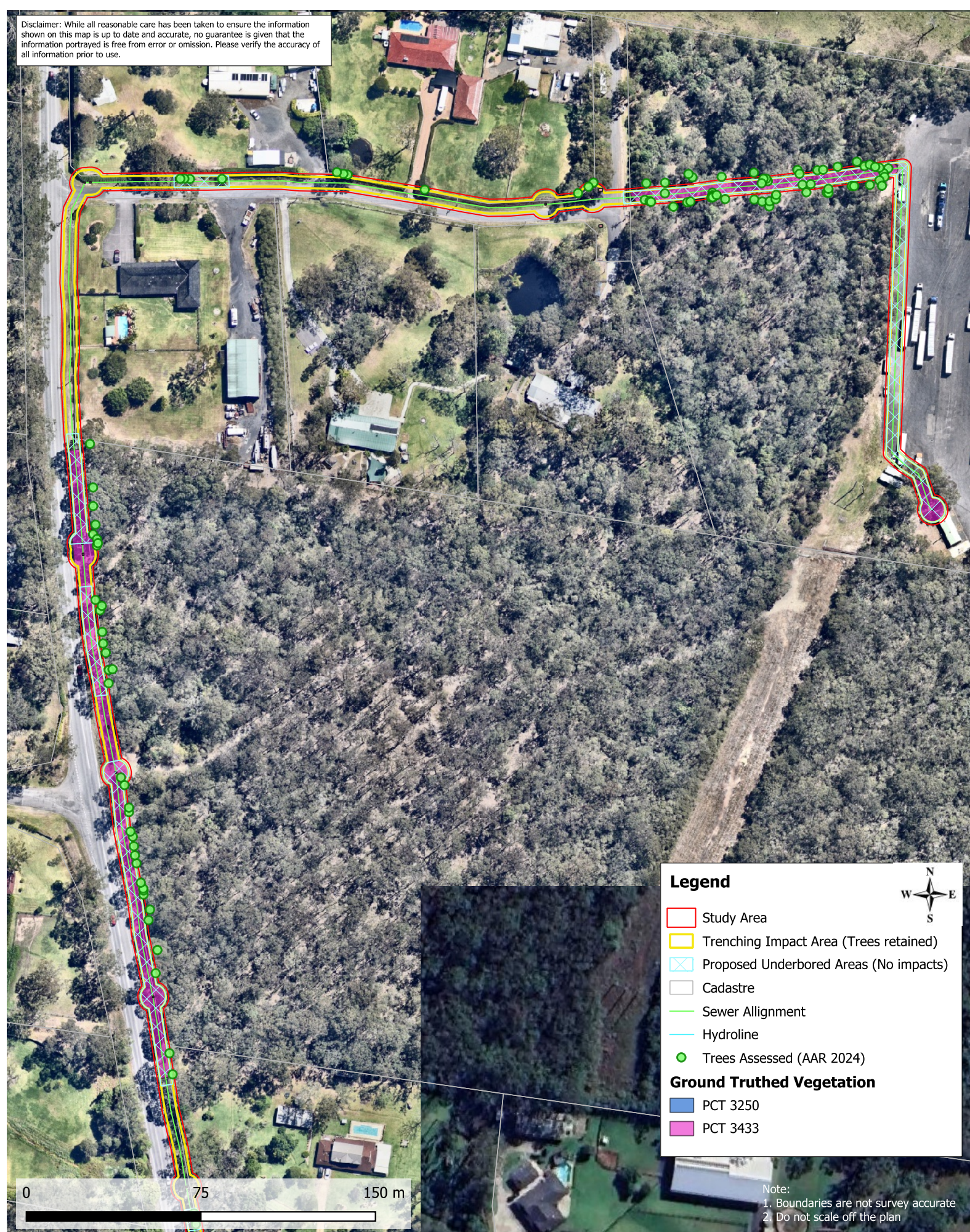
Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.



AEP

Figure 17 - Impacted and Retained (North)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

- Study Area
- Trenching Impact Area (Trees retained)
- Proposed Underbored Areas (No impacts)
- Cadastre
- Sewer Alignment
- Hydroline
- Trees Assessed (AAR 2024)

Ground Truthed Vegetation

- PCT 3250
- PCT 3433



0 75 150 m

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 18 - Impacted and Retained (Centre)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.



Legend

- Study Area
- Trenching Impact Area (Trees retained)
- Proposed Underbored Areas (No impacts)
- Cadastral
- Sewer Alignment
- Hydroline
- Trees Assessed (AAR 2024)

Ground Truthed Vegetation

- PCT 3250
- PCT 3433



AEP

Figure 19 - Impacted and Retained (Centre)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

-  Study Area
-  Trenching Impact Area (Trees retained)
-  Proposed Underbored Areas (No impacts)
-  Cadastre
-  Sewer Alignment
-  Hydroline
-  Trees Assessed (AAR 2024)

Ground Truthed Vegetation

-  PCT 3250
-  PCT 3433



0 75 150 m

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 20 - Impacted and Retained (South)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

- Study Area
- Trenching Impact Area (Trees retained)
- Proposed Underbored Areas (No impacts)
- Cadastral
- Sewer Alignment
- Hydroline
- Trees Assessed (AAR 2024)

Ground Truthed Vegetation

- PCT 3250
- PCT 3433



AEP

Figure 21 - Impacted and Retained (East)

Date: November 2024

Location: Wyong Service Centre Sewer Connection

Client: Mostyn Copper

AEP ref: 2634.03

6.6 Database Searches

Searches were undertaken of databases within a 5km radius of the Subject Site for BC Act listings and EPBC Act listings. Note that any records considered erroneous, historic only, or obviously of no relevance to the site in regards to habitat (e.g., seabirds, marine species etc.) were omitted.

The potential for listed threatened species to occur within the site is considered in **Table 6** and selection for subject species in **Table 7** below. Detailed ecological profiles of threatened species can be found at: <https://www.environment.nsw.gov.au/threatenedspeciesapp/>.

Table 6 - Threatened Species Appraisal

Table 6 - Threatened Species Appraisal							
Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
Flora							
<i>^^Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V,P,2	V	1	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). 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, Silvertop Ash, Red Bloodwood, and Black Sheoak.	Only marginally suitable habitat exists in the broader alignment area and no species were located during targeted surveys undertaken in late November. There are very few BioNet records in the local area, and no suitable habitat is proposed to be cleared, with only 0.06ha of native vegetation impacted. These areas of impact predominantly consist of scattered landscaped areas managed as planted gardens, road verges and remnant native canopy. Therefore the species is not a Subject Species.	N
<i>Angophora inopina</i>	Charmhaven Apple	V	V	61	A small to large tree, up to 8 m high, often multi-stemmed, and with persistent shortly fibrous bark throughout. 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.	Moderately suitable habitat exists in the broader alignment area but no species were located during targeted surveys. Additionally, no suitable habitat is proposed to be cleared and thus it is unlikely that the species will be impacted significantly by the proposal. Therefore the species is not a Subject Species.	N
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E1,P,2	V	2	The Thick Lip Spider Orchid is from a group of orchids characterised by five long spreading petals and sepals around a broad down-curved labellum ('lip'). Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations).	The species has only few records around the alignment area. Minimal suitable habitat for the species has been identified on site, as impact areas predominantly consist of scattered landscaped areas managed as planted gardens, road verges and remnant native canopy. Targeted surveys were undertaken for the species in September 2024. No species were located, and due to the removal of only 0.06ha of native vegetation for the	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
						alignment, the species is not considered to be a Subject Species.	
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V,3		2	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 an sharp tip, thickened margins, and distinct lateral veins. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Only marginally suitable habitat exists in the broader alignment area and no species were located during targeted surveys undertaken in late November. There are very few BioNet records in the local area, and no suitable habitat is proposed to be cleared, with only 0.06ha of native vegetation impacted. Therefore the species is not a Subject Species.	N
<i>Corunastylis</i> sp. <i>Charmhaven</i>		E4A,P, 2	CE	18	Charmhaven (NSW896673) is a terrestrial orchid that has recently been formally described as <i>Genoplesium branwhiteorum</i> . Flowering has been observed from November through to March. It occurs within low woodland to heathland with a shrubby understorey and ground layer.	The species has a limited number of records around the alignment area. Minimal suitable habitat for the species has been identified on site, as impact areas predominantly consist of scattered landscaped areas managed as planted gardens, road verges and remnant native canopy. Three rounds of targeted surveys were able to be undertaken for the species in December 2023, and January and April 2024. No species were located, and due to the removal of only 0.06ha of native vegetation for the alignment, the species is not considered to be a Subject Species.	N
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	1	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. 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	No suitable habitat exists in the broader alignment area and no species were located during targeted surveys. The lack of BioNet records suggest that the species doesn't occur. Additionally, no suitable habitat is proposed to be cleared and only 0.06ha of native vegetation will be impacted, and thus it is unlikely that the species will be impacted significantly by	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					Eucalyptus oblonga Narrow-leaved Stringybark, Eucalyptus capitellata Brown Stringybark and Eucalyptus haemastoma Scribbly Gum.	the proposal. Therefore the species is not a Subject Species.	
<i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i>	Eucalyptus parramattensis C. Hall. subsp. <i>parramattensis</i>	E2		99	A woodland tree up to 15m that 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. Flowers from November to January. Propagation mechanisms are currently poorly known. Seed dispersal is likely to be effected by wind and animals.	Only marginally suitable habitat exists in the broader alignment area and no species were located during targeted surveys. Additionally, no suitable habitat is proposed to be cleared and only 0.06ha of native vegetation will be impacted. These areas of impact predominantly consist of scattered landscaped areas managed as planted gardens, road verges and remnant native canopy. Therefore the species is not a Subject Species.	N
<i>Genoplesium insigne</i>	Variable Midge Orchid	E4A,P, 2	CE	1	A terrestrial orchid with a solitary cylindrical leaf that encloses the flowering stem. Appears to be associated with PCT 1636 Scribbly Gum – Red Bloodwood – Angophora inopina (not always present) heathy woodland on lowlands of the Central Coast and variations containing Angophora costata (Smooth-barked Apple). Recent and historic disturbance regimes (fire, clearing, routine slashing) appear to influence above ground emergence (i.e. leaf and flowers). Several known sites exhibit a removed/managed shrub layer and canopy, therefore shading and competition/biomass is likely to inhibit above ground emergence.	Minimal suitable habitat exists in the broader alignment area and no species were located during targeted surveys undertaken in late November. Further to this, no suitable habitat is proposed to be cleared, with only 0.06ha of native vegetation impacted. These areas of impact predominantly consist of scattered landscaped areas managed as planted gardens, road verges and remnant native understorey. Therefore the species is not a Subject Species.	N
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	V	V	99	A low spreading to erect shrub, usually less than a metre high. Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Found over a	Minimal suitable habitat exists in the broader alignment area and no species were located during targeted surveys undertaken in late November 2023. Further to this, no suitable habitat is proposed to be cleared, with only 0.06ha	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Often occurs in open, slightly disturbed sites such as along tracks.	of native vegetation impacted. These areas of impact predominantly consist of scattered landscaped areas managed as planted gardens, road verges and remnant native canopy. Therefore, the species is not a Subject Species.	
<i>Macadamia integrifolia</i>	Macadamia Nut		V	3	This species is commonly found in various habitats, including rainforests, wet sclerophyll forests, and along creek banks. It prefers well-drained soils and can tolerate a range of environmental conditions.	The only suitable habitat in the Study Area is located in Biodiversity Values mapped land, containing wet sclerophyll vegetation which will be avoided using underboring. Additionally, only few BioNet records surround the locality, and the species was not detected during field surveys. With the removal of approx. 0.06ha of native vegetation, it is considered unlikely that this species would be seriously impacted by the proposal.	N
<i>Maundia triglochoides</i>		V		2	Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Flowering occurs during warmer months. Associated with wetland species e.g. Triglochin procerum.	Minimal local records exist around the Subject Site, and the targeted searches in aquatic habitat in the broader alignment area did not locate the species. No suitable habitat is proposed to be cleared and thus it is unlikely that the species will be impacted significantly by the proposal.	N
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	535	Biconvex Paperbark is a shrub or small tree, usually up to 10 m tall, though occasionally as high as 20 m. The bark is that of a typical paperbark. The species generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October. Resprouts following fire.	There is an abundance of recent records of the species within the local BioNet search, and the species was located during surveys as occurring outside of the alignment in the south east. With the removal of approx. 0.06ha of marginal habitat, it is considered unlikely <i>Melaleuca biconvexa</i> would be seriously impacted by the proposal. However, the species has been identified as a Subject Species for further assessment.	Y

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
<i>Prostanthera askania</i>	Tranquillity Mintbush	E1	E	1	An erect but spreading and sometimes scrambling, openly-branched shrub that grows from 1 – 3 metres high. Occurs adjacent to, but not immediately in, drainage lines on flat to moderately steep slopes formed on Narrabeen sandstone and alluvial soils derived from it. Occurs in moist sclerophyll forest and warm temperate rainforest communities.	The only suitable habitat in the Study Area is located in Biodiversity Values mapped land, containing wet sclerophyll vegetation which will be avoided using underboring. Additionally, few BioNet records surround the locality, and the species was not detected during targeted field surveys. With the removal of approx. 0.06ha of unsuitable native vegetation, this species was not identified as a Subject Species.	N
<i>Rhodamnia rubescens</i>	Scrub Turpentine	E4A	CE	14	Shrub or small tree to 25 m high with reddish/brown, fissured bark. Young stems densely covered in fine hairs. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	The only suitable habitat in the Study Area is located in Biodiversity Values mapped land, containing wet sclerophyll vegetation which will be avoided using underboring. Additionally, few BioNet records surround the locality, and the species was not detected during targeted field surveys. With the removal of approx. 0.06ha of unsuitable native vegetation, this species was not identified as a Subject Species.	N
<i>Rhodomyrtus psidioides</i>	Native Guava	E4A	CE	3	A shrub or small tree to 12 m high with brown scaly bark. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	The only suitable habitat in the Study Area is located in Biodiversity Values mapped land, containing wet sclerophyll vegetation which will be avoided using underboring. Additionally, only few BioNet records surround the locality, and the species was not detected during field surveys. With the removal of approx. 0.06ha of unsuitable native vegetation, this species was not identified as a Subject Species.	N
<i>Rutidosia heterogama</i>	Heath Wrinklewort	V	V	97	Heath Wrinklewort is a small perennial herb to 30 cm tall, with a woody base bearing sparse upright, or sometimes horizontal, branches with upright shoots at the end. Grows in heath on	Only 0.06ha of sparse native vegetation is proposed to be impacted by the alignment. Given this, and the marginally small impact area, it is unlikely that the species will be occur, or be significantly impacted	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	by the proposal. Targeted surveys were undertaken for the species in September 2024, and no species were located. Therefore the species is not a Subject Species.	
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E1	V	37	The Magenta Lilly Pilly is a small to medium sized rainforest tree that grows to 8 m tall. Deep magenta fruits, which may be spherical or egg-shaped, mature in May, and contain a single seed. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	The only suitable habitat in the Study Area is located in Biodiversity Values mapped land, containing wet sclerophyll vegetation which will be avoided using under boring. Additionally, only few BioNet records surround the locality, and the species was not detected during targeted field surveys in June 2024. With the removal of approx. 0.06ha of marginal habitat it is considered unlikely that this species would be seriously impacted by the proposal.	N
<i>Tetradlea juncea</i>	Black-eyed Susan	V	V	63	A low shrub that grows in clumps of single or multiple stems. Flowers face downwards and usually have 4 petals which range from white to pink to dark purple in colour. It is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape.	The works proposed are only set to impact 0.06ha of native vegetation. These areas of impact predominantly consist of scattered landscaped areas managed as planted gardens, road verges and remnant native canopy. Targeted surveys were undertaken for the species in September 2024. No species were located, and due to the removal of only 0.06ha of native vegetation for the alignment, the species is not considered to be a Subject Species.	N
<i>Thelymitra adorata</i>	Wyong Sun Orchid	E4A,P, 2	CE	389	A ground orchid up to 60 cm tall with a single leaf. Occurs from 10-40 m a.s.l. in grassy woodland or occasionally derived grassland in well-drained clay loam or shale derived soils. A number of sites where the species occurs are subject to past and ongoing disturbance, including sites on the edges of roads that	The Wyong Sun Orchid has several recent and close records around the alignment area. Targeted surveys were undertaken for the species in early September 2024, and then again 2 weeks later following confirmation of flowering, and no targeted species were located. Some <i>Thelymitra</i>	Y

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					contain a mixture of native and introduced species in the understorey, though competition with invasive introduced species is a threat.	species were detected outside of the alignment area in the North, however these were identified as <i>T. pauciflora</i> . This species has been designated as a Subject Species for further consideration.	
Fauna							
<i>Crinia tinnula</i>	Wallum Froglet	V		9	Wallum Froglets typically occurs 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. Shelter sites are wet or very damp and often located near the water's edge.	Given the low number of local BioNet records and lack of suitable aquatic habitat, this species is not considered likely to occur. Additionally, no suitable aquatic habitat is proposed to be cleared or modified and only 0.06ha of native vegetation will be impacted, as such it is unlikely that the species will be impacted significantly by the proposal. The species was not detected during targeted nocturnal surveys within the survey period, and as such the species is not a Subject Species.	N
<i>Mixophyes iteratus</i>	Giant Barred Frog	E1	E	3	Giant Barred Frogs are found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor. However, Giant Barred Frogs will also sometimes occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and even occasionally around dams.	Given the low number of local BioNet records and lack of suitable aquatic habitat, this species is not considered likely to occur on site, nor be impacted significantly by the proposal. The species was not detected during targeted nocturnal surveys within the survey period, and as such the species is not a Subject Species.	N
<i>Mixophyes balbus</i>	Stuttering Frog	E1,P,2	V	24	The Stuttering Frog is relatively large and muscular, growing to about 8 cm in length. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side	The Subject Site lacks the suitable aquatic habitat, and as such this species is not considered likely to occur. There are a few BioNet records within the locality, however	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	no aquatic areas with rainforest or wet sclerophyll vegetation are proposed to be cleared or modified, and only 0.06ha of native vegetation will be impacted. The species was not detected during targeted nocturnal surveys within the survey period, and as such the species is not a Subject Species.	
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	1	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas.	Given the low number of local BioNet records and lack of suitable aquatic habitat, this species is not considered likely to occur. No habitat is proposed to be cleared or modified and only 0.06ha of native vegetation will be impacted, as such it is unlikely that the species will be impacted significantly by the proposal. The species was not detected during targeted nocturnal surveys within the survey period, and as such the species is not a Subject Species.	N
<i>Litoria brevipalmata</i>	Green-thighed Frog	V		2	Isolated localities along the coast and ranges from just north of Wollongong to south-east Queensland. Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range, but extends into drier forests in northern NSW and southern Queensland.	Given the low number of local BioNet records, geographic unsuitability, and lack of suitable aquatic habitat, this species is not considered likely to occur on site, or to be impacted significantly by the proposal. The species was not detected during targeted nocturnal surveys within the survey period, and as such the species is not a Subject Species.	N
<i>Saccolaimus flaviventris</i>	Stephens' Banded Snake	V,P		1	Stephens' Banded Snake is a medium-sized partly tree-dwelling snake up to one metre long. It is brown or yellow-brown above, with a series of irregular, broad, dark crossbands. It inhabits rainforest and eucalypt forests and rocky areas up to 950 m in altitude. Stephens' Banded	This species only has one (1) BioNet record in the locality, and potential habitat within the Subject Site has been modified and is in degraded condition. With only 0.06ha of native vegetation proposed to be impacted and all trees being retained,	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					Snake is nocturnal, and shelters between loose bark and tree trunks, amongst vines, or in hollow trunks limbs, rock crevices or under slabs during the day.	the species is not considered as a Subject Species.	
Aves							
<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A,P, 2	CE	12	The Regent Honeyeater is a striking and distinctive, medium-sized, black and yellow honeyeater with a sturdy, curved bill. The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests.	Given the area is not mapped as important Regent Honeyeater habitat, and the number of local BioNet records are low, it is considered highly unlikely for this species to occur on site. The site does not contain any significant foraging habitat, and the proposed removal of only 0.06ha of native vegetation will not significantly impact the species. It is not a Subject Species.	N
<i>Anseranas semipalmata</i>	Magpie Goose	V,P		1	The Magpie Goose is a large, distinctive black and white water-bird (from 70 - 90 cm long) with a prominent knob on the head, and orange legs. Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off.	The alignment will not impact any temporary or permanent wetlands or swamps. Given the lack of suitable aquatic habitat, this species is not considered likely to occur on site. Therefore this species is not deemed as a Subject Species.	N
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V,P		5	The dusky woodswallow is a medium-sized bird (16-19.5 cm, 35 g), with a longish tail. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally	Given the lack of preferred habitat, being intact eucalypt woodland, and relatively low BioNet Records, this species is considered unlikely to occur on site. Additionally, site surveys returned no results for the species. The proposal to remove 0.06ha of native vegetation will	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	not significantly impact the species, and as such, it is not a Subject Species.	
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	3	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.).	Given the low number of local BioNet records, geographic unsuitability, and lack of suitable aquatic habitat, this species is not considered likely to occur on site. The alignment will not impact any temporary or permanent wetlands or swamps. Therefore this species is not deemed as a Subject Species.	N
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1		13	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Given that this is a migratory coastal shorebird and the area is not mapped as important shorebird habitat, low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat.	Populations of Bush-Stone Curlew are known in the Central Coast LGA, however these are further south of the Subject Site. There are only low numbers of local BioNet records near the alignment, and lack of suitable aquatic habitat. As such, this species is not considered likely to occur on site and the proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	E	10	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration.	Given that this is a migratory coastal shorebird and the area is not mapped as important shorebird habitat, low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site. The proposal to remove 0.06ha of native vegetation will not significantly impact the	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland shores.	species, and as such, it is not a Subject Species.	
<i>Calidris tenuirostris</i>	Great Knot	V,P	CE,C,J,K	1	A medium-sized bulky wader with a straight, dark-brown bill and yellowish-brown legs. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms.	Given that this is a migratory coastal shorebird and the area is not mapped as important shorebird habitat, very low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	E	7	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. 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.	Given the lack of suitable habitat (HBTs), and low number of local BioNet records, this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat. Additionally, the proposed removal of 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo	V	V	38	The South-eastern Glossy Black-Cockatoo is a small brown-black cockatoo with a massive, bulbous bill and a short crest. Inhabits open	No <i>Allocasurinas</i> are proposed to be impacted by the proposal, and given the lack of Hollow-Bearing Trees (HBT), this	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Feeds almost exclusively on the seeds of several species of she-oak, 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. They are usually seen in pairs or small groups feeding quietly in sheoaks.	species is not considered likely to occur on site, and at best the site offers marginal foraging habitat. Additionally, the proposed removal of 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	
<i>Chthonicola sagittata</i>	Speckled Warbler	V,P		2	The Speckled Warbler is a small well-camouflaged very heavily streaked ground-dwelling bird related to the scrubwrens, reaching a length of 13cm. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	Given the lack of preferred habitat in the Study Area, being grassy woodland, and the few BioNet Records, this species is considered unlikely to occur on site. The proposal to remove 0.06ha of degraded native vegetation will not significantly impact this woodland bird, and as such, it is not a Subject Species.	N
<i>Circus assimilis</i>	Spotted Harrier	V		14	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Given the low number of local BioNet records and lack of preferred grassland and open woodland habitat, this species is not considered likely to occur on site. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P		46	The Varied Sittella is a small (10 cm) songbird with a sharp, slightly upturned bill, short tail, barred undertail, and yellow eyes and feet. Inhabits eucalypt forests and woodlands,	Given the lack of preferred habitat in the Study Area, being intact eucalypt forest/woodland, and the few BioNet Records, this species is considered	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	unlikely to occur on site. The proposal to remove 0.06ha of degraded native vegetation will not significantly impact this woodland bird, and as such, it is not a Subject Species.	
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1		27	Black-necked Storks are widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas). In NSW, the species becomes increasingly uncommon south of the Clarence Valley, and rarely occurs south of Sydney. Since 1995, breeding has been recorded as far south as Bulahdelah. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	Given that this is a migratory coastal shorebird and the area is not mapped as important shorebird habitat, and lack of suitable aquatic habitat, this species is not considered likely to occur on site. At best the site offers marginal foraging habitat. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Epthianura albifrons</i>	White-fronted Chat	V,P		2	The White-fronted Chat is an endemic Australian passerine bird, 12 cm in length and weighing approximately 13g. Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground.	The alignment will not impact any temporary or permanent wetlands or swamps. Given the lack of suitable aquatic habitat, this species is not considered likely to occur on site. Therefore this species is not deemed as a Subject Species.	N
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		48	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain	Given that nest sites include riparian HBTs and nest sites are often well established, this species is not considered likely to occur on site, and at best the site offers marginal foraging habitat. The site does not contain any Hollow-Bearing Trees, and the proposed removal of 0.06ha of native vegetation will not significantly	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs. Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	impact the species, and as such, it is not a Subject Species.	
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V		1	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast. The availability of suitable nesting sites may limit populations. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	Given that this is a coastal shorebird and the area is not mapped as important shorebird habitat, low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat.	N
<i>Haematopus longirostris</i>	Pied Oystercatcher	E1,P		1	The Pied Oystercatcher is an unmistakable, large, black and white wader, reaching 50 cm in length. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish.	Given that this is a coastal shorebird and the area is not mapped as important shorebird habitat, low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat.	N
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V		282	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,	Habitat assessment including Stick Nest searches, and diurnal bird surveys, returned no results for the species. Given the lack of suitable habitat, and lack of recognisable stick nests, this species is not considered likely to occur on site, or at best the site offers marginal foraging	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					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.	habitat. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	
<i>Hieraaetus morphnoides</i>	Little Eagle	V		20	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	Habitat assessment including Stick Nest searches, and diurnal bird surveys, returned no results for the species. Given the lack of preferred (open) woodlands, and low number of local BioNet records, this species is considered unlikely to occur on site and as such, it is not a Subject Species.	N
<i>Hirundapus caudacutus</i>	White-throated Needletail		V	84	Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south-eastern Siberia, Mongolia, the Korean Peninsula and northern Japan June-August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. These conditions are often used by insects to swarm (eg termites and ants) or tend to lift insects away from the surface which favours sighting of White-throated Needletails as they feed. More common in coastal areas, less so inland.	Given that this is a highly-mobile migratory species, and the impact area is a linear in-ground alignment, the proposal will not impact any significant foraging habitat or important area for the species. At best the site offers marginal foraging habitat, but the proposal to remove 0.06ha of native vegetation will not significantly impact the species. As such, it is not a Subject Species.	N
<i>Irediparra gallinacea</i>	Comb-crested Jacana	V		1	The Comb-crested Jacana occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the	Given the lack of wetland habitat and the single local BioNet record, this species is not considered likely to occur on site, and at best the site offers marginal foraging habitat. The proposal to remove 0.06ha of native vegetation will not significantly	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					Hunter region of NSW, with stragglers recorded in south-eastern NSW (possibly in response to unfavourable conditions further north). Inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation.	impact the species, and as such, it is not a Subject Species.	
<i>Ixobrychus flavicollis</i>	Black Bittern	V		7	The Black Bittern has a wide distribution, from southern NSW north to Cape York and along the north coast to the Kimberley region. The species also occurs in the south-west of Western Australia. In NSW, records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	Given the low number of local BioNet records, geographic unsuitability, and lack of suitable aquatic habitat, this species is not considered likely to occur on site. The alignment will not impact any temporary or permanent wetlands or swamps. Therefore this species is not deemed as a Subject Species.	N
<i>Lathamus discolor</i>	Swift Parrot	E1	E	23	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted, Red Bloodwood, Forest Red Gum, Mugga Ironbark, and White Box.	Given the area is not mapped as important Swift Parrot habitat, and the number of local BioNet records are low, it is considered highly unlikely for this species to occur on site. The site does not contain any significant foraging habitat, and the proposed removal of only 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Limosa limosa</i>	Black-tailed Godwit	V		2	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern	Given that this is a migratory coastal shorebird and the area is not mapped as	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the coast, and inland. Primarily a coastal species, Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps.	important shorebird habitat, low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	
<i>Lophoictinia isura</i>	Square-tailed Kite	V		56	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Given the lack of preferred habitat and relatively low BioNet Records, this species is considered unlikely to occur on site. Additionally, habitat assessment including Stick Nest searches, and diurnal bird surveys, returned no results for the species. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Ninox strenua</i>	Powerful Owl	V		29	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. The species inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and	Given the lack of suitable habitat (HBTs), and moderately low number of local BioNet records, this species is not considered likely to occur on site, and at best the site offers marginal foraging habitat. The site does not contain any evidence of use by owls such as pellets, white-wash and roosting sites. The lack of HBTs, and the proposed removal of only 0.06ha of native vegetation means that the proposal will not significantly impact the	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					occasionally hunts in open habitats. As most prey species require hollows and a shrub layer, these are important habitat components for the owl.	species, and as such, it is not a Subject Species.	
<i>Numenius madagascariensis</i>	Eastern Curlew		E	1	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern Curlews are rarely recorded inland. In NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts.	Given that this is a migratory coastal shorebird and the area is not mapped as important shorebird habitat, low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Oxyura australis</i>	Blue-billed Duck	V		3	The Blue-billed Duck is endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation.	Given the low number of local BioNet records, geographic unsuitability, and lack of suitable aquatic habitat, this species is not considered likely to occur on site. The alignment will not impact any temporary or permanent wetlands or swamps. Therefore this species is not deemed as a Subject Species.	N
<i>Pandion cristatus</i>	Eastern Osprey	V		16	Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. Favour coastal	Given the lack of suitable habitat, and relatively low number of local BioNet records, this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat. Additionally, habitat assessment including Stick Nest searches, and diurnal bird surveys, returned no results for the	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					areas, especially the mouths of large rivers, lagoons and lakes.	species. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	
<i>Petroica phoenicea</i>	Flame Robin	V,P		1	The Flame Robin is a small Australian robin that reaches 14 cm in length. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes.	Given the lack of preferred habitat, being intact tall moist eucalypt woodland, and the single BioNet Record, this species is considered unlikely to occur on site. The proposal to remove 0.06ha of native vegetation will not significantly impact this woodland bird, and as such, it is not a Subject Species.	N
<i>Pterodroma leucoptera leucoptera</i>	Gould's Petrel	V,P	E	1	Has a body length of 30 cm and a wingspan of 75 cm. The upper surface of their long narrow wings has a distinctive 'M' pattern. Principal nesting habitat is located within two gullies which are characterised by steeply, sloping rock scree with a canopy of Cabbage Tree Palms. They nest predominantly in natural rock crevices among the rock scree and also in hollow fallen palm trunks, under mats of fallen palm fronds and in cavities among the buttresses of fig trees.	Given that this is a migratory coastal shorebird and the area is not mapped as important shorebird habitat, low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Pterodroma neglecta neglecta</i>	Kermadec Petrel (west Pacific subspecies)	V,P	V	2	A medium-sized petrel. Breeds on islands across the South Pacific. Nests in a crevice amongst rocks. Vagrant birds occur in coastal NSW waters, particularly after storm events.	Given that this is a migratory coastal shorebird and the area is not mapped as important shorebird habitat, low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
<i>Ptilinopus superb</i>	Superb Fruit-Dove	V,P		1	The Superb Fruit-dove is a small pigeon, approximately 24 cm in length. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	The only suitable habitat in the Study Area is located in Biodiversity Values mapped land, containing wet sclerophyll/rainforest vegetation which will be avoided using underboring. And given the relatively low BioNet Records, this species is considered unlikely to occur on site. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Rostratula australis</i>	Australian Painted Snipe	E1	E	6	The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	The alignment will not impact any temporary or permanent wetlands or swamps. Given the lack of suitable habitat and low number of local BioNet records, this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat. The proposal to remove 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Sternula albifrons</i>	Little Tern	E1		1	Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria. It breeds in spring and summer along the entire	Given that this is a migratory coastal shorebird and the area is not mapped as important shorebird habitat, low number of local BioNet records, and lack of suitable aquatic habitat, this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat. The proposal to remove 0.06ha of	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					east coast from Tasmania to northern Queensland, and is seen until May, with only occasional birds seen in winter months. Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records).	native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	
<i>Stictonetta naevosa</i>	Freckled Duck	V		86	The Freckled Duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. The duck is forced to disperse during extensive inland droughts when wetlands in the Murray River basin provide important habitat. The species may also occur as far as coastal NSW and Victoria during such times. Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree.	The alignment will not impact any temporary or permanent wetlands or swamps. Given the lack of suitable aquatic habitat, this species is not considered likely to occur on site. Therefore this species is not deemed as a Subject Species.	N
<i>Tyto novaehollandiae</i>	Masked Owl	V		7	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 1000 hectares or more, depending on prey availability. Roosts and breeds in moist	Given the lack of suitable habitat (HBTs), and low number of local BioNet records, this species is not considered likely to occur on site, and at best the site offers marginal foraging habitat. The site does not contain any evidence of use by owls such as pellets, white-wash and roosting sites. The lack of HBTs, and the proposed removal of only 0.06ha of native vegetation means that the proposal will not significantly impact the species, and as such, it is not a Subject Species.	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.		
<i>Tyto tenebricosa</i>	Sooty Owl	V		9	Occupies the eastern most one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Territories are occupied permanently. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum or Sugar Glider. Nests in very large tree-hollows.	Given the lack of suitable habitat (HBTs), and low number of local BioNet records, this species is not considered likely to occur on site, and at best the site offers marginal foraging habitat. The site does not contain any evidence of use by owls such as pellets, white-wash and roosting sites. The lack of HBTs, and the proposed removal of only 0.06ha of native vegetation means that the proposal will not significantly impact the species, and as such, it is not a Subject Species.	N
Mammals							
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V		3	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. 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. They may occupy small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understory, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities.	Given the low number of local BioNet records, and lack of suitable roosting habitat (HBTs), this species is not considered to occur on site. Additionally, the species was not detected during camera trapping or spotlighting. As such, and given the insignificant area of impact, this species is not considered to occur on site and is not a Subject Species.	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	3	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features.	This species was not recorded on site following use of high-frequency Anabat recorders. Given the low number of local BioNet records, and lack of suitable roosting habitat, this species is unlikely to occur in the area of impact for significant foraging habitat or breeding. This species is not a Subject Species.	N
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	2	The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites.	Given the low number of local BioNet records, lack of indicator 'latrine sites', this species is not considered likely to occur on site, or at best the site offers marginal foraging habitat. Additionally, the proposed removal of 0.06ha of native vegetation will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		23	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy.	This species was identified to a species group, recorded using high-frequency Anabat recorders, likely foraging in the broader Study Area. However, the proposal will avoid all impacts to trees and Hollow-Bearing-Trees, and no significant habitat features associated with Microbat sp. were detected in the area of impact (e.g. structures, rocky habitat). Given the low number of local BioNet records, and lack of suitable roosting habitat, this	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
						species is unlikely to be reliant on features in the area of impact for significant foraging habitat or breeding. As such, this species is not a Subject Species.	
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V		32	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	This species was definitively recorded using high-frequency Anabat recorders, likely foraging in the broader Study Area. However, the proposal will avoid all impacts to trees and Hollow-Bearing-Trees, and no significant habitat features associated with Microbat sp. were detected in the area of impact (e.g. structures, rocky habitat). Given the lack of suitable roosting habitat, this species is unlikely to be reliant on features in the area of impact for significant foraging habitat or breeding. As such, this species is not a Subject Species.	N
<i>Miniopterus australis</i>	Little Bent-winged Bat	V,P		49	Little Bentwing-bats are small dark chocolate brown insectivorous bats with a body length of about 45 mm. Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	This species was definitively recorded using high-frequency Anabat recorders, likely foraging in the broader Study Area. However, the proposal will avoid all impacts to significant habitat features associated with Microbat sp. (e.g. structures, rocky habitat). Given the lack of suitable roosting habitat, this species is unlikely to be reliant on features in the area of impact for significant foraging habitat or breeding. As such, this species is not a Subject Species.	N
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V,P		61	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in	This species was definitively recorded using high-frequency Anabat recorders, likely foraging in the broader Study Area. However, the proposal will avoid all impacts to significant habitat features	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					forested areas, catching moths and other flying insects above the tree tops.	associated with Microbat sp. (e.g. structures, rocky habitat). Given the lack of suitable roosting habitat, this species is unlikely to be reliant on features in the area of impact for significant foraging habitat or breeding. As such, this species is not a Subject Species.	
<i>Myotis macropus</i>	Southern Myotis	V		18	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	This species was definitively recorded using high-frequency Anabat recorders, likely foraging in the broader Study Area. However, the proposal will avoid all impacts to Hollow-Bearing-Trees, and no significant habitat features associated with Microbat sp. were detected in the area of impact (e.g. structures, rocky habitat). Given the low number of local BioNet records, and lack of suitable roosting habitat, this species is unlikely to be reliant on features in the area of impact for significant foraging habitat or breeding. As such, this species is not a Subject Species.	N
<i>Petauroides volans</i>	Southern Greater Glider	E1	E	1	The Southern Greater Glider occurs in eastern Australia, in eucalypt forests and woodlands, where it has a broad distribution from around Proserpine in Queensland, south through NSW and the Australian Capital Territory into Victoria.	Given the low number of local BioNet records, and lack of suitable roosting habitat (HBTs), this species is not considered to occur on site. Additionally, the species was not detected during camera trapping or spotlighting. As such, and given the insignificant area of impact, this species is not considered to occur on site and is not a Subject Species.	N
<i>Petaurus australis</i>	Yellow-bellied Glider	V	V	13	The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occur in tall mature eucalypt forest	Given the low number of local BioNet records, and lack of suitable roosting habitat (HBTs), this species is not considered to occur on site. Additionally,	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	the species was not detected during camera trapping or spotlighting. As such, and given the insignificant area of impact, this species is not considered to occur on site and is not a Subject Species.	
<i>Petaurus norfolcensis</i>	Squirrel Glider	V		50	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum Forest west of the Great Dividing Range and Blackbutt-Bloodwood Forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites.	Given the low number of local BioNet records, and lack of suitable roosting habitat (HBTs), this species is not considered to occur on site. Additionally, the species was not detected during camera trapping or spotlighting. As such, and given the insignificant area of impact, this species is not considered to occur on site and is not a Subject Species.	N
<i>Phascolarctos cinereus</i>	Koala	E1	E	3	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Inhabit eucalypt woodlands and forests.	The occurrence of Koala is further assessed below in the Chapter 4 – Biodiversity and Conservation (Koala Habitat Protection). Given the low number of local BioNet records, and targeted surveys including nocturnal spotlighting, call-playback, and SATs, which failed to identify any scratchings, scat or other signs of use. As such, and given the insignificant area of impact, this species is not considered to occur on site.	N
<i>Phoniscus papuensis</i>	Golden-tipped Bat	V,P		6	The Golden-tipped Bat has dark brown, curly fur with bright golden tips. The distinctively coloured fur extends along the wings, legs and tail. It has a short, pointed, over-hanging muzzle and pointy, funnel-shaped ears. Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, Casuarina dominated riparian forest and	This species was definitively recorded using high-frequency Anabat recorders, likely foraging in the broader Study Area. However, the proposal will avoid all impacts to trees and Hollow-Bearing-Trees, and no significant habitat features associated with Microbat sp. were detected in the area of impact (e.g.	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					coastal Melaleuca forests. Roost mainly in rainforest gullies on small first- and second-order streams in usually abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests modified with an access hole on the underside. Bats may also roost under thick moss on tree trunks, in tree hollows, dense foliage and epiphytes.	structures, rocky habitat). Given the low number of local BioNet records, and lack of suitable roosting habitat, this species is unlikely to be reliant on features in the area of impact for significant foraging habitat or breeding. As such, this species is not a Subject Species.	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	121	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	The site at best offers marginal foraging habitat. The only suitable roosting habitat in the Study Area is located in Biodiversity Values mapped land, containing wet sclerophyll vegetation which will be avoided using underboring. No roosts however were located along the alignment area. The species was incidentally observed on site during a site visit, however the proposed removal of only 0.06ha of native vegetation means that the proposal will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V		3	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	This species was definitively recorded using high-frequency Anabat recorders, likely foraging in the broader Study Area. However, the proposal will avoid all impacts to trees and Hollow-Bearing-Trees, and no significant habitat features associated with Microbat sp. were detected in the area of impact (e.g. structures, rocky habitat). Given the low number of local BioNet records, and lack of suitable roosting habitat, this species is unlikely to be reliant on features in the area of impact for significant foraging	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
						habitat or breeding. As such, this species is not a Subject Species.	
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		27	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m. Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	This species was definitively recorded using high-frequency Anabat recorders, likely foraging in the broader Study Area. However, the proposal will avoid all impacts to trees and Hollow-Bearing-Trees, and no significant habitat features associated with Microbat sp. were detected in the area of impact (e.g. structures, rocky habitat). Given the low number of local BioNet records, and lack of suitable roosting habitat, this species is unlikely to be reliant on features in the area of impact for significant foraging habitat or breeding. As such, this species is not a Subject Species.	N
<i>Thylogale stigmatica</i>	Red-legged Pademelon	V		2	Patchily distributed along coastal and subcoastal eastern Australia from Cape York to the Hunter Valley in NSW. Inhabits forest with a dense understorey and ground cover, including rainforest, moist eucalypt forest and vine scrub. Wet gullies with dense, shrubby ground cover provide shelter from predators.	The only suitable habitat in the Study Area is located in Biodiversity Values mapped land, containing wet sclerophyll vegetation which will be avoided using underboring. Given the species known distribution and low number of local BioNet records this species is not considered to occur on site. The lack of HBTs, and the proposed removal of only 0.06ha of native vegetation means that the proposal will not significantly impact the species, and as such, it is not a Subject Species.	N
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		8	The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single	This species was identified to a species group, recorded using high-frequency Anabat recorders, likely foraging in the broader Study Area. However, the proposal will avoid all impacts to trees and Hollow-Bearing-Trees, and no significant	N

Scientific Name	Common Name	NSW Status	Comm. Status	BioNet Records	Likelihood of Occurrence		Subject Species (Y/N)
					Species Description	Assessment	
					record from southern NSW, east of the ACT. Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest.	habitat features associated with Microbat sp. were detected in the area of impact (e.g. structures, rocky habitat). Given the low number of local BioNet records, and lack of suitable roosting habitat, this species is unlikely to be reliant on features in the area of impact for significant foraging habitat or breeding. As such, this species is not a Subject Species.	

From **Table 6** above, the following species are considered key subject or indicator species for the Subject Site due to being recorded on site, potentially likely to forage and roost or nest on the site, the site potentially forms an important part of a local home range for resident specimens and some potential habitat will be removed by the proposal (refer **Table 7 & 8**). Key (Subject) Species are further assessed in **Section 8 Table 9** informing the subsequent 5-part test assessment.

Table 7 - Key Species Consideration

Scientific Name	Common Name	BC Act	EPBC Act
Flora			
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V
<i>Thelymitra adorata</i>	Wyong Sun Orchid	E4A,P,2	CE

7.0 Key Species Considerations

The species identified for further consideration have been categorised into guilds. By considering these species and their lifecycle needs, many other species are also inadvertently considered. The analysis below considers key lifecycle features for each guild of species in more detail, and assists in informing the subsequent 5-part test assessment (refer **Table 8**).

Table 8 - Key Species Analysis

Guild/Species	Key Habitat Feature	Comment
Threatened Flora		
<i>Melaleuca biconvexa</i> (Biconvex Paperbark))	Detected in close proximity to the Study Area	Several individuals of <i>Melaleuca biconvexa</i> (Biconvex Paperbark) were identified near the alignment but they are not proposed to be impacted by the development proposal. The only suitable habitat along the alignment is located in Biodiversity Values mapped land, containing wet sclerophyll vegetation which will be avoided using underboring. As such no direct or indirect impacts are predicted to occur. It is hereby addressed in the 5-part test as a Subject Species.
<i>Thelymitra adorata</i> (Wyong Sun Orchid)	Surveyed in season- Not detected	<i>Thelymitra adorata</i> (Wyong Sun Orchid) occurs in grassy woodland or occasionally derived grassland in well-drained clay loam or shale derived soils. A number of sites where the species occurs are subject to past and ongoing disturbance, including sites on the edges of roads that contain a mixture of native and introduced species in the understorey, though competition with invasive introduced species is a threat. Several recent and close records for the species surround around the alignment area. However, targeted surveys were undertaken for the species in early September 2024, and then again 2 weeks later following confirmation of flowering, and no species were located. Some <i>Thelymitra</i> species were detected outside of the alignment area in the North, however these were identified as <i>T. pauciflora</i> . Only 0.06ha of native vegetation is proposed to be impacted with the alignment, however taking a precautionary approach, the species has been identified as a Subject Species for further assessment.

8.0 5-Part Test Assessment

Section 7.3 of the BC Act lists five factors that must be taken into account in determining the significance of potential impacts of proposed activities on threatened species, populations, ecological communities and/or their habitats as listed within the BC Act.

The 5-part test is used to determine whether there is likely to be a significant impact, and thus whether the Biodiversity Offsets Scheme (BOS) is triggered or a Species Impact Statement (SIS) is required (refer **Table 9**).

Table 9 - 5-part test

Section of BC Act 7.3	Requirement	Assessment
a)	<i>in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</i> For the following threatened flora species: • <i>Melaleuca biconvexa</i> • <i>Thelymitra adorata</i>	The given area proposed to be cleared is minimal and consists of predominantly scattered landscaped areas managed as planted gardens, road verges and remnant native canopy, it is unlikely that the proposal will have an adverse effect on the life cycle of any of the flora species such that they would be placed at risk of localised extinction. The proposed development has sought advice from arborists to retain all trees, and implemented under boring in areas of high retention-value. The proposal has also sought to use areas previously trenched for existing services alignments. The areas of impact that remain are kept to a minimum (0.06ha). Species specific assessments under the five-part test are given below: <i>Melaleuca biconvexa</i>:(Biconvex Paperbark): This species has been identified in close proximity to the Study Area. However targeted searches along the alignment have confirmed that no individuals are located in the narrow area of impact. This, combined with the adoption of underboring techniques to prevent disturbance of significant vegetation patches, aligns with a conservation-focused approach for the species. This will enable the retention of suitable habitat located in Biodiversity Values mapped land, containing wet sclerophyll vegetation. Additionally, measures such as WSUD controls will ensure that impacts to potential threatened flora in the area are minimised during and post-construction works. This is particularly relevant for groundwater dependent species such as <i>Melaleuca biconvexa</i>. The limited scope of the development, which utilises existing service lines, and landscaped areas rather than the wet sclerophyll habitats where the species thrives, further reduces the potential for any significant effects on its life cycle. <i>Thelymitra adorata</i> (Wyong Sun Orchid): The Wyong Sun Orchid tends to occupy grassy woodlands and derived grasslands—habitats similar to the areas scheduled for the alignment. However, detailed targeted surveys were undertaken for the species in early September 2024, and then again 2 weeks later following confirmation of flowering, and no species were located. Some <i>Thelymitra</i> species were detected outside of the alignment area in the North, however these were identified as <i>T. pauciflora</i>. Regardless, the areas proposed for trenching have been reduced where possible, with underboring employed where the alignment intersects higher-quality habitat. The proposal will also implement measures to ensure that impacts to potential threatened flora are minimised during and post-construction works. Additionally, the total area of impacts including entry/exit pits, and any potential indirect impacts

Section of BC Act 7.3	Requirement	Assessment
		have been included in the calculations for the alignment width. Given that the species was not detected during site surveys, the likelihood of the orchid's life cycle being disrupted is minimal. The species ability to remain dormant and re-emerge under favourable conditions, also demonstrates its resilience to localised disturbances.
b)	<i>in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</i> (i) <i>is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i>	PCT 3433 is associated with <i>Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions a listed Endangered Ecological Community</i>. However, the geographic and geological characteristics of the Subject Site, as well as the species composition across all stratum, indicates that it is unlikely for the PCT on site to be commensurate with this EEC. Further to this, the stretch of land proposed for the alignment has been subject to various disturbances, consisting of fragmented road reserve vegetation and council-managed verges. While portions of the linear Subject Site contain high quality habitat, most of the intersected vegetation has been subject to ongoing management and historical clearing. As such it is unlikely for any of this vegetation to be representative of the EEC, and the impacts to these areas are considered minimal (0.06ha fragmented native vegetation). The development also reduces potential impacts by under boring the areas of higher-quality habitat, and retaining all trees along the alignment. Given the above, has been determined that the proposal is not likely to place the any EECs at risk of extinction.
	(ii) <i>is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</i> Including: <i>Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions</i>	As above, the vegetation along the linear Subject Site is unlikely to be commensurate with this EEC. The removal of 0.06ha of native vegetation is unlikely to place this ecological community at risk of extinction within the local area, given that all trees have been identified for retention (AAR, 2024) and under boring has been used to avoid biodiversity values.
c)	<i>In relation to the habitat of a threatened species or ecological community:</i> i) <i>the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	Impacts to habitat of the threatened flora species and threatened ecological communities as mentioned above are considered to be minimal. The impact to 0.06ha of PCT 3250 and PCT 3433 is unlikely to adversely affect any threatened ecological communities or threatened species habitat. Vegetation is unlikely to be representative of any EECs, and the impacts to the community are considered minimal given the avoidance of higher quality BV mapped land, and the retention of all trees. Species specific addresses for threatened flora and their habitats are given below: <i>Melaleuca biconvexa (Biconvex Paperbark):</i> The Biconvex Paperbark is found in proximity to the Study Area; however, targeted searches have confirmed that its habitat will not be encroached upon by the development's narrow impact area. Underboring and the use of Water Sensitive Urban Design (WSUD) controls will prevent significant habitat disturbance or secondary impact on the

Section of BC Act 7.3	Requirement	Assessment
		species. The development will not removal any potential species habitat, which consists of wet sclerophyll vegetation. Additionally, the proposal has been designed to avoid all impacts to trees. <i>Thelymitra adorata</i> (Wyong Sun Orchid): The Wyong Sun Orchid tends to occupy grassy woodlands and derived grasslands—habitats similar to the areas scheduled for the alignment. However, detailed targeted surveys were undertaken for the species in early September 2024, and then again 2 weeks later following confirmation of flowering, and no species were located. Some <i>Thelymitra</i> species were detected outside of the alignment area in the North, however these were identified as <i>T. pauciflora</i>. As such, it is considered that the proposal will not impact any threatened species of flora. The planned development will implement measures such as WSUD and soft excavation to ensure that impacts to potential threatened flora habitat are minimised during and post construction works. The total area of impacts (0.06ha) including entry/exit pits, and any potential indirect impacts have been included in the calculations for the alignment width. In summary, the proposed development is designed to have minimal impact on the habitats of the threatened species mentioned. The use of non-invasive techniques such as underboring, the retention of all trees, and the implementation of mitigation strategies, seek to protect the habitats of threatened species and ecological communities.
	ii) <i>whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	The nature of the linear development is a short-term impact to a small portion of native vegetation (0.06ha). All trees have been identified for retention, and no areas of habitat will be fragmented by the proposal. The retention of higher quality vegetation and canopy has been allowed via underboring, which will continue to provide habitat values to fauna and flora species within the area. Fragmentation and isolation of habitat is not proposed to occur.
	iii) <i>the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality</i>	The habitat areas identified for potential removal or modification are predominantly scattered landscaped areas, road verges, and remnant native canopy—not primary habitats for the listed threatened flora species. These spaces have been managed in a way that does not protect and/or ensure the long-term survival of the species considered. The nature of the linear development is a short-term impact to a small portion of native vegetation (0.06ha). The proposed development avoids impacts to trees, and retains areas of higher-quality habitat and BV mapped land through the use of under boring. All areas proposed for trenching will employ measures to reduce secondary impacts, as given in Section 13. The design to underbore maintains habitat connectivity by reducing vegetation clearing, preventing any potential for genetic isolation or barrier to species movement. The small area (0.06ha) of habitat to be impacted by the alignment is of limited importance to the long-term survival of the listed Subject Species and ecological communities.
d)	<i>Whether the proposed development or activity is likely to</i>	The proposed development is not expected to have an adverse effect on any declared areas of outstanding

Section of BC Act 7.3	Requirement	Assessment
	<i>have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)</i>	biodiversity value. Measures such as underboring and environmental controls are in place to protect intact vegetation, and prevent direct or indirect impacts on high-value (BV mapped) areas.
e)	<i>Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process (KTP)</i>	The development has potential to contribute to the following KTPs: <i>Anthropogenic climate change</i> The proposal will contribute in a small way to the processes causing Anthropogenic Climate Change via the removal of vegetation which acts as a carbon sink. However, due to the small area of vegetation to be impacted, it is considered an insignificant contribution to this KTP. <i>Clearing of native vegetation</i> The proposal will require a temporary impact to a small amount (approx. 0.06ha) of exotic and remnant native vegetation. However, the removal is not considered to contribute to this KTP in any notable magnitude. <i>Invasion and establishment of aggressive weed species and exotic perennial grasses</i> Weed species and exotic grasses were recorded at the Subject Site. However, the proposed development will not contribute to this KTP, and may reduce the establishment of aggressive weed species by clearing and maintaining the vegetation within the proposed development. <i>Infection of native plants by <i>Phytophthora cinnamomi</i></i> There is potential for the development to contribute to this KTP during the clearing and construction phase. Appropriate hygiene protocols are outlined in Section 13. If such controls are implemented, the risk for the proposal to contribute to this KTP will be minimised. <i>Introduction and establishment of Exotic Rust Fungi of the order <i>Pucciniales</i> pathogenic on plants of the family <i>Myrtaceae</i></i> There is potential for the proposal to contribute to this KTP during the clearing and construction phase. Appropriate hygiene protocols are outlined within Section 13. If such controls are implemented, the risk for the development to contribute to this KTP will be minimised.

9.0 EPBC Act Assessment

A Protected Matters Search of an area of 5km radius of the Subject Site was conducted in December 2023 for Matters of National Environmental Significance as relevant to the Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act). The following Matters of National Significance are considered in this assessment.

World Heritage Properties:

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

National Heritage Places:

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

Wetlands of International Significance (declared Ramsar wetlands):

The site has no Internationally or Nationally important Wetlands, and it is not in close proximity to any such place.

Great Barrier Reef Marine Park:

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

Commonwealth Marine Areas:

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

Threatened Ecological Communities:

From a search of the EPBC Protected Matters website (12/12/2023), four (4) listed Threatened Ecological Communities (TECs) were considered likely to occur within a 5km radius of the Subject Site.

One (1) Critically Endangered Ecological Community:

- *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria.*

Two (2) Endangered Ecological Communities:

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

One (1) Vulnerable Ecological Community:

- *Subtropical and Temperate Coastal Saltmarsh.*

Ground truthing of vegetation on site identified that the vegetation on site is not commensurate with the EPBC TECs listed above.

Threatened Species:

86 listed threatened species were recorded as likely to occur within the buffer area. *Melaleuca biconvexa* (Biconvex Paperbark) is the only EPBC listed threatened species identified in close proximity to the Study Area in the south-east. However targeted searches along the alignment have confirmed that no individuals are located in the narrow area of impact (Subject Site). This, combined with the adoption of under boring techniques to prevent disturbance of significant vegetation patches, aligns with a conservation-focused approach for the species. No trees are proposed for removal. No threatened fauna species listed under the EPBC Act were recorded within Subject Site. Therefore, given that only a very small amount of seasonal foraging habitat is being removed, this development is unlikely to impact significantly on EPBC listed threatened fauna species.

Migratory Species:

63 listed migratory species were recorded as likely to occur within the buffer area. There is potential for some of the migratory terrestrial species listed in the EPBC Act to visit the site on an irregular basis.

However, given the heavily disturbed and roadside nature of the vegetation to be impacted, it is considered that the proposal is unlikely to significantly affect the availability of potential habitat for such mobile species, or disrupt migratory patterns.

EPBC Act Assessment Conclusion:

Consideration of the EPBC Act revealed that it is unlikely that significant impacts on Matters of National Environmental Significance will occur as a result of the proposal. As such a referral is not considered likely to be necessary.

10.0 State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2021 (BC SEPP) commenced on the 1st March 2022, under the Environmental Planning and Assessment Act 1979, and repealing the previous State Environmental Planning Policy (Koala Habitat Protection) 2020 and State Environmental Planning Policy (Koala Habitat Protection) 2021. The aims of Chapter 4 – Koala Protection 2021 are to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

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

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

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

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

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

Review of the information identified that the Subject Site is within Central Coast LGA, is more than one hectare and does not have an approved koala plan of management. Therefore, the BC SEPP 2021 applies and additional assessments were required to satisfy the Development Assessment Process.

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

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

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

ii. is not core koala habitat,

Site inspections identified that trees belonging to the koala use tree species listed in Schedule 3 for the relevant koala management area were located on site.

In regards to identifying the site as core koala habitat, core koala habitat is defined as;

- a. an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or*
- b. an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.*

Highly Suitable Koala Habitat is defined as – Where trees within any PCT are the regionally relevant species of those listed in Schedule 3 for the relevant koala management area.

Koala Investigation Results

As koala feed trees were identified on site additional assessments were undertaken to determine if koalas were present on site and to determine if the site was core koala habitat as per the definitions above.

Survey effort for Koalas included:

- Targeted searches including nocturnal searches (11 & 12/12/2023);

- Spot Assessment Technique (Phillips & Callaghan 2011) – 2 x SAT's undertaken 5/12/2023.
- Call playback (11&12/12/2023); (refer **Figures 8-11**).

Targeted surveys failed to identify any sign of koala utilisation of the site. Desktop assessment of local records in BioNet Atlas showed three (3) koala records within the 10km BioNet search over the past 18 years.

One record from 2013 was recorded within close proximity of the site. The most recent record (2017-2019) was recorded approximately 5km south of the Subject Site, and the single remaining record was recorded approximately 5km north in 2007.

Based on paucity of recent local records, the results of the targeted surveys as well as incidental survey work it is considered unlikely that koala are present within the Subject Site. Therefore, the Subject Site does not constitute Core Koala Habitat and no further assessment is required.

However, utilising the precautionary principle, further assessment was undertaken as detailed below.

Tier 2 Assessment

Part A: Presence of highly suitable Koala Habitat

Determine the PCT (using suitable methods) and if PCT have Schedule 2 listed trees an assessment must be undertaken to determine koala presence.

The Subject Site is located from Lot 41/-/DP814963, where it follows the road reserve along the south side of Brolga Way, west side of Hue Hue Road, and south side of Alison Way. The land proposed for the sewer upgrade is within the Central Coast City Council (CCC) and has been ground-truthed to determine native vegetation communities. Native canopy that is present within the Subject Site contain trees listed under Schedule 2 of the BC SEPP. Therefore, the site is deemed to have 'Highly Suitable Koala Habitat' and a Tier two assessment is required. Targeted Koala surveys were undertaken on site to achieve a diligent survey effort for Koalas.

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

An assessment of BioNet indicated three (3) records within 10km of the Subject Site within the last 18 years, however only one (1) of these records is within a 2.5km radius from the Subject Site. This single record is from 2013, located approx. 500m east of the southern end of Hue Hue Road at Wyong Christian Community School.

Part B Assessment

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

- AEP undertook Nocturnal Surveys and Call Playback on 11/12/2023. Two Koala SATs were undertaken on the 5/12/2023. No Koala scats or tree scratch marks were found during searches at the base of the 'koala use trees' listed in Schedule 2 of SEPP 2021, within the Subject Site. No evidence of Koala was detected on songmeters or camera traps, or during nocturnal surveys (including call playback and spotlighting).

ii) Koala Records

As stated above, one (1) BioNet record occurs within 2.5km from the Subject Site within the last 18 years.

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

Table 10 - Koala Assessment

Principles	Criteria	Assessment
Introduction	Describe the nature of the proposed development.	The proposal includes upgrades and realignment of sewer services along several main roads in Wyong. The linear area proposed for the alignment spans 4.5kms from Northwest to Southeast. Starting at Lot 41/-/DP814963, it follows the road reserve along the south side of Brolga Way, west side of Hue Hue Road, and south side of Alison Way. The proposed development will retain all trees, and primarily impact cleared/managed areas within the road reserve.
	Define how the SEPP applies to the proposed development.	Refer above to Tier 1 and Tier 2 Assessment.
Koala habitat values – addressing criteria 1 and 2	Describe the site area, including the general environment and condition, location and extent of the development area and any other areas that may be directly or indirectly impacted by the proposed development.	The proposal is located along the road reserve from Wyong M1 (Northbound) service station beginning at Lot 41, DP814963; following Brolga Way, Hue Hue Road and Alison Road. Fieldwork identified the presence of <i>PCT 3250 - Northern Foothills Blackbutt Grassy Forest</i> and <i>PCT 3433 - Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest</i> as the communities on site, however both have undergone significant clearing and management. Vegetation on site was in a highly disturbed condition with patches of canopy, shrub, and ground layer present with a high dominance of weeds. Surrounding lots have a variety of use including a mix of rural enterprise, private recreation areas, golf course and permanent residential dwellings. Surrounding lands have a variety of zoning, including RU1 – Primary Production, C2 – Environmental Conservation, C3 – Environmental Management, and RE1 – Public Recreation. Given the nature of the development being a long, linear strip, the native vegetation in the Study Area has varying degrees of connectivity. The majority of the proposal intersects with road reserve and landscaped vegetation, which is moderately fragmented from any continuous patches. Development would entail impacts to approx. 0.06ha of native vegetation, with underboring used to enable the retention of BV mapped vegetation. Due to the use of underboring, the retention of all trees, and minimal clearing, it is considered unlikely that the proposal will impact

Principles	Criteria	Assessment
		the connectivity or condition of the general environment.
	Provide details of koala survey as undertaken in accordance with Appendix C. This should include details of the results of the koala surveys, including how the site area meets the definition of core koala habitat and mapping that shows habitat areas and koala records within the site area and adjoining areas.	Flora surveys were undertaken by AEP confirming PCT's and Schedule 3 species and percentage cover within the Subject Site; Targeted koala searches including nocturnal searches, Spot Assessment Technique (Phillips & Callaghan 2011), and call playback were conducted by AEP in November and December 2023 (refer Table 3 above). BioNet records and desktop analysis do not indicate that the area meets the criteria of core koala habitat.
	Describe the site context (including mapping showing habitat that might be associated with vegetation in the adjoining landscape and records within the vicinity of the site area) and provide an analysis of the koala habitat values (including how koalas might use the site area and the relative importance of the site area to a local koala population).	PCTs within the Subject Site include; • PCT 3250 - <i>Northern Foothills Blackbutt Grassy Forest</i>; and • PCT 3433 - <i>Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest</i>. The following tree species are identified in the SEPP Schedule 3: Koala use tree species of the Central Coast koala management area, and were noted within the Subject Site or local vicinity; <i>Angophora floribunda</i>, <i>Corymbia maculata</i>, <i>Eucalyptus fibrosa</i>, <i>Eucalyptus pilularis</i>, <i>Eucalyptus saligna</i>, <i>Eucalyptus siderophloia</i>. The development has been focussed on areas that have previously been cleared and managed. Underboring techniques will be used to avoid impacting threatened or areas of high biodiversity value. Additionally, no trees are proposed for removal. No signs of occupation or foraging by koalas was found despite considerable survey effort and desktop analysis. Given this and the managed condition of the Subject Site, it is considered that there is no current local population, or if there is that it does not utilise the Subject Site. As such it is clear that the proposed development has avoided any known areas of higher quality koala habitat located further off site within the region.
Measures taken to avoid impacts to koalas –	Describe the site selection process, including how koala habitat was taken into account and any avoidance	The development is predominantly located within the road reserve which contains existing services and pits. Avoidance of Koala habitat is

Principles	Criteria	Assessment
addressing criteria 3, 4, 5, 6, 7 and 8	outcomes achieved through this process.	demonstrated by the retention of all trees, enabled by use of underboring and soft excavation. Underboring techniques will also be used to avoid impacts to higher-quality habitat and biodiversity values (BV) mapped vegetation. As such, only a small area (0.06ha) of lower stratum is being impacted. Targeted surveys failed to identify any sign of koala utilisation of the site. As such it was determined that it is unlikely that koalas are present within the Subject Site.
	Describe how the proposed development avoids or minimises direct impacts to koala habitat and habitat function within the site area.	The alignment has been located on lands with existing services, subject to ongoing maintenance. The use of underboring will avoid further impact to threatened species and areas of high biodiversity values mapped in the area. Additionally, an Arborist Assessment Report (AAR), as undertaken in 2023 has provided detailed measures to enable the retention of all trees. As such it is clear that the proposed development has avoided areas of higher quality koala habitat within the locality.
Analysis of potential impacts – addressing criteria 9	Identify the residual direct impacts to koalas and koala habitat within the site area, including the nature and extent of impacts and the likely implications for the viability of a local koala population.	The proposal requires a short-term impact to 0.06ha of native vegetation, with no impacts to trees. As stated above, surveys failed to find any sign of koala presence within the Subject Site.
	Identify the relevant potential indirect impacts to koalas and koala habitat within the site area and adjacent habitat areas, including the nature and extent of potential indirect impacts and the likely implications for the viability of a local koala population.	The proposal requires a short-term impact to 0.06ha of native vegetation, with no impacts to trees. No impacts, both direct and indirect are predicted to occur on the species. As stated above, surveys failed to find any sign of koala presence within the Subject Site.
Plan to manage and protect koalas and their habitat – addressing criteria 10, 11, 12 and 13	Describe the management measures that will be implemented as part of proposed construction and operations to manage the direct and indirect impacts identified. These measures should be outcomes focussed and include performance targets.	The proposal may have temporary impacts during the construction phase of the alignment; however all suitable habitat will be avoided via under boring, and given that no reduction in habitat, being Koala use trees, will occur, no Koala specific measures are required. General measures are provided for the proposal in Section 13 .
	Describe any compensatory measures that will be delivered, including an analysis of the suitability of these measures against criteria 9 and 10.	No specific koala offsets required because of the lack of a koala population that could utilise the site.

Principles	Criteria	Assessment
	Outline a plan for monitoring, adaptive management and reporting against the key outcomes and performance targets.	Not applicable as no local koala population is likely to be present.

Conclusion

Field surveys identified that Koala use trees as listed in *Schedule 3: Koala Use Trees* of the Koala SEPP occurred on site. Desktop assessment showed that there were three (3) records of koalas from within 5km of the Subject Site within the past 18 years, of which only one (1) was within the specified 2.5km. Detailed koala surveys were undertaken which did not detect evidence of koalas within the Subject Site. Additionally, the areas of proposed impact (0.06ha) are situated on lands previously disturbed/maintained, and all trees are being retained. As such it has been identified that koalas are not present on site, the site is not considered to be core koala habitat, and it is not anticipated that the proposal will impact koalas in the present or future.

11.0 Important Area Map Assessment

No sections of the Subject Site have been mapped as “Swift Parrot Important Areas”, “Regent Honey Eater Important Areas”, or “Migratory Species Important Areas” as defined by the Biodiversity Assessment Method Calculator Important Area Map (DPIE 2021).

As such it is not considered that the development would have any major adverse impacts upon these species or species groups.

12.0 State Environmental Planning Policy (Resilience and Hazards) 2021

Investigations in accordance with the State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP) found that the Subject Site is not identified as Coastal wetlands, Littoral Rainforests, but does fall within the Coastal Use Area and Coastal Environment Area Mapping.

Table 11 provides an assessment in accordance with the Coastal SEPP.

Table 11 – Coastal Use and Coastal Environmental Assessment

Clause Number	Clause	Assessment
Division 3 Coastal Environment Area		
2.10 (1) Development on land within the coastal environment area		
2.10 (1) 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:		
2.10 (1)	(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,	Several mapped water bodies and mapped hydrolines exist within the close proximity to the Study Area, with the alignment spanning over a bridge which crosses a 4th Order Stream, Porters Creek, which flows into Wyong River. The development is set back from the banks of Wyong River, and is separated by road reserve vegetation and existing public use infrastructure (footpaths, road bridges, etc). The proposed development proposes to meet Central Coast Council guidelines for both stormwater and water treatment. Under boring will be employed to ensure that no impacts occur along this section. Typical water sensitive urban design is expected to be incorporated around the development, to ensure erosion does not occur and water run-off is contained and managed.
	(b) coastal environmental values and natural coastal processes.	The proposed development is located less than 50m north of Wyong River, which is connected to Tuggerah Lake in the broader locality. The development is positioned across land containing existing services infrastructure, and by use of under boring and WSUD principles, the proposed sewer upgrades will avoid any direct impact on coastal environmental values and natural coastal processes.
	(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.	Typical water sensitive urban design is expected to be incorporated into the management of water on site and around the development, to ensure erosion does not occur and water run-off is contained and managed. As such, the proposed development is not expected to impact the sensitive coastal environment.
	(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,	The proposed development is located less than 50m north of Wyong River, which is connected to Tuggerah Lake. This is connected to the ocean via Tuggerah Entrance; however, the Subject Site is situated over 10kms away from Marine areas. The development is positioned across land containing existing services infrastructure, and integrates the

Clause Number	Clause	Assessment
		use of under boring and WSUD principles. As such, the proposal will avoid direct impact on the entities as listed; marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms.
	(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.	The proposed development will not impact or alter 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.
	(f) Aboriginal cultural heritage, practices and places,	No known Aboriginal cultural heritage, practices and places records were identified on NSW State Heritage Inventory website. For an extensive search consultation with a registered Heritage assessor is required.
	(g) the use of the surf zone.	The site will not impact the surf zone.
2.10 (2) Development consent must not be granted to development on land to which this section applies unless the consent authority is satisfied that		
2.10 (2)	(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or	The proposed development is located away from the foreshore avoiding direct impact on the coastal environmental values and natural coastal processes.
	(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or	As above.
	(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.	As above.
2.10 (3)	This section does not apply to land within the Foreshores and Waterways Area within the meaning of <i>State Environmental Planning Policy (Biodiversity and Conservation) 2021</i>, Chapter 6. As Per Chapter 6 of the BC SEPP (a) the Sydney Drinking Water Catchment, (b) the Sydney Harbour Catchment, (c) the Georges River Catchment, (d) the Hawkesbury-Nepean Catchment.	Not Applicable to this application.
Division 4 Coastal Use Area		
2.11(1) Development consent must not be granted to development on land that is within the coastal use area unless the consent authority:		
2.11 (1)	(a) has considered whether the proposed development is likely to cause an adverse impact on the following: (i) existing, safe access to and along the foreshore, beach, headland or rock platform	The proposed development is located within the road reserve and there will be limited impact to accessibility of public land whilst works are undertaken. Once complete access would not be constrained by these works.

Clause Number	Clause	Assessment
	for members of the public, including persons with a disability, (ii) overshadowing, wind funnelling and the loss of views from public places to foreshores, (iii) the visual amenity and scenic qualities of the coast, including coastal headlands, (iv) Aboriginal cultural heritage, practices and places, (v) cultural and built environment heritage, and	Furthermore, no known Aboriginal cultural heritage, practices or places are known to this area and no adverse impacts are expected. No known cultural and built environment and heritage places are known to this Lot and no adverse impacts are expected. Searches were carried out on the NSW Public Aboriginal Heritage Map Website. For an extensive search consultation with a registered Heritage Assessor is required (Heritage NSW 2021).
	(b) is satisfied that: (i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or (ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (iii) if that impact cannot be minimised—the development will be managed to mitigate that impact, and	As mentioned above, no impacts on matters referred to in Clause 2.11 (1) (a) are expected as a result of the proposed development.
	(C) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development.	The works are required to upgrade sewer for proposed service station upgrades and is unlikely to impact surrounding coastal built environment, and the bulk scale and size of the proposed development is required for sewer upgrades.
2.11 (2)	This section does not apply to land within the Foreshores and Waterways Area within the meaning of <i>Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005</i>.	Not applicable to this application.

As demonstrated in the above assessment it has been determined that the proposed development will have minimal to no impact to the mapped Coastal Use Area and Coastal Environment Area.

13.0 Recommendations

This proposed development has been determined to have no significant impacts on threatened species, ecological communities or key habitat features. Direct impact to mapped areas of biodiversity values (BV mapped) and all trees in the direct path of the alignment will be avoided using under boring techniques, and the use of existing access pits. Where trenching is required, an Arborist Assessment Report (AAR, AEP 2024) has assessed all trees within the Study Area, providing advice to enable their retention. The following measures will be implemented during construction to avoid impacts to canopy along the alignment:

- A Project Arborist (Minimum AQF5) should be appointed to provide a Tree Protection Plan (TPP) detailing specific construction methodology prior to CC stage for all trees close to the trenching footprints, inclusive of;
- Ground protection measures will be installed within all Tree Protection Zones which intersect with the direct trench footprint, implemented following guidance in Australian standard AS4970 – 2009 Protection of trees on development Sites (Appendix E);
- The use of “soft” construction methods including manual and vacuum removal of soils is required for works conducted within the SRZ and TPZ of assessed trees; and
- Any works within the SRZ of these trees should only be conducted under supervision of the project arborist.

Residual impacts include the clearing of 0.06ha of native vegetation. Impacts to the connectivity, biodiversity and habitat features of the Subject Site and the broader landscape have been appropriately considered and reduced/eliminated. General recommendations are made for consideration to mitigate potential impacts on local biodiversity as a result of the development of the site.

It is recommended that;

- An Erosion and Sedimentation Control Plan (ESCP) should be prepared for the proposal following guidelines from the “Blue Book” (Landcom, 2004);
- Best practice erosion and sedimentation controls should be put in place prior to development to limit offsite movement of materials into the surrounding areas and adjacent vegetation;
- Erosion and sedimentation controls should be checked daily and maintained in working order especially after rain events;
- Pre-clearance surveys should be undertaken to identify and clearly mark all habitat features, and observe any occupied hollows prior to felling. Appropriate measures should be devised prior to vegetation removal works to minimise impacts on resident fauna during the felling process;
- Required clearing of any vegetation on site should be undertaken in the presence of a suitably experienced Ecologist to ensure any displaced native fauna can be taken into care and dealt with appropriately;
- Prior to construction commencing, exclusion flagging tape and signage will be installed to delineate construction zone from retained vegetation. This will ensure that all impacts are within the assessed width of the Subject Site, and do not encroach into areas excluded from approvals; and
- Development works should be undertaken by minimal-impact, trenchless Horizontal Directional Drilling (HDD), referred to as ‘Underboring’ in this report. This technique is used to minimise impacts on native vegetation, and will allow all intersections with threatened flora species biodiversity values (BV) mapped land to be avoided.

14.0 References

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Appendix A – BOSET Report

Biodiversity Values Map and Threshold Report

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

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

There are two pathways for determining whether a BDAR is required for the proposed development:

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

Biodiversity Values Map and Threshold Report

Date of Report Generation		07/11/2024 11:17 AM
1. Biodiversity Values (BV) Map - Results Summary (Biodiversity Conservation Regulation Section 7.3)		
1.1	Does the development Footprint intersect with BV mapping?	no
1.2	Was <u>ALL</u> BV Mapping within the development footprint added in the last 90 days? (dark purple mapping only, no light purple mapping present)	no
1.3	Date of expiry of dark purple 90 day mapping	N/A
1.4	Is the Biodiversity Values Map threshold exceeded?	no
2. Area Clearing Threshold - Results Summary (Biodiversity Conservation Regulation Section 7.2)		
2.1	Size of the development or clearing footprint	184.9 sqm
2.2	Native Vegetation Area Clearing Estimate (NVACE) (within development/clearing footprint)	2.3 sqm
2.3	Method for determining Minimum Lot Size	LEP
2.4	Minimum Lot Size (10,000sqm = 1ha)	00 sqm
2.5	Area Clearing Threshold (10,000sqm = 1ha)	2,500 sqm
2.6	Does the estimate exceed the Area Clearing Threshold? (NVACE results are an estimate and can be reviewed using the Guidance)	no
REPORT RESULT: Is the Biodiversity Offset Scheme (BOS) Threshold exceeded for the proposed development footprint area?		no
(Your local council will determine if a BDAR is required)		

What do I do with this report?

- If the result above indicates the BOS Threshold has been exceeded, your local council may require a Biodiversity Development Assessment Report with your development application. Seek further advice from Council. An accredited assessor can apply the Biodiversity Assessment Method and prepare a BDAR for you. For a list of accredited assessors go to: <https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor>.
- If the result above indicates the BOS Threshold has not been exceeded, you may not require a Biodiversity Development Assessment Report. This BMAT report can be provided to Council to support your development application. Council can advise how the area clearing threshold results should be considered. Council will review these results and make a determination if a BDAR is required. Council may ask you to review the area clearing threshold results. You may also be required to assess whether the development is “likely to significantly affect threatened species” as determined under the test in Section 7.3 of the *Biodiversity Conservation Act 2016*.
- If a BDAR is not required by Council, you may still require a permit to clear vegetation from your local council.
- If all Biodiversity Values mapping within your development footprint was less than 90 days old, i.e. areas are displayed as dark purple on the BV map, a BDAR may not be required if your Development Application is submitted within that 90 day period. Any BV mapping less than 90 days old on this report will expire on the date provided in Line item 1.3 above.

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

Review Options:

- If you believe the Biodiversity Values mapping is incorrect please refer to our [BV Map Review webpage](#) for further information.
- If you or Council disagree with the area clearing threshold estimate results from the NVACE in Line Item 2.6 above (i.e. area of Native Vegetation within the Development footprint proposed to be cleared), review the results using the [Guide for reviewing area clearing threshold results from the BMAT Tool](#).

Acknowledgement

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

Signature: _____

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

Date: _____

07/11/2024 11:17 AM

Biodiversity Values Map and Threshold Tool

The Biodiversity Values (BV) Map and Threshold Tool identifies land with high biodiversity value, particularly sensitive to impacts from development and clearing.

The BV map forms part of the Biodiversity Offsets Scheme threshold, which is one of the factors for determining whether the Scheme applies to a clearing or development proposal. You have used the Threshold Tool in the map viewer to generate this BV Threshold Report for your nominated area. This report calculates results for your proposed development footprint and indicates whether Council may require you to engage an accredited assessor to prepare a Biodiversity Development Assessment Report (BDAR) for your development.

This report may be used as evidence for development applications submitted to councils. You may also use this report when considering native vegetation clearing under the State Environmental Planning Policy (Biodiversity and Conservation) 2021 - Chapter 2 vegetation in non-rural areas.

What's new? For more information about the latest updates to the Biodiversity Values Map and Threshold Tool go to the updates section on the [Biodiversity Values Map webpage](#).

Map Review: Landholders can request a review of the BV Map where they consider there is an error in the mapping on their property. For more information about the map review process and an application form for a review go to the [Biodiversity Values Map Review webpage](#).

If you need help using this map tool see our [Biodiversity Values Map and Threshold Tool User Guide](#) or contact the Map Review Team at map.review@environment.nsw.gov.au or on 1800 001 490.

Appendix B – Flora Species List

FLORA SPECIES LIST

The following list includes all species of vascular plants observed on site during fieldwork. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora present on the site. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as Orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list as thus:

- specimens that could only be identified to genus level are indicated by the generic name followed by the abbreviation “sp.”, indicating an unidentified species of that genus;
- specimens for which identification of the genus was uncertain are indicated by a question mark (“?”) placed in front of the generic, which is followed by the abbreviation “sp.” and;
- specimens that could be accurately identified to genus level, but could be identified to species level with only a degree of certainty are indicated by a (“?”) placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow the references outlined below.

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Names of families and higher taxa follow a modified Cronquist System (1981).

Introduced species are indicated by an asterisk “*”.

Threatened species listed under the BC Act or the EPBC Act are indicated in **bold font** (none observed).

Family	Scientific Name	Common Name
Apiaceae	<i>Centella asiatica</i>	Swamp Pennywort
Apocynaceae	<i>Araujia sericifera</i> *	Mothvine
Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod
Araceae	<i>Gymnostachys anceps</i>	Settlers Flax
Asparagaceae	<i>Asparagus africanus</i> *	
Asparagaceae	<i>Asparagus asparagoides</i> *	Bridal Creeper
Asparagaceae	<i>Asparagus virgatus</i> *	Asparagus Fern
Asteraceae	<i>Bidens pilosa</i> *	Cobbler's Pegs
Asteraceae	<i>Hypochaeris radicata</i> *	Flatweed
Asteraceae	<i>Ozothamnus diosmifolius</i>	Ball Everlasting
Bignoniaceae	<i>Pandorea pandorana</i>	Wonga Vine
Caprifoliaceae	<i>Lonicera japonica</i> *	Japanese Honeysuckle
Celastraceae	<i>Denhamia disperma</i>	Orange Boxwood
Commelinaceae	<i>Tradescantia fluminensis</i> *	Wandering Jew
Commelinaceae	<i>Commelina diffusa</i>	
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Cyperaceae	<i>Carex</i> spp.	
Cyperaceae	<i>Gahnia clarkei</i>	Tall Saw-sedge
Dilleniaceae	<i>Hibbertia pedunculata</i>	
Elaeocarpaceae	<i>Elaeocarpus reticulatus</i>	Blueberry Ash
Ericaceae	<i>Leucopogon juniperinus</i>	Prickly Beard-heath
Euphorbiaceae	<i>Breynia oblongifolia</i>	Coffee Bush
Fabaceae	<i>Acacia irrorata</i>	Green Wattle
Fabaceae	<i>Acacia longifolia</i>	
Fabaceae	<i>Daviesia ulicifolia</i>	Gorse Bitter Pea
Fabaceae	<i>Glycine clandestina</i>	Twining Glycine
Fabaceae	<i>Pultenaea</i> spp.	
Fabaceae	<i>Senna pendula</i> var. <i>glabrata</i> *	
Fabaceae	<i>Senna pendula</i> *	
Fabaceae	<i>Acacia decurrens</i>	Black Wattle
Fabaceae	<i>Acacia fimbriata</i>	Fringed Wattle
Fabaceae	<i>Hardenbergia violacea</i>	False Sarsparilla
Fabaceae	<i>Kennedia rubicunda</i>	Dusky Coral Pea
Goodeniaceae	<i>Goodenia heterophylla</i>	
Haloragaceae	<i>Gonocarpus teucrioides</i>	Raspwort
Lauraceae	<i>Cassythia glabella</i>	
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor Laurel
Lauraceae	<i>Cryptocarya microneura</i>	Murrogun
Lobeliaceae	<i>Lobelia purpurascens</i>	Whiteroot
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Matt-rush
Lomandraceae	<i>Lomandra longifolia</i>	Spiky-headed Mat-rush
Lomandraceae	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	Many-flowered Mat-rush

Family	Scientific Name	Common Name
Luzuriagaceae	<i>Geitonoplesium cymosum</i>	Scrambling Lily
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's Lucerne
Meliaceae	<i>Toona ciliata</i>	Red Cedar
Menispermaceae	<i>Stephania japonica</i>	Snake vine
Monimiaceae	<i>Wilkiea huegeliana</i>	Wilkiea, Veiny Wilkiea
Moraceae	<i>Ficus coronata</i>	Sandpaper Fig
Myrsinaceae	<i>Embelia australiana</i>	
Myrsinaceae	<i>Myrsine variabilis</i>	Muttonwood
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple
Myrtaceae	<i>Eucalyptus pilularis</i>	Blackbutt
Myrtaceae	<i>Eucalyptus siderophloia</i>	Northern Grey Ironbark
Myrtaceae	<i>Acmena smithii</i>	Lillypilly
Myrtaceae	<i>Callistemon salignus</i>	Willow Bottlebrush
Myrtaceae	<i>Corymbia maculata</i>	Spotted Gum
Myrtaceae	<i>Eucalyptus fibrosa</i>	Broad Leaved Ironbark
Myrtaceae	<i>Eucalyptus saligna</i>	Sydney Blue Gum
Myrtaceae	<i>Leptospermum trinervium</i>	Slender Tea-tree
Myrtaceae	<i>Melaleuca biconvexa</i>	Biconvex Paperbark
Myrtaceae	<i>Melaleuca linariifolia</i>	Snow in Summer
Myrtaceae	<i>Melaleuca nodosa</i>	Ball Honey Myrtle
Myrtaceae	<i>Syzygium australe</i>	Brush Cherry
Ochnaceae	<i>Ochna serrulata</i> *	Mickey Mouse Plant
Oleaceae	<i>Ligustrum lucidum</i> *	Large-leaved Privet
Oleaceae	<i>Ligustrum sinense</i> *	Small-leaved Privet
Oleaceae	<i>Notelaea longifolia</i>	Mock Olive, Large Mock-olive
Orchidoideae	<i>Thelymitra pauciflora</i>	Slender Sun Orchid
Phormiaceae	<i>Dianella caerulea</i>	Blue Flax-lily
Phormiaceae	<i>Dianella caerulea</i> var. <i>caerulea</i>	Flax Lily
Phyllanthaceae	<i>Glochidion ferdinandi</i>	Cheese Tree
Phyllanthaceae	<i>Glochidion ferdinandi</i> var. <i>pubens</i>	Hairy Cheese Tree
Pittosporaceae	<i>Rhytidosporum</i> spp.	
Pittosporaceae	<i>Billardiera scandens</i>	Hairy Appleberry
Pittosporaceae	<i>Hymenosporum flavum</i>	Native Frangipani
Pittosporaceae	<i>Pittosporum multiflorum</i>	Orange Thorn
Pittosporaceae	<i>Pittosporum revolutum</i>	Yellow Pittosporum
Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum
Plantaginaceae	<i>Plantago lanceolata</i> *	Ribwort
Poaceae	<i>Andropogon virginicus</i> *	Whisky Grass
Poaceae	<i>Avena barbata</i> *	Bearded Oats
Poaceae	<i>Axonopus fissifolius</i> *	Narrow-leaved Carpet Grass
Poaceae	<i>Briza maxima</i> *	Quaking Grass
Poaceae	<i>Dichelachne micrantha</i>	Short-hair Plume Grass
Poaceae	<i>Ehrharta erecta</i> *	Panic Veldtgrass

Family	Scientific Name	Common Name
Poaceae	<i>Holcus lanatus</i> *	Yorkshire Fog
Poaceae	<i>Hyparrhenia hirta</i> *	Coolatai Grass
Poaceae	<i>Megathyrsus maximus</i> *	
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass
Poaceae	<i>Paspalum urvillei</i> *	Vasey Grass
Poaceae	<i>Entolasia marginata</i>	Bordered Panic
Poaceae	<i>Entolasia stricta</i>	Wiry Panic
Poaceae	<i>Imperata cylindrica</i>	Blady Grass
Poaceae	<i>Oplismenus aemulus</i>	Basket Grass
Poaceae	<i>Themeda triandra</i>	Kangaroo Grass
Proteaceae	<i>Persoonia linearis</i>	Narrow-leaved Geebung
Ranunculaceae	<i>Clematis aristata</i>	Old Man's Beard
Rhamnaceae	<i>Alphitonia excelsa</i>	Red Ash
Rubiaceae	<i>Opercularia diphylla</i>	
Santalaceae	<i>Exocarpos cupressiformis</i>	Native Cherry
Sapindaceae	<i>Alectryon tomentosus</i>	Hairy Bird's Eye
Sapindaceae	<i>Cupaniopsis anacardioides</i>	Tuckeroo
Sapindaceae	<i>Guioa semiglauc</i>	Guioa
Smilacaceae	<i>Smilax australis</i>	Lawyer Vine
Verbenaceae	<i>Lantana camara</i> *	Lantana
Verbenaceae	<i>Verbena bonariensis</i> *	Purpletop
Vitaceae	<i>Cissus antarctica</i>	Kangaroo Vine

Appendix C – Fauna Species List

FAUNA SPECIES LIST

The following list includes fauna species that were observed within the Subject Site during fieldwork, given site attributes and location.

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

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

Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratching's (F), Nest (E), Burrow (FB)

Bat Records Observed (O), Definitely (D) Possible or within Species Group (P) Likely (L)

Anabat (U), Songmeter (AR), Camera Trap (Q)

Scientific Name	Common Name	NSW status	Comm. status	BioNet Records	Surveyed Observations	Survey Equipment
Amphibia/Reptilia						
<i>Litoria fallax</i>	Eastern Dwarf Tree Frog	P		197	W	
<i>Litoria tyleri</i>	Tyler's Tree Frog	P		123	W	
<i>Litoria peronii</i>	Peron's Tree Frog	P		127		Q
<i>Intellagama lesueurii</i>	Eastern Water Dragon	P		29	O	Q
<i>Pseudechis porphyriacus</i>	Red -bellied Black Snake	P		241	O	
Aves						
<i>Acridotheres tristis</i>	Common Myna*			627	OW	
<i>Ailuroedus crassirostris</i>	Green Catbird	P		9	OW	
<i>Anthochaera carunculata</i>	Red Wattlebird	P		242	O	
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	P		320	O	
<i>Cacatua sanguinea</i>	Little Corella	P		137	O	
<i>Ceyx azureus</i>	Azure Kingfisher	P		37	OW	
<i>Chenonetta jubata</i>	Australian Wood Duck	P		502	OW	
<i>Circus approximans</i>	Swamp Harrier	P		363	O	
<i>Cracticus nigrogularis</i>	Pied Butcherbird	P		266	W	
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	P		725	O	Q
<i>Eolophus roseicapilla</i>	Galah	P		337	W	
<i>Eopsaltria australis</i>	Eastern Yellow Robin	P		361	OW	Q
<i>Eudynamys orientalis</i>	Eastern Koel	P		162	W	

Scientific Name	Common Name	NSW status	Comm. status	BioNet Records	Surveyed Observations	Survey Equipment
<i>Grallina cyanoleuca</i>	Magpie-lark	P		1019	O	
<i>Gymnorhina tibicen</i>	Australian Magpie	P		1121	W	
<i>Hirundo neoxena</i>	Welcome Swallow	P		955	OW	
<i>Malurus cyaneus</i>	Superb Fairy-wren	P		1216	OW	
<i>Manorina melanocephala</i>	Noisy Miner	P		854	W	
<i>Manorina melanophrys</i>	Bell Miner	P		465	W	
<i>Meliphaga lewinii</i>	Lewin's Honeyeater	P		595	OW	
<i>Myiagra rubecula</i>	Leaden Flycatcher	P		61	W	
<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater	P		219	W	
<i>Neochmia temporalis</i>	Red-browed Finch	P		489	OW	
<i>Pachycephala pectoralis</i>	Golden Whistler	P		365	OW	
<i>Psophodes olivaceus</i>	Eastern Whipbird	P		403	W	Q
<i>Rhipidura albiscapa</i>	Grey Fantail	P		790	W	
<i>Rhipidura leucophrys</i>	Willie Wagtail	P		796	W	
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	P		1354	W	
<i>Vanellus miles</i>	Masked Lapwing	P		1094	W	
<i>Orthonyx temminckii</i>	Logrunner	P		1		Q
<i>Neosericornis citreogularis</i>	Yellow-throated Scrubwren	P		53		Q
<i>Sericornis frontalis</i>	White-browed Scrubwren	P		684		Q
Mammalia						
<i>Macropus sp.</i>	kangaroo / wallaby	P		58	W	
<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	P		248	O	
<i>Petaurus breviceps</i>	Sugar Glider	P		118		Q
<i>Acrobates pygmaeus</i>	Feathertail Glider	P		71		Q
<i>Antechinus stuartii</i>	Brown Antechinus	P		462		Q
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	P, V	V	121	O	

Scientific Name	Common Name	NSW status	Comm. status	BioNet Records	Surveyed Observations	Survey Equipment
<i>Rattus rattus</i>	Black Rat*			33	O	Q
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	P		164	O	Q
<i>Vulpes vulpes</i>	Fox*			62	O	Q
<i>Austronomus australis</i>	White-striped Free-tailed Bat	P		37	D	U
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	P		88	D	U
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	P		36	D	U
<i>Micronomus norfolkensis</i>	Eastern coastal Free-tailed Bat	V,P		40	D	U
<i>Miniopterus australis</i>	Little Bent-winged Bat	V,P		49	D	U
<i>Miniopterus orianae oceanensis</i>	Eastern Bent-winged Bat	V,P		61	D	U
<i>Myotis macropus</i>	Large-footed Myotis	V,P		25	D	U
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	P		35	D	U
<i>Rhinolophus megaphyllus</i>	Eastern Horseshoe Bat	P		13	D	U
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat	V,P		4	D	U
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V,P		37	D	U
<i>Vespadelus pumilus</i>	Eastern Forest Bat	P		46	D	U
<i>Falsistrellus tasmaniensis</i>	Eastern Falsistrelle	P		25	P	U
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	P		64	P	U
<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat	P		46	P	U
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat	P		37	P	U
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V,P		8	P	U
<i>Vespadelus vulturnus</i>	Little Forest Bat	P		35	P	U

Appendix D – Site Photographs



ABOVE: *Corymbia maculata* (Spotted Gum) on roadside

BELOW: Area adjacent to carpark of service station





ABOVE: Native vegetation adjacent to carpark at service station

BELOW: Entry point to reserve at intersection of Peacock Avenue and Brolga Way





ABOVE: Porters Creek Bridge on northern side - Noted Landcare site adjacent

BELOW: Roadside with exotic vegetation facing east towards bridge over M1





ABOVE: Roadside area with mix of exotic and native vegetation

BELOW: Grassy woodland area with some rubbish dumping at intersection of Peacock Avenue and Brolga Way



Appendix E – Author CV's

BYRON DE JAGER

Ecologist

Profile Summary

Byron has worked with AEP in the role of Ecologist since 2022. He has a Bachelor of Science, majoring in Sustainable Resource Management. Byron has experience in a variety of environmental work, in a professional and volunteer capacity, including flora, and field surveys, reporting and mapping, habitat restoration and community volunteering.

Academic Qualifications

- Certificate III Conservation and Land Management, Ryde TAFE 2017
- Bachelor of Science, Sustainable Resource Management (GPA 5.1) University of Newcastle

Training, Licences and Professional Memberships

- AABR - Australian Association of Bush Regeneration, Accredited Bush Regenerator
- NSW Class C Driver's Licence
- WHS WA Construction Induction White Card
- First Aid (Provide First Aid HLTAID011)
- Certificate II in Public Safety, through State Emergency Service (SES)
- Leadership fundamentals, SES
- AQF3 Chemical user Certificate
- Chainsaw use statement of attainment: Fell small trees. Trim and cut felled trees
- Cert IV Digital Media
- WIRES Rescue and Immediate care course
- WIRES Snake Handling and Rescue course
- WIRES Microbat and Flying Fox Handling and Rescue course

Professional Experience

Ecologist Anderson Environment & Planning Newcastle NSW	2022 – Present
Supervisor; Bush Regenerator Toolijooa Hunter Valley Special Projects Division Supervisor	2019 - 2022
Bush Regenerator Toolijooa Special Projects Division Supervisor Hunter Valley	2017 - 2019
WIRES rescue volunteer	2023 - Present
Bushcare, Blackwall Mountain Landcare	2014 - 2014

Relevant Project Experience

Ecological Survey examples

- Targeted Flora walking transect surveys
- Assisting in Biodiversity Assessment Method (BAM) plot flora surveys
- Targeted Fauna habitat surveys including Hollow Bearing Tree Assessment
- Camera trap surveys including deployment placement, baiting, collecting and analysis
- Nocturnal Fauna spotlighting surveys including Myotis (Microbats), Koalas, Forest Owls, Gliders and Snakes and Frogs
- Diurnal Fauna surveys including Birds, Animals, Invertebrates and Snakes
- Snake funnel trap installation and checking
- Koala SAT surveys
- Installation of Nest Boxes
- Microbat surveys including Anabat deployment and retrieval
- Desktop analysis of site conditions before visit
- Due Diligence report site surveys
- Biodiversity Management Plan Surveys
- Clearance Supervision ensuring clearance is done according to Development Approval

Ecological Assessment Report writing

Assist in writing:

- Biodiversity Management Plans (BMP)
- Vegetation Management Plans (VMP)
- Due Diligence reports (DD)
- Environmental Impact Assessment Reports (EAR)
- Biodiversity Assessment Reports (BDAR)
- Streamlined Biodiversity Assessment Reports (SBDAR)

- Environmental Assessments (EA)

Ecological Monitoring

- Biodiversity Management Plan (BMP) Monitoring Plot monitoring
- Nest Box camera inspections

Volunteer Experience

- WIRES wildlife Rescue
- SES State Emergency Service
- Trees in Newcastle, Environmental Sector Placement
- Research assistant, Kooragang Island.
- Hunter Water; Catchment Management department

BEN GRAHAM

Ecologist

Profile Summary

Ben worked with AEP in the role of Ecologist and graduated with a Bachelor of Environmental Science and Management (Ecology and Conservation) in November 2023. Ben's studies and past experience in a variety of roles developing data analysis, reporting, land rehabilitation, biodiversity offset management, leadership and WHS skills add to his growing ecological knowledge and experience. Ben joined the Glencore graduate program in Jan 2024.

Academic Qualifications

- Bachelor of Environmental Science and Management (Ecology and Conservation) Charles Sturt University; to be completed November 2023
- Bachelor of Engineering (Chemical) University of Newcastle (2015)

Training, Licences and Professional Memberships

- First Aid and CPR (HLTAID001, HLTAID002, HLTAID003) (Completed on 10/02/2021)
- C-Class Driver's License NSW

Professional Experience

Ecologist Anderson Environment & Planning Newcastle NSW	Feb 2023 – Jan 2024
Environment and Community Vacation Student Glencore Coal assets Australia Newcastle NSW	Oct 2022 – Jan 2023

Relevant Project Experience

Ecological Surveys

- Field assessment assistance with Biodiversity Assessment Method plots, vegetation mapping and habitat assessments
- Targeted flora surveys for threatened species, transects.
- Hollow bearing trees surveys, Koala Spot Assessment Technique (SAT) surveys, Camera trapping surveys for ground and arboreal species,
- Microbat surveys by observation and Anabat deployment, collection, and servicing.

Ecological Assessment & Reporting

- Contributing junior author on reports within several LGA's on Biodiversity Development Assessment Reports, Fauna and Flora Assessment Reports and Bushfire Threat Assessment Reports;
- GIS mapping
- Ecological field survey, covering terrestrial flora and fauna, to inform the production of Ecological Reports within NSW;

Ecological Monitoring

- Nest Box camera inspections

EAMON MCENTEE

Ecologist

Profile Summary

Eamon McEntee is a recent graduate of University of Newcastle, with a Bachelor degree of Environmental Science and Management (Sustainability). Eamon has been with AEP since 2023 following a 2-month student placement, and is proficient in desktop assessments, legislation, and reporting. Eamon is a keen bird-watcher and outdoors enthusiast, and has a professional interest in sustainable planning and development practices.

Academic Qualifications

- Bachelor Of Environmental Science & Management – University of Newcastle (current) (Expected graduation June 2024)
- Diploma of Tourism & Travel Management – Hamilton Tafe (2018)
- Diploma of Event Management – Hamilton Tafe (2018)

Training, Licences and Professional Memberships

- NSW Class C Driver's Licence
- WHS NSW Construction Induction White Card
- First Aid (Provide First Aid HLTAID011)
- Responsible Service of Alcohol/Responsible Conduct of Gambling (Competency Card)

Professional Experience

Ecologist	2023 – Present
Anderson Environment & Planning Newcastle NSW	
Hospitality	2013 – 2023
Bar manager, supervisor, events management, and front of house staff.	

Relevant Project Experience

Ecological Surveys

- White-bellied Sea-Eagle nest locating and monitoring Glenning Valley and Chisholm
- Targeted flora surveys in Newcastle, Lake Macquarie, and Central Coast regions
- Diurnal bird surveys
- Nocturnal surveys; spotlighting.
- Targeted reptile surveys and pitfall trapping for *Delma impar* in Blueys Beach Camera trapping for terrestrial and arboreal species, inclusive of deployment, servicing, collection and data analysis.
- Camera trapping for terrestrial and arboreal species, inclusive of deployment, servicing, collection and data analysis.

Ecological Assessment

- Author and analysis of shorebird sightings and population in Newcastle and Lake Macquarie (Eastern Curlew and Australasian Bittern)
- Analysis and identification of camera trap data on multiple projects within the Hunter, Lake Macquarie, and Central Coast region.
- PCT determination according to the Plot - PCT tool and internal AEP procedures.
- Author and assessment of various Environmental Assessment Reports (EARs) within the Hunter, Lake Macquarie, and Central Coast region.
- Assessment and production of Due Diligence (DD) letters/report within the Hunter, Lake Macquarie, and Central Coast region.
- Co-author of various Biodiversity Assessment Reports (BDARs) within the Hunter, Lake Macquarie, and Central Coast region.
- Co-author of various Streamlined Biodiversity Assessment Reports (SBDARs) within the Hunter, Lake Macquarie, and Central Coast region.

Ecological Monitoring

- White-bellied Sea-Eagle nest locating and monitoring Glenning Valley and Chisholm

KARA DUNN

Ecologist

Profile Summary

Kara works with AEP in the role of Ecologist. She Graduated with a Bachelor of Science Majoring in Zoology in 2022, through the University of New England. Kara has worked at AEP since July 2022 and in addition to this, she has undertaken numerous volunteering projects in the environmental/ecology sector. Her background experience in invertebrate, avian and fauna related field work, is utilised in an array of applications in her current role. Kara has competence in data management, GIS mapping and report writing. She has experience in conducting field surveys, fauna handling, and flora & fauna identification, and designing wildlife management plans.

Academic Qualifications

- Bachelor of Science majoring in Zoology – University of New England, 2022

Training, Licences and Professional Memberships

- NSW Class C Driver's Licence (Manual)
- WHS NSW Construction Induction White Card
- First Aid (Provide First Aid HLTAID011)
- Bushfire Awareness Certificate (NSW RFS 2023)

Professional Experience

Ecologist	2021 – Present
Anderson Environment & Planning Newcastle NSW	
Volunteer Field Assistant	2020 - 2022
Multiple UNE Projects	
Intern	2020 - 2021
Upland Lagoons Project	

Relevant Project Experience

Ecological Surveys

- Wildlife Surveys including cage trapping, pitfall traps, cameras, acoustics, spot assessment technique (SAT), Elliot trapping, funnel trapping, diurnal and nocturnal surveys, call-playback, aural-visual surveys, and nestbox monitoring (2021-present).
- Detection of several threatened fauna species during surveys or review of collected data including; Powerful Owl, Glossy Black Cockatoos, Grey-Crowned Babbler, Little Lorikeet, Square-tailed Kite, White-bellied Sea Eagle, Whistling Kite, Giant Dragonfly, Yellow-bellied Glider, Wallum Froglet, Green and Gold Bell Frog, Brush-Tailed Phascogale, Squirrel Glider, Eastern-Pygmy Possum, Scarlet Robin, Turquoise Parrot, Spotted-tailed Quoll, Grey-headed Flying Fox, Striped Legless Lizard, and various microbat species.

- Systematic flora surveys including parallel transects, general incidental flora, random meander, Biodiversity Assessment Method (BAM) plots, and Rapid Data Points (RDP) (2021-present). Notable results of these are as follows:
Detection of several threatened plant species including; *Thelymitra adorata*, *Melalueca biconvexa*, *Tetratheca juncea*, *Digitaria porrecta*, *Genoplesium insigne*, *eucalyptus camaldulensis*, *Tetratheca glandulosa*, *Eucalyptus glaucina*; at various sites.
- Identification of habitat including hollow-bearing trees, hydrological features, and rocky habitat;
- Fauna identification skills with a focus on Australian native birds, reptiles and mammals; and
- Use of botany to identify dominant plant species, and determine vegetation community types and/or ecotones.

Ecological Assessment

- Contributing author of various Biodiversity Development Assessment Reports (BDAR), Streamlined Biodiversity Development Assessment Reports (SBDAR), Ecological Assessment Reports (EAR) and Riparian Assessment Report (RAR).

Ecological Monitoring

- Nest box monitoring, reporting and data review at Warnervale for Squirrel Glider (2023/2024).

NAOMI STACKHOUSE

Project Lead

Profile Summary

Naomi works with AEP in the role of Ecology Project Lead. She has a Bachelor of Science (Advanced), majoring in Ecology, Biodiversity and Conservation Science. Naomi has worked at AEP since November 2021, and in addition to this, she has undertaken numerous volunteering projects in the environmental/ecology sector. She has experience with the Australian Wildlife Conservancy, Hunter Wildlife Rescue, and has volunteered doing fauna surveys and marine research at UON and UTAS. Naomi has competence in project management at various stages, high-level data management, GIS mapping and complex report writing. She has experience in conducting and leading field surveys, fauna handling, and flora & fauna identification, and designing wildlife management and ecological restoration plans.

Academic Qualifications

- Bachelor of Science (Advanced), Ecology, Conservation and Biodiversity Major, with Distinction – University of Newcastle, 2023

Training, Licences and Professional Memberships

- NSW Class C Driver's Licence (Manual)
- Provide First Aid (HLTAID011)
- Animal Handling and Rescue Certificate (NATF 2022)
- Bushfire Awareness Certificate (NSW RFS 2023)
- White Card (2023)
- Introduction to Temperate Marine Biology (UTAS, XAS101)
- Coral Research/Data collection at Norfolk Island through UON, contributing to the work of Charlotte Page (PhD)
- Marine Mammal Observer Course 2023

Professional Experience

Ecology Project Lead Anderson Environment & Planning Newcastle NSW	2024 – Present
Ecologist Anderson Environment & Planning Newcastle NSW	2021 - 2024
Wildlife Rescue and Transport Hunter Wildlife Rescue	2022 - 2022
Volunteer Field Assistant Australian Wildlife Conservancy	2021 - 2021
Fieldwork Research Assistant UON, Newcastle NSW	2020 - 2021

Relevant Project Experience

Ecological Surveys

- Wildlife Surveys including cage trapping, pitfall traps, cameras, acoustics, spot assessment technique (SAT), Elliot trapping, funnel trapping, diurnal and nocturnal surveys, call-playback, aural-visual surveys, and nestbox monitoring (2021-present). Notable results of these are as follows:

Detection of several threatened fauna species during surveys or review of collected data including; Powerful Owl (Raymond Terrace), Masked Owl and Glossy Black Cockatoos (Muswellbrook), Pale-Headed Snake (Gunnedah), Grey-Crowned Babbler (Beresfield, Pokolbin, Ellalong), Little Lorikeet (Pokolbin), Square-tailed Kite and White-bellied Sea Eagle (Blueys beach), Brush-Tailed Phascogale and Squirrel Glider (Allandale), Eastern-Pygmy Possum (Somersby), and Striped Legless Lizard (Muscle Creek).

- Systematic flora surveys including parallel transects, general incidental flora, random meander, Biodiversity Assessment Method (BAM) plots, and Rapid Data Points (RDP) (2021-present). Notable results of these are as follows:
Detection of several threatened plant species including *Corybas dowlingii*, *Thelymitra adorata*, *Melalueca biconvexa*, *Rhodamnia rubescens*, *Tetratheca juncea*, *Digitaria porrecta*, *Eucalyptus glaucina*; at various sites along the East coast of NSW or Upper Hunter Region;
- Identification of habitat including hollow-bearing trees, hydrological features, and rocky habitat;
- Fauna identification skills with a focus on Australian native birds, reptiles and mammals;
- Use of botany to identify dominant plant species, and determine vegetation community types and/or ecotones; and
- Project management of various seasonal survey rounds, including the use of spatial data and minimum effort requirements to coordinate targeted species surveys.

Ecological Assessment

- Contributing author of various Biodiversity Development Assessment Reports (BDAR), Biodiversity Certification Assessment Reports (BCAR) and Biodiversity Stewardship Site Assessment Reports (BSSAR). (Terrigal, Kincumber, Cooranbong, Somersby, Pokolbin, Tuggerah, etc (November 2021 to Present))
- Contributing author of Ecological Assessment Reports (EAR). (Various Sites November 2021 to Present).
- Contributing author of Biodiversity Management Plans (BMP) and Vegetation Management Plans (VMP). (Various Sites November 2021 to Present).
- Primary author of several complex reports and submissions including tailored Eco-advice and tender applications (Barangaroo, Macquarie Park, North Windella, North Head, Raymond Terrace, Orchard Hills, etc (November 2021 to Present)).

Ecological Monitoring

- Design of methodology and scope for ongoing wildlife and ecological monitoring plans, in addition to Biodiversity Management Plans (BMP) and Vegetation Management Plans (VMP) (Terrigal, Kincumber, Tuggerah, Raymond Terrace, Blueys Beach, North Head, etc. (November 2021 to Present)).
- Nest box monitoring, reporting and data review at Wyee for Squirrel Glider (May 2023).

SIMON PURCELL

Senior Ecologist

Profile Summary

Simon works with AEP in the role of Senior Ecologist. Simon has over 20 years of professional experience managing projects in the fields of terrestrial ecology, animal care and husbandry, mining and mine rehabilitation and environmental management.

Simon's background in terrestrial ecology developed whilst living in Weipa Far North Queensland, where he successfully managed and implemented numerous projects focussing on threatened species (Palm Cockatoo, red Goshawk, Northern Quoll and Black-footed Tree-rat) within the Cape York Peninsula Bioregion. Additional to the threatened species program, Simon managed and was involved in mine pre-clearance and rehabilitation works.

In recent years Simon has drawn his experience into Project Management of a wide range of projects within New South Wales from small to large scale biodiversity, stewardship and ecological assessments, bushfire threat assessments, riparian assessments, vegetation and biodiversity management plans and other ecological management plans, provision of design advice and involvement in preparing expert witness documentation associated with Section 34 and Land and Environment Court Proceedings.

Academic Qualifications

- Bachelor of Applied Science, Major Wildlife Science – University of Queensland Gatton, 2013
- Certificate III in Animal Care and Management – Companion Animal Services 2008

Training, Licences and Professional Memberships

NSW Class C Driver's Licence
First Aid (Provide First Aid HLTAID011)
Rehabilitation / Fauna Spotter Catcher Permit (QLD)
Fauna and Venomous Snake Handling
Apply Risk Management
Construction White Card

Professional Experience

Senior Ecologist Anderson Environment & Planning Newcastle NSW	2020 – Present
Manger / Team Leader / Ecologist Ecotone Flora Fauna Consultants Weipa QLD	2014 - 2019
Field Technician / Ecologist Ecotone Flora Fauna Consultants Weipa QLD	2013 - 2014

Mine Operator and Trainer Rio Tinto Weipa QLD	2010 - 2012
Parks and Garden Maintainer Spotless Group Weipa QLD	2009 – 2010
Vet Nurse Tableland Veterinary Service Weipa QLD	2009 - 2009
Manager The Pet Centre Sydney NSW	2003 - 2009
Sales Assistant The Pet Centre Sydney NSW	2001 - 2003

Relevant Project Experience

Ecological Surveys

- Kincumber Biodiversity Field Surveys (NSW) 2022 - 2024
- Eden Biodiversity Field Surveys (NSW) 2020 - 2024
- Pokolbin Biodiversity Field Surveys (NSW) 2022 - 2024
- Waterford Preclearing Surveys (NSW) 2022 - 2024
- Halloran Biodiversity Field Surveys (NSW) 2020 - 2024
- Mardi Biodiversity Field Surveys (NSW) 2020 - 2024
- Order of Magnitude and Prefeasibility Studies (Nth QLD) 2015 – 2019
- Pre clear flora and fauna surveys - Mining and drilling programs (Nth QLD) 2014 - 2019
- Various annual EVNT bird nest searches, habitat surveys and monitoring programs - Palm Cockatoo, Red Goshawk, Rufous Owl (Nth QLD) 2014-2019.
- Various EVNT research programs Northern Quoll, Black-footed Tree Rat, Chestnut Dunnart (Nth QLD) 2017 – 2019.
- Various annual EVNT bird trapping and tracking programs (Nth QLD) 2017 – 2019.
- Artificial bird nesting hollow program - Palm Cockatoo (Nth QLD) 2018 – 2019.
- Various mammal camera surveys and trapping programs (Nth QLD) 2012 - 2019.
- Preclearing Flora and fauna survey road alignment (Nth QLD).
- Hydrological monitoring (Nth QLD) 2014-2015.
- Frigatebird Counts and Roost Tree Mapping (Nth QLD) 2014.
- Microbat House Evictions – Various (Nth QLD) 2014-2015.
- Annual rehabilitation surveys (Nth QLD) 2019.
- Rehabilitation field trials and annual rehabilitation surveys (Nth QLD) 2014-2016.
- Rehabilitation fauna Surveys (Nth QLD) 2013-2015.

- Baseline fauna surveys (Nth QLD) 2013.

Ecological Assessment

- Old Maitland Road, Mardi, Residential Subdivision and Services Alignment (BDAR, BMP, AIA, BTA, AAR)
- Avoca Drive, Kincumber, Residential Subdivision (BDAR, BMP, AIA)
- Sparks Road, Halloran, Industrial Subdivision and Sewer Alignment (BDAR, BMP, BTA, AIA)
- Kings Avenue, Terrigal, Residential Developments (BDAR, AIA, BMP)
- Tennant Street, Bell Bird, Residential Subdivision (BDAR)
- Carrs Road, Neath, Caravan Park (BDAR)
- Orient Road, Greendale, Industrial Development (BDAR)
- Eleventh Avenue, Austral, Residential Subdivision (BDAR, BTA, Bio certification)
- Croatia Ave, Edmondson Park, Multi-storey Residential (BDAR, BTA, Bio certification)
- Main Road / Cessnock Road, Gillieston Heights, Residential Subdivision (BDAR, BMP)
- West Wilton Growth Centre (Planning Proposal Cumberland Plain Conservation Plan Compliance Report, BTA, RAR)
- Ampol Service Centres Re-development, Pheasants Nest (BDAR, BMP, AIA)
- Ampol Service Centres Re-development, Eastern Creek (EAR, BMP, AIA)
- Ampol Service Centres (Services Alignment), Wyong (EAR, AIA)
- Macleay Ave, Woy Woy, Planning Proposal / Residential Subdivision (EAR, AIA, BMP, BTA)
- The Vintage, Pokolbin, Residential Subdivisions (EAR, BDAR, BMP, AIA)
- Weed Management Plan Fieldwork and Reporting (Nth QLD) 2018.
- Migratory Bird Species Review for Terrestrial Management Plan (Nth QLD) 2015.
- Seed processing and management (Nth QLD) 2013-2015

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Ecological Monitoring

- Species Response Plan Preparation (Nth QLD) 2018-2019
- Internal bird nest camera monitoring program - Palm Cockatoo and Red Goshawk (Nth QLD) 2018 – 2019.
- EVNT Orchid offset program (Nth QLD) 2016 – 2019.
- Fauna Spotter / Field Assistant, Humble Bee Films (NSW) (2012).
- Biodiversity Stewardship Site Agreements Mardi

TIM MOUTON

Senior Ecologist

Profile Summary

Tim works with AEP in the role of Senior Ecologist. Tim has over 15 years of professional experience managing projects in the fields of ecology, natural area restoration, biodiversity conservation, community education, and construction environmental management. Tim also has 5 years' experience working in the field as a bush regenerator.

Academic Qualifications

- Master of Environmental Science – Southern Cross University, 2008
- Certificate II Conservation Land Management – TAFE2003
- Bachelor of Environmental Science University of Newcastle (2001)

Training, Licences and Professional Memberships

- NSW Class C Driver's Licence
- WHS NSW Construction Induction White Card
- First Aid (Provide First Aid HLTAID011)
- Biodiversity Assessment Methodology (BAM) Accredited Assessor (BAAS: 19083)
- Erosion & Sediment Control Training (4-day Blue Book course / CPESC)
- Feral Animal Control training (1080 & Pindone baiting)
- Certificate 3 in Chemical Application (AQF3)

Professional Experience

Senior Ecologist Anderson Environment & Planning Newcastle NSW	2019 – Present
Senior Project Officer / Ecologist Conservation Volunteers Australia / WetlandCare Australia Ballina NSW	2015 - 2018
Senior Ecologist / Environmental Scientist Onsite Environmental Management Redhead NSW	2009 - 2015
Bush Regenerator / Leading Hand Lane Cove Council, Australian Wetlands Sydney NSW	2008 - 2009
Ecologist / Environmental Scientist GeoLINK Consulting Coffs Harbour NSW	2006 - 2007
Bush Regenerator / Leading Hand Gondwana Bush Restoration, Willoughby City Council Sydney NSW	2002 - 2006
Environmental Officer John Holland Construction Newcastle NSW	2001 - 2002

Relevant Project Experience

Ecological Surveys

- Undertaking floristic plot surveys in accordance with the BAM within small to large development and offset sites, including stratifying vegetation zones across these sites to determine suitable location and orientation of plots.
- Experience applying appropriate guidelines and techniques for targeted threatened flora surveys across small to large development and offset sites, including two-phase grid technique for threatened flora.

Ecological Assessment

- Project management and preparation of detailed ecological assessments in accordance with state and federal legislation, including Ecological Assessment Reports, Biodiversity Development Assessment Reports, Biodiversity Stewardship Site Assessment Reports, and Biodiversity Certification Assessment Reports.

Ecological Monitoring

- Undertaking site assessment and monitoring for medium to long term ecological monitoring programs including monitoring the progress of on-ground works associated with the implementation of Vegetation Management Plans.

Ecological Restoration

- Project managing small to large restoration projects throughout all phases of implementation, including scoping and planning on-ground works, contractor management and procurement, and progress reporting on various stages of works.

Appendix F – Bat Call Summary Report



AEP

BIODIVERSITY | BUSHFIRE | ARBORICULTURE

NEWCASTLE | SYDNEY

Bat Call Summary Report

M1 Service Centre
Alison Road, Wyong



19 December 2023

AEP Ref: 2634

1.0 Method

Analysis of bat echolocation calls was undertaken using Anabat Insight software. Identification was carried out utilising Pennay et al. (2004) along with comparison from recorded reference calls associated with the Sydney Basin.

Reference calls used were obtained from the NSW database and AEP confirmed bat call collection.

All calls were viewed, with unique calls tagged and identified. Calls that were too short (three pulses or less) were not analysed and tagged as unknown.

Certain microbat species have similar call frequencies, call shape and other characteristics which can make identification to species impossible using just call analysis. Where it was not possible to differentiate calls due to similar call characteristics the call was marked as species group.

Table 1: Confidence ratings of bat call sequences

Confidence	Description
Definite	Call has been identified to a particular species and could not be confused with another species.
Probable	Call has been identified to a particular species, with a low chance that it could be confused with another species.
Possible	Call has been identified to a particular species, but there is a moderate chance of confusion with another species.
Species group	Call could not be identified as a particular species due to call characteristics (poor quality/short sequence, bat species with overlapping frequencies, etc).
Unknown	Call sequences that are too short or of very poor quality.

2.0 Differentiation of species with similar calls

Separation of species with similar calls is possible using particular call characteristics, a short description of characteristics used to distinguish species is included in **Table 2**. Note that it is not always possible to separate similar calls and is affected by the length and quality of recorded calls.

Species names are based on the Australian Chiroptera taxonomic list (Reardon et al. 2015) with changes made to keep the naming conventions in line with DPIE.

Table 2: Call characteristics used to differentiate species

Species	Characteristic
<i>Miniopterus australis</i> / <i>Vespadelus pumilus</i>	Differences in frequency or presence of a down-sweeping tail indicating <i>M.australis</i> .
<i>Chalinolobus morio</i> / <i>Vespadelus</i> sp.	Presence of a down-sweeping tail on majority of calls indicated <i>C.morio</i> .
<i>Vespadelus troughtoni</i> / <i>Vespadelus vulturnus</i> / <i>Vespadelus pumilus</i>	It is not currently possible to differentiate between <i>V.vulturnus</i> and <i>V.troughtoni</i> on call characteristics alone. <i>V.pumilus</i> can be differentiated only when call frequency is above 54khz.
<i>Ozimops ridei</i> / <i>Micronomus norfolkensis</i>	Call frequency and alternation of pulses within the call indicates <i>M.norfolkensis</i> .
<i>Ozimops ridei</i> / <i>Ozimops</i> <i>planiceps</i>	Differentiated using characteristic frequency.
<i>Chalinolobus gouldii</i>	Differentiated from other species by frequency and presence of curved alternating calls.
<i>Austronomus australis</i>	Differentiated using characteristic frequency.
<i>Saccolaimus flaviventris</i>	Differentiated using characteristic frequency.
<i>Rhinolophus</i> <i>megaphyllus</i>	Differentiated using characteristic frequency and shape.
<i>Myotis macropus</i> / <i>Nyctophilus</i> spp.	<i>M.macropus</i> differentiated based on calls with initial slope >400 OPS and pulse intervals <75ms. Secondary characters used include central kink and slope variances between pulses. Requires high quality calls and is not always reliable.
<i>Scotorepens orion</i> / <i>Scoteanax rueppellii</i>	Calls from these species are very similar. Differentiation is based on the characteristic frequency and the frequency of the knee when compared to the characteristic frequency.
<i>Falsistrellus</i> <i>tasmaniensis</i>	Can be differentiated within good call sequences from <i>Scotorepens orion</i> / <i>Scoteanax rueppellii</i> based on length of pre-characteristic but generally difficult to separate.
<i>Miniopterus orianae</i> <i>oceanensis</i> / <i>Vespadelus</i> sp.	<i>M.orianae</i> oceanensis differentiated based on call timing, shape and frequency.
<i>Vespadelus regulus</i> / <i>Vespadelus darlingtoni</i>	These species are not differentiated from each other by us.

It should be noted that the number of call sequences for specific species does not allow for a quantitative understanding of the numbers present on site. Instead, it should be taken as an idea of activity within the site for that particular species. It is not possible to compare activity levels between species due to differences in species detectability, foraging strategies and call characteristics.

3.0 Results

7704 call sequences were recorded of which 4063 were analysable (not short calls or noise files). Species that were identified definitively include:

- *Austronomus australis* (White-striped Free-tailed Bat)
- *Chalinolobus gouldii* (Gould's Wattled Bat)
- *Chalinolobus morio* (Chocolate Wattled Bat)
- *Micronomus norfolkensis* (Eastern coastal Free-tailed Bat)
- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus orianae oceanensis* (Eastern Bent-winged Bat)
- *Myotis macropus* (Large-footed Myotis)
- *Ozimops ridei* (Ride's Free-tailed Bat)
- *Rhinolophus megaphyllus* (Eastern Horseshoe Bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Vespadelus pumilus* (Eastern Forest Bat)

Bats that are likely to be on site but could not be definitively identified (i.e. those that were classified as possible or within a species group) include:

- *Falsistrellus tasmaniensis* (Eastern Falsistrelle)
- *Nyctophilus geoffroyi* (Lesser Long-eared Bat)
- *Nyctophilus gouldi* (Gould's Long-eared Bat)
- *Scotorepens orion* (Eastern Broad-nosed Bat)
- *Vespadelus troughtoni* (Eastern Cave Bat)
- *Vespadelus vulturnus* (Little Forest Bat)

While all care has been taken it should be noted that certain bat species are difficult to identify by bat call and others may not have been recorded by the detectors. It is therefore recommended that a habitat assessment should be used in conjunction with this analysis to determine the likely occurrence of other bat species.

4.0 Sample Time vs Frequency graphs

A sample call for each unique bat species, that was identified (definitive/probable), is included below.



Figure 1 – *Austronomus australis* definite call

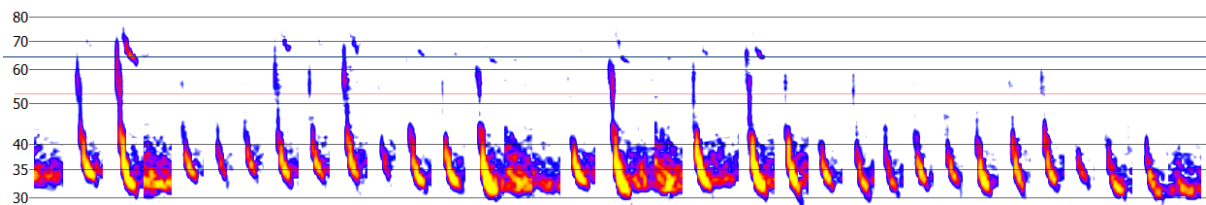


Figure 2 – *Chalinolobus gouldii* definite call

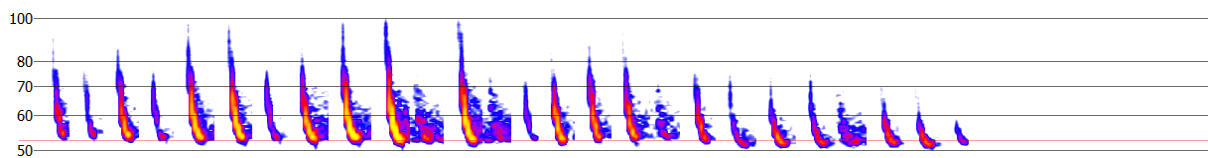


Figure 3 – *Chalinolobus morio* likely call

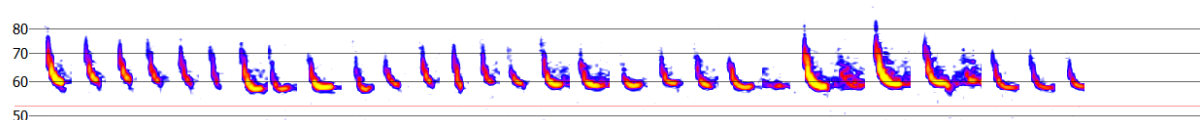


Figure 4 – *Miniopterus australis* definite call

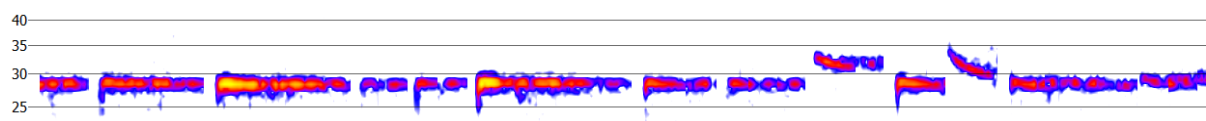


Figure 5 – *Micronomus norfolkensis* definite call

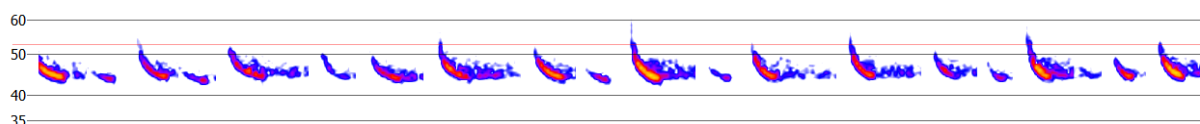


Figure 6 – *Miniopterus orianae oceanensis* definite call

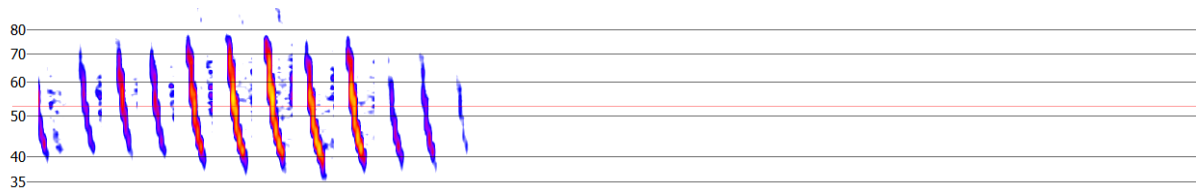


Figure 7 – *Myotis macropus* likely call

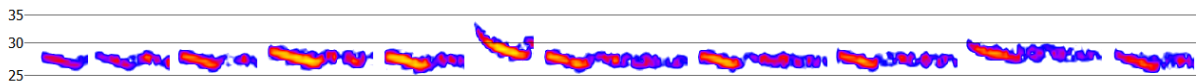


Figure 8 – *Ozimops ridei* definite call

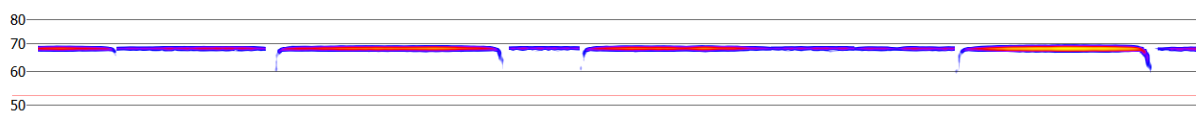


Figure 9 – *Rhinolophus megaphyllus* definite call

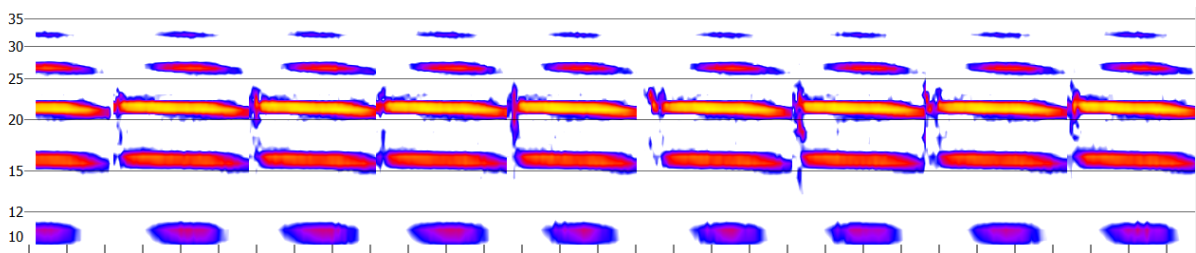


Figure 10 – *Saccolaimus flaviventris* definite call with harmonics and sub harmonic

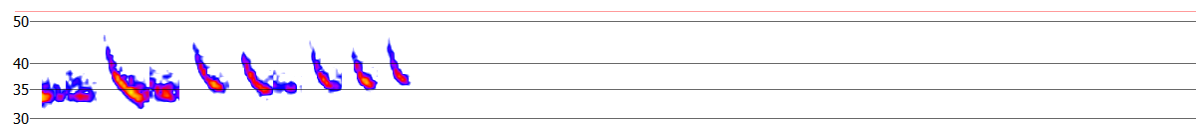


Figure 11 – *Scotenax rueppellii* likely call

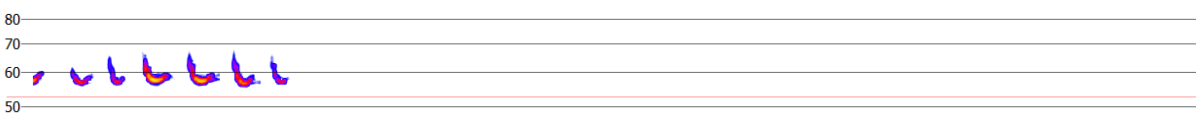


Figure 12 – *Vespadelus pumilus* definite call