Biodiversity Management Sub-Plan 89 John Whiteway Drive, Gosford, NSW 2250

Prepared For: Deicorp
Prepared By: Anderson Environment and Planning
Date: 28 November 2022
AEP Reference: 2583
Revision: 02

View of boundary with adjacent residential block

View of APZ from development envelope

Tree canopy with scattered weeds and native shrubs

Zone 3 facing south west to sheer drop

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1.0 Biodiversity Management Sub-Plan Objectives

Anderson Environment & Planning AEP has prepared this Biodiversity Management Sub-Plan (BMSP) to schedule actions required to address animal welfare issues from clearing for, and biodiversity issues within retained vegetation and associated Asset Protection Zones (APZs) associated with an approved development for residential flat buildings at 89 John Whiteway Drive, Gosford, NSW (the Site)

The BSMP is written to satisfy conditions of consent imposed by the NSW Minister for Planning and Public Spaces in Schedule 1 SSD-10321 (SSD-10321) and recommendations for biodiversity and native animal welfare provided in the following ecology reports for the development:

- *Tree Assessment Report Proposed Residential Flat Buildings, SSD-10321, 89 John Whiteway Drive, Gosford* Vers. 3. (Conacher 2021a) (the TAR);
- *Vegetation Management Plan, Proposed Residential Flat Buildings, SSD-10321, 89 John Whiteway Drive, Gosford.* Vers. 4 (Conacher, 2021b) (the VMP);
- *Updated Biodiversity Development Assessment Report, Proposed Residential Flat Buildings, SSD-10321, 89 John Whiteway Drive, Gosford* (Conacher, 2021c) (the BDAR);

Collectively known as the "Reports". The BMSP supersedes these documents.

The overall BMSP objectives are to:

- Support the objectives of the approved VMP;
- Schedule measures identified in the Ecology Reports to minimise, mitigate and manage impacts on biodiversity, including timing and responsibility for delivery of the measures; and
- Identify areas of land (the BMSP Lands) where impacts on biodiversity are to be avoided or minimised.

1.1 Biodiversity Management Sub-Plan Lands Location

BMSP works will be undertaken in conjunction with construction works within Lot 100 in DP 1075037 and Lot 1 in DP 45551 89 John Whiteway Drive Gosford, NSW 2250. **Figure 1** shows the BMSP Lands location.

1.2 BMSP Lands

The BMSP lands consist of three (3) Management Zones (MZs):

- MZ1 - Inner Protection Area (IPA), with selective removal of canopy trees and management of understorey;
- MZ2 - Outer Protection Area (OPZ) with a different regime of removal of canopy trees and management of understorey; and
- MZ3 - The BMSP Lands, an area to be protected where construction impacts are to be avoided and rehabilitation works are to be undertaken.

The BMSP Lands are identified in Conacher (2021c) VMP (refer Appendix A). These zones are located on the top ridge of the former quarry site with steep sandstone cliffs dropping away to neighbouring residential flat blocks.

1.3 Existing Vegetation

AEP undertook ground-truthing of vegetation detailed in the Reports (see **Figure 3**) and confirmed the Plant Community Type (PCT) 684 - *Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion* occurs in the Site.

Recent inspection (March 2022) within the Site showed that the lower stratum, while patchy at best, was dominated by *Lomandra longifolia, Imperata cylindrica and Themeda triandra*. The upper stratum was dominated by *Eucalyptus pilularis* and *Angophora floribunda.* There was a sparse shrub layer throughout the Site with *Allocasuarina torulosa, Acacia decurrens, Pittosporum undulatum* and *Persoonia linearis*.

The native species present are diagnostic species of PCT 684; hence the regional mapping is supported and is shown in **Figure 3 (Conacher, 2021)**.

Non-native exotics and weeds

Weed density is relatively low in the shrub layer due in part to the lack of bare ground and steep cliffs. Species in the management zones for control include *Lantana camara, Ochna serrulata, Ligustrum lucidum, Ligustrum sinense* and *Asparagus aethiopicus*.

Refer to the VMP for full species list (Conacher, 2021). These species present have potential to dominate if soil is disturbed in the clearing process.

1.4 Particular Site Risks

Due to the steep residual sandstone cliffs as a result of quarrying, undertaking clearing and BMSP works within the Site poses a number of risks to life and property. When designing works plans the following risks particular to this Site include:

- Traffic management will be required for clearing sections on the north east boundary along John Whiteway Drive;
- The use of clearing machinery in parts of the Site would pose extreme risks to machine operators, residents and adjacent properties;
- Overhead powerlines near the power easement in the west of the Site;
- Scattered boulders along the northern boundary making mechanical removal in this area high risk; and
- Potential erosion and cliff collapse impacts from felling trees.

2.0 BMSP Implementation

2.1 Site Preparation

Prior to the commencement of regeneration, the Management Zones must be prepared. **Table** 1 outlines the works and a detailed scheduled to comply with the approved VMP and Biodiversity measures in the approve BDAR.

The following works have been recommended to assist in site preparation:

- Installation of 21 nest boxes in retained trees;
- Residual waste and structures from quarrying (including bulk steel items) to be removed before or during civil works;
- Installation of temporary protection fencing to demarcate no-go areas (BMSP Lands) prior to commencement of civil works. It is to be noted that the entire property is already fenced off. Therefore, temporary fencing will ensure construction traffic is kept out of no-go zones. Location of temporary fencing is shown in **Figure 4;**
- Installation of rock catch fencing (**Figure 2**) in boundary areas with steep cliffs as per approved Geotech report;
- Prior to Earthworks, sediment and erosion controls should be designed and installed that meet the specifications set out in the latest edition of the Landcom publication "Soils and Constructions – Volume 2004 (The Blue Book)";
- Monitoring points for each Management Zone established; and
- Establishment of baseline data to monitor progress against targets.

Within each Management Zone, assessments will be undertaken with the aim of establishing baseline data that will be monitored against over the seven-year period of the BMSP.

2.2 Nest Boxes

All hollows proposed to be removed during tree removal works are to be replaced with a fauna nest box of similar size to be installed within MZ2 and 3.

A total of 21 hollows in 7 trees (Tag ID 72, 93, 112, 124, 180, 212, 286) are proposed to be removed. It is recommended that the following nest box types are utilised to replace these hollows:

- Nest boxes suitable for large possum or glider x 5
- Nest boxes suitable for micro bats x 5
- Nest boxes suitable for small glider or parrot x 11

The Project Ecologist will be responsible for installation of nest boxes.

Nest boxes are to be constructed from either modified recycled hollow logs or materials recognised as suitable and durable for nest box construction such as hardwood or moisture resistant plywood.

A suitable and secure nest box attachment method such as cable or galvanised wire of suitable thickness protected by tubing or hose material is to be utilised to minimise damage to the host trees and maximise the safety of persons and property on the site.

Nest boxes may be installed in any of the retained native trees present on the site at a height of at least 4 metres above ground level. Multiple boxes (up to 2) shall only be installed in large trees and should be located at varying locations and heights on the tree. It is recommended that nest boxes are not oriented in a north-facing position to limit heat stress to any occupying fauna.

The locations of the nest boxes installed are to be recorded and provided to Council in the Pre-clearing Compliance Letter documenting compliance.

2.3 Potential Pathogens / Disease

As with any civil construction site, there is the potential for pathogens and diseases to be introduced to the Site during construction. Appropriate hygiene controls are to be employed to minimise the chances of any such introduction occurring such as machinery decontamination pre and post operation.

Response plans are needed to be designed and implemented in construction plans to mitigate impacts in the event of disease or pathogen outbreaks.

Controls should be used or visits for maintenance of APZ areas for the life of the BMSP.

2.4 Erosion and Sediment Control Plan

A site-specific erosion and sediment control plan is to be prepared for the proposed earthworks and construction works. The controls are to be monitored throughout the works, particularly following heavy rainfall. The erosion and sediment control plan is to be updated on an ongoing basis to ensure that effective controls are in place for the duration of the works.

To mitigate against potential erosion and sedimentation issues, trees to be removed within the APZ areas of the site are to be lopped at the base and the stump is to be retained. Where tree or weed removal works expose soils which are likely to be susceptible to erosion, appropriate erosion and sediment control measures are to be installed. Erosion and sediment control measures will need to be implemented to avoid damage to native vegetation and shall be coordinated with weed management works on site. Additional planting of ground cover vegetation within the site will also be completed to reduce existing erosion.

2.5 Monitoring

Monitoring must be undertaken in accordance with the approved VMP.

2.6 Project Monitoring and Reporting

The Project Ecologist will be responsible for the establishment of monitoring points within the property along with collection of baseline photos and data that will be monitored against this over the seven-year period of this BMSP.

A report is to be prepared annually (by June 30) and delivered to the consent authority for the life of the BMSP with a final report prepared at the end of the BMSP outlining how the conditions of the BMSP have been met.

The reports should include evaluations and recommendations relating to all areas covered in the monitoring schedule and also address any other problems or deficiencies found during monitoring. If required the report should also outline any changes that are required to planned works to ensure better ecological outcomes.

A review of the progress of the BMSP targets will be undertaken as part of the Year 2, Year 5 and final reports and will inform required changes to regeneration methods.

3.0 Vegetation Clearing

3.1 Vegetation Clearing Methodology

All lands within Lot 100 that are not in MZ1, MZ2 or MZ3 are approved for clearing, including some remnant or regrowth native vegetation. Within the APZ Lands, some vegetation clearing will be undertaken to meet APZ standards (refer **Figure 1.1** in the Conacher VMP (Conacher 2021B).

To mitigate against biodiversity and native fauna welfare issues arising from clearing works, the following procedures should be followed:

- All trees to be removed are to be clearly marked prior to clearing commencing;
- Prior to commencement of clear, hollows to be removed must be replaced by nest boxes or salvaged hollows within the property at a ratio of 2:1 within Zone 3;
- At the start of works and in the event of staff changes, Civil Construction staff will be informed of clearing protocols;
- A staged approach to clearing is to be undertaken to provide fauna the opportunity to disperse outside the area of impact. Staging is to include Phase 1 Clearing: Under scrubbing, Phase 2 Clearing: Removal of non-habitat trees, and Phase 3 Clearing: Removal of habitat and connecting trees;
- All clearing works are to be undertaken under the supervision of the Project Ecologist;
- Understory in the APZ (other than high threat weeds (Conacher 2021) should not be removed as it may result in severe erosion. High threat woody weeds identified in Conacher 2021 should be treated by “cut and paint” method and left in-situ. To prevent potential cliff collapse, **soil is not to be disturbed within 10m of cliff edges;**
- Where practical, hollows won from clearing can be salvaged for remanufacture; and
- Sections of hollows won from clearing and not suitable for salvage can be installed in Z3 as ground habitat for native fauna.

3.2 Other Clearing Considerations

The Site has several high-risk factors which should be fully considered in the EMP, including:

- Traffic management will be required for clearing sections on the north east boundary along Joh Whiteway Drive;
- Due to the high erosion potential of the site, care should be taken to identify trees that can be safely retained.
- Tree removal by machinery is likely to be only possible in some areas of the south western boundary and requires consideration with Arborist and Project Ecologist in planning of clearing;
- Access by machinery to other areas is not possible due to the cliff faces, overhead powerlines and scattered boulders along the northern boundary. Mechanical removal in this area is high risk and has potential to impact on the adjoining residual areas by erosion and tree felling.
- Trees to be removed by hand are to be climbed and deconstructed to avoid sections rolling down the cliff face onto the residential property below.

4.0 Native Fauna Welfare

Clearing methodology for hollow-bearing trees (HBTs) will be designed by the Project Ecologist, working with the climbers and civil contractor to manage native fauna welfare with consideration of the challenges scheduled in **Section 3.**

Elements of the clearing methods may include:

- Implement clearing protocols, including pre-clearance surveys to identify habitat and vegetation to be retained;
- Where habitat trees are required to be removed, felling will be supervised by a suitably equipped and experienced ecologist to deal appropriately with any displaced fauna species;
- Clearing of all hollow bearing features will be managed by the Project Ecologist consulting the climbing arborist;
- Where safe to do so, hollows will be sectionally cut and lowered;
- Any fauna rescued during vegetation clearing is to be assessed for injuries, and subsequently released in a suitable nearby location; this may require holding fauna until dusk for release in accordance with relevant animal ethics licencing and standards;
- Ideally, vegetation clearing would be timed to avoid cold weather periods where overnight temperatures are forecast to be less than 12°C. Cold weather is likely to make it difficult for resident hollow dependent fauna to successfully relocate. This is particularly relevant for low body-weight species such as microbats
- If any fauna is injured during vegetation clearing, they are to be taken promptly to a nearby veterinarian or suitable wildlife carer contact;
- In addition, prior to clearing of any vegetation, an Ecologist is to inspect the area for any signs of resident fauna requiring attention, and in particular nesting birds. Where such is identified, appropriate strategies are to be developed and instigated to minimise impacts;

4.1 Removal of Cleared Vegetation

- All cleared vegetation is to be removed from MZ 1 and MZ 2. Some hollow logs won from clearing should be placed in Zone 3 to help stabilise exposed soil, provide habitat for native fauna and minimise offsite movement of biomass.
- Do not use any mulch containing weed propagules in MZ 3.

Table 1 - BMSP Schedule of Works

Action	Stage									Responsibility Project Manager -PM Civil Contractor - CC Project Ecologist -PE Climbing Arborist (CA) Bush Regenerator BR) Developer (D)
	Prior to start of civil works	During civil works	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	
Survey and clear marking between development and Management Zones										PM / CC
Demarcation rural-style fencing (not barbed wire) and signage between development and MZs										PM / CC
Rock-catch fencing										PM / CC
Erosion & sediment controls in accordance with CEMP and the Blue Book										PM / CC
Pre-clearing diurnal and nocturnal surveys for fauna										PE
Mark trees for Retention in MZ 1 & MZ 2 (all trees retained in MZ 3)										PE
Differentially mark HBTs for sectioning and lowering clearing methodology										PE
Set up Monitoring Plots and Photo Points (collect baseline data)										PE
Install 21 nest boxes in suitable retained trees in MZ3										D
Implement weed and pathogen management protocols			Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	D
Clearing to establish Bushfire APZs and maintain to APZ standards in perpetuity			Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	D
Removal of rubbish and human structures in Management Zones										D
Vegetation clearing in development footprint supervised by Project Ecologist										D
Primary weeding works (note special methodology for works close to cliff edges) in all MZs										D
Set up Monitoring Plots and Photo Points in all MZs and collect baseline data										D
Pre-Clearing Works Compliance Letter to Council										D
Annual monitoring and report to Council due 30 June annually										D
Selective planting of endemic natives (informed by monitoring to meet targets)										D
Follow up weeding works (informed by monitoring to meet targets)										D
BMSP review against targets (informed by annual monitoring and reporting)										D
Final BMSP Compliance Report to Council										D

Note 1 – Maintain weed & pathogen controls for every maintenance visit to site.

AEP

Title: Figure 1 - Location

Date: November 2022

Location: 89 John Whiteway Drive, Gosford, NSW

Client: Deicorp

AEP Ref: 2583


Legend
Subject Site Boundary
Rock catch fence location in accordance with Approved Geotech Report
VMA 1 - Building & Works Footprint
VMA 2 - Bushfire APZ and Wildlife Corridor
VMA 3 - Vegetation Retention & Restoration Area
Plant Community Types
1 Zone 1 - PCT 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
2 Zone 2 - PCT 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion (mostly exotic regrowth)
conacher consulting
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Drawn By: AM
Drawing Version: 3
Drawing No: 21020
Date: 16/03/2021
* Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © Nearmap (2021) Air Photo Date: 20/10/2019
Figure 1.1
Vegetation Management Areas
John Whiteway Drive, Gosford

5.0 References

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Appendix A – Compliance with Determination Conditions and BDAR Recommendations

Scheduled BMSP Lands – 89 John Whiteway Drive Gosford, NSW		
Compliance with Schedule SSD 10321 - Prior To Commencement of Construction		
No	Condition	BMSP Section
C19	The Biodiversity Management Sub-Plan (BMSP) must address, but not be limited to, the following: (a) be prepared by a suitably qualified and experienced person/s; (b) identify areas of land where impacts on biodiversity are to be avoided as outlined in the biodiversity development assessment report prepared by Conacher Consulting dated March 2021 and set out how these areas will be protected from construction impacts; and (c) set out the measures identified in the Biodiversity Development Assessment Report to minimise, mitigate and manage impacts on biodiversity, including timing and responsibility for delivery of the measures.	See BDAR below

BDAR Table 5.1 – Proposed Impact Mitigation & Management Measures

Table Item	Impact from Development	Mitigation Recommendation	BMSP Section
a	Site clearing on native ground fauna	Biodiversity Measure 1: Pre-clearing surveys to evacuate the site of ground dwelling fauna species by a suitably qualified and experienced wildlife handler / ecologist	3
b	Loss of existing structures on native fauna	Biodiversity Measure 2: The completion of a pre-clearing fauna relocation survey for the human made structures on the site.	3
c	Vegetation removal	Biodiversity Measure 3: Undertake strategic revegetation within retained lands.	2
d	Hollow-bearing Tree removal impacts on native arboreal faun	Biodiversity Measure 4: The provision of one fauna nest for every hollow removed with boxes of comparable size to be erected in the retained APZ areas of the site.	3
e	Construction works impact on retained vegetation areas	Biodiversity Measure 5: Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.	3
f	HBT removal impacts on hollow-dependent native fauna	Biodiversity Measure 6: The implementation of hollow-bearing tree sectional dismantling procedures completed under the supervision of an ecologist.	3, 4
j	Weed and pathogen spread from construction works	Biodiversity Measure 10: Implement protocols to prevent the spread of weeds and pathogens between the site and offsite areas.	2
k	Loss of habitat for native flora and fauna	Biodiversity Measure 11: The use and maintenance of native flora species in site landscaping.	2
l	Various	Biodiversity Measure 12: Implement the Vegetation Management Plan (Conacher Consulting 2021a) and tree protection measures documented in the Tree Assessment Report (Conacher Consulting 2021b)	All

Note: Measures 5.1 Items g, h and l relate to non-ecology matters in the CEMP

BDAR Table 6.2 – Assessment of Potential Impacts			
Table Item	**Impact**	**Consequence**	**BMSP Section**
a	Removal of vegetation within impact footprint	Reduction in available local habitats and loss of breeding site within hollow trees	3
b	Removal of seven Hollow-bearing Trees	Loss of fauna shelter and breeding sites	3
k	Loss of habitat for native fauna	Threat to native species including threatened entities from increased risk of starvation, exposure and loss of shade or shelter eased risk for fauna of starvation, exposure and loss of shade or shelter	3
l	Loss of breeding habitats	Loss of fauna shelter and breeding sites from removal of HBTs	3
v	Disturbance to specialist breeding habitat,	Loss of habitat for hollow-dependent fauna	3
x	Impacts to Man-made structures	Loss of habitat to structure-roosting and nesting species including threatened Microbats	3
y	Impacts to non-native vegetation	Loss of foraging and nesting habitat	2, 3
z	Habitat connectivity & movement patterns	The proposal will temporarily remove habitat connectivity along the northern site boundary.	2

Note: Not all impacts relate to ecology matters.

Appendix B – Approved VMP

VEGETATION MANAGEMENT PLAN
(VERSION 4)

PROPOSED RESIDENTIAL FLAT BUILDINGS
SSD-10321

89 JOHN WHITEWAY DRIVE
GOSFORD

MARCH 2021
REF: 21020

VEGETATION MANAGEMENT PLAN

PROPOSED RESIDENTIAL FLAT BUILDINGS
SSD-10321

89 JOHN WHITEWAY DRIVE
GOSFORD

MARCH 2021

Conacher Consulting Pty Ltd

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PREFACE

This Vegetation Management Plan has been prepared by *Conacher Consulting Pty Ltd* to accompany an Environmental Impact Statement for State Significant Development Application No. SSD-10321 at John Whiteway Drive, Gosford.

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DOCUMENT DETAILS

Project Name	Vegetation Management Plan - John Whiteway Drive Gosford
Reference No.	21020
Status	Updated Report
Version No.	Version 4 / 16 March 2021 / 21020
Previous Versions	Version 3 / 9 March 2021 / 21020 Version 2 / October 2020 / 20109/2 Version 1 / February 2020 / 9096
Revision Details	Assessment of revised impact footprint

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SECTION 1

BACKGROUND DETAILS

1.1 INTRODUCTION

Conacher Consulting have been engaged to prepare a Vegetation Management Plan and for a proposed development (SSD-10321) at John Whiteway Drive Gosford. This Plan applies to the Vegetation Management Area of the site, mapped within Figure 1.1.

This VMP is prepared in accordance with the relevant sections of the Vegetation Management Plan section of the Flora and Fauna Guidelines (Central Coast Council 2019).

TABLE 1.1
SITE DETAILS

Location	Lot 100 DP 1075037, Lot 1 DP 45551 and SP 72557 John Whiteway Drive, Gosford
Site Area	2.31 hectares
Development Footprint Area	Approximately 2.27 hectares
Local Government Area	Central Coast
Existing Land Use	Vacant Land / Previous Quarry Site
Site Zoning	R1 General Residential

1.2 LAND OWNERSHIP DETAILS

The subject site is currently a privately owned property. It is envisaged that the site will be managed in the future by an owners corporation under a strata scheme.

1.3 PROPOSED DEVELOPMENT

The proposed development assessed in this report is a residential flat building development, an elevated boardwalk and viewing platform and associated infrastructure including but not limited to bushfire asset protection zones, connection to services, access, excavation and site stabilisation works, installation of a rock-catch fence around the northern and western sections of the site and site landscaping. The proposed development areas are shown in Figure 1.1. There is a small area in the western section of the site which is proposed to be retained and will not be impacted by the proposal.

The NSW Rural Fire Service have provided Draft Approval Conditions dated 7 June 2020 which identifies that the site is to be managed as an inner protection area. This includes a requirement that the canopy tree cover within the site is maintained at less than 15% at maturity. An area to the east of the site within 80 John Whiteway Drive is also required to be managed as an outer protection area bushfire asset protection zone with the tree canopy cover maintained to less than 30% at maturity.

An elevated boardwalk is proposed through the northern sections of the site. The boardwalk is to be constructed from steel mesh and supported by footings, rather than constructed on grade. The boardwalk has been designed to avoid trees where possible and align with the proposed excavation footprint and is similar in design to elevated boardwalks used by Central Coast Council in the adjoining Rumbalara Reserve. The northern extension of the boardwalk has been removed from the proposal to reduce impacts.

It is intended that the land in the northern and western areas of the site be maintained and managed as both an asset protection zone and suitable corridor for native wildlife.

Additional detailed plans of the proposal are provided as separate documentation to this report.

1.4 PLAN IMPLEMENTATION

The implementation of this plan is to commence following the issue of the construction certificate and for a seven year period after commencement. This plan is to be implemented across the following Vegetation Management Areas (VMAs) of the site shown in Figure 1.1:

- VMA 1 Building and Landscaping Works Footprint
- VMA 2 Wildlife Corridor, APZ & Boardwalk Management Areas
- VMA 3 Vegetation Retention and Restoration Area

1.5 LEGISLATIVE CONTEXT & CONSIDERATIONS

The proposed development is State Significant Development under Division 4.7 of the *Environmental Planning and Assessment Act* (1979). Vegetation removal and biodiversity offsetting has been assessed in accordance with the requirements of the *Biodiversity Conservation Act* (2016) in the Biodiversity Development Assessment Report prepared by Conacher Consulting (2021a).

1.6 BACKGROUND DETAILS

The following site-specific documents and associated plans have been prepared for the proposal which are relevant to the preparation of this VMP:

1. Biodiversity Development Assessment Report (Conacher Consulting 2021a)
2. Tree Assessment Report (Conacher Consulting 2021b)
3. Bushfire Assessment Report (Clarke Dowdle & Associated 2020)
4. Landscape Report and Plans (Distinctive 2020)
5. Environmental Impact Statement (Ethos Urban 2020)


Legend
Subject Site Boundary
Rock catch fence location
VMA 1 - Building & Works Footprint
VMA 2 - Bushfire APZ and Wildlife Corridor
VMA 3 - Vegetation Retention & Restoration Area
Plant Community Types
1 Zone 1 - PCT 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
2 Zone 2 - PCT 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion (mostly exotic regrowth)
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Drawing Version: 3
Drawing No: 21020
Date: 16/03/2021
* Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © Nearmap (2021) Air Photo Date: 20/10/2019
Figure 1.1
Vegetation Management Areas
John Whiteway Drive, Gosford

SECTION 2

SITE CHARACTERISTICS

2.1 HISTORICAL LAND USES

The site has a history of previous use as a sandstone quarry, dating back many years. Disturbances to the natural vegetation and soils from the previous quarrying activities are evident and include the presence of large, excavated areas and exposed sandstone quarry faces haul roads/vehicle tracks, eroded and shallow soils and cleared areas which support significant weed invasion.

2.2 TOPOGRAPHY, GEOLOGY & SOILS

The areas of retained vegetation are located in areas which are typically steep and underlain by Interbedded laminite, shale and fine to coarse grained lithic sandstone of the Terrigal formation (Gosford Subgroup).

The site is mostly mapped within areas of Disturbed Terrain with fringing areas of the Erina Soil Landscape. The soils are typically shallow, disturbed or not present due to historical quarry operations. This has resulted in some stunted tree growth and areas where the soil is not deep enough and tree root plates have failed to anchor trees in the ground.

2.3 HYDROLOGY & DRAINAGE

The site is located on top of a hill and drainage to the offsite areas is via overland flow. No watercourses are present within the site.

2.4 NATIVE VEGETATION CHARACTERISTICS

The natural vegetation within the site consists of disturbed areas of Plant Community Type 684 Blackbutt – Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion. The dominant canopy species are *Eucalyptus pilularis, Eucalyptus paniculata* and *Angophora floribunda.* The condition of the understory vegetation varies across the site, with some areas supporting an intact cover of regenerating native species, areas of high weed densities and sections with large areas of bare ground.

The locations of Plant Community Type 684 and cleared areas within the site are mapped in Figure 1.1.

A photograph of the native vegetation within the site is shown in Plate 1.

Plate 1. Plant Community Type 684 Blackbutt – Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion.

2.5 WEEDS AND WEED SOURCES

The exotic flora species observed within the site to be targeted for removal during weed management works are listed in Table 2.1. The majority of the weeds recorded are isolated to the proposed construction footprint which has been heavily disturbed as part of the historical use of the site as a quarry. The species which are likely to be effectively managed within the site have been identified as target species.

TABLE 2.1
EXOTIC FLORA SPECIES OBSERVED

Scientific Name	Common Name	Indicative cover	Target Species
High Threat Exotics			
Asparagus aethiopicus	Asparagus Fern	Low	Yes
Ageratina adenophora	Crofton Weed	Low / mostly within construction footprint	Yes
Ageratina riparia	Mistflower	Very low	Yes
Andropogon virginicus	Whisky Grass	Low	Yes
Axonopus fissifolius	Narrow-leafed Carpet Grass	Low	Yes
Bidens pilosa	Cobbler's Pegs	Very low	Yes
Cenchrus clandestinus	Kikuyu Grass	Low	Yes
Chloris gayana	Rhodes Grass	Low	Yes
Cinnamomum camphora	Camphor Laurel	Low	Yes
Cortaderia jubata	Pink Pampas Grass	Low / mostly within construction footprint	Yes
Ehrharta erecta	Panic Veldt-grass	Low to moderate	Yes
Eragrostis curvula	African Love Grass	Low to moderate	Yes

TABLE 2.1 EXOTIC FLORA SPECIES OBSERVED			
Scientific Name	**Common Name**	**Indicative cover**	**Target Species**
Erythrina x sykesii	Coral Tree	Very low	Yes
Lantana camara	Lantana	Low	Yes
Ligustrum lucidum	Large-leaved Privet	High particularly at No 80	Yes
Ligustrum sinense	Small-leaved Privet	Low to moderate	Yes
Ochna serrulata	Mickey Mouse Plant	Low to moderate	Yes
Paspalum dilatatum	Paspalum	Low	Yes
Paspalum quadrifarium	Tussock Paspalum	Low to moderate	Yes
Phoenix canariensis	Canary Island Date Palm	Low	Yes
Pinus elliotii	Slash Pine	Low	Yes
Pinus radiata	Radiata Pine	Low	Yes
Polygala myrtifolia		Moderate to high	Yes
Pyracantha angustifolia	Orange Firethorn	Low to moderate	Yes
Ricinus communis	Castor Oil Plant	Very low to nil	Yes
Other Exotics			
Anagallis arvensis	Scarlet Pimpernel	Low	No
Cirsium vulgare	Spear Thistle	Low	Yes
Conyza bonariensis	Flaxleaf Fleabane	Low to nil	No
Coreopsis lanceolata	Coreopsis	Low to nil	No
Cyperus congestus		Low to nil	No
Furcraea foetida	Mauritius Hemp	Moderate mostly within northern section of site	Yes
Gomphocarpus fruticosus	Narrow-leaved Cotton Bush	Low to nil	Yes
Jacaranda mimosifolia	Jacaranda	Low to nil	Yes
Juncus acutus subsp. acutus		Low to nil	No
Melinis repens	Red Natal Grass	Low to nil	No
Modiola caroliniana	Red-flowered Mallow	Low to nil	Yes
Nerium oleander	Oleander	Low to nil	Yes
Olea europaea subsp. cuspidata	African Olive	Low to moderate	Yes
Oxalis debilis var. corymbosa			
Plantago lanceolata	Lamb's Tongues	Low to nil	No
Pyrus communis	Common Pear	Low to nil	Yes
Rhaphiolepis indica	Indian Hawthorn	Low to nil	Yes
Richardia brasiliensis	Mexican Clover	Low to nil	No
Setaria parviflora		Low to nil	No
Setaria pumila		Low to nil	No
Sida rhombifolia		Low to nil	Yes
Solanum nigrum	Black-berry Nightshade	Low to nil	No
Sporobolus africanus	Parramatta Grass	Low to nil	No
Strelitzia reginae	Bird of Paradise	Low to nil	Yes
Verbena bonariensis	Purpletop	Low to nil	No
*Verbena rigida var. rigida**	Veined Verbena		

2.6 HABITAT AND CORRIDOR VALUES

The site forms part of a larger approximately 2.5 ha vegetation patch, which is separated from adjoining habitats by John Whiteway Drive. A narrow band of vegetation in the northern section of the site provides a linkage between retained bushland areas to the west of the site and larger areas of remnant vegetation to the northeast within Rumbalara Reserve which forms part of Council's Coastal Open Space System. Some of the connectivity within this area is also provided by trees offsite adjoining the northern site boundary.

The proposal will result in the retention of selected trees, rocky habitats and managed understorey vegetation within the northern areas of the site and replanting works will also be completed within this area following civil works. This will ensure that some connectivity remains within this part of the site for wildlife species.

2.7 BUSHFIRE HAZARD

The site contains bushfire prone land and will be required to be managed as a bushfire asset protection zone to the standard of an inner protection area as part of the future site management requirements.

SECTION 3

VEGETATION MANAGEMENT DETAILS

3.1 VEGETATION MANAGEMENT OBJECTIVES

The proposal will result in the construction of residential flat buildings and associated infrastructure within the developed areas of the site and a requirement to manage the site as an inner protection area.

The objectives of vegetation management works for this site are to:

i. Maximise existing native vegetation retention under the proposed development scheme (VMAs 2, 3);
ii. Manage weed levels within the site (VMAs 2, 3);
iii. Replant suitable native vegetation where appropriate (VMAs 2, 3);
iv. Manage the site as an inner protection area asset protection zone in perpetuity (VMAs 2/3).

Replanting and landscape works within VMA 1 are to be in-accordance with the landscape plan provided by Distinctive Landscapes.

3.2 NATIVE VEGETATION PROTECTION & RETENTION

Tree retention and removal is to be undertaken in accordance with the tree Assessment Report prepared by Conacher Consulting (2021b). No native vegetation removal is to occur within VMA 3. Trees not designated for removal in VMA 2 are to be retained in accordance with the Tree Protection Plans provided in the Tree Assessment Report. Following initial tree removal and prior to the commencement of civil works tree protection fencing is to be installed in the locations shown in Tree Protection Plans.

3.3 BUSHFIRE ASSET PROTECTION ZONE MANAGEMENT

Except for the APZ area south of John Whiteway Drive, VMA 1 & 2 are required to be managed to the standard of an inner protection area within the bushfire asset protection zone (APZ). The area to the south of John Whiteway Drive is to be managed as an outer protection area. The APZ area should be maintained in perpetuity and on an annual basis in advance of the fire season as a minimum. All other works within these VMAs are to have regard for the ongoing bushfire APZ management requirements.

In order to achieve the requirements of the NSW Rural Fire Service's documents *Planning for Bushfire Protection* (RFS 2019) the following works are required in order to establish and maintain an Inner or Outer Protection Area component of the Asset Protection Zone:

Trees

- The tree canopy (at maturity) should be reduced and maintained at less than 15% cover for inner protection zone areas and 30% for outer protection zone areas;
- Trees (at maturity) should not touch or overhang the building;
- Lower limbs should be removed up to a height of 2m above ground;
- Canopies should be separated by 2 to 5m; and
- Preference should be given to the retention of smooth barked and evergreen trees.

Shrubs

- Create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings
- Shrubs should not be located under trees
- Shrubs should not form more than 10% cover for inner protection zones and 20% for outer protection zones;
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Groundcovers

- Should be kept mown (as a guide grass should be kept to no more than 100mm in height)
- Litter fuels within the IPA should be kept below 1cm in height and be discontinuous
- Grass should be kept mown
- Leaves and vegetation debris should be removed

3.4 WEED MANAGEMENT

Weed control is to be undertaken in VMA 2, and 3 following the completion of bulk earthworks and construction of the proposed elevated boardwalk. Weed control is to consist of one primary or initial weed control event and follow-up or secondary weed control events as necessary. These works are to be undertaken by a professional bush regeneration contractor.

This is to ensure that weeds which regrow from the soil seed bank are managed after the initial weed control efforts. Weed control methods include both physical and herbicide controls, both of these methods can be applied to this site.

i. *Physical Control Methods*

Physical control methods involve using physical means such as machinery, hand removal and the use of hand tools and hand operated power equipment to remove either specific or broad ranges of weeds.

ii. Herbicide Control Methods

Herbicide control methods involve the use of chemicals which can target specific types of weeds or a broad spectrum of weeds. Herbicide control is suitable for this site as a supplementary control method in conjunction with physical controls.

The use of personal protective equipment, safe work management practices and appropriate training should be adhered to for all persons handling and using herbicides. Herbicide type and application method should be targeted to the species subject to control and should aim to avoid impacts to retained native vegetation. For this reason the suitable chemical types and application methods for herbicide control, identified on a species specific basis and updated from time-to-time in the NSW Weed Control Handbook (NSW DPI 2018), or the most recent version, should be adhered to for all herbicide control works.

Target Weed Species

Target weed species for management are listed in Table 2.1.

Weed Management Performance Targets

Councils Vegetation Management Guidelines identify that any performance targets set for the objective measurement of the implementation of the VMP are to be specific, measureable, achievable and time based.

The performance targets set for the specifics of this VMP are based on the following criteria:

i) Intensity of occurrence of weed species,
ii) Private ownership of all future residential lots,
iii) Use of lots for residential dwellings and associated ancillary activities,
iv) Management of all vegetation to the standard of an inner protection area as required by the Rural Fire Service,
v) Councils requirements.

The specific and time based performance targets for this VMP (as required by Council) are identified in Table 3.1.

TABLE 3.1
VMP PERFORMANCE TARGETS

SPECIFIC VMP ACTION	MEASURABLE QUANTITY	TIME PERIOD	ACHIEVED OUTCOME
1. Fencing	- Temporary construction fence, - Lineal metres of perimeter fence.	Within 1st year	To be determined at monitoring/reporting stage
2. Weed Management	-Less than 2% reduction of woody weeds, - Less than 20% reduction of groundcover weeds.	20% each year for 7 years	To be determined at monitoring/reporting stage
3. Rubbish Management	- Volume of rubbish removed	100% removed by end of 2 years.	To be determined at monitoring/reporting stage
4. Monitoring	- Annual monitoring	Annually by 30th June	To be determined at monitoring/reporting stage
5. Reporting to Council	- Annual reporting	Annually by 30th June	To be determined at monitoring/reporting stage

3.5 NATIVE VEGETATION REPLANTING

i. *Planting Areas*

Replanting works are to be undertaken in VMA 2 following the completion of weed control works if natural regeneration does not occur, to achieve the maximum native vegetation cover targets allowable in an inner protection area. This includes the planting of new canopy tree species to replace retained trees if they die.

Replanting of any batters in VMA 2 will be required following civil works.

ii. *Soil Remediation*

It is expected that the civil works required will result in some areas of the site having no topsoil or a shallow topsoil depth not capable of supporting healthy plant growth.

Following civil works topsoil is to be used in suitable areas of VMA 2 where the natural soil has been removed and the soil depth is not deep enough to support plantings. Top soil should aim for a depth of at least one metre for areas required to support tree growth and of at least 0.5m in other areas. The topsoil used is be free of contaminants, be of low fertility, be acidic, and free draining. The topsoil should not be compacted. Approximately 50-100mm layer of weed-free eucalypt mulch to assist in water retention should be spread over topsoil areas where tree planting is to occur.

iii. *Plant Sources*

Where possible plants are to be endemic species propagated where possible from genetic stock sourced within the Central Coast local government area. A qualified and experienced bushland regenerator is to be engaged for any native plant propagation works. Seed collection and propagation is to be undertaken generally in accordance with the Office of Environment and Heritage (2011) Conservation Management Notes on Seed Collecting. Appropriate permissions for any collections undertaken and appropriate licensing under the *Biodiversity Conservation Act* (2016) will need to be obtained for any seed collected from offsite areas. This will be the responsibility of the bushland regenerator engaged to undertaken the works.

iv. Planting Species and Densities

Suitable species for replanting and appropriate target planting densities are specified in Table 3.2. Planting densities have been provided for replanting in cleared areas. Replanting densities should be determined on an area specific basis if revegetation is to occur where existing components of the native vegetation cover is present. Planting densities have been determined based on the site APZ management requirements.

Supplementary plantings should particularly occur within cleared areas and where exotic vegetation has been removed or where soil stabilisation works are required outside of the Building and Landscape Works Footprint (VMA 1).

Replanting of tree species is to occur in areas not containing trees and where trees initially retained reach the end of their life and no recruitment of new trees is occurring. Planting of new trees is to ensure that the tree canopy cover across the site does not exceed 15% cover. This will ensure that the appropriate maximum canopy cover allowable is retained across the APZ areas in perpetuity.

TABLE 3.2
REPLANTING SPECIES

Species Name	Cover Targets	Planting Size
Trees	**Up to 15% cover at maturity**	**200ml Pot**
Angophora floribunda *Corymbia gummifera* *Eucalyptus pilularis* *Eucalyptus resinifera* *Eucalyptus saligna* *Eucalyptus paniculata*		
Shrubs	**Up to 10% cover**	**Tubestock**
Acacia ulicifolia *Acmena smithii* *Banksia serrata* *Breynia oblongifolia* *Dodonaea triquetra* *Duboisia myoporoides* *Glochidion ferdinandii* *Gompholobium latifolium* *Hibbertia empetrifolia* *Leucopogon juniperinus* *Maytenus silvestris* *Notelaea longifolia* *Persoonia levis* *Persoonia linearis* *Pittosporum undulatum* *Platysace linearifolia*		

TABLE 3.2 REPLANTING SPECIES		
Species Name	**Cover Targets**	**Planting Size**
Podolobium ilicifolium *Pultenaea flexilis* *Xanthorrhoea spp.*		
Ground Covers	**At least 80% cover**	**Tubestock and/or seed mix**
Gonocarpus teucrioides *Lomandra confertifolia* *Lomandra cylindrica* *Lomandra filiformis* *Lomandra glauca* *Lomandra longifolia* *Lomandra multiflora subsp. multiflora* *Digitaria parviflora* *Echinopogon caespitosus* *Echinopogon ovatus* *Entolasia marginata* *Entolasia stricta* *Eragrostis brownii* *Microlaena stipoides var. stipoides* *Oplismenus aemulus* *Oplismenus imbecillis* *Panicum simile* *Poa labillardierei var. labillardierei* *Pseuderanthemum variabile* *Rytidosperma pallidum* *Themeda triandra* *Dianella caerulea*		

v. Pest and Pathogen Management

Monitoring of new plantings is to be undertaken to ensure that pest insect attacks and pathogens are detected early and appropriate control measures are implemented to prevent the widespread loss of plantings.

vi. Mulch and Fertiliser Application

Mulching of exposed soils and around plantings is permissible provided any mulch used is free from weeds and harmful pathogens. Mulch can be applied to a maximum depth of 100mm and should not be used as a planting substrate. A slow release native plant specific fertiliser is to be applied to the base of each planting hole at the time of planting.

vii. Plant Protection

Plant stakes and guards may need to be provided for any new plantings depending on the site conditions and locations of the plantings.

viii. Watering

Watering of new plantings is to be undertaken during initial planting. Additional watering is also to be undertaken during periods of prolonged dry and/or hot weather for the first three months to support plant establishment. Ongoing watering will be subject to local rainfall and soil moisture conditions.

ix. Performance Monitoring and Targets

A performance target of 80% survival is to be achieved for plantings over the management period. Planting losses in excess of 80% are to be replaced by the developer.

3.6 FAUNA MANAGEMENT AND HABITAT SUPPLEMENTATION

i. *Fauna Management*

Prior to clearing works the clearing contractors are to be provided with an environmental induction by the project ecologist who is to identify the vegetation and fauna management requirements for the site.

The following measures are to be implemented, under the direct supervision of a qualified and experienced ecologist during clearing works, to ensure appropriate management of fauna species:

- Immediately prior to any clearing a diurnal survey is to be undertaken by the project ecologist to capture and remove ground fauna and check for tree nesting or roosting fauna that have potential to be disturbed by clearing activities.

- All hollow bearing trees to be removed are to be marked with spray paint with the letter H (i.e. Hollow Tree for removal) and flagged with flagging tape.

- Any fauna present should be removed or encouraged to vacate hollows where possible prior to clearing works. Prior to felling all hollows potentially containing fauna are where possible to be bagged or blocked at the ends, by an arborist or ecologist. The hollow sections are then to be removed from the tree with care taken to not cut through any hollow sections potentially containing fauna. These hollows are to be lowered carefully to the ground with ropes.

- The bagging is to be removed once the branch has been lowered to allow for immediate inspection of the hollow sections for the presence of any fauna species. Where fauna species are present they should either be removed and released preferably in a temporary nesting box on the site. Alternatively if they are within a hollow section, the hollow is to be transported to the retained area of the site to enable their departure at nightfall.

- Where a tree is identified as not safe to climb or access with an elevated work platform, an excavator may be used for removal of the hollow bearing tree. The machine operator is to tap the tree with the machine several times in an effort to encourage resident fauna to leave hollows and find refuge elsewhere. The tree is to then be nudged over by the machine grabbing the trunk or holding the root bole in an effort to lower the tree as slowly as possible. Once the tree is lowered all hollows are to be inspected by the consulting ecologist and any resident fauna is to be cared for or released.

Fauna encountered during clearing activities are to be assessed and checked for injury. If fauna is injured during vegetation clearing operations they are to be immediately transported to the nearest convenient veterinary hospital for appropriate treatment. If immature fauna species are displaced and are deemed unable to care for themselves then they are to be transferred to a local wildlife care organization for care and rehabilitation. Healthy displaced fauna will be allowed to disperse or will be captured and released on the subject site within

the retained areas. A record of displaced fauna, including species and condition, is to be maintained for reporting purposes.

ii. *Fauna Habitat Supplementation*

All hollows proposed to be removed during tree removal works are to be replaced with a fauna nest box of similar size to be installed within VMAs 2 and 3.

A total of 21 hollows in 7 trees (72, 93, 112, 124, 180, 212, 286) are proposed to be removed. It is recommended that the following nest box types are utilised to replace these hollows:

- Nest boxes suitable for large possum or glider x 5
- Nest boxes suitable for micro bats x 5
- Nest boxes suitable for small glider or parrot x 11

The nest boxes are to be constructed from either modified recycled hollow logs or materials recognised as suitable and durable for nest box construction such as hardwood or moisture resistant plywood.

A suitable and secure nest box attachment method such as cable or galvanised wire of suitable thickness protected by tubing or hose material is to be utilised to minimise damage to the host trees and maximise the safety of persons and property on the site.

Nest boxes may be installed in any of the retained native trees present on the site at a height of at least 4 metres above ground level. Multiple boxes (up to 3) shall only be installed in large trees and should be located at varying locations and heights on the tree. It is recommended that nest boxes are not oriented in a north-facing position to limit heat stress to any occupying fauna. The locations of the nest boxes installed are to be recorded and provided to Council in a letter documenting compliance with this Report.

Where bushrock within the site is required to be moved for APZ implementation and construction works, it should be piled in designated locations and retained on the site as habitat for terrestrial fauna species.

3.7 EROSION & SEDIMENT CONTROL

A site specific erosion and sediment control plan is to be prepared for the proposed earthworks and construction works. The controls are to be monitored throughout the works, particularly following heavy rainfall. The erosion and sediment control plan is to be updated on an ongoing basis to ensure that effective controls are in place for the duration of the works.

To mitigate against potential erosion and sedimentation issues, trees to be removed within the APZ areas of the site are to be lopped at the base and the stump is to be retained. Where tree or weed removal works expose soils which are likely to be susceptible to erosion, appropriate erosion and sediment control measures are to be installed. Erosion and sediment control measures will need to be implemented to avoid damage to native vegetation and shall be coordinated with weed management works on site. Additional planting of ground cover vegetation within the site will also be completed to reduce existing erosion.

3.8 RUBBISH MANAGEMENT

Some rubbish was observed within the areas subject to this plan. Any rubbish present is to be removed and disposed of or recycled at an approved waste management or recycling facility. No rubbish is to be stored or left in retained bushland areas subject to this plan.

3.9 WORKPLACE HEALTH AND SAFETY CONSIDERATIONS

Any bushland regeneration contractors involved in the implementation of this Plan are to hold and maintain current and relevant safe work method statements, current chemical handling certificates and workers compensation insurance, in accordance with current workplace safety requirements and legislation. Particular care is to be undertaken to ensure that safe work practices are maintained on steep parts of the site where there is a potential fall hazard.

SECTION 4

IMPLEMENTATION, MONITORING & MANAGEMENT PROGRAM

4.1 WORKS PROGRAM

This plan is to be implemented at the commencement of site construction works. Monitoring for a period of seven years is to commence once site occupation occurs. The works outlined in the various sections of this Plan are to be implemented as outlined in Table 4.1. Monitoring and management of VMA 2 and 3 will be required in perpetuity.

4.2 MONITORING & REVIEW

Monitoring inspections are to be undertaken by the project ecologist in accordance with the schedule provided in Tables 3.1 and 4.1. This will allow for appropriate ecological supervision and identification of any areas for improvement or which require additional management tasks.

Monitoring reports are to be prepared annually and submitted to Council by 30 June each year following the Monitoring Pro Forma included in Appendix 3. Monitoring is to include assessment of performance and any non-compliance issues encountered during implementation of this plan. Monitoring photographs are to be taken to document the weed control works proposed. If compliance with the monitoring requirements is not achieved within the timeframe of this Plan, the monitoring and management works period is to be extended until the works have been undertaken, to the satisfaction of Council.

Monitoring will include a performance evaluation of the works and will include assessment addressing any deficiencies observed, and determination of a successful outcome for vegetation protection, weed management and any replanting works. Monitoring is to include:

- Photographs to be taken from the monitoring locations;
- Estimates of density of exotic vegetation;
- Estimates of density of native plant canopy, shrub and understorey cover;
- The survival rate for any plantings; and
- Identification of any adaptive changes or additional measures required to ensure vegetation regeneration and weed control meets the required targets.

A Monitoring Proforma for completion of the Annual Site Inspection Monitoring Reports is included as Appendix 1 of this VMP. The proforma is to be modified as necessary.

Plan Review
The VMP is to be implemented over a seven year period. A detailed review of the performance of the works implemented will be completed after five years. This will allow a further two years for the plan implementation phase to be undertaken to address any additional works that may be required for successful completion of works outlined in this VMP and the VMP review.

A final evaluation and review of the VMP will be undertaken during the seventh year of the implementation period.

4.3 REPORTING

Progress reports are to be submitted to Council's Ecologist each year for a minimum of 5 years after the commencement of works. Reports are to detail the progress of the works and any recommended additional actions, with a final report certifying completion of the Vegetation Management Plan at the end of the implementation period, or once the specific objectives of the plan have been met. Any recommended additional actions must be completed to the satisfaction of Council prior to the lodgement of the final report.

TABLE 4.1
SCHEDULE OF VEGETATION MANAGEMENT WORKS

Management Tasks	Stage								Works to be undertaken by
	Prior to clearing / civil works	During civil works	Following Civil Works Completion						
			Year 1	Year 2	Year 3	Year 4	Years 5-6	Year 7	
1. Undertake pre-clearing surveys and supervise hollow tree removal works									Project ecologist
2. Establish Bushfire Asset Protection Zone and maintain in perpetuity									Arborist / Clearing contractors
3. Install temporary protection fencing around VMA. Maintain fencing and remove at the completion of works.									Civil works / fencing contractor
4. Install erosion and sediment controls in accordance with the requirements of the Soil and Water Management Plan / Remove silt fences following civil works and stabilisation									Civil contractor
5. Implement weed and pathogen management protocol for works under this plan									Civil works contractor
6. Undertake planting works									Bushland regenerator
7. Undertake works to achieve weed management targets									Bushland regenerator
8. Undertake annual compliance monitoring inspections and submit annual monitoring reports to Council by the end of the financial year.									Project ecologist
9. Ensure that the management recommendations of compliance monitoring reports are implemented									Landowner(s)
10. Undertake VMP Review									Landowner(s)

5. REFERENCES

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APPENDIX 1

VEGETATION MANAGEMENT PLAN MONITORING PROFORMA

ANNUAL SITE INSPECTION MONITORING REPORT

DA No. **REPORT NO:**

ADDRESS: **DATE:**

RELEVANT MANAGEMENT PLAN: **INSPECTED BY:**

1) ACTIONS UNDERTAKEN DURING REPORTING PERIOD

- Fencing
-
-
- Weed Management
-
-
- Native Species Replanting
-
-
- Rubbish Management
-

2) VEGETATION CONDITION ASSESSMENT

- Condition of retained Vegetation (maps, description, photos)
- Growth of planted vegetation
  - Height
  - Survival Rate
-
- Details of natural regeneration occurring.
-
-
-
- Weed Occurrences/Location/Cover
-
-

3) OTHER MATTERS

Eg. Bushfire/flood events, weed invasions, severe weather events etc.

-
-
-
-

4) COMPLIANCE/NON COMPLIANCE WITH REQUIREMENTS OF VEGETATION MANAGEMENT PLAN

- VMP Performance Targets (Tabel 3.2 of VMP)
-
-

5) REFERENCE AREA PHOTOGRAPHS

-
-
-

6) FOLLOW UP ACTIONS

-
-
-
-

7) CONCLUDING COMMENTS

-
-

INSPECTION TO BE COMPLETED IN JUNE/JULY EACH YEAR REPORT TO BE FORWARDED TO COUNCIL BY END OF JULY

Appendix C – Approved BDAR

UPDATED
BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

PROPOSED RESIDENTIAL FLAT BUILDINGS
SSD-10321

89 JOHN WHITEWAY DRIVE
GOSFORD

MARCH 2021
REF: 21018

UPDATED
BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

PROPOSED RESIDENTIAL FLAT BUILDINGS
SSD-10321

89 JOHN WHITEWAY DRIVE
GOSFORD

MARCH 2021

Conacher Consulting Pty Ltd

Environmental and Land Management Consultants

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PREFACE

This Updated Biodiversity Development Assessment Report has been prepared by *Conacher Consulting Pty Ltd* to accompany an Environmental Impact Statement for State Significant Development Application No. SSD-10321 at John Whiteway Drive, Gosford.

This report provides an assessment of the proposed biodiversity impacts in accordance with the requirements of the *Biodiversity Conservation Act* (2016) and the Secretary's Environmental Assessment Requirements.

PROJECT TEAM

Personnel	Qualifications	Title	Tasks Completed
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DOCUMENT DETAILS

Project Name	BDAR John Whiteway Drive Gosford
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Revision Details	Revision to tree schedule and deletion of northern section of elevated boardwalk

REPORT CERTIFICATION

This Biodiversity Development Assessment Report has been prepared *by Conacher Consulting Pty Ltd* on the basis of the requirements of and information provided under the Biodiversity Assessment Method on 16 March 2021.

JACOB MANNERS B.Sc. MWldMgt
Biodiversity Assessment Method Assessor Accreditation No. BAAS17099

GLOSSARY OF TERMS AND ACRONYMS

Acronym	Term	Description
BAM	Biodiversity Assessment Method	The method established under Part 6 of the *BC Act* (2016) for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values, where required under the BC Act (2016), Local Land Services Act 2013 (LLS Act) or the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017
BAM Calculator	Biodiversity Assessment Method Calculator	An online application of the Biodiversity Assessment Method (BAM). The calculator uses the rules and calculations outlined in the BAM, and allows the user to apply the BAM at a site and observe the results of the assessment.
BC Act	Biodiversity Conservation Act	The Act administered by the NSW Government which contains the NSW biodiversity protection and impact assessment provisions
BCF	Biodiversity Conservation Fund	The fund which receives money paid by proponents to meet offset obligations under the NSW Biodiversity Offsets Scheme
BCT	Biodiversity Conservation Trust	Established under the BC Act to oversee private land conservation programs and establish Biodiversity Stewardship Agreements as part of the Biodiversity Offsets Scheme. The credits generated by these agreements can then be sold to offset development impacts.
BDAR	Biodiversity Development Assessment Report	For the purposes of the biodiversity offsets scheme, a biodiversity development assessment report is a report prepared by an accredited person in relation to proposed development or activity that would be authorised by a planning approval, or proposed clearing that would be authorised by a vegetation clearing approval, that: a) assesses in accordance with the biodiversity assessment method the biodiversity values of the land subject to the proposed development, activity or clearing, and (b) assesses in accordance with that method the impact of proposed development, activity or clearing on the biodiversity values of that land, and (c) sets out the measures that the proponent of the proposed development, activity or clearing proposes to take to avoid or minimise the impact of the proposed development, activity or clearing, and (d) specifies in accordance with that method the number and class of biodiversity credits that are required to be retired to offset the residual impacts on biodiversity values of the actions to which the biodiversity offsets scheme applies.
-	Biodiversity Credit	A biodiversity credit created by (and in accordance with) a biodiversity stewardship agreement.

Acronym	Term	Description
BOS	Biodiversity Offsets Scheme	A transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity and a scheme for establishing biodiversity stewardship agreements, which are voluntary in-perpetuity agreements entered into by landholders, to secure offset sites
BSSAR	Biodiversity Stewardship Site Assessment Report	For the purposes of the biodiversity offsets scheme, a biodiversity stewardship site assessment report is a report prepared by an accredited person in relation to a proposed biodiversity stewardship agreement under Part 5 that: (a) assesses the biodiversity values of the proposed biodiversity stewardship site in accordance with the biodiversity assessment method, and (b) sets out the management actions proposed to be carried out on the proposed site, and (c) specifies in accordance with the biodiversity assessment method the number and class of biodiversity credits that may be created in respect of those management actions.
BV MAP	Biodiversity Values Map	Development within an area identified on the map requires assessment using the BAM.
DoEE	Department of the Environment and Energy	Commonwealth Department which administers the EPBC Act
EPBC Act	Environment Protection and Biodiversity Conservation Act	Commonwealth legislation which contains biodiversity protection and impact assessment provisions
IBRA	Interim Biogeographic Regionalisation For Australia	A classification system for Australia's landscape which separates areas which are geographically distinct into Regions (based on common climate, geology landform and biodiversity characteristics) and Subregions (based on localised geomorphology patterns).
NSW DPIE	NSW Department of Planning, Industry and Environment	NSW Department which administers the BC Act
PCT	Plant Community Type	The vegetation classification unit used for vegetation communities in the BAM from the Bionet Vegetation Classification (NSW OEH)
	Prescribed Impact	Impacts identified as prescribed under the BC Regulation which are required to be assessed but not for the purposes of calculating credits

Acronym	Term	Description
SAII	Serious and irreversible impact	An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct for the reasons identified in the BC Regulation. For Part 4 development the consent authority must refuse to grant consent if it is of the opinion that the proposed development is likely to have serious and irreversible impacts on biodiversity values.
TEC	Threatened Ecological Community	Means a critically endangered ecological community (CEEC), an endangered ecological community (EEC) or a vulnerable ecological community (VEC) listed in Schedule 2 of the BC Act.
TS	Threatened Species	Means a critically endangered species, an endangered species or a vulnerable species listed in Schedule 1. For the purposes of the BAM these are further separated into ecosystem credit and species credit type threatened species

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SECTION 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Conacher Consulting has been engaged to prepare an Updated Biodiversity Development Assessment Report for State Significant Development Application No. SSD-10321 at John Whiteway Drive, Gosford.

This Report has been prepared to provide an assessment of the biodiversity values of the subject land and an assessment of the impact of the proposed development in accordance with the *Biodiversity Conservation Act* (2016) and version 1 of the Biodiversity Assessment Methodology (BAM) (NSW OEH 2017). This Report:

- Assesses in accordance with the Biodiversity Assessment Method the biodiversity values of the land subject to the proposed development; and
- Assesses in accordance with the Biodiversity Assessment Method, the impact of proposed development on the biodiversity values of the proposed development site; and
- Sets out the measures that the proponent of the proposed development proposes to take to avoid or minimise the impact of the proposed development; and
- Specifies in accordance with the Biodiversity Assessment Method, the number and class of biodiversity credits that are required to be retired to offset the residual impacts on biodiversity values of the actions to which the Biodiversity Offsets Scheme applies (See Appendix 1).

This Report also provides assessments and considerations of the following:

- State Environmental Planning Policy (Coastal Management) 2018;
- State Environmental Planning Policy 19 Bushland in Urban Areas;
- State Environmental Planning Policy 44 - Koala Habitat Protection;
- State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017;
- Draft State Environmental Planning Policy (Environment).

This Report has been updated to reflect the removal of the northern section of the elevated boardwalk and address submissions received from the Department of Planning, Industry and Environment and Central Coast Council. The overall areas of vegetation assessed for removal and retention have not changed since the issue of the previous version of this BDAR submitted and a revised BAMC credit report is not required.

1.2 SITE CHARACTERISTICS

The planning and cadastral details of the subject site are provided in Table 1.1.

TABLE 1.1
SITE DETAILS

Location	Lot 100 DP 1075037, Lot 1 DP 45551 and SP 72557 John Whiteway Drive, Gosford
Site Area	2.31 hectares
Development Footprint Area	Approximately 2.27 hectares
Impact Avoidance Area	0.04 ha
Local Government Area	Central Coast

TABLE 1.1 SITE DETAILS	
Existing Land Use	Vacant Land / Previous Quarry Site
Site Zoning	R1 General Residential
Applicable Minimum Lot Size	0.06 ha
Area of Proposed Native Vegetation Clearing	>1ha
BAM Assessment Method Used	Full BAM Method (BAM 2017)

1.3 PROPOSED DEVELOPMENT

The proposed development assessed in this report is the construction and use of four residential flat buildings, an elevated boardwalk and viewing platform and associated infrastructure including but not limited to bushfire asset protection zones, connection to services, access, excavation and site stabilisation works, installation of a rock-catch fence around the northern and western sections of the site and site landscaping.

The areas of the site which will be impacted by the proposal are shown in Figures 1.1a and 1.1bi-iii. The locations of trees to be retained and removed, including the large live trees with diameter at 1.4m of greater than 45cm, are shown in these figures. There is a small area in the western section of the site which is proposed to be retained and will not be impacted by the proposal.

The NSW Rural Fire Service have provided Draft Conditions of Consent dated 7 June 2020 which identifies that the site is to be managed as an inner protection area asset protection zone, including a requirement that the tree canopy within the site is maintained at less than 15% cover at maturity. An area to the east of the site within 80 John Whiteway Drive is also required to be managed as an outer protection area bushfire asset protection zone where the tree canopy is to be managed to 30% cover at maturity.

The retained vegetation within the site is to be managed in accordance with the Vegetation Management Plan (*Conacher Consulting* 2021a) and Tree Assessment Report (*Conacher Consulting* 2021b), which will ensure that the NSW RFS requirements for bushfire asset protection zones are met.

The current level of tree retention proposed has been increased from the previous extent proposed. Selected trees will be retained within the site, outside of the construction and excavation footprint areas. The trees which have been given the highest priority for retention in these areas are the large and medium size trees identified in the Tree Assessment Report (*Conacher Consulting* 2021b) which contribute most to the visual and biodiversity values of the site. Some large trees will require removal due to being located within or directly adjoining the proposed excavation footprint. Other large trees require removal to ensure that the potential risk associated with trees which are not suitable for long term retention is appropriately managed. Most of the large trees in the northern section of the site which are proposed for removal are considered to be not suitable for long term retention due to low SULE Ratings and observable structural defects and site conditions such as erosion around structural root zones, site slope, shallow soil conditions and proximity to cuttings and existing adjoining habitable areas.

An elevated boardwalk is proposed through the northern section of the site in an east to west direction from John Whiteway Drive. The northern extension of the boardwalk has been removed from the design as an impact avoidance measure. The boardwalk is to be constructed from steel mesh and supported by footings, rather than constructed on grade. The boardwalk has been designed to avoid trees where possible and align with the proposed

excavation footprint and is similar in design to elevated boardwalks used by Central Coast Council in the adjoining Rumbalara Reserve.

It is intended that the land in the northern and western areas of the site be maintained and managed as both an asset protection zone and suitable corridors for native wildlife. The future management of the vegetation and the trees on the site is to be in accordance with the Vegetation Management Plan (*Conacher Consulting* 2021a) and the Tree Assessment Report (*Conacher Consulting* 2021b) prepared for the proposal. The building and works footprint will be subject to landscaping incorporating Australian native plants, as identified in the Landscape Plans prepared by Distinctive (2021).

Additional detailed plans of the proposal are provided as separate documentation to this report.

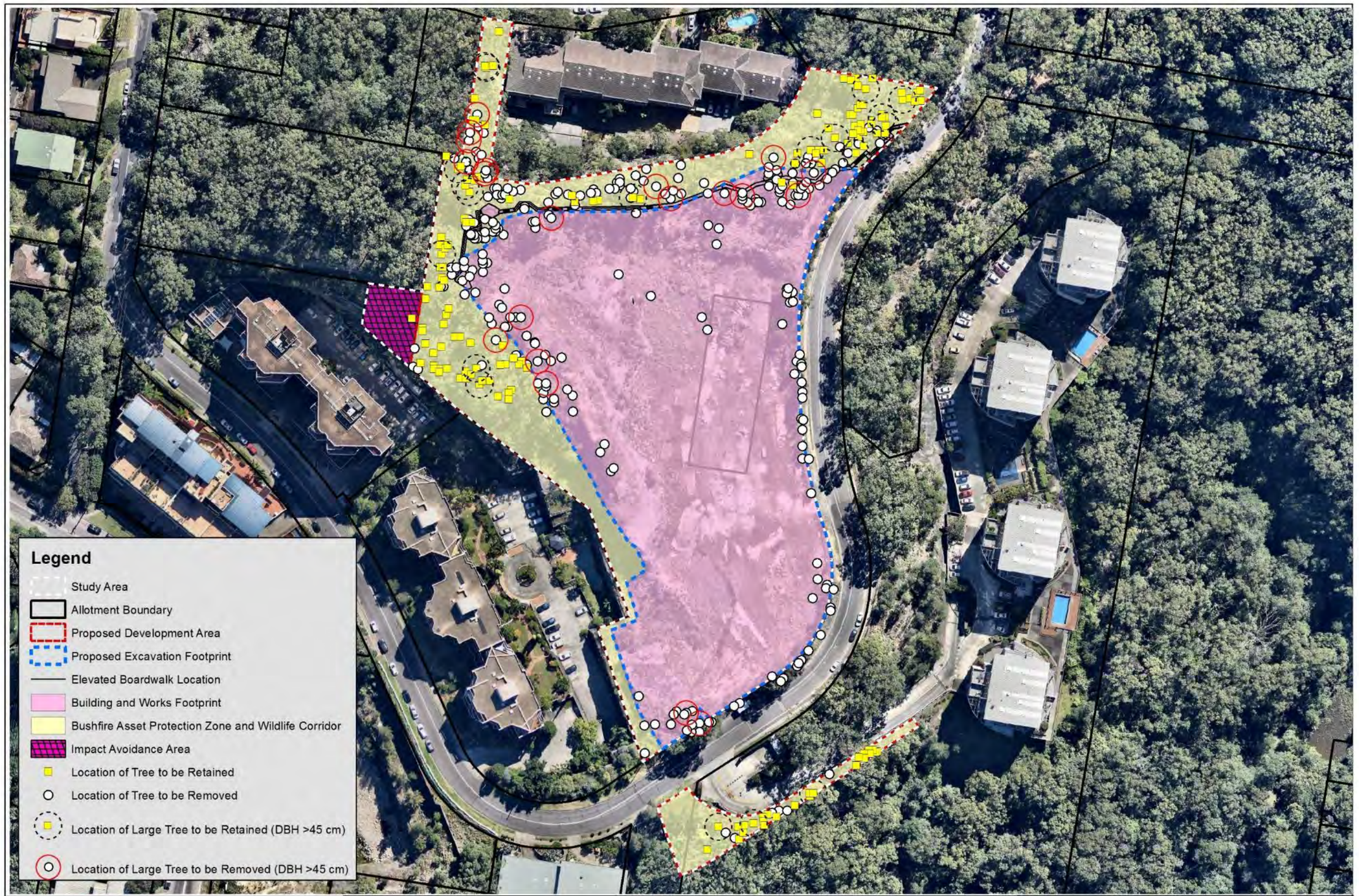

Figure 1.1a
Proposed Development Footprint
John Whiteway Drive, Gosford

Figure 1.1b(i)
Proposed Development Footprint - Northern Portion
John Whiteway Drive, Gosford

Figure 1.1b(iii)
Proposed Development Footprint - Southern Portion
John Whiteway Drive, Gosford

1.4 BIODIVERSITY VALUES MAP

The subject site is not included on the Biodiversity Values Map.

1.5 LITERATURE REVIEW & INFORMATION SOURCES

Details on the previous ecological surveys and assessments reviewed and utilised for this report are outlined as follows. Additional documents referred to in the text are listed in the References Section of this Report.

i. The Natural Vegetation of the Gosford Local Government Area, Central Coast, New South Wales Revised and Updated (Bell 2009) and Review of vegetation mapping, Gosford LGA: addressing vegetation loss since 2004 (Bell 2013)

This report and the associated map files were reviewed to inform the plant community type mapping and determinations within this BDAR.

One vegetation type, Map Unit E22ai – Narrabeen Coastal Blackbutt Forest, has been mapped by Bell (2013) within this site.

ii. Bionet Atlas of NSW Wildlife

The Bionet Atlas of NSW Wildlife (NSW DPIE 2020) was checked to determine whether any threatened species have been recorded within the subject site or the 1500m buffer area surrounding the site. Details of the threatened species recorded within 1500m of the site are provided in Table 1.2.

TABLE 1.2
THREATENED SPECIES RECORDED ON THE BIONET ATLAS WITHIN 1500m

Scientific Name	Common Name	Number of Records	Most Recent Record Date
Bush Stone-curlew	*Burhinus grallarius*	18/10/2017	1
Green Turtle	*Chelonia mydas*	19/09/2003	2
Varied Sittella	*Daphoenositta chrysoptera*	26/11/2010	2
Spotted-tailed Quoll	*Dasyurus maculatus*	31/12/2004	4
	Epacris purpurascens var. purpurascens	30/04/1970	1
Slaty Red Gum	*Eucalyptus glaucina*	23/02/1955	1
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	21/06/2015	1
Black-breasted Buzzard	*Hamirostra melanosternon*	15/08/1984	1
Spreading Guinea Flower	*Hibbertia procumbens*	1/10/1991	1
Swift Parrot	*Lathamus discolor*	30/12/1960	1
Fraser's Screw Fern	*Lindsaea fraseri*	3/06/1955	1
Biconvex Paperbark	*Melaleuca biconvexa*	18/07/2003	10
Little Bent-winged Bat	*Miniopterus australis*	20/08/2014	3
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	31/12/1994	1
Southern Myotis	*Myotis macropus*	23/12/2001	1
Powerful Owl	*Ninox strenua*	23/04/2017	9
Eastern Osprey	*Pandion cristatus*	11/06/2014	4

TABLE 1.2 THREATENED SPECIES RECORDED ON THE BIONET ATLAS WITHIN 1500m			
Scientific Name	**Common Name**	**Number of Records**	**Most Recent Record Date**
Squirrel Glider	*Petaurus norfolcensis*	13/12/1996	7
Koala	*Phascolarctos cinereus*	17/10/1994	1
Long-nosed Potoroo	*Potorous tridactylus*	31/12/1969	1
Tranquility Mintbush	*Prostanthera askania*	31/07/1915	1
Grey-headed Flying-fox	*Pteropus poliocephalus*	12/04/2000	6
Scrub Turpentine	*Rhodamnia rubescens*	31/01/2003	1
Magenta Lilly Pilly	*Syzygium paniculatum*	13/03/2015	5
Masked Owl	*Tyto novaehollandiae*	20/11/1992	1
Sooty Owl	*Tyto tenebricosa*	28/02/2003	5

iii. Revised Flora and Fauna Assessment Report – Proposed Residential Flat Building, John Whiteway Drive Gosford (Conacher Consulting 2019)

This Report was prepared for a separate development application for the site. The surveys completed as part of this report identified the following species foraging within the site:

- Large Bent-winged Bat (foraging activity only);
- Little Bent-winged Bat (foraging activity only); and
- Grey-headed Flying-fox (flying over the site).

SECTION 2

LANDSCAPE FEATURES AND SITE CONTEXT

2.1 LANDSCAPE FEATURES

The Site Map is provided as Figure 2.1 and a Location Map is provided as Figure 2.2. The landscape features relevant to the site are identified as follows.

i. IBRA BIOREGION & SUBREGION

- IBRA Bioregion: Sydney Basin
- IBRA Subregion: Wyong
- Refer to Figure 2.2.

ii. NSW LANDSCAPE REGION

- Gosford – Cooranbong Coastal Slopes and Newcastle Coastal Alluvial Plains.
- Refer to Figure 2.2.

Gosford – Cooranbong Coastal Slopes was used for assessment purposes as most of the impact area is within this landscape and it best reflects the characteristics of the site.

iii. RIVERS, STREAMS AND ESTUARIES

There are no rivers, streams or estuaries located within the site. The locations of these features within 1500m of the development site are mapped in Figure 2.3.

iv. IMPORTANT AND LOCAL WETLANDS

There are no important or local wetlands, on or directly adjacent to, the development site.

v. HABITAT CONNECTIVITY

A map of the local habitat connectivity is provided in Figure 2.4 and the following considerations are provided.

A narrow and disturbed area of vegetation within and adjoining the northern section of the site provides a linkage between retained bushland areas to the west of the site and larger areas of remnant vegetation to the northeast within Rumbalara Reserve which forms part of Council's Coastal Open Space System.

It is intended that the land in the northern and western areas of the site be maintained and managed as both an asset protection zone and suitable corridors for native wildlife.

Several of the existing trees will be retained within the north-eastern and north-western sections of the site and replanting will be undertaken for areas within the central northern section of the site disturbed during civil works.

The existing benched sandstone areas in the south-western section of the site will be retained in their current condition as potential connective boardwalk for small mammals and reptiles.

These areas will be maintained in perpetuity as wildlife corridors. Further information on the future management of the site is provided in the Vegetation Management Plan prepared by *Conacher Consulting* (2021a).

A part of the proposal a bushfire asset protection zone (APZ) area will be located offsite to the south of the existing access to 80 John Whiteway Drive. This portion of the APZ area is not likely to provide important connectivity due to the separation created by the existing access road.

vi. AREAS OF GEOLOGICAL SIGNIFICANCE AND SOIL HAZARD FEATURES

The development site does not contain any karst or caves. The site consists of a disused quarry with some crevices associated with the quarried rock faces.

The development site does not contain any identified soil hazard features. The site is mapped as no know occurrence of acid sulphate soils on Council's Acid Sulphate Soils Planning Maps.

vii. AREAS OF OUTSTANDING BIODIVERSITY VALUE

The development site does not contain any areas of Outstanding Biodiversity Value, declared by the Minister.

2.2 SITE CONTEXT FEATURES

The following site context features have been identified from an inspection of the site and GIS assessment using ArcMap software and available shapefiles and aerial imagery. These features are used to determine the biodiversity values that are important for identifying the site context and habitat suitability of the proposed development site for the purposes of impact assessment.

i. ASSESSMENT METHOD APPLIED

The site-based assessment method was utilised for this assessment.

ii. NATIVE VEGETATION COVER

The native vegetation cover within the 1500m buffer of the proposed development site has been determined from aerial imagery obtained from an aerial photograph flown on 31st March 2019 (Nearmap 2021) and has been mapped as 26.5% cover as shown in Figure 2.5.

iii. PATCH SIZE

The patch size associated with the subject development site is greater than 100 hectares.

Figure 2.1
Site Map
John Whiteway Drive, Gosford

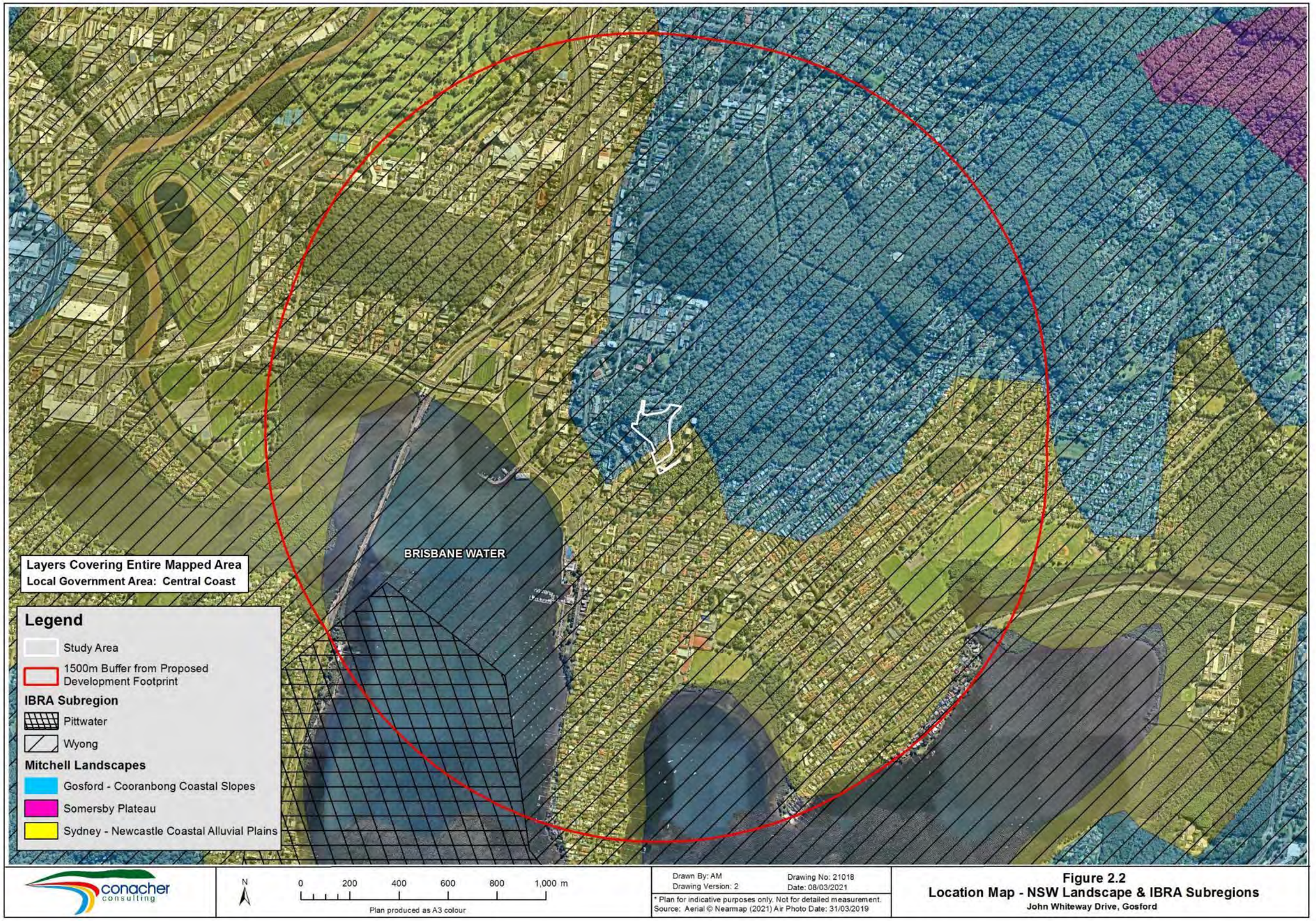

Figure 2.2
Location Map - NSW Landscape & IBRA Subregions
John Whiteway Drive, Gosford

Figure 2.3
Location Map - Rivers, Streams and Local & Regional Wetlands
John Whiteway Drive, Gosford

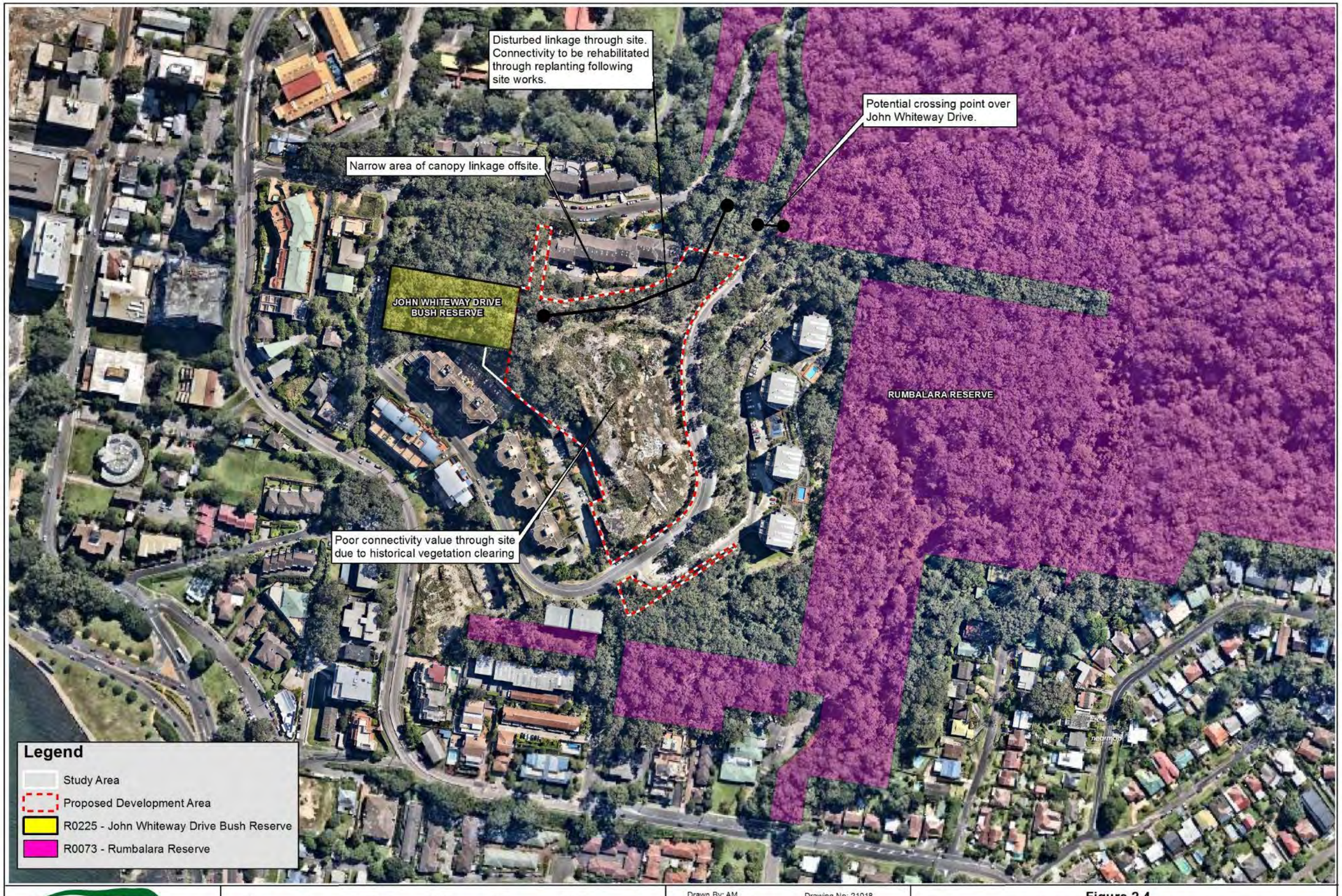

Figure 2.4
Habitat Connectivity Map
John Whiteway Drive, Gosford

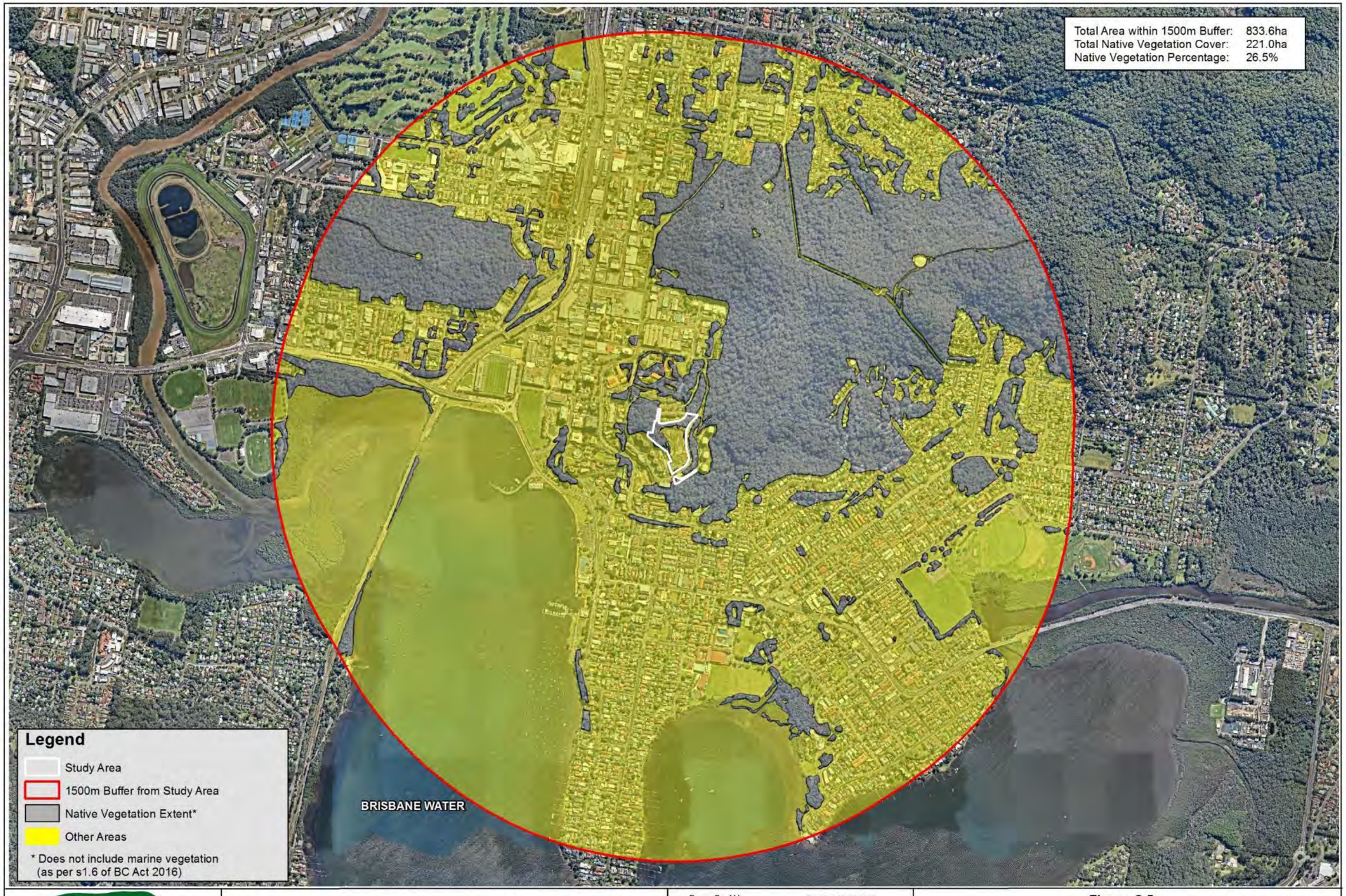

Figure 2.5
Native Vegetation Cover Map
John Whiteway Drive, Gosford

SECTION 3

NATIVE VEGETATION & VEGETATION INTEGRITY ASSESSMENT

3.1 NATIVE VEGETATION AND PLANT COMMUNITY TYPES

i. Plant Community and Floristic Survey Methods

The previous reports and vegetation mapping relevant to the site, identified in Section 1.5, were utilised to determine the likely plant community types present within the site. A field survey, which consisted of a belt transect survey across the site was conducted to identify the occurrence of the dominant flora species and the extent and location of native vegetation and corresponding plant community types (PCTs) present. The dominant species observed within the plots were entered into the Bionet Vegetation Classification (NSW DPIE 2020) which assisted in the determination of the PCTs present.

A stratified plot-based vegetation survey of the subject land was undertaken to assess the expected environmental variation and address any gaps in previous mapping and site information, as no previous plot surveys had been completed for this site. The PCTs, associated zones and stratified survey effort is listed in Table 3.1.

TABLE 3.1
DETAILS OF PLANT COMMUNITY TYPES AND SURVEY EFFORT STRATIFICATION

PCT	Vegetation Zone	Area within Footprint (ha)	Plots Completed
PCT 684 Blackbutt – Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	Zone 1 – Disturbed Remnant Vegetation	0.93	1 Plot (Plot 2 completed 6 November 2019)
PCT 684 Blackbutt – Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	Zone 2 – Disturbed Mostly Exotic Regrowth	1.34	1 Plot (Plot 1 completed 6 November 2019)

Plants recorded within plots which were not readily identified in the field were photographed and/or sampled for further identification. Any specimens of plants tentatively identified as threatened species were sent to the Sydney Royal Botanic Gardens for confirmation of the identification.

All vascular plants were identified using keys, nomenclature and/or information in The Royal Botanic Gardens and Domain Trust (2020) and Richardson *et al*., (2016). Wherever they were known, changes to nomenclature and classification have been incorporated into the results.

ii. Description of Plant Community Types Present

The following description in Table 3.2 is provided for the plant community type and associated zones observed within the site.

TABLE 3.2 DESCRIPTION FOR PCT 684 BLACKBUTT – NARROW-LEAVED WHITE MAHOGANY SHRUBBY TALL OPEN FOREST OF COASTAL RANGES, NORTHERN SYDNEY BASIN BIOREGION	
Vegetation Formation	Wet Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class	North Coast Wet Sclerophyll Forests
Vegetation Zones	Zone 1 (Disturbed Remnant Vegetation) Zone 2 (Disturbed Mostly Exotic Regrowth)
Extent within Development Footprint (ha)	Zone 1: 0.93 ha Zone 2: 1.34ha
Dominant Native Tree Species (Zone 1)	*Eucalyptus pilularis* *Eucalyptus paniculata** *Eucalyptus resinifera** *Angophora floribunda* ** = not within plots surveyed*
Dominant Native Shrub Species (Zone 1)	*Pittosporum undulatum* *Leucopogon juniperinus*
Dominant Native Groundcover Species (Zone 1)	*Lomandra longifolia* *Imperata cylindrica* *Dichelachne micrantha* *Rytidosperma fulvum* *Themeda triandra*
Floristic differences for zones 2 & 3	Zone 2 contains mostly exotic regrowth vegetation
Justification of PCT identification	PCT 684 Blackbutt – Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion and PCT 1564 Blackbutt – Rough-barked Apple – Turpentine – ferny tall open forest of the Central Coast were initially identified as candidate PCTs. PCT 684 was selected due to the presence of *Eucalyptus paniculata* onsite and the lack of *Angophora costata* which occurs as a dominant within PCT 1564.
Threatened Ecological Community Status	Not listed
Estimate of PCT percentage cleared value	42
Correlation with aerial photograph and mapped extent	Yes
Patch Size	>100ha

iii. Floristic Plot Results

The flora species observed within the plot surveyed and the corresponding species richness and cover scores are provided in Table 3.3 and plot field data sheets and photographs are provided in Appendix 2.

TABLE 3.3
FLORISTIC SURVEY PLOT RESULTS

Family	Scientific Name	Common Name	PCT 684 Zone 1 Plot Ref: 2		PCT 684 Zone 2 Plot Ref: 1	
			Cover	Abundance	Cover	Abundance
Native Plants						
Trees						
Casuarinaceae	*Allocasuarina torulosa*	Forest Sheoak			3	5
Casuarinaceae	*Casuarina glauca*	Swamp Oak	1	4	0.5	10
Fabaceae (Mimosoideae)	*Acacia decurrens*	Black Wattle	1	5		
Myrtaceae	*Acmena smithii*	Lilly Pilly	1	1		
Myrtaceae	*Angophora floribunda*	Rough-barked Apple	10	10		
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	40	10		
Shrubs						
Ericaceae	*Leucopogon juniperinus*	Prickly Beard-heath	1	10	0.1	1
Fabaceae (Faboideae)	*Podolobium ilicifolium*	Prickly Shaggy Pea	0.1	2		
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	15	25		
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	0.1	1		
Grass & Grass Like						
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge			0.1	1
Lomandraceae	*Lomandra filiformis subsp. filiformis*		0.1	2		
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	25	800		

TABLE 3.3 FLORISTIC SURVEY PLOT RESULTS						
Family	**Scientific Name**	**Common Name**	**PCT 684 Zone 1 Plot Ref: 2**		**PCT 684 Zone 2 Plot Ref: 1**	
			Cover	**Abundance**	**Cover**	**Abundance**
Poaceae	*Dichelachne micrantha*		1	10		
Poaceae	*Entolasia stricta*	Wiry Panic	0.1	1		
Poaceae	*Imperata cylindrica*	Blady Grass	1	50	0.1	10
Poaceae	*Paspalum sp.**		0.1	1		
Poaceae	*Rytidosperma fulvum*	Wallaby Grass	1	50		
Poaceae	*Themeda triandra*	Kangaroo Grass	1	50	1	200
Forbs						
Colchicaceae	*Burchardia umbellata*	Milkmaids	0.1	1		
Phormiaceae	*Dianella caerulea var. caerulea*	Blue Flax-lily			0.1	5
Phormiaceae	*Dianella caerulea var. producta*	Blue Flax-lily	0.1	10		
Other						
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine	1	25		
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	0.1	20		
Exotic Plants						
High Threat Exotics						
Arecaceae	*Phoenix canariensis**	Canary Island Date Palm	0.1	1		
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern	0.1	5	0.1	1
Asteraceae	*Ageratina adenophora**	Crofton Weed			5	10
Lauraceae	*Cinnamomum camphora**	Camphor Laurel	1	2		
Ochnaceae	*Ochna serrulata**	Mickey Mouse Plant	0.1	5	0.1	1
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet	0.1	5		

TABLE 3.3 FLORISTIC SURVEY PLOT RESULTS						
Family	**Scientific Name**	**Common Name**	**PCT 684 Zone 1 Plot Ref: 2**		**PCT 684 Zone 2 Plot Ref: 1**	
			Cover	**Abundance**	**Cover**	**Abundance**
Oleaceae	*Ligustrum sinense**	Small-leaved Privet	0.1	5		
Pinaceae	*Pinus radiata**	Radiata Pine	1	1		
Poaceae	*Andropogon virginicus**	Whisky Grass			**Cover**	**Abundance**
Poaceae	*Axonopus fissifolius**	Narrow-leafed Carpet Grass				
Poaceae	*Cenchrus clandestinus**	Kikuyu Grass	0.1	1		
Poaceae	*Eragrostis curvula**	African Love Grass			3	5
Poaceae	*Paspalum quadrifarium**	Tussock Paspalum			0.5	10
Polygalaceae	*Polygala myrtifolia**		1	20		
Verbenaceae	*Lantana camara**	Lantana	1	10		
Other Exotics						
Asteraceae	*Cirsium vulgare**	Spear Thistle				
Asteraceae	*Conyza bonariensis**	Flaxleaf Fleabane				
Asteraceae	*Coreopsis lanceolata**	Coreopsis			0.1	1
Gentianaceae	*Centaurium spp.**					
Malvaceae	*Sida rhombifolia**					
Myrsinaceae	*Anagallis arvensis**	Scarlet Pimpernel				
Oleaceae	*Olea europaea subsp. cuspidata**	African Olive	0.1	5		
Oxalidaceae	*Oxalis debilis var. corymbosa**				0.1	1
Verbenaceae	*Verbena rigida var. rigida**	Veined Verbena				

3.2 VEGETATION INTEGRITY DETAILS

i. Vegetation Integrity Survey Methods

A vegetation integrity assessment was completed for each plot in accordance with the requirements of Section 5.3 of the BAM.

ii. Plot Function Results

The habitat function data collected during the field assessment is presented in Table 3.4.

TABLE 3.4
PCT COMPOSITION CONDITION DATA / SPECIES RICHNESS

PCT and Zone	**PCT 684 Zone 1**	**PCT 684 Zone 2**
Plot Number	**Plot 2**	**Plot 1**
Trees	5	2
Shrubs	4	1
Forbs	8	3
Grass & Grass Like Plants	2	1
Ferns	0	0
Other Species	2	0

iii. Vegetation Integrity Scores

The habitat structure data collected during the field assessment is presented in Table 3.5.

TABLE 3.5
PCT STRUCTURE CONDITION DATA / COVER

PCT and Zone	**PCT 684 Zone 1**	**PCT 684 Zone 2**
Plot Number	**Plot 2**	**Plot 1**
Trees	53	3.5
Shrubs	16.2	0.1
Forbs	29.3	1.2
Grass & Grass Like Plants	0.2	0.1
Ferns	0	0
Other Species	1.1	0

iv. Plot Function Condition Data

The habitat function condition data collected during the field assessment is presented in Table 3.6.

TABLE 3.6 PCT FUNCTION CONDITION DATA		
PCT and Zone	**PCT 684 Zone 1**	**PCT 684 Zone 2**
Plot Number	**Plot 2**	**Plot 1**
TREE DBH Size Class Tally		
Trees DBH <5cm	Present	Present
Trees DBH 5-9cm	Present	Present
Trees DBH 10-19cm	Present	Present
Trees DBH 20-29cm	Present	Absent
Trees DBH 30-49cm	Present	Absent
No. trees DBH 50-79cm	2	0
No. trees DBH ≥80cm	0	0
No. Hollow-bearing Trees	1	0
Fallen Log Length (m)	21	3.5
Average Litter Cover	54	39
High Threat Weed Cover	4.6	30.4

v. Vegetation Integrity Scores

The vegetation integrity scores were determined in accordance with Section 5.4 of the BAM and are provided in Table 3.7.

TABLE 3.7 PCT COMPOSITION CONDITION DATA / SPECIES RICHNESS		
PCT and Zone	**PCT 684 Zone 1**	**PCT 684 Zone 2**
Composition Score	29.4	8.7
Structure Score	50.1	0.3
Function Score	64.4	37.9
Vegetation Integrity Score	45.6	4.7

vi. Use of Local Data

No additional local data was used for the purposes of assessing benchmark condition.

PCT 684	Extent within Study Area (ha)	Extent within Development Footprint (ha)
Zone 1	0.97	0.93
Zone 2	1.34	1.34

Legend

- Study Area
- Proposed Development Area
- BAM Assessment Plot Location
- 1 — Zone 1 - PCT 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
- 2 — Zone 2 - PCT 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion (mostly exotic regrowth)

conacher consulting

N

0 20 40 60 80 100 m

Plan produced as A3 colour

Drawn By: AM
Drawing Version: 2
Drawing No: 21018
Date: 08/03/2021

* Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © Nearmap (2021) Air Photo Date: 20/10/2019

Figure 3.1
Plant Community Types & BAM Assessment Plot Locations
John Whiteway Drive, Gosford

SECTION 4

THREATENED SPECIES DETAILS

4.1 HABITAT FEATURES PRESENT

The development site contains disturbed habitats for fauna species. Details of the micro-habitat features observed are provided in Table 4.1. Mapping of hollow bearing-tree locations is provided in Figure 4.2.

TABLE 4.1
FAUNA HABITATS PRESENT

Key habitat Type	Presence	Comments
Hollow bearing trees	Yes	See Hollow Bearing Tree Assessment in Appendix 3.
Mature trees	Yes	Several present
Culverts	No	None observed
Rock Shelters / Caves / Crevices	No	Small rock overhangs present on site. No suitable bat cave roosting habitat identified.
Acacia shrubs	Yes	Low densities
Banksia shrubs	No	None observed
Native Grasses	Yes	Native Understory grasses are present
Man-made features	Yes	Stockpiled building materials / refuse
The native vegetation types present	Yes	See Section 3.1
Areas of cleared land and exotic vegetation	Yes	See Section 3.1
Any exposed areas of bush rock including outcrops	Yes	Exposed rock present particularly on old quarry faces
Natural burrows	No	None observed
Large trees with basal cavities	Yes	One observed (Hollow tree No. 93)
Logs	Yes	Observed
Wetlands, streams, and waterbodies etc.	No	None present
Nests and roosts	No	None observed
Wombat burrows	No	None observed
Dens used by Petaurus gliders	No	No hollows observed
Petaurus glider sap feed trees	No	None observed
Distinctive scats	No	None observed
Latrine and den sites pf the Spotted-tailed Quoll	No	None observed
Allocasuarina spp. trees	Yes	*A. torulosa* is present.
Flying-fox camps	No	None observed
Micro chiropteran bat subterranean roosts (culverts, tunnels and disused mineshafts	No	None observed
Regent Honeyeater feed or nest trees;	No site use observed	None observed
Swift Parrot feed trees;	No site use observed	Suitable feed trees present (*Eucalyptus pilularis*)
Winter-flowering eucalypts	No	None observed

TABLE 4.1 FAUNA HABITATS PRESENT		
Key habitat Type	**Presence**	**Comments**
Mistletoes	No	None observed
Permanent soaks and seepages	No	None present
Areas that can act as corridors for plant and animal species	Yes	See below
Connectivity value of the site	Yes	See Habitat Connectivity in Section 2.1

Photo 1. Example of exposed sandstone rock from historical quarry operations.

Photo 2. Area along the northern site boundary showing regrowth native trees and saplings, bare earth and mixed exotic and native grass cover.

Photo 3. Cleared site area showing stockpiled building materials and dense exotic vegetation growth.

4.2 THREATENED SPECIES DETAILS

4.2.1 *Ecosystem Credit Species*

The threatened species for which the likelihood of occurrence or elements of habitat can be predicted by vegetation surrogates and landscape features, or for which targeted surveys are likely to have a low probability for detection, are identified as 'Ecosystem Credit' species.

The Ecosystem Credit Species predicted to occur are listed in Table 4.2, a determination of suitable habitat presence is provided.

TABLE 4.2
ECOSYSTEM CREDIT SPECIES & SITE HABITAT SUITABILITY

Species	Habitat Constraints	Geographic Limitations	Sensitivity to Gain Class	BC Act Listing Status	EPBC Act Listing Status	Confirmed Predicted Species	Predicted PCTs and Vegetation Zones with Suitable Habitat	Predicted PCTs and Vegetation Zones with No Suitable Habitat
Anthochaera phrygia Regent Honeyeater (Foraging)	-	-	High	CE	CE	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Artamus cyanopterus cyanopterus Dusky Woodswallow	-	-	Moderate	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Callocephalon fimbriatum Gang-gang Cockatoo (Foraging)	-	-	Moderate	E	E	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-

TABLE 4.2 ECOSYSTEM CREDIT SPECIES & SITE HABITAT SUITABILITY								
Species	**Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Listing Status**	**EPBC Act Listing Status**	**Confirmed Predicted Species**	**Predicted PCTs and Vegetation Zones with Suitable Habitat**	**Predicted PCTs and Vegetation Zones with No Suitable Habitat**
Calyptorhynchus lathami Glossy Black-Cockatoo	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Daphoenositta chrysoptera Varied Sittella	-	-	Moderate	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Dasyurus maculatus Spotted-tailed Quoll	-	-	High	V	E	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Glossopsitta pusilla Little Lorikeet	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-

TABLE 4.2 ECOSYSTEM CREDIT SPECIES & SITE HABITAT SUITABILITY								
Species	**Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Listing Status**	**EPBC Act Listing Status**	**Confirmed Predicted Species**	**Predicted PCTs and Vegetation Zones with Suitable Habitat**	**Predicted PCTs and Vegetation Zones with No Suitable Habitat**
Hieraaetus morphnoides Little Eagle	-	-	Moderate	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Lathamus discolor Swift Parrot (Foraging)	-	-	Moderate	E	CE	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Lophoictinia isura Square-tailed Kite (Foraging)	-	-	Moderate	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-

TABLE 4.2 ECOSYSTEM CREDIT SPECIES & SITE HABITAT SUITABILITY								
Species	**Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Listing Status**	**EPBC Act Listing Status**	**Confirmed Predicted Species**	**Predicted PCTs and Vegetation Zones with Suitable Habitat**	**Predicted PCTs and Vegetation Zones with No Suitable Habitat**
Miniopterus australis Little Bent-winged Bat (Foraging)	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Miniopterus orianae oceanensis Large Bent-winged Bat (Foraging)	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Ninox connivens Barking Owl (Foraging)	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Ninox strenua Powerful Owl (Foraging)	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-

TABLE 4.2 ECOSYSTEM CREDIT SPECIES & SITE HABITAT SUITABILITY								
Species	**Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Listing Status**	**EPBC Act Listing Status**	**Confirmed Predicted Species**	**Predicted PCTs and Vegetation Zones with Suitable Habitat**	**Predicted PCTs and Vegetation Zones with No Suitable Habitat**
Phascolarctos cinereus Koala (Foraging)	-	-	High	V	V	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Pteropus poliocephalus Grey-headed Flying-fox (Foraging)	-	-	High	V	V	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-
Tyto novaehollandiae Masked Owl (Foraging)	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-

TABLE 4.2 ECOSYSTEM CREDIT SPECIES & SITE HABITAT SUITABILITY								
Species	**Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Listing Status**	**EPBC Act Listing Status**	**Confirmed Predicted Species**	**Predicted PCTs and Vegetation Zones with Suitable Habitat**	**Predicted PCTs and Vegetation Zones with No Suitable Habitat**
Varanus rosenbergi Rosenberg's Goanna	-	-	High	V	-	Yes	PCT 684 Zone 1 Disturbed Remnant Vegetation PCT 684 Zone 2 Exotic Regrowth	-

4.2.2 *Species Credit Species*

The threatened species, which can be reliably detected by survey and for which the likelihood of occurrence or elements of suitable habitat cannot be confidently predicted by vegetation surrogates and landscape features, are identified as 'species credit' species. Some threatened species may also be assessed partly for ecosystem credits and partly for species credits where part of the habitat is assessed as a species credit (such as breeding habitat, or important habitat locations).

An assessment of the candidate species credit type threatened species to determine those required to be subject to targeted surveys is provided in in Table 4.3. The species listed include those predicted by the BAM Calculator with suitable habitat present and any threatened species credit species previously identified from the site, if known from previous reports or recorded on the Bionet Atlas (NSW OEH 2020). The details of preferred habitat and habitat constraints have been provided based on information obtained from the BAM Calculator, NSW Bionet (NSW DPIE 2020) and additional relevant references where listed.

TABLE 4.3
CANDIDATE THREATENED SPECIES (SPECIES CREDITS)

Name	Preferred Habitat & Habitat Constraints	Geographic Limitations	Sensitivity to Gain Class	BC Act Status	EPBC Act Status	Confirmed Candidate Species	Justification
Anthochaera phrygia *Regent Honeyeater* (Breeding)	**Habitat Constraints:** As per mapped Area	-	High	Critically Endangered	Critically Endangered	No	The site is not within mapped area.
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	**Preferred Habitat:** In spring and summer, generally found in tall mountain forests and woodlands. Favours old growth forest and woodland attributes for nesting and roosting. The species may need larger patches and more intact landscapes for breeding. **Habitat Constraints:** Eucalypt trees with hollows >9cm diameter.	-	High	Vulnerable	Not Listed	Yes	-

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	**Habitat Constraints:** Hollow bearing trees living or dead with hollows greater than 15cm diameter and greater than 5m above ground.	-	High	Vulnerable	Not Listed	Yes	-
Cercartetus nanus Eastern Pygmy-possum	**Preferred Habitat:** In most areas woodlands and heath appear to be preferred. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes	-	High	Vulnerable	Not Listed	Yes	-
Chalinolobus dwyeri Large-eared Pied Bat	**Habitat constraints:** Cliffs or within 2km of rock areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	-	Very High	Vulnerable	Vulnerable	Yes	-

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Corybas dowlingii Red Helmet Orchid	**Preferred Habitat:** Bionet Atlas (NSW DPIE 2020) identifies that this species occurs in sheltered areas such as gullies and southerly slopes in tall open forest on well drained gravelly soil at elevations of 10-200m within the Cessnock, Great Lakes, Lake Macquarie and Port Stephens LGAs. A study funded by the NSW DPIE (2020) by Wagner *et al*., (2020) has found this species to be of hybrid origin.	-	Moderate	Endangered	Not Listed	No	The site is not located within this species known distribution. The site does not contain gravelly soils and all south facing slopes have been heavily disturbed and substantially degraded due to historical quarrying activities and site clearing. Species is unlikely to occur.
Cryptostylis hunteriana Leafless Tongue Orchid	**Preferred Habitat:** Occurs in a variety of habitats, however recorded within the Central Coast and Lake Macquarie areas in moist sandy soil in heath and sedgeland and coastal forest communities of Scribbly Gum, Bloodwood, Brown Stringy Bark and Smooth-barked Apple in moist to dry clay loam (Bell 2001).	-	High	Vulnerable	Vulnerable	Yes	Included on a precautionary basis only, this site is substantially degraded and not a habitat type associated with known occurrences of this species.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Cynanchum elegans White-flowered Wax Plant	**Preferred Habitat**: Edge of dry rainforest vegetation and also in association with littoral rainforest, Coastal Tea-tree/Coastal Banksia scrub, Bracelet Honeymyrtle scrub, Forest Red Gum Open Forest and Spotted Gum open forest and woodland.	-	High	Endangered	Endangered	Yes	-
Diuris praecox Rough Doubletail	**Preferred Habitat:** Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey.	-	Moderate	Vulnerable	Vulnerable	Yes	Included on a precautionary basis only, this site is substantially degraded and not a habitat type associated with known occurrences of this species.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Hieraaetus morphnoides Little Eagle (Breeding)	**Habitat Constraints:** Nest trees – live (occasionally dead) large old trees within vegetation -Breeding habitat is live (occasionally dead) large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy. **Preferred Habitat:** Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. This species is not likely to nest in isolated trees or tolerate human disturbance within at least 50m (Marchant & Higgins 1993; Debus *et al*. 2007).	-	Moderate	Vulnerable	Not Listed	Yes	-
Hoplocephalus bitorquatus Pale-headed Snake	**Preferred Habitat:** Mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas. Shelters during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees.	-	High	Vulnerable	Not Listed	Yes	Included on a precautionary basis, the site is located outside of this species known range and is substantially degraded.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Lathamus discolor Swift Parrot (Important Habitat)	Only present in non-breeding season; present in northern NSW for a shorter period than southern NSW. The species is a dual credit species, with the species credit component mapped as an important area. These mapped areas do NOT require survey as it is presumed that the species is present. Any impact from development could potentially be serious and irreversible. Ecosystem credit areas are unlikely to have potential serious and irreversible impacts.	-	Moderate	Endangered	Critically Endangered	No	The site is not mapped as important habitat.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Litoria aurea Green and Golden Bell Frog	**Habitat Constraints:** Semi-permanent / ephemeral wet areas / within 1km of wet areas (Swamps) / Within 1km of a waterbody **Preferred Habitat:** Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs.	-	High	Endangered	Vulnerable	No	No suitable habitat is present and the site is too degraded to support this species.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Litoria brevipalmata Green-thighed Frog	**Preferred Habitat:** 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. Breeding occurs following heavy rainfall from spring to autumn, with larger temporary pools and flooded areas preferred. Frogs may aggregate around breeding sites and eggs are laid in loose clumps among water plants, including water weeds. The larvae are free swimming.	-	Moderate	Vulnerable	Not Listed	No	No suitable habitat is present and the site is too degraded to support this species.
Lophoictinia isura Square-tailed Kite (Breeding)	**Habitat Constraints:** Nest Trees **Preferred Habitat:** The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. Square-tailed Kites need to be in attendance to confirm breeding sites.	-	Moderate	Vulnerable	Not Listed	Yes	-

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Melaleuca groveana Grove's Paperbark	**Preferred Habitat:** Grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcropping granite, rhyolite and sandstone on rocky outcrops and cliffs. Widespread, scattered populations in coastal districts north of Yengo National Park to southeast Queensland. Also found as a disjunct population near Torrington on the northern tablelands.	-	High	Vulnerable	Not Listed	Yes	-
Miniopterus australis Little-bent-winged Bat (Breeding)	**Habitat Constraints:** Cave, tunnel, mine, culverts or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature	-	Very High	Vulnerable	Not Listed	No	Habitat constraints are not met.
Miniopterus orianae oceanensis Large Bent-winged Bat (Breeding)	**Habitat constraints:** Cave, tunnel, mine or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature.	-	Very High	Vulnerable	Not Listed	No	Habitat constraints are not met.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Mixophyes iteratus Giant Barred Frog	**Habitat constraints:** Land within 50m of semi-permanent and permanent drains. **Preferred Habitat:** 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. Breeding takes place from late spring to summer.	-	Moderate	Endangered	Endangered	No	No suitable habitat is present and the site is too degraded to support this species.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Myotis macropus Southern Myotis	**Habitat constraints:** Hollow bearing trees within 200m of a riparian zone. Bridges, caves or artificial structures within 200 m of riparian zone. These include rivers, creeks, billabongs, lagoons, dams and other waterbodies within 200m of the site. **Preferred Habitat:** Forages over streams and pools catching insects and small fish by raking their feet across the water surface. Generally roost in groups close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	-	High	Vulnerable	Not Listed	Yes	-
Ninox connivens Barking Owl (Breeding)	**Habitat Constraints:** Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	-	High	Vulnerable	Not Listed	No	No suitable habitat present. The site is too degraded and the habitat constraints are not met, refer to Hollow Bearing Tree Assessment in Appendix 3.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Ninox strenua Powerful Owl (Breeding)	**Habitat Constraints:** Living or dead trees with hollow greater than 20cm diameter.	-	High	Vulnerable	Not Listed	No	No suitable habitat present. The site is too degraded ad the habitat constraints are not met, refer to Hollow Bearing Tree Assessment in Appendix 3.
Petaurus norfolcensis Squirrel Glider	**Preferred Habitat:** Survey year round but sites with bi-pinnate acacia, autumn winter flowering trees and shrubs such as *Eucalyptus robusta* and Banksia sp (integrifolia etc) should be subject to a more retracted survey period of between March-August. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	-	High	Vulnerable	Not Listed	Yes	-
Petrogale penicillata Brush-tailed Rock-wallaby	**Habitat Constraints:** Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines.	-	Very High	Endangered	Vulnerable	No	The site is too disturbed due to isolation from known habitat areas and historical clearing.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Phascogale tapoatafa Brush-tailed Phascogale	**Habitat Constraints:** Hollow bearing trees **Preferred Habitat:** Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. -- Constraints include the presence of Hollow bearing trees	-	High	Vulnerable	Not Listed	No	No suitable habitat present, the site is too degraded and isolated from areas where this species occurs in the wild.
Phascolarctos cinereus Koala	Important' habitat is defined by the density of koalas and quality of habitat determined by on-site survey - contact OEH for more information.	-	High	Vulnerable	Vulnerable	No	No suitable habitat present, the site is too degraded and isolated from areas where this species occurs in the wild.
Planigale maculata Common Planigale	**Preferred Habitat:** Rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water.	-	High	Vulnerable	Not Listed	Yes (precautionary inclusion only)	No suitable habitat present, species not known from the locality and is not likely to occur. Precautionary surveys completed.
Pseudophryne australis Red-crowned Toadlet	**Preferred Habitat:** Triassic Hawkesbury and Narrabeen Sandstone habitats in the vicinity of permanently moist soaks and vegetated near head-water ephemeral stream beds (NSW NPWS 2001).	-	Moderate	Vulnerable	Not listed	No	No suitable habitat present, the site is too degraded and does not contain any watercourses.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	**Habitat constraints:** Breeding camps If a camp is located the survey only needs to take place in the camp (that is the area occupied by the target species) to identify breeding females	-	High	Vulnerable	Vulnerable	No	No suitable habitat is present.
Rhodamnia rubescens Scrub Turpentine	**Preferred Habitat:** Rainforest and most forest	-	High	Critically Endangered	Not Listed	Yes	Suitable habitat is present
Tetratheca glandulosa Glandular Pink-bell	**Preferred Habitat:** Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies Sandstone Ridgetop Woodland vegetation on ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches.	-	High	Vulnerable	Not Listed	Yes	Site is substantially degraded, included on a precautionary basis only.
Tetratheca juncea Black-eyed Susan	**Preferred Habitat:** Occurs in low open forest/woodland with a mixed shrub Understory and grassy groundcover. It generally prefers well-drained sites below 200m elevation and annual rainfall between 1000 - 1200mm. The preferred substrates are sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral.	-	High	Vulnerable	Vulnerable	Yes	Site substantially degraded and location south of this species current range, surveys completed on a precautionary basis.

TABLE 4.3 CANDIDATE THREATENED SPECIES (SPECIES CREDITS)							
Name	**Preferred Habitat & Habitat Constraints**	**Geographic Limitations**	**Sensitivity to Gain Class**	**BC Act Status**	**EPBC Act Status**	**Confirmed Candidate Species**	**Justification**
Tyto novaehollandiae Masked Owl (Breeding)	**Habitat Constraints:** Hollow bearing trees, living or dead with hollows greater than 20cm diameter.	-	High	Vulnerable	Not Listed	No	No suitable habitat present. Habitat constraints are not met, refer to Hollow Bearing Tree Assessment in Appendix 3.

4.3 THREATENED SPECIES TARGETED SURVEY METHODS

Threatened Flora Surveys Completed
Targeted surveys were completed for all threatened flora species were generally in accordance with the NSW Guide to Surveying Threatened Plants (NSW OEH 2016). Targeted belt transects of 5-10m width were undertaken throughout the areas of the site which contain suitable habitat for the target threatened flora species. Details on the targeted surveys completed for candidate threatened flora species are listed in Table 4.4 and survey locations are shown in Figure 4.1.

Targeted belt transects of 5-10m width were undertaken throughout the areas of the site which contain suitable habitat for the target threatened flora species, as detailed in Table 4.4.

TABLE 4.4
THREATENED FLORA SURVEY DETAILS

Survey Date	Survey Method	Time Spent
20 May 2019	Belt transects search (5-10m spacing)	5hrs x 2 persons (1200-1700)
21 May 2019	Belt transects search (5-10m spacing)	8hrs x 2 persons (0900-1700)
27 May 2019	Belt transects search (5-10m spacing)	0.5hrs (1330-1400) x 1 person
6 August 2019	Belt transects search (5-10m spacing)	1.5hrs x 2 persons (1500-1630)
10 September 2019	Belt transects search (5-10m spacing)	2hrs x 2 persons (1330-1530)
6 November 2019	Belt transects search (5-10m spacing)	2hrs x 2 persons (1500-1700)
7 November 2019	Belt transects search (5-10m spacing)	1hr 50min x 2 persons (1250-1440)

Fauna Surveys Completed
Targeted surveys were completed for the candidate threatened fauna species with reference to the following methods:

- Field Survey methods – Field survey methods for environmental consultants and surveyors when assessing proposed development or their activities on site containing threatened species (NSW DEC 2004a)
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC 2004b)
- 'Species Credit' Threatened Bats and their Habitats – NSW Survey Guide for the Biodiversity Assessment Method
- Bat Calls of NSW – Region Based Guide to the echolocation calls of microchiropteran bats (Pennay *et al*., 2004)

Targeted surveys were completed for the candidate threatened species identified in Table 4.3. The surveys undertaken were generally in accordance with the following survey methods:

The fauna surveys completed included the following:

- Habitat assessment and hollow bearing tree search / assessment;

- SEPP 44 Koala Habitat Assessment;
- Diurnal census including:
  - Nest site searches for candidate raptor species;
  - Diurnal census and flushing search for birds;
  - Searches for microbat roost sites;
- Nocturnal census including:
  - Nocturnal Spotlighting; and
  -Threatened nocturnal fauna call playback.
- Trapping and remote detection surveys
  -Arboreal and terrestrial Elliot Trapping;
  - Arboreal and terrestrial baited remote infrared camera survey; and
  - Ultrasonic microbat call recording.

Fauna survey effort details are provided in Table 4.5 and the locations of targeted threatened species surveys are mapped in Figure 4.1.

TABLE 4.5
CURRENT FAUNA SURVEY DETAILS

Survey Type	Date	Weather Conditions	Survey Method	Survey Effort/Time
Diurnal Surveys	12 March 2018	1/8 cloud, light wind, 25ºC	Reptile habitat search Mammal census Bird census Opportunistic observation	0.5hrs (1445-1515)
	14 March 2018	1/8 cloud, moderate wind, 26ºC	Amphibian habitat search Reptile habitat search Mammal census Bird census Hollow bearing tree survey Opportunistic observation	2 hrs (1500-1700)
	21 March 2018	8/8 cloud, moderate wind, 21ºC	Amphibian habitat search Reptile habitat search Mammal census Bird census Hollow bearing tree survey Opportunistic observation	0.5hrs (1000-1030)
	8 April 2019	0/8 cloud, WNW breeze, 28ºC	Diurnal fauna census and habitat search	0.5hrs (1050-1120)
	20 May 2019	0/8 cloud, no wind, 18-20ºC	Diurnal fauna census and habitat search	5hrs x 2 persons (1200-1700)
	21 May 2019	0/8 cloud, no wind, 20-25ºC	Diurnal fauna census and habitat search	8hrs x 2 persons (0900-1700)

TABLE 4.5 CURRENT FAUNA SURVEY DETAILS				
Survey Type	**Date**	**Weather Conditions**	**Survey Method**	**Survey Effort/Time**
	27 May 2019	0/8 cloud, WNW breeze, 20ºC	Diurnal fauna census and habitat search	0.5hrs (1330-1400)
	6 August 2019	0/8 cloud, E breeze, 22ºC	Diurnal fauna census and habitat search	1.5hrs x 2 persons (1500-1630)
	10 September 2019	0/8 cloud, SW breeze, 22ºC	Diurnal fauna census and habitat search	2hrs x 2 persons (1330-1530)
	6 November 2019	0/8 cloud, NW breeze, 25ºC	Diurnal fauna census and habitat search	2hrs x 2 persons (1500-1700)
	7 November 2019	0/8 cloud, WNW breeze, 25ºC	Diurnal fauna census and habitat search	1hr 50min x 2 persons (1250-1440)
	4 February 2019	8/8 cloud, SSW wind, 22ºC	Microbat breeding habitat search Update hollow bearing tree assessment	1hr (0930-1030)
Nocturnal Surveys	14 March 2018	1/8 cloud, light wind, 23ºC	Spotlight search and quiet listening for nocturnal bird, mammal and amphibian calls Threatened nocturnal fauna playback survey / nocturnal bird census Targeted amphibian search	1945-2030 (45 min)
	13 November 2019	0/8 cloud, no wind, 18ºC	Stag watch survey, spotlight search and quiet listening Threatened nocturnal fauna playback survey / nocturnal bird census	1.25 hrs (1945-2100)
Trapping Surveys	16-18 October 2019	Variable	Terrestrial Mammal Elliot Trapping	75 trap nights 3 nights x 25 traps
	16-18 October 2019	Variable	Arboreal Mammal Elliot Trapping	30 trap nights 3 nights x 10 traps
Remote Detection Surveys	14 March 2018 – 21 March 2018	Variable conditions	Terrestrial Baited Remote Infrared Camera Survey	14 terrestrial baited camera nights (2 cameras x 7 nights)

TABLE 4.5 CURRENT FAUNA SURVEY DETAILS				
Survey Type	**Date**	**Weather Conditions**	**Survey Method**	**Survey Effort/Time**
	14 March 2018 – 21 March 2018	Variable conditions	Arboreal Baited Remote Infrared Camera Survey	14 arboreal baited camera nights (2 cameras x 7 nights)
	14 March 2018 2017 – 16 March 2018	Variable conditions	Ultrasonic micro bat call recording survey (continuous recording overnight)	2 ultrasonic call detection nights (1 unit x 2 nights)
	6-19 November 2019	Variable conditions	Ultrasonic micro bat call recording survey (continuous recording overnight)	14 ultrasonic call detection nights (1 unit x 14 nights)
	10-11 December 2019	Variable conditions	Ultrasonic micro bat call recording survey (continuous recording overnight)	2 ultrasonic call detection nights (1 unit x 2 nights)

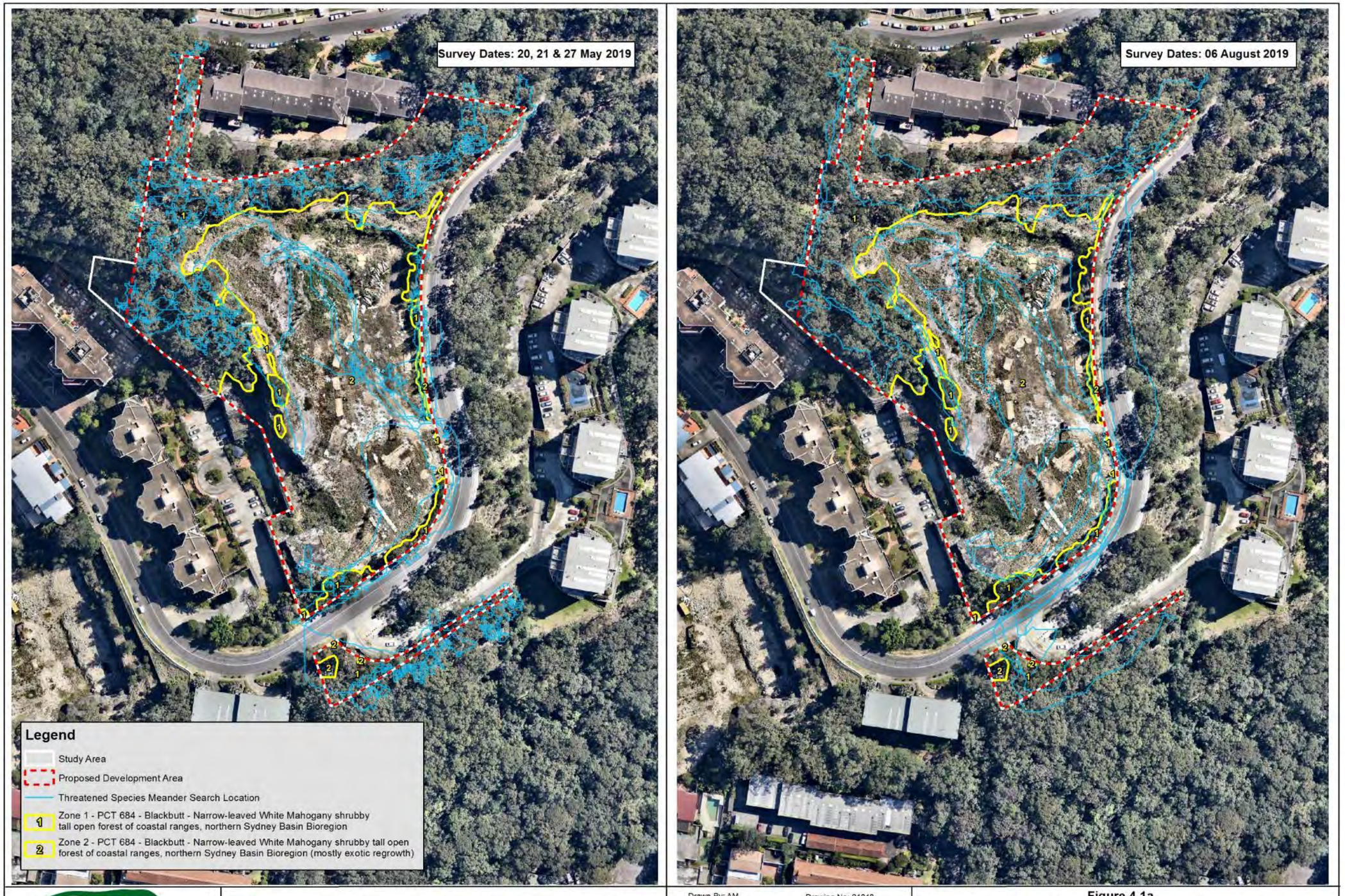

Figure 4.1a
Threatened Species Meander Search Locations
May & August
John Whiteway Drive, Gosford

Figure 4.1b
Threatened Species Meander Search Locations
September & November
John Whiteway Drive, Gosford

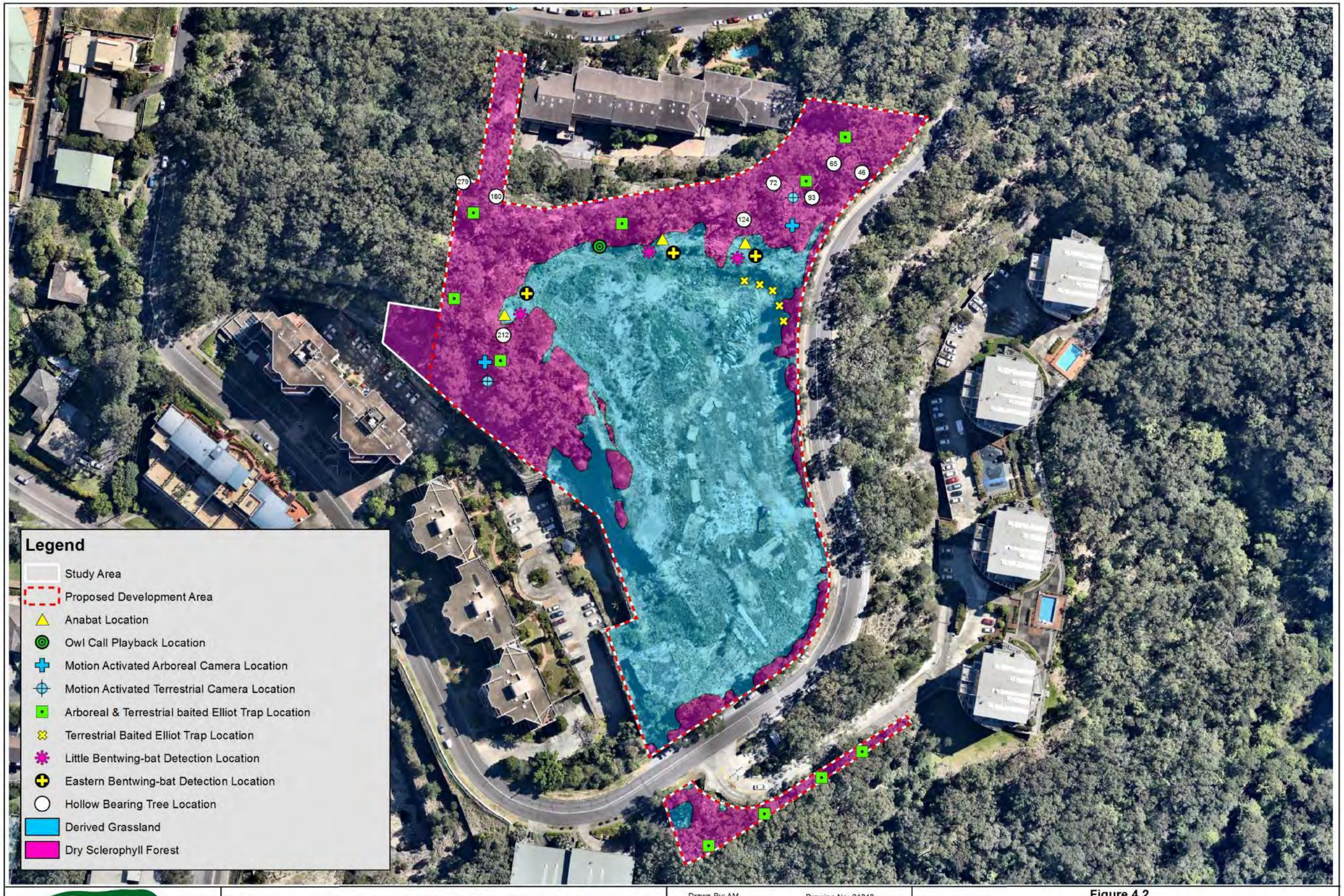

Figure 4.2
Fauna Habitat Types & Fauna Survey Locations
John Whiteway Drive, Gosford

4.4 THREATENED SPECIES SURVEY RESULTS

No candidate or predicted threatened species were recorded during surveys.

A summary of the survey effort and details of the survey results and potential occurrence for the candidate threatened species is provided in Table 4.6.

TABLE 4.6
CANDIDATE THREATENED SPECIES SURVEY RESULTS

Species Name	Potential for Occurrence	Survey Period	Survey Methods Applied	Observation Details
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	Low, not previously recorded breeding within the locality.	October to January	Diurnal search - 6 & 7 November 2019	Not Observed
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	Low	March to August	Diurnal search -20,21 & 27 May 2019 -6 August 2019	Not Observed
Cercartetus nanus Eastern Pygmy-possum	Low	October to March	30 arboreal trap nights October 2019 14 Camera trap nights March 2018	Not Observed
Chalinolobus dwyeri Large-eared Pied Bat	Moderate	November to January	Breeding habitat search - 6 & 7 November 2019 Ultrasonic call recording surveys - 14 Nights November 2019 - 2 Nights December 2019	Not Observed
Cryptostylis hunteriana Leafless Tongue Orchid	Low, not known locally from this PCT	November to January (Local peak flowering is November)	Belt transect searches 6 & 7 November 2019	Not Observed
Cynanchum elegans White-flowered Wax Plant	Very Low Not known to occur within 10km of the site.	All year	Belt transect searches -20,21 & 27 May 2019 -6 August 2019 -10 September 2019 -6 & 7 November 2019	Not Observed

TABLE 4.6 CANDIDATE THREATENED SPECIES SURVEY RESULTS				
Species Name	**Potential for Occurrence**	**Survey Period**	**Survey Methods Applied**	**Observation Details**
Diuris praecox Rough Doubletail	Not likely, typically occurs closer to the sea. Nearest known population is at Forresters Beach / Wyrrabalong National Park NSW.	August	Belt transect search -6 August 2019	Not Observed
Hieraaetus morphnoides Little Eagle (Breeding)	Low	August to October	Diurnal census and nest site searches - 6 August 2019 - 10 September 2019	Not Observed
Hoplocephalus bitorquatus Pale-headed Snake	Not likely, not previously recorded within 10km of the site.	November to March	Nocturnal spotlighting searches - 14 March 2019 - 13 November 2019	Not Observed
Lophoictinia isura Square-tailed Kite (Breeding)	Low to moderate	September to January	Diurnal census and nest site searches - 10 September 2019 - 6 November 2019 - 7 November 2019	Not Observed
Melaleuca groveana Grove's Paperbark	Not likely to occur, not previously recorded within 10k of the site.	All year	Belt transect searches -20,21 & 27 May 2019 -6 August 2019 -10 September 2019 -6 & 7 November 2019	Not observed
Myotis macropus Southern Myotis	Moderate	October to March	Ultrasonic call recording surveys - 2 Nights March 2018 - 14 Nights November 2019	Not Observed

TABLE 4.6 CANDIDATE THREATENED SPECIES SURVEY RESULTS				
Species Name	**Potential for Occurrence**	**Survey Period**	**Survey Methods Applied**	**Observation Details**
Petaurus norfolcensis Squirrel Glider	Low	All year	Spotlighting - 14 March 2018 - 13 November 2019 Arboreal Elliot Trapping - 30 trap nights October 2019 Arboreal remote baited camera survey - 14 camera trap nights March 2018	Not Observed
Planigale maculata Common Planigale	Not likely, not previously recorded within 10k of the site.	All year	Terrestrial Elliot Trapping - 75 trap nights October 2019 (reduced from 100 trap nights due to high levels of site disturbance and small site area) Terrestrial remote baited camera survey - 14 camera trap nights March 2018	Not Observed
Rhodamnia rubescens Scrub Turpentine	Moderate	All year	Belt transect searches -20,21 & 27 May 2019 -6 August 2019 -10 September 2019 -6 & 7 November 2019	Not Observed
Tetratheca glandulosa Glandular Pink-bell	Low	August to November	Belt transect searches -6 August 2019 -10 September 2019 -6 & 7 November 2019	Not Observed
Tetratheca juncea Black-eyed Susan	Low, site is south of species current range.	September to October	Belt transect search -10 September 2019	Not Observed

SECTION 5

IMPACT AVOIDANCE AND MINIMISATION ASSESSMENT

5.1 IMPACT AVOIDANCE AND MINIMISATION CONSIDERATIONS

5.1.1 *Avoidance and Minimisation of Impacts on Native Vegetation and Habitats*

The following considerations are provided in relation to avoidance and minimisation measures for direct and indirect impacts associated with the project and ancillary features relating to native vegetation and habitats.

i. Locating the project areas and ancillary facilities in areas where there are no biodiversity values (BAM Sections 8.1.1.3 (a) and 8.1.2.1 (b)).

The site contains an area which has been historically cleared and subject to quarrying, this area now contains predominantly exotic vegetation and very low biodiversity values. The building footprints which require total clearing have been situated within these areas.

ii. Locating the project and ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score) (BAM Sections 8.1.1.3 (b) and 8.1.2.1 (c))

The entire site contains native vegetation which has been subject to historical disturbances and is now in relatively poor condition due to removal of topsoil, vegetation clearing, weed invasion, changes to patterns of connectivity to other native vegetation and increased erosion. This is due to the use of the site for historical quarrying activities and the development of the adjoining site areas for residential flat buildings and public roads.

iii. Locating the project and ancillary facilities in areas that avoid habitat for species that have a high biodiversity risk weighting or native vegetation that is a critically endangered ecological community (CEEC) or an endangered ecological community (EEC) (BAM Sections 8.1.1.3 (c) and 8.1.2.1 (d))

The surveys completed did not observe any threatened species with a high biodiversity risk weighting, critically endangered or endangered ecological communities.

iv. Reducing the clearing footprint of the project (BAM Section 8.1.2.1 (a))

The following modifications have been made to reduce the clearing footprint of the project:

- Redesign of the footprint of the proposed boardwalk to minimise tree removal, including removal of the northern section of the boardwalk and meandering the boardwalk around existing trees; and
- Completion of an assessment of individual trees present to maximise the retention of visually prominent trees, large trees with high biodiversity values and trees which have appropriate characteristics and SULE ratings for retention.

v. Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained and providing structures to enable species and genetic material to move across barriers or hostile gaps (BAM Sections 8.1.1.3 (d) and 8.1.2.1 (e))

The proposal has been designed to enable the replanting of native vegetation within asset protection zone areas following civil works, in compliance with the NSW RFS asset protection zone requirements. Targeted vegetation replanting will help to stabilise the area and to maintain potential wildlife connectivity and movement between areas east and west of the site.

vi. An analysis of alternative modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology (BAM Section 8.1.1.4 (a))

It is considered that the current project layout and multi-storey construction will result in an efficient use of the site and no suitable alternative modes or technologies have been identified.

vii. Analysis of alternative routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route (BAM Section 8.1.1.4 (b))

The proposed site access from John Whiteway Drive is considered to be the best route for entry and egress from the site in relation to impact minimisation and avoidance.

The route of the proposed boardwalk has been aligned close to the existing development footprint to limit the requirement for site works and removal of vegetation. The northern section of the proposed boardwalk has also been removed from the access handle section of the site to reduce the impact footprint.

viii. Analysis of alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location (BAM Section 8.1.1.4 (c))

The proposal assessed within this report is a site-based development. There are no alternative locations where this particular development could be feasibly or reasonably located.

ix. Analysis of alternative sites within a property on which the project is proposed that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site (BAM 8.1.1.4 (d))

If the proposed buildings were situated within other areas of the site, a greater extent of cut and fill would be required and the proposal would require the removal of more native vegetation from the site.

The current layout is appropriate as the proposed building sites, which require a totally cleared footprint, will make use of the site areas which are already mostly cleared. This will enable the future selective retention and management of the existing trees within the site within the proposed asset protection areas.

x. Justifications for project location decisions should identify any other site constraints that the proponent has considered in determining the location and design of the project, e.g. bushfire protection requirements including clearing for asset protection zones, flood planning levels, servicing constraints (BAM Section 8.1.1.5)

Further reducing the extent of vegetation and habitat removal is constrained by the extent of clearing required for bushfire asset protection zones and site stabilisation works.

xi. Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site (BAM Section 8.1.2.1 (f))

The vegetation within the bushfire asset protection zone areas will be subject to ongoing management, replanting of native species and maintenance of a native tree canopy cover. The proposed future management of the vegetation within the site is documented within the Vegetation Management Plan (Conacher Consulting 2021a) and the Tree Assessment Report (Conacher Consulting 2021b).

5.1.2 *Avoidance and Minimisation of Prescribed Biodiversity Impacts*

The following consideration is provided in relation to avoidance and minimisation measures for prescribed impacts.

i. ***Locating the envelope of surface works to avoid direct impacts on the following habitat features (BAM Section 8.2.2.1(a)):***

- ***karst, caves, crevices, cliffs and other geological features of significance, or***
- ***rocks, or***
- ***human made structures, or***
- ***non-native vegetation***

The site has been previously used as a sandstone quarry and there is highly modified exposed sandstone rock present. The site does not contain areas of extensive natural rock, karst, caves, crevices of significance or other geological features of significance.

There is refuse present within the site and it is expected that this will be removed and appropriately disposed or recycled. The refuse material present has not been identified as providing suitable habitat for threatened species or ecological communities.

The non-native vegetation within the site has also not been identified as providing habitat of significance for any threatened species.

ii. ***Locating the envelope of sub-surface works, both in the horizontal and vertical plane, to avoid and minimise operations beneath the habitat features identified in Paragraph 8.2.1.2, e.g. locating longwall panels away from geological features of significance or water dependent plant communities and their supporting aquifers (BAM Section 8.2.2.1(b)).***

The proposal is not likely to result in any sub-surface works beneath retained habitat features.

iii. ***Locating the project to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths to important habitat or local movement boardwalks (BAM Section 8.2.2.1(c).***

The site forms part of a larger approximately 2.5 ha vegetation patch, which is separated from adjoining habitats by John Whiteway Drive. A narrow band of vegetation in the northern section of the site provides a linkage between retained bushland areas to the west of the site and larger areas of remnant vegetation to the northeast within Rumbalara Reserve which forms part of Council's Coastal Open Space System. Some of the connectivity within this area is also provided by trees offsite adjoining the northern site boundary.

It is intended to utilise this area as a corridor for native wildlife through a combination of vegetation retention where suitable and native vegetation replanting works.

The northern access handle to John Whiteway Drive and an area along the western section of the site is also proposed to be retained for wildlife connectivity purposes.

iv. ***Optimising project layout to minimise interactions with threatened species and ecological communities, e.g. designing turbine layout to allow buffers around features that attract and support aerial species, such as forest edges, riparian corridors and wetlands, ridgetops and gullies (BAM Section 8.2.2.1(d))***

The project layout has been optimised to retain selected trees and vegetation along forest edges and ridgetops where suitable.

v. ***Locating the project to avoid direct impacts on water bodies (BAM Section 8.2.2.1(e))***

The proposal will not have a direct impact on any water bodies.

vi. ***An analysis of alternative modes or technologies that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed mode or technology (BAM Section 8.2.2.2(a))***

No alternative modes or technologies that would avoid or minimise prescribed biodiversity impacts have been identified.

vii. ***An analysis of alternative routes that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed route (BAM Section 8.2.2.2(b))***

The proposal is not likely to impact prescribed habitat features of significant importance to the threatened biodiversity observed.

The route of the proposed boardwalk has been aligned to the existing development footprint and cut and fill area, to reduce the requirement for site works and removal of vegetation. Where this could not occur, the boardwalk has been aligned around existing large trees which are suitable for retention. The boardwalk footprint has also been reduced through the removal of the northern section of the boardwalk which was previously located in the northern access handle to John Whiteway Drive.

Excavation of the area along the northern section of the site will be required to stabilise the site. There is no alternative location for these works as the current stability issues have resulted from historical site quarrying activities.

viii. ***An analysis of alternative locations that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed location (BAM Section 8.2.2.2(c))***

The proposal is not likely to impact prescribed habitat features of significant importance to the threatened biodiversity observed.

The proponent has identified that there are no alternative locations where this development could be feasibly or reasonably located.

ix. ***An analysis of alternative sites within a property on which the project is proposed that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed site (BAM Section 8.2.2.2(d))***

If the proposed buildings were situated within the proposed asset protection areas of the site, a greater extent of cut and fill would be required, and the proposal would require the removal of more exposed rock from the site.

The current layout is appropriate as the proposed building sites, which require a totally cleared footprint, will be situated within the site areas which are already mostly cleared with high levels of exotic vegetation. It is preferable that the proposal clear exotic vegetation and result in prescribed impacts than result in the removal of native vegetation.

x. ***Justifications for project location decisions should identify any other site constraints that the proponent has considered in determining the location and design of the project, e.g. bushfire protection requirements including clearing for asset protection zones, flood planning levels, servicing constraints (BAM Section 8.2.2.3)***

Further reducing the extent of vegetation and habitat removal is constrained by the extent of clearing required for bushfire asset protection zones and site stabilisation works.

xi. ***Avoidance and minimisation through application of engineering solutions, e.g. proven techniques to minimise fracturing of bedrock underlying features of geological significance, water dependent communities and their supporting aquifers, proven engineering solutions to restore connectivity and favoured movement boardwalks (BAM Section 8.2.3.1(a))***

The proposal will result in the construction of a residential flat building which has applied detailed engineering and design solutions to achieve a substantially smaller footprint when compared to other types of residential accommodation, such as detached residential dwellings.

xii. ***Avoidance and minimisation through design of project elements to minimise interactions with threatened and protected species and ecological communities, e.g. designing turbines to dissuade perching and minimise the diameter of the rotor swept area, designing fencing to prevent animal entry to transport corridors (BAM Section 8.2.3.1(b))***

The proposed works areas will be fenced during construction where necessary to prevent inappropriate fauna interactions.

xiii. ***Avoidance and minimisation through design of the project to maintain environmental processes critical to the formation and persistence of habitat features not associated with native vegetation (BAM Section 8.2.3.1(c))***

The proposal is not likely to impact any environmental processes critical to the formation and persistence of habitat features not associated with native vegetation.

xiv. ***Avoidance and minimisation through design of the project to maintain hydrological processes that sustain threatened species and TECs (BAM Section 8.2.3.1(d))***

Potential direct and indirect impacts on hydrological processes will be avoided and minimised through the implementation of suitable erosion and sediment controls and stormwater management measures.

xv. ***Avoidance and minimisation through design of the project to avoid and minimise downstream impacts on rivers, wetlands and estuaries by control of the quality of water released from the site (BAM Section 8.2.3.1(e))***

Potential direct and indirect impacts on downstream environments will be avoided and minimised through the implementation of sediment and erosion control measures and stormwater management measures.

5.2 IMPACT MITIGATION & MANAGEMENT MEASURES

The following measures identified in Table 5.1 will be undertaken to mitigate and manage impacts following project approval and as part of the works and operation of the site.

TABLE 5.1 PROPOSED IMPACT MITIGATION & MANAGEMENT MEASURES					
IMPACT	**MITIGATION MEASURE**	**TIMING**	**MONITORING SCHEDULE**	**OUTCOME**	**RESPONSIBILITY**
Site clearing	**Biodiversity Measure 1:** Pre-clearing surveys to evacuate the site of ground dwelling fauna species by a suitably qualified and experienced wildlife handler / ecologist	Prior to site clearing	Report to Consent Authority once completed	Protection of resident ground fauna	Project Ecologist
Site clearing	**Biodiversity Measure 2:** The completion of a pre-clearing fauna relocation survey for the human made structures on the site	Prior to site clearing	Report to Consent Authority once completed	Protection of any fauna inhabiting existing structures	Site Manager and Project ecologist
Vegetation Removal	**Biodiversity Measure 3:** Undertake strategic revegetation within APZ Areas	Commence during civil works	Annually	Maximise areas of native vegetation	Site Manager and Bushland Regenerator
Hollow bearing tree loss	**Biodiversity Measure 4:** The provision of one fauna nest for every hollow removed with boxes of comparable size to be erected in the retained APZ areas of the site.	Prior to site clearing	Report to Consent Authority once completed	No-net loss of hollow nest sites	Site Manager and Project ecologist
Site clearing and construction works	**Biodiversity Measure 5:** Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	During site works	Report to Consent Authority once completed	Protection and management of site environmental features	Site manager and Project ecologist
Hollow bearing tree loss	**Biodiversity Measure 6:** The implementation of hollow-bearing tree sectional dismantling procedures completed under the supervision of an ecologist	During site works	Report to Consent Authority once completed	Protection of hollow dependant fauna	Site Manager, Project ecologist / clearing contractor
Erosion and sedimentation	**Biodiversity Measure 7:** Implementation and maintenance of an erosion and sediment control plan	During site works	Ongoing during site works and particularly prior to and following rain events.	Protection of adjoining waterways	Site Manager and Erosion and Sediment Control Consultant.

TABLE 5.1 PROPOSED IMPACT MITIGATION & MANAGEMENT MEASURES					
IMPACT	**MITIGATION MEASURE**	**TIMING**	**MONITORING SCHEDULE**	**OUTCOME**	**RESPONSIBILITY**
Stormwater impacts	**Biodiversity Measure 8:** Implementation of an erosion and sediment control plan and stormwater management measures	During site works	Ongoing during site works and occupation.	Mitigation of potential stormwater impacts	Site Manager.
Noise and dust generation	**Biodiversity Measure 9:** Strict adherence to standard EPA noise and dust generation management measures and controls or approval requirements;	During site works	Ongoing during site works	Protection of adjoining areas	Site Manager and Excavation Contractor
Weed and pathogen spread	**Biodiversity Measure 10:** Implement protocols to prevent the spread of weeds and pathogens between the site and offsite areas	During site works	Ongoing during site works	Prevention of weed and pathogen spread	Site Manager and Excavation Contractor
Weed spread and loss of native vegetation	**Biodiversity Measure 11:** The use and maintenance of native flora species in site landscaping	Following construction and during operation	Refer to Landscape Management Plan	Habitat creation for native fauna	Construction contractor / site landscaper
Various	**Biodiversity Measure 12:** Implement the Vegetation Management Plan (*Conacher Consulting* 2021a) and tree protection measures documented in the Tree Assessment Report (*Conacher Consulting* 2021b)	As documented in the Plan	As documented in the Plan	Various	Proponent / Project Ecologist / Bushland Regenerator / Project Arborist

SECTION 6

ASSESSMENT OF RESIDUAL DIRECT AND INDIRECT IMPACTS

6.1 PROPOSED DEVELOPMENT IMPACTS

i. Impact Assessment

The areas of vegetation removal, modification and retention within the site are shown in Figure 6.1. The extent of removal proposed for each PCT zone is listed in Table 6.1.

TABLE 6.1
PLANT COMMUNITY TYPE IMPACT AREAS ASSESSED

Plant Community Type	Area of Impact
PCT 684 – Blackbutt – Narrow-leaved White mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion (Zone 1 - Disturbed Remnant Vegetation)	0.93 ha
PCT 684 – Blackbutt – Narrow-leaved White mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion (Zone 2 - Disturbed Mostly Exotic Regrowth)	1.34 ha

The proposal will result in the total removal of areas required for the building footprints and associated infrastructure and the total clearing of areas where site stabilisation and excavation works are required.

Three designated areas of vegetation will be modified (partially retained) and managed as part of the bushfire asset protection zones as inner protection areas in accordance with Planning for Bushfire Protection (NSW RFS 2019). A Vegetation Management Plan (*Conacher Consulting* 2021a) and Tree Assessment Report (*Conacher Consulting* 2021b). have been prepared for the site. These documents provide further details on the extent of tree retention and removal required for the proposal. The canopy cover across the development footprint will be maintained at less than 15% at maturity, shrubs will not form more than 10% of the ground cover or be located under trees and grasses will be kept mown to no more than 100m in height. Leaves and debris will also be subject to ongoing removal.

There is one area in the western section of the site which is designated for retention and will not be impacted by the proposal.

Both PCT zones within the development footprint have been assessed as zero as a precautionary measure, despite the level of tree retention which is proposed to occur. This is due to the small extent of the site and the level of ongoing management required.

Specific direct and indirect impacts required to be assessed under Section 9.1 and 9.2 of the BAM, including prescribed impacts, are assessed in Table 6.2.

TABLE 6.2
ASSESSMENT OF POTENTIAL IMPACTS

Potential Impact	Impact Nature and Extent	Impact Frequency /Duration / timing	Impact Consequence	Threatened Biodiversity Likely to be Affected
Direct Impacts to Vegetation	Removal of vegetation within impact footprint	One-off / permanent / during construction	Reduction in available local habitats and loss of breeding site within hollow trees Reduction in local connectivity	Ecosystem credit species
Direct Impacts to Hollow-bearing Trees	Seven hollow bearing trees will be removed.	One-off / permanent / during construction	Loss of fauna shelter and breeding sites	Ecosystem credit species
Impacts to Serious and Irreversible Impact Entities	No	NA	NA	NA
Indirect Impacts on Adjacent Vegetation and Habitat during Construction	Not likely to occur, adjoining areas will be protected with rock-catch fencing.	NA	NA	NA
Indirect Impact on Adjacent Vegetation and Habitat During Operation	The proposal has potential to alter light levels, connectivity and runoff patterns to adjacent areas.	Ongoing / permanent / All phases	Minimal impacts as adjoining areas are already in a disturbed state	Ecosystem credit species
Impacts on Adjacent Vegetation and Habitat Arising from a change in land-use patterns	The proposal has potential to result in a minor decrease in the suitability of adjoining habitats due to increased occupation of the site.	Ongoing / permanent / All phases	Minimal impacts as adjoining areas are already in a disturbed state	Ecosystem credit species
Inadvertent impact on adjacent habitat or vegetation	Not likely to occur, adjoining areas will be retained and subject to appropriate management and protection during works.	NA	NA	NA
Reduced viability of adjacent habitat due to edge effects	There is some potential for this to occur, however the extent of the impacts is likely to be minor as the adjoining habitats are already disturbed.	Ongoing / permanent / All phases	Minimal impacts as adjoining areas are already in a disturbed state	Ecosystem credit species

TABLE 6.2 ASSESSMENT OF POTENTIAL IMPACTS				
Potential Impact	**Impact Nature and Extent**	**Impact Frequency /Duration / timing**	**Impact Consequence**	**Threatened Biodiversity Likely to be Affected**
Reduced viability of adjacent habitat due to noise, dust or light spill	Future light spill may affect adjoining areas Dust control will be implemented during construction. Some noise impacts may occur.	Construction and operation	Minimal as the adjoining areas are already highly disturbed.	Ecosystem credit species
Transport of weeds and pathogens from the site to adjacent vegetation	A weed and pathogen management protocol will be implemented as documented in the Vegetation Management Plan prepared by *Conacher Consulting* (2021a).	Construction	Minimal as suitable management measures will be implemented.	Ecosystem credit species
Increased risk for fauna of starvation, exposure and loss of shade or shelter	The site is highly disturbed and the fauna species present are predominantly mobile species. Any resident type species observed during pre-clearing surveys will be relocated.	One-off / permanent / during construction	Minor, impact will be managed and mitigated by completion of pre-clearing surveys.	Ecosystem credit species
Loss of breeding habitats	Seven hollow bearing trees are proposed to be removed.	One-off / permanent / during construction	Impact will be managed and mitigated by installation of compensatory nest boxes	Hollow dependant ecosystem credit species
Trampling of threatened flora species	Not likely to occur, none observed.	NA	NA	NA
Inhibition of nitrogen fixation and increased soil salinity	Not likely to occur.	NA	NA	NA
Fertiliser drift	Not likely to occur.	NA	NA	NA
Rubbish dumping	Not likely to occur. The site is proposed to be managed in accordance with the Vegetation Management Plan prepared by *Conacher Consulting* (2021a).	NA	NA	NA
Wood collection	Not likely to occur. The site is proposed to be managed in accordance with the Vegetation Management Plan prepared by *Conacher Consulting* (2021a).	NA	NA	NA

TABLE 6.2 ASSESSMENT OF POTENTIAL IMPACTS				
Potential Impact	**Impact Nature and Extent**	**Impact Frequency /Duration / timing**	**Impact Consequence**	**Threatened Biodiversity Likely to be Affected**
Bush rock removal and disturbance	The site contains exposed rock and has been previously quarried. Further disturbance to the rock within the site will occur, however bush rock can remain in the APZ areas.	One-off / permanent / during construction	Loss of suitable habitat sites.	Ecosystem credit species
Increase in predatory species populations	Site is already highly disturbed and further site clearing is not likely to influence predatory species populations	NA	NA	NA
Increase in pest animal populations	Not likely to occur as a result of the proposal.	NA	NA	NA
Increased risk of fire	Not likely to occur. Fire risk will be reduced through appropriate site management.	NA	NA	NA
Disturbance to specialist breeding and foraging habitat, e.g. Beach nesting for shorebirds.	Seven hollow bearing trees are proposed to be removed.	One-off / permanent / during construction	Loss of habitat for hollow dependant fauna	Ecosystem credit species
Impacts to Karst, caves, crevices, cliffs and other features of geological significance	The site does not contain karst, caves or cliffs of significance and does not contain any other geological features of significance. The site has been historically quarried.	NA	NA	NA
Impacts to Man-made structures	Removal of material stockpiles and refuse	One-off / permanent / during construction	Minor loss of man-made habitat	None
Impacts to non-native vegetation	Removal of exotic flora species is likely to occur.	One-off / permanent / during construction	Minor loss of habitat	Not likely to be used by threatened biodiversity
Habitat connectivity & movement patterns	The proposal will temporarily remove habitat connectivity along the northern site boundary. Following civil works the area will be revegetated.	One-off / permanent / during construction	Minor alteration to movement boardwalks for mobile species	Ecosystem credit species.

TABLE 6.2 ASSESSMENT OF POTENTIAL IMPACTS				
Potential Impact	**Impact Nature and Extent**	**Impact Frequency /Duration / timing**	**Impact Consequence**	**Threatened Biodiversity Likely to be Affected**
Water quality, water bodies and hydrological processes	Potential for sedimentation of downstream habitats	Sporadic / during rainfall events / during construction	Minor, impact will be suitably managed through installation of appropriate controls	None identified, but potential for impacts to any EEC vegetation and threatened species downstream.
Wind turbine strikes	Will not occur.	NA	NA	NA
Vehicle Strikes	Not likely to occur within the site, suitable speed limits will be imposed.	NA	NA	NA

ii. Plant Community Type Impact Summary

The impact summary details required for the plant community types identified at the development site are documented in Table 6.3.

TABLE 6.3 PLANT COMMUNITY TYPE IMPACT SUMMARY		
Impact Summary Considerations	**PCT 684 (Zone 1)**	**PCT 684 (Zone 2)**
Area	0.9 ha	1.3 ha
Current Vegetation Integrity Score	45.6	4.7
Future Vegetation Integrity Score	0	0
Change in Vegetation Integrity Score	-45.6	-4.7
Sensitivity to Gain	High	High
Biodiversity Risk Weighting	1.5	1.5
BC Act Listing Status	Not listed	Not listed
Ecosystem Credits	16	0

iii. Threatened Species Impact Summary

No species credit threatened species were observed during surveys.

iv. BAM Biodiversity Credit Reports and Measures Proposed to Address the Offset Obligation

A total of 16 ecosystem credits for PCT 684 Blackbutt – Narrow-leaved White mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion are required to address the residual impact offset obligations for the proposal.

The total number and classes of biodiversity credits required to be retired for the proposed development are listed in the BAM Biodiversity Credit Report (Like for Like) and the BAM Biodiversity Credit Report (Variations) provided in Appendix 1.

To address the offset obligation the proponent proposes to purchase and retire 16 PCT 684 ecosystem credits. The credits will be sourced directly from the market in accordance with the like for like and/or variation credit requirements depending on market availability. Payment will be made to the Biodiversity Conservation Trust for any credits which are not purchased directly from the market.

6.2 SERIOUS AND IRREVERSIBLE IMPACTS

No serious and irreversible impact entities are likely to be impacted by the proposed development.

6.3 IMPACTS WHICH DO NOT REQUIRE AN OFFSET

Offsets are not required for PCT 684 – Blackbutt – Narrow-leaved White Mahogany shrubby tall open forest on coastal ranges, northern Sydney Basin Bioregion Zone 2 - mostly exotic regrowth, due to the vegetation integrity score being below the threshold.

PCT 684	Extent within Study Area (ha)	Extent within Development Footprint (ha)
Zone 1	0.97	0.93
Zone 2	1.34	1.34

conacher consulting

N

0 20 40 60 80 100 m

Plan produced as A3 colour

Drawn By: AM
Drawing Version: 3
Drawing No: 21018
Date: 16/03/2021

* Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © Nearmap (2021) Air Photo Date: 20/10/2019

Figure 6.1
Plant Community Types & Development Impact Areas
John Whiteway Drive, Gosford

SECTION 7

ADDITIONAL STATUTORY BIODIVERSITY ASSESSMENTS

7.1 STATE ENVIRONMENTAL PLANNING POLICY (COASTAL MANAGEMENT)

The subject site is not mapped within a Coastal Wetland or Littoral Rainforest Area or associated Proximity Area under this SEPP.

The site is partially located within a Coastal Environment Area. It is considered that the proposal is designed, sited and will be managed to minimise impacts to the matters identified in Clause 13 (1) of the SEPP.

7.2 STATE ENVIRONMENTAL PLANNING POLICY 19 BUSHLAND IN URBAN AREAS

The proposal contains land which adjoins bushland zoned or reserved for public open space purposes including land zoned RE1 to the west (R0225 John Whiteway Bush Reserve) and to the north-east (R0073 Rumbalara Reserve). The following considerations under this SEPP are provided:

Clause 9(c): The need to retain any bushland on the land

Response
The site is subject to a previous development application and current development approval which requires the retained site areas to be managed as a bushfire asset protection zone.

Under this current application selected trees and managed bushland areas will be retained on the site to maintain scenic qualities and habitat within the site as shown in Figure 6.1. These areas will be supplemented with replanting of native vegetation in some of the areas of the site which will be cleared, in accordance with the Vegetation Management Plan prepared by *Conacher Consulting* (2021a).

Clause 9(d): The effect of the proposed development on bushland zoned or reserved for public open space purposes and, in particular, on the erosion of soils, the siltation of streams and waterways and the spread of weeds and exotic plants within the bushland

Response
Suitable environmental controls will be implemented to mitigate potential impacts to the adjoining areas of bushland zoned or reserved for public open space purposes. These controls include:

- The provision of suitable tree protection measures;
- Installation and maintenance of suitable erosion and sediment controls during works to prevent erosion of soils and siltation of streams and waterways;
- Completion of weed management works within the site to prevent the spread of weeds and exotic plants; and
- Retention and planting of endemic flora species in suitable areas.

These measures are documented in the Vegetation Management Plan prepared by *Conacher Consulting* (2021a).

Clause 9(e): any other matters which, in the opinion of the approving or consent authority, are relevant to the protection and preservation of bushland zoned or reserved for public open space purposes.

The consent authority has not identified any other matters for consideration under this section.

Conclusion
It is considered that the matters identified for consideration within SEPP 19 have been adequately addressed.

7.3 STATE ENVIRONMENTAL PLANNING POLICY 44 KOALA HABITAT PROTECTION (2020)

The subject site was assessed for activity by Koalas using the following methods:

i. A search of the BioNet Atlas of NSW Wildlife (NSW OEH 2020) was undertaken to identify records of Koalas in the area;

ii. The site was surveyed on foot with any species of Koala food trees being inspected for signs of Koala usage. Trees were inspected and identified for presence of Koalas, scratch and claw marks on the trunk and scats around the base of each tree. The proportion of any trees showing signs of Koala use was calculated for the whole of the site. Additionally the location and density of droppings if found were documented;

iii. Koalas were also targeted during spotlight surveys;

iv. Identification and assessment of the density of tree species listed as Koala food trees in State Environmental Planning Policy No. 44 - Koala Habitat Protection was undertaken across the site.

One planted specimen of the Koala food tree species, *Eucalyptus viminalis*, as listed on Schedule 2 of State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) was observed within the subject site. This species does not constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. Therefore the site does not contain potential koala habitat as defined by SEPP 44. No Koalas were observed during the fauna survey and no evidence of Koala habitation, such as scats, claw and scratch marks, were located on the site. Therefore the subject site is considered to not form core koala habitat as defined by SEPP 44.

7.4 STATE ENVIRONMENTAL PLANNING POLICY (VEGETATION IN NON RURAL AREAS) 2017

An authority to clear vegetation in non-rural areas is not required for the proposed development, in accordance with Clause 8(1) of this SEPP.

7.5 DRAFT STATE ENVIRONMENTAL PLANNING POLICY (ENVIRONMENT)

This Draft SEPP is intended to repeal and consolidate seven existing SEPPs, including a SEPP relevant to the proposal, SEPP 19 Bushland in Urban Areas. The majority of the provisions of SEPP 19 are proposed to be transferred to SEPP (Environment). Consideration of SEPP 19 is provided in Section 7.2 of this Report.

SECTION 8

CONCLUDING COMMENTS

8.1 SURVEY AND ASSESSMENT CONCLUSIONS

Based on the field surveys completed and information provided in this report it is concluded that:

i. A total of 16 ecosystem credits are required for PCT 684 Blackbutt – Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin;

ii. No species credits are required;

iii. It is considered that the proposal is not likely to have a Serious and Irreversible Impact, as no potential Serious and Irreversible Impact Entities were observed during surveys; and

iv. The impact avoidance and minimisation measures outlined in Section 5.2 of this Report should be implemented for the proposal.

REFERENCES

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APPENDIX 1 – BIODIVERSITY CREDIT REPORTS

NSW GOVERNMENT

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018252/BAAS17099/19/00018253	JWD RFB SSD 10321	26/11/2019
Assessor Name	Report Created	BAM Data version *
	20/02/2020	22
Assessor Number	BAM Case Status	Date Finalised
	Finalised	20/02/2020
Assessment Revision	Assessment Type	
0	Major Projects	

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

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion								
1	684_Z1_Disturbed_Rem	45.6	0.9	0.25	High Sensitivity to Potential Gain	1.50		16

2	684_Z2_Disturbed_exotic	4.7	1.3	0.25 High Sensitivity to Potential Gain	1.50	0
					Subtotal	**16**
					Total	**16**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018252/BAAS17099/19/00018253	JWD RFB SSD 10321	26/11/2019
Assessor Name	Assessor Number	BAM Data version *
		22
Proponent Names	Report Created	BAM Case Status
The Trustee for JWD Developments Unit Trust	20/02/2020	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Major Projects	20/02/2020

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

Potential Serious and Irreversible Impacts

Nil

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

BAM Biodiversity Credit Report (Like for like)

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	Not a TEC	2.3	16.00

684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion

Like-for-like credit retirement options

Class	Trading group	HBT	IBRA region
North Coast Wet Sclerophyll Forests This includes PCT's: 487, 613, 661, 684, 686, 692, 693, 694, 695, 699, 747, 748, 752, 812, 1073, 1208, 1217, 1222, 1237, 1244, 1245, 1257, 1259, 1260, 1261, 1265, 1266, 1282, 1284, 1285, 1504, 1561, 1562, 1563, 1566, 1567, 1568, 1569, 1572, 1573, 1575, 1579, 1841, 1843, 1915	North Coast Wet Sclerophyll Forests - < 50% cleared group (including Tier 7 or higher).	Yes	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

No Species Credit Data

NSW GOVERNMENT

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018252/BAAS17099/19/00018253	JWD RFB SSD 10321	26/11/2019
Assessor Name	Assessor Number	BAM Data version *
		22
Proponent Name(s)	Report Created	BAM Case Status
The Trustee for JWD Developments Unit Trust	20/02/2020	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Major Projects	20/02/2020

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

Potential Serious and Irreversible Impacts

Nil

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

BAM Biodiversity Credit Report (Variations)

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	Not a TEC	2.3	16.00

684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion

Like-for-like credit retirement options

Class	Trading group	HBT	IBRA region
North Coast Wet Sclerophyll Forests This includes PCT's: 487, 613, 661, 684, 686, 692, 693, 694, 695, 699, 747, 748, 752, 812, 1073, 1208, 1217, 1222, 1237, 1244, 1245, 1257, 1259, 1260, 1261, 1265, 1266, 1282, 1284, 1285, 1504, 1561, 1562, 1563, 1566, 1567, 1568, 1569, 1572, 1573, 1575, 1579, 1841, 1843, 1915	North Coast Wet Sclerophyll Forests - < 50% cleared group (including Tier 7 or higher).	Yes	Wyong,Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	HBT	IBRA region

	Wet Sclerophyll Forests (Shrubby sub-formation)	Tier 7 or higher	Yes (including artificial)	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

APPENDIX 2 – BAM PLOT DATA AND PHOTOGRAPHS

6/11/2019 9055

John Whiteway Drive

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

Survey Name	Zone ID	Recorders
		AM / JM

Date	6 11 19			Plot dimensions	20×50	Photo #	
Zone	Datum	Plot ID	1				
Easting	Northing	IBRA region		Midline bearing from 0 m			

Vegetation Class	Revised constructed on grassy flat	Confidence: H M L
Plant Community Type	PCT 687 EEC:	Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm	1	
5 – 9 cm	11	
< 5 cm	𝍸 𝍸 𝍸	n/a
Length of logs (m) (≥ 10 cm diameter, >50 cm in length)	3.5m	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

70 30 10 80 5 | 30 30 10 10 15

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	70 30 10 80 5	30 30 10 10 15		30
Average of the 5 subplots	39	19		6

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (Identify native/exotic)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

BAM PLOT FIELD SHEET

400m² Sheet of	Survey name	Plot Identifier	Recorders
Date: 6/11/19	John Whiteway Drive	Plot 1	JM/AM

GF Code	Top 3 native species in each growth form group: Full species name mandatory, Other species: Full species name where practicable	N, E or HTE	Cover	Abund	Stratum	Voucher
	1 Angophora floribunda		5	10	G	
	2 Eucalyptus quadrangulata		10	30	G	
	3 Corymbia gummifera		0.1	50	G	
	4 Themeda triandra		1	1000	G	
	5 Cistus salviifolius		0.5	50	G	
	6 Eragrostis curvula		5	500	G	
	7 Lomandra cylindrica		0.1	10	G	
	8 Calotis glauca.		0.5	10	U	
	9 Dianella caerulea var caerulea		0.1	5	G	
	10 Cirsium vulgare		0.1	5	M	1517/02
	11 Asparagus aethiopicus		0.1	1	G	
	12 Hakea sericea		0.1	5	G	
	13 Conyza bonariensis		0.1	1	G	
	14 Olea europaea subsp cuspidata		0.1	1	M	
	15 Leucopogon juniperinus		0.1	1	M	
	16 Olea europaea subsp cuspidata		0.1	10	M	
	17 Centaurium erythraea		0.1	5	G	
	18 Asparagus fillicinus		0.1	5	G	
	19 Sida corrugata		0.1	1	G	
	20 Hyparrhenia hirta		5	10	G	
	21 Cynodon dactylon		0.1	3	G	
	22 Cynodon gracilis		0.1	1	G	
	23 Polygala myrtifolia		5	100	M	
	24 Anagallis arvensis		0.1	10	G	
	25					
	26					
	27					
	28					
	29					
	30					
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	32					
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	34					
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	38					
	39					
	40					
	41					
	42					
	43					

GF – Circle is top 3, **Cover:** 0.1,0.2,0.3,...,1,2,3,...,10,15,20,25,...100% (foliage cover) **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2.0x2.0m, 5% = 4x5m, 25% = 10x10m **Abundance**: 1,2,3,..., 10,20,30,...100,200,...1000,...

Photo 1. Plot 1 Facing East

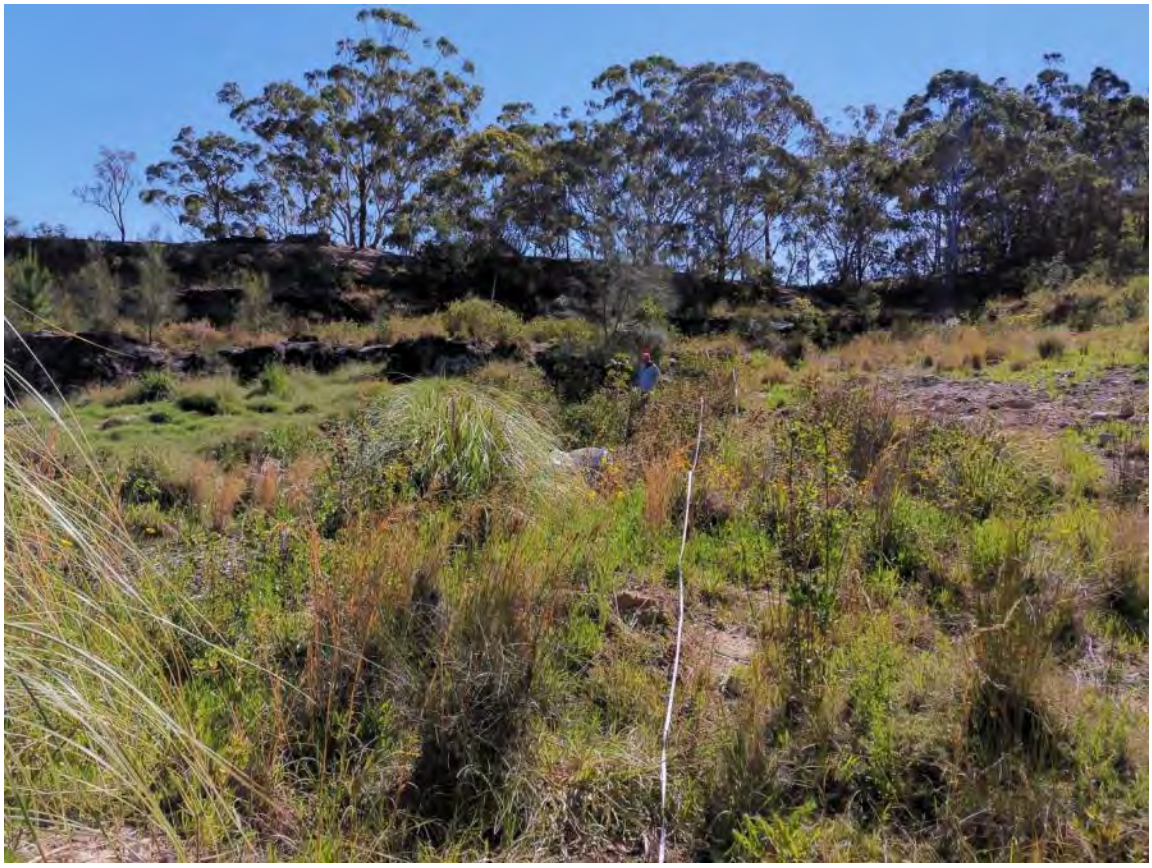

Photo 2. Plot 1 Facing West

BAM Site – Field Survey Form

Site Sheet no: 2 of 2

		Survey Name	Zone ID	Recorders			
Date	6 11 19			AM / JM			
Zone	Datum	Plot ID	2	Plot dimensions	20 x 50	Photo #	
Easting	Northing	IBRA region		Midline bearing from 0 m			
Vegetation Class		Regenerating grazing surround				Confidence: H M L	
Plant Community Type		1t 684		EEC:		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	0	
50 – 79 cm	2	
30 – 49 cm	6	1
20 – 29 cm	12	
10 – 19 cm	16	
5 – 9 cm	20	
< 5 cm	30	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	21 m	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30,... 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 30 70 10 50	0 60 5 70 0		5 5 5 20 0
Average of the 5 subplots	54	27		7

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, bark/flakes and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (sheep/cattle/horses)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

BAM PLOT FIELD SHEET

400m² Sheet of	Survey name	Plot Identifier	Recorders
Date: 6/11/19	John Whiteway Dr Gosford	Plot 2	JM/AM

GF Code	Top 3 native species in each growth form group: Full species name mandatory. Other species: Full species name where practicable	N, E or HTE	Cover	Abund	Stratum	Voucher
	1 Eucalyptus [illegible]		40	10	U	
	2 [illegible]		1	1	M	
	3 Angophora floribunda		10	10	U	
	4 [illegible]		[illegible]	25	M	
	5 [illegible]		1	2	M	
	6 [illegible]		25	[illegible]	G	
	7 [illegible]		1	[illegible]	G	
	8 [illegible]		1	10	M	
	9 [illegible]		1	50	G	
	10 [illegible]		1	5	M	
	11 [illegible]		0.1	5	G	
	12 [illegible]		1	4	U	
	13 [illegible]		0.1	10	G	
	14 [illegible]		1	50	G	
	15 [illegible]		0.1	5	M	
	16 [illegible]		0.1	2	M	
	17 [illegible]		1	50	G	
	18 [illegible]		0.1	5	M	
	19 [illegible]		0.1	1	M	
	20 [illegible]		0.1	20	G	
	21 [illegible]		1	5	M	
	22 [illegible]		0.1	5	M	
	23 [illegible]		[illegible]	10	M	
	24 [illegible]		0.1	1	G	
	25 [illegible]		0.1	5	M	
	26 [illegible]		1	20	M	
	27 [illegible]		1	10	G	
	28 [illegible]		0.1	2	G	
	29 [illegible]		0.1	1	G	
	30 [illegible]		0.1	1	G	
	31 [illegible]		1	1	M	
	32 [illegible]		0.1	1	M	
	33 [illegible]		0.1	1	G	
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					

GF – Circle is top 3, **Cover:** 0.1,0.2,0.3,...,1,2,3,...,10,15,20,25,...100% (foliage cover) **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2.0x2.0m, 5% = 4x5m, 25% = 10x10m **Abundance:** 1,2,3,..., 10,20,30,...100,200,...1000,...

Photo 3. Plot 2 Facing north-west

Photo 4. Plot 2 Facing south-east

APPENDIX 3

HOLLOW BEARING TREE DETAILS

HOLLOW BEARING TREE DETAILS

1. HOLLOW BEARING TREE ASSESSMENT METHODOLOGY

A hollow bearing tree survey of the proposed development area was undertaken during June 2017. Systematic searches were conducted throughout the subject site on foot to assess and detect the presence of hollow bearing trees. Inspection of trees was undertaken by encircling trees from ground level from vantage points which allowed inspection from each cardinal point.

A pair of binoculars was utilised to assist with the detection of tree hollows. Observation of fauna use was also recorded and included searches for scratches on the truck of trees and evidence of nesting material, signs of chewing, rubbing, scratching or droppings on hollow entrances, presence of fauna inside hollows and fauna entering or exiting hollows. Each hollow bearing tree observed was numbered and tagged and its location was recorded either by GPS or on a map of the site.

The following Information was recorded for each hollow bearing observed:

- Tree tag number;
- Tree species name;
- Hollow aperture in increments;
- Quantity of separate hollows; and
- Species of any fauna observed utilising the hollows observed.

Visual inspection from ground level has inherent limitations and can result in observer bias where actual tree hollows are not visible to the observer or false hollows are recorded. Hollows can be obscured due to the location within the tree and the angle of observation by the surveyor and not all tree hollows present may have been identified. False hollows can also be recorded due to variables such as dark stains, wounds or marks on trees, poor visibility, solid branch ends or the presence of shallow cavities. In instances where the observer was uncertain as to the presence of a tree hollow the precautionary principle was applied and a hollow was assumed to be present.

2. HOLLOW BEARING TREE ASSESSMENT RESULTS

Eight hollow bearing trees were observed during surveys and are mapped in Figure 2.1. The details of these hollow bearing trees are provided in Table A2.1. The hollows observed provide potential den and nesting sites habitat for reptiles, micro-chiropteran bats, small arboreal mammals and small sized birds. No hollow bearing trees with characteristics suitable for large forest owl nest sites were observed.

TABLE 1.1 HOLLOW BEARING TREE DETAILS						
Tag No.	**Tree Species**	**DBH**	**Height**	**Number of Hollows and Aperture Size**	**Comments**	**Action**
46	*Eucalyptus pilularis*	75	20	2 x 10-15cm		Remove
72	*Eucalyptus pilularis*	120	12	2 x 5cm		Remove
65	*Eucalyptus pilularis*	60	16	2x5cm hollows		Retain
93	Dead	50 / 30	17	2 x5cm 2 x 10cm 1 x <20cm 1 x 30cm basal	The branch hollow faces upright and has a crack along its length. This hollow is not greater than 20cm diameter and is not suitable as a nesting site for forest owls.	Remove
124	*Eucalyptus pilularis*	75	13	2 x 10cm		Remove
180	*Eucalyptus pilularis*	33	15	1 x 5cm) 1 x 20cm basal		Remove
212	Dead	40	8	5 x5cm		Remove
279	*Eucalyptus saligna*	30	7	Low potential 10cm hollow / broken dead trunk		Remove

APPENDIX 4

PROJECT TEAM CURRICULA VITAE

PHILLIP CONACHER

Qualifications

- Masters Degree of Natural Resources (University of New England)
- Bachelor of Science (1st Class Honours) (UNE)
- Diploma of Urban and Regional Planning (UNE)
- Graduate Certificate of Applied Science - Ornithology (CSU)
- Certificate of Air Photograph Interpretation (Bathurst School of Civil Engineering)

Professional Affiliations

- Environmental Institute of Australia
- Ecological Consultants Association of Australia
- Soil Science Society of Australia

Fields of Expertise

- Biodiversity Planning and Advice
- Environmental Impact Assessment
- Flora and Fauna Surveys and Habitat Assessment
- Extractive Industry Management
- Site Rehabilitation Planning
- Soil Conservation - Urban, Rural
- Bushfire Hazard Assessment

Employment History

2014- Current	Project Director at *Conacher Consulting Pty Ltd*
2008-2013	Director at *Conacher Environmental Group*
1998-2007	Director at *Conacher Travers Pty Ltd*
1991	Established *Integrated Site Planning and Management*, an Environmental and Land Management Consultancy Business.
1990-91	*Travers Morgan Pty Ltd*. (Planning and Management Consultants). Held position of Senior Consultant and Manager of the Gosford Office.
1980-90	*Soil Conservation Service of New South Wales*. Held various positions including: • Officer In Charge - Sydney District 1984-1985 • Secondment to DMR Freeway Construction 1986-1988 • Officer In Charge - Central Coast District 1989-1990 • Catchment Management Projects - Sydney 1989
1979-80	Technical Officer (Scientific) – *National Herbarium of NSW*

Project Experience

1) Ecological Assessment

- Biodiversity Conservation Assessment and Management Strategy - Valla Urban Growth Area
- Ecological Site Assessment Report for residential development - Riverside Teagardens
- Ecological Site Assessment Report for residential development - Parkside Terrigal
- Species Impact Statement for Northlakes Residential Estate - Wallsend (Masked Owl / Squirrel Glider)
- Species Impact Statement for Pambulong Forest - Wallsend (Masked Owl / Squirrel Glider)
- Species Impact Statement for Landcom Estate Teralba (Squirrel Glider / Powerful Owl)
- Species Impact Statement for Retirement Village - Salamander Bay (Squirrel Glider / Bats)
- Species Impact Statement for Tourist Resort - Mulbring (Comb Crested Jacana)
- Wadalba Residential Release Area - 6 Separate SIS Reports (Squirrel Glider / Masked Owl)
- Species Impact Statement for Industrial Development for Belrose (Duffy's Forest / Southern Brown Bandicoot)
- Species Impact Statement for Prestons Industrial Estate (Cumberland Plain Woodland / Cumberland Plain Snail)
- Species Impact Statement for Residential Estate Landcom Campbelltown (Koala / Cumberland Plain Snail)
- Ku-ring-gai Biodiversity Survey – Ku-ring-gai Municipal Council
- Gosford Biodiversity Surveys– Gosford City Council

2) Bushfire Assessment

- Bushfire Assessment for 105 Lot Residential Subdivision – Johns Road Wadalba
- Bushfire Assessment for 89 Lot Residential Subdivision – Pacific Highway Wadalba
- Bushfire Assessment for 48 Lot Residential Subdivision – Hamlyn Road Hamlyn Terrace
- Bushfire Assessment for 109 Lot Residential Subdivision – Central Coast Highway Forresters Beach
- Bushfire Assessment for Rezoning for 46 Lot Residential Subdivision - Bakali Road Forresters Beach
- Bushfire Assessments for 55 Public schools throughout NSW for Bovis Lend Lease
- Bushfire Assessment for 97 Lot Residential Subdivision - UrbanGrowth Myall Road, Hillsborough
- Land and Environment Court Expert Witness for Bushfire Matters – 7 Lot Rural Residential Subdivision Bensville

3) Site Rehabilitation Plans/ Landscape Plans

I have completed site rehabilitation, revegetation and landscape management plans for the following extractive industries.

• Kincumber Quarry	Kerta Rd, Kincumber
• Springfield Quarry	Clarence Rd, Springfield
• Nells Road Quarry	Nells Rd, West Gosford
• Narellan Sand Quarry	Springs Rd, Narellan
• Dripstone Roadside Quarry	Mumbil Rd, Dripstone
• Suntop Roadside Quarry	Guerie Rd, Suntop
• Stuart Town Diggings	Burrendong Dam, Stuart Town
• Mangrove Mountain Quarry	Wiseman's Ferry Rd, Mangrove Mountain
• Martin's Creek Quarry	Station Street, Martin's Creek
• Point Clare Sandstone Quarry	Manooka, Pont Clare

4) Environmental Audits and Supervision

- Mangrove to Mardi Link project – WSC contracted Environmental Officer
- Woy Woy Commuter Carpark – NSW Government Transport Construction Authority contracted Environmental Representative
- Ardglen Basalt Quarry, New England Highway, Ardglen (Major Project No.06/0264) – Audit team member.

5) Environmental Management Plans – Extractive Industries

I have completed Environmental Management Plans incorporating monitoring, compliance with consent conditions, ongoing works and site rehabilitation for the following quarries:

- Somersby Quarry Ongoing Annual Reporting — Kangoo Rd, Somersby
- Piles Creek Quarry Ongoing Annual Reporting — Old Pacific Highway, Somersby
- Kangoo Road Quarry Ongoing Annual Reporting — Somersby
- Debenham Road Quarry Ongoing Annual Reporting — Kariong
- Mount White Quarry Ongoing Annual Reporting — Ashbrookes Rd, Mount White
- Calga Quarry Ongoing Annual Reporting — Peats Ridge Rd, Calga
- Kurrajong Quarry Ongoing Annual Reporting — Bull's Ridge Rd, East Kurrajong
- Cattai Quarry Ongoing Annual Reporting — Wiseman's Ferry Rd, Cattai
- Luddenham Quarry Ongoing Annual Reporting — Adams Rd, Luddenham (P91/02045)
- Mangrove Mtn Quarry Ongoing Annual Reporting — Wiseman's Ferry Rd, Mangrove Mtn

6) Pollution Incident Response Management Plans

I have prepared the necessary documentation and reporting for the Pollution Incident Response Management Plans to address Part 5.7A of the *Protection of the Environment Operations Act* (1997) for the following licenced premises.

- Cattai Quarry — Wiseman's Ferry Rd, Cattai
- Kurrajong Quarry — Bull's Ridge Rd, East Kurrajong
- Narallen Sand Quarry — Springs Rd, Narrallen

7) Large Scale Site Rehabilitation Works

I was involved in the following large scale landform reshaping and revegetation projects in either a supervisory, planning or management role:

- Botany Bay (Southern Foreshore) Sand Drift and Revegetation Project
  Captain Cooks Landing Place / Kamay Botany Bay National Park
- Kurnell Dune Rehabilitation Project
  Captain Cooks Landing Place / Kamay Botany Bay National Park
- Cape Bailey Lighthouse Dune Stabilization
- Cronulla Beach Dune Stabilization
- Soldiers Beach Dune Reshaping and Revegetation
- Wamberal Dune Blowout Revegetation
- Lakes Beach Dune Reshaping and Revegetation
- ANZAC Rifle Range Revegetation
- Wahroonga to Berowra F3 Revegetation and Erosion Control
- Trees by the Sea – Coastal Parks Landscaping and Vegetation Plantings
- Warnervale Town Centre Construction (Site Clearing, Earthworks, Revegetation)

JACOB MANNERS

SENIOR ECOLOGIST / PROJECT MANAGER (ACCREDITED BAM ASSESSOR)

Jacob Manners has over ten years of experience in the biodiversity assessment and management industry as a private consultant. He has provided advice and prepared assessments and management reports for a variety of projects including major sandstone and hard rock quarries, local government infrastructure works, industrial estates and facilities, residential subdivisions and dwellings, estuarine seagrass studies and road upgrade projects. the following selected project experience is provided.

- Biodiversity Development Assessment Report 2019 – Industrial Development West Gosford
- Biodiversity Development Assessment Report 2019 – Industrial Development Annangrove Road Rouse Hill
- Biodiversity Development Assessment Report 2019– Hallidays Point NSW
- Biodiversity Development Assessment Report 2019– Taylors Beach NSW
- Species Impact Statement – 60 Lot Residential Subdivision Warnervale Road Warnervale
- Flora and Fauna Addendum Assessment 2019 – Industrial Development Somersby
- Flora and Fauna Assessment Report 2019 – Residential Dwelling Great North Road Murrays Run
- Flora and Fauna Assessment Report 2009 – Australian Post Facility, Sunnybank Road Lisarow
- Flora and Fauna Assessment Report 2018 – Aged Care Facility Woy Woy
- Flora and Fauna Assessment Report & Vegetation Management Plan Seniors Living Facility St Ives
- Flora and Fauna Assessment Report 2018 – Residential Flat Building - Gosford
- Biodiversity Offset Assessment Options Report – Blackhill NSW
- Biodiversity Offset and Habitat Rehabilitation Plan – Sand Quarry Development Somersby
- Biodiversity Management Plan –6 Lot Rural-residential subdivision, Wisemans Ferry Rd Somersby
- Vegetation Management Plan –18 Lot Residential Subdivision at Anderson Road Glenning Valley
- Riparian Corridor Vegetation Management Plan –79 Lot Subdivision at Macpherson Street Warriewood
- Flora and Fauna Management Plan for a 9 Lot Subdivision at Reeves Street Somersby
- Conservation Area Management Plan – 200 Lot Residential Subdivision at Sandy Beach
- Flora and Fauna Assessment Report - Road Upgrade Chain Valley Bay, for Central Coast Council
- Flora and Fauna Assessment - Shared Boardwalk at Charmhaven for Central Coast Council
- Flora and Fauna Assessment - Road and Drainage Upgrade – Buff Point, for Wyong Shire
- Flora and Fauna Assessment - Kanangra Drive Upgrade, Crangan Bay for Wyong Shire Council
- Flora Offset Monitoring Reports 2011-2014 - Warnervale Business Park Offset for Wyong Shire Council
- Biodiversity Assessment Report – Sparks Road & Warnervale Town Centre Intersection Upgrade.

Jacob is an accredited BAM Assessor under the *Biodiversity Conservation Act* (2016) and has skills in advanced plant identification and fauna survey. A full list of his qualifications is provided below.

- Master of Wildlife Management – Macquarie University
- Bachelor of Science - University of Newcastle
- OEH Accredited Biodiversity Assessment Method Assessor
- Advanced Plant Identification Skills for Research & Environmental Assessment, UNSW
- Nocturnal Bird and Mammal: Species Identification & Survey Skills workshop.
- Frog, Bat and Reptile: Species Identification and Survey Skills Workshop, NSW DPI
- Shorebird identification Workshop - Birds Australia
- Woodland Birds Identification & Ecology Workshop. DPI Forests NSW
- Commercial Photography Certificate III - TAFE Ultimo Campus
- OHS General Induction for Construction Work in NSW - Workcover NSW
- Open Water Dive Certificate (PADI)
- NPWS Registered Flora and Fauna Surveyor

ASHLEY MULLAHEY

Research Assistant and GIS Technician

Ashley has over four years of experience as a Research Assistant and GIS Technician at Conacher Consulting since 2015. His key areas of expertise are GIS mapping and analysis, fauna surveys including experience in trapping and remote camera deployment and identification, amphibian surveys, microbat detector deployment and call identification, threatened flora searches and reporting assistance. Ashely has completed a number of university levels courses of relevance to ecological consulting including chemistry, environmental science, biology, GIS, ecology, marine science and statistics.

Selected Project Experience

GIS Mapping

- BAL and APZ mapping for 105 Lot Residential Subdivision – Johns Road Wadalba
- BAL and APZ mapping for 109 Lot Residential Subdivision – Central Coast Highway Forresters Beach
- BAL and APZ mapping for Rezoning & 46 Lot Residential Subdivision - Bakali Road Forresters Beach
- Flora and Fauna Mapping Martins Creek Quarry SSD
- Bushfire and Flora and Fauna Mapping – Multi Lot Rural Residential Development Somersby
- Soil & Water Management Plan - Somersby

Fauna Survey Experience

- Field Survey Assistant for Species Impact Statement– Warnervale Road Warnervale NSW
- Red-crowned Toadlet Survey – Arcadia NSW
- Red-crowned Toadlet Survey Mangrove Mountain NSW
- Wallum Froglet Survey – Chain Valley Bay NSW
- Remote Camera Trapping for Heath Monitor – Oxford Falls NSW
- Remote Camera Survey – Lake Munmorah NSW
- Remote Camera Survey – Tacoma NSW
- Elliot Trapping –Empire Bay NSW
- Elliot Trapping – Green Point NSW
- Hair Tube & Nest Box Survey – Somersby NSW
- Large Forest Owl Nest Tree Survey Assistant– Hillsborough
- Large Forest Owl Nest Tree Survey Assistant– Wyong
- Remote camera survey – Wyong

Flora Survey Experience

- *Rutidosis heterogama* Monitoring Survey Assistant –Chelmsford Road Charmhaven
- *Tetratheca juncea* Survey Assistant – Wyee Road Morisset
- *Tetratheca glandulosa* Survey Assistant – Bell Road Mangrove Mountain
- *Pimelea spicata* Survey Assistant – Lodges Road Narellan
- *Prostanthera junonis* Survey Assistant– Grants Road Somersby
- *Melaleuca biconvexa Survey Assistant* – Springfield Road, Springfield
- *Melaleuca biconvexa Survey Assistant* – Oyster Shell Road Lower Mangrove
- Threatened Orchid Survey Assistant – Martins Creek
- Threatened Orchid Survey Assistant – Pacific Highway Lake Munmorah
- Threatened Orchid Survey Assistant – Sparks Road Halloran
- Threatened Orchid Survey Assistant – Empire Bay Drive Bensville
- Threatened Orchid Survey Assistant – Warnervale Road, Warnervale

DEAN CONACHER

Research Assistant and GIS Technician

Dean has over ten years of experience as a Research Assistant and GIS Technician at Conacher Consulting (2009-2015 / 2018-2019). His key areas of expertise are GIS mapping and analysis, fauna surveys including experience in trapping, anabat and remote camera deployment, and assistance with nocturnal surveys and threatened species searches.

Selected Project Experience

Fauna Survey Experience

- Eastern Pygmy Possum Trapping– Wisemans Ferry Road Somersby
- Diurnal and nocturnal fauna surveys – Residential Subdivision Killcare
- Diurnal and nocturnal fauna surveys – Residential Subdivision Helensburgh
- Diurnal and nocturnal fauna surveys / Elliot Trapping / Amphibian surveys – Martins Creek
- Elliot Trapping – Warnervale Road Hamlyn Terrace
- Elliot Trapping – Maitland Avenue Sunshine
- Elliot Trapping – Walu Avenue Halekulani
- Elliot Trapping – Ruttleys Road, Wyee
- Cumberland Land Snail Search – Western Sydney Parklands
- Remote Camera Trapping – Pacific Highway Lake Muynmorah
- Remote Camera Trapping – Warnervale Road, Hamlyn Terrace
- Remote Camera Trapping – Great North Road, Laguna
- Remote Camera Trapping – Tarthra Street West Gosford

Flora Survey Experience

- *Rutidosis heterogama* Monitoring Survey Assistant –Chelmsford Road Charmhaven
- Targeted Threatened Flora Search – Residential Subdivision Lake Munmorah
- *Tetratheca juncea* Survey Assistant – Offset Site Investigations Sunshine NSW
- *Prostanthera junonis* Survey Assistant– Grants Road Somersby
- Targeted Threatened Flora Search – Extractive Industry Development Martins Creek
- Targeted Threatened Flora Search – Pacific Highway Lake Munmorah

Appendix D – BMSP Lands Signage

NO UNAUTHORISED ENTRY

This is a Vegetation Rehabilitation Area

- **NO DUMPING or WASTE DISPOSAL**
- **NO ANIMALS, VEHICLES or MACHINERY**

For information – contact Site Manager

AEP VMP SIGNAGE permanent sign, minimum size 600mm x 400mm erected and maintained at key access points to VMP lands for the life of the project

Appendix E - Site Photos

Above: Hollow Bearing Tree in APZ – some to be removed due to reduce canopy cover

Above: Small area suitable for planting near BMSP Zone 3

Above: *Eucalyptus tereticornis* and *Eucalyptus saligna* individuals recorded near BMSP site in addition to BAM plot data (Conacher, 2021)

Above: BMSP Zone 2 native understorey with *Pittosporum undulatum* (Sweet Pittosporum)

:

Above: Evidence of sheet erosion next to BMSP Zone 3

Above: Litter cover in the BMSP Zone 3

Appendix F – Authors' CV's

The BMSP was produced by:

Staff	Title/Qualification	Tasks
Dennis Neader	Senior Ecologist BSc (Env. Geo.)	Fieldwork, Reporting, Review,
Simon Purcell	Senior Ecologist BAppSc (Wildlife Science); Cert III Animal Care and Management	Project Lead, Review, Issue
Alissa Rogers	Ecologist BEnv (Climate Science)	Fieldwork, Reporting, Mapping