

Our Ref:CC190073

9 June 2020

General Manager  
Central Coast Council  
49 Mann Street  
GOSFORD NSW 2250

Dear Sir/Madam,

**18 Macleay Avenue, Woy Woy – Proposed Rezoning**

Please find enclosed our LEP Amendment Request application for a planning proposal (rezoning) for the abovementioned property. Attached is a USB containing all relevant information as referenced in the Planning Proposal. Including,

- Application form and letter of authority from Pacific Link Housing giving permission for Barker Ryan Stewart to submit this application on their behalf.
- A cheque made payable to Central Coast Council for the application fee, as quoted.
- Planning Proposal Report prepared by Barker Ryan Stewart, including the following appendices provided under separate cover;
  - Appendix A – Concept Plan by ADG Architects
  - Appendix B – Preliminary Bushfire Hazard Assessment Report by Conacher Consulting
  - Appendix C – Biodiversity Review Report by Conacher Consulting
  - Appendix D – Phase 1 Contaminated Site Investigation by Douglas Partners
  - Appendix E – Preliminary Geotechnical Assessment by Douglas Partners
  - Appendix F – AHIMS Search
  - Appendix G – Site Survey by Barker Ryan Stewart
  - Appendix H – Civil Engineering Advice

Please do not hesitate to contact our office if you wish to clarify any of the attached information.

Yours faithfully



Sarah Hartley | Senior Town Planner  
Barker Ryan Stewart Pty Ltd

# Local Environmental Plan (LEP) Amendment Request Form


## PRIVACY NOTIFICATION

The information provided in this form and supporting documentation, is required to enable it to be assessed by Council and relevant State agencies. Members of the public may request access and to the application and supporting documentation in accordance with the *Government Information (Public Access) Act 2009*. Persons identified on the application may apply to Council to access or amend the information at any time.

## 1 PROPONENT DETAILS

Company	Pacific Link Housing c/- Barker Ryan Stewart		
Name(s)	Mark Glew / Lisa Wrightson		
Postal Address	Suite 603, Level 6, 12 Century Circuit BAULKHAM HILLS NSW 2153		
Phone	02 9659 0005	Facsimile	
Mobile		Email	coast@brs.com.au
Is the Proponent of this request an employee/councillor of the Central Coast Council or have a relationship to any staff, which may potentially present a conflict of interest?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, please state name(s) of the person who is an employee/councillor with whom there is a relationship			
Please state the nature of the relationship with that person (e.g. family member, friend, business partner)			
If the request is lodged on behalf of a company, are the shareholders/position holders or persons with a pecuniary interest in the company an employee/councillor of the Central Coast Council or have a relationship to any staff, which may potentially present a conflict of interest?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If yes, please state name(s) of the person who is an employee/councillor with whom there is a relationship			
Please state the nature of the relationship with that person (e.g. family member, friend, business partner)			

## 2 SUBJECT LAND & OWNER DETAILS (Must be completed)

Lot	16	Section		DP / SP	255220
Land Area	5,712sqm				
Street Address	18 Macleay Avenue, Woy Woy				
Owner/s Name	Pacific Link Housing				
Owner/s Consent (signature) OR details of consultation undertaken with Owner/s					
					Date: 21 / 5 / 2020

**Note:** Please attach additional sheets for additional properties if required

**3 DESCRIPTION OF PROPOSED AMENDMENT/CHANGES SOUGHT****Existing Zoning / Provision**

RE1 Public Recreation

**Proposed Zoning / Provision**

Part RE1 Public Recreation and part R1 General Residential

**4 ESTIMATED FUTURE DEVELOPMENT POTENTIAL**

\$

Yield (Lots/Dwellings/Jobs): Approx 15 dwellings

**5 SUPPORTING DOCUMENTATION**

<input checked="" type="checkbox"/>	Lodgement Form ( <i>this document</i> )	Mandatory
<input checked="" type="checkbox"/>	Environmental Assessment in the format prescribed by <u>A Guide to Preparing Planning Proposals</u> prepared by the Department of Planning and Environment (August 2016)	Mandatory
<input checked="" type="checkbox"/>	Phase 1 Contaminated Land Assessment	
<input type="checkbox"/>	Economic Impact/Feasibility Assessment	
<input type="checkbox"/>	Flooding and Stormwater Assessment	
<input checked="" type="checkbox"/>	Flora and Fauna Assessment	
<input type="checkbox"/>	Traffic & Transport Assessment	
<input checked="" type="checkbox"/>	Bushfire Assessment	
<input type="checkbox"/>	Servicing and Civil Infrastructure Assessment	
<input checked="" type="checkbox"/>	Aboriginal/European Cultural Heritage Assessment (To be provided)	
<input type="checkbox"/>	Social Impact Assessment	
<input type="checkbox"/>	Visual and/or Acoustic Impact Assessment	
<input type="checkbox"/>	Geotechnical Assessment	

**Note:** The above list is not exhaustive - refer to Council's Planning Proposal Documentation Requirements for further information. Council may request additional studies to be undertaken (at your expense) in order to further assess the merits of the request.

**OFFICE USE ONLY**

☒ Phase 1 Fees Paid      File Number Allocated: / /      Customer Service Officer: L.W

\$13,200    A/N: 4421 8848

83.2020.107.1

## 6 POLITICAL DONATION AND GIFT DISCLOSURE

In making a request to amend Gosford LEP 2014 or Wyong LEP 2013, any person with a financial interest in the application (including owners, applicants or other interested party/ies), must disclose any political donations or gifts at the time the request is lodged with Council. The period of disclosure commences 2 years before the application is made and ends when the application is determined.

Political donations and gifts include:

- a. all reportable political donations made to any local councillor of that council (*being those of or above \$1,000*); and/or
- b. all gifts made to any local councillor or employee of that council (*being a gift of money or the provision of any other valuable thing or service for no consideration or inadequate consideration*)

Is a political donation and gift disclosure statement required?

- ☐ Yes (Please complete a Political Disclosure Form and attach to this lodgement form) ☒ No

## 7 PROPONENT'S DECLARATION

In lodging this request to amend Gosford LEP 2014 or Wyong LEP 2013, and signing this declaration, I/We:

### a. Declare:


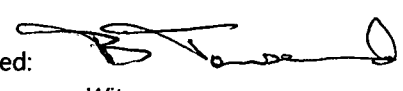
- i. That all the information provided in this lodgement form and any associated documentation is true and correct to the best of my/our knowledge.

### b. Acknowledge:

- i. Council has not made any representation or promise that the proposed amendment to Gosford LEP 2014 or Wyong LEP 2013, will continue to finality, or that it will exercise the statutory discretions that it has under the Environmental Planning and Assessment Act, 1979 in any manner;
- ii. Council maintains a discretion to terminate the request, and if it is terminated, that no damages, penalties or other costs are payable by the Council in respect of any costs incurred by the Proponent in relation to the request;
- iii. Council may, at its absolute discretion, engage the services of Consultants, and authorise any Consultant to engage Sub-Consultants, to undertake any studies or preparation of any document relating to the request at my/our expense;
- iv. Council is solely responsible for instructing and managing any Consultant that it engages;
- v. Council will ensure that any Tax Invoice that it submits to the Proponent includes particulars of the work that has been undertaken by Council's employees, Consultants or Sub-Consultants and the component of that work that exceeds the work that Council is required to provide as a result of receipt of a relevant Fee;
- vi. Council will not be compelled to undertake any work in the furtherance of the request until such time as the terms or outstanding fees of any written requirements or invoices have been settled or paid to Council's satisfaction.

### c. Agree:

- i. To grant a royalty free, non-exclusive licence or will obtain the grant of such a licence to the Council to copy, reproduce, republish, transcribe or distribute the documents lodged with this request to amend Gosford LEP 2014 or Wyong LEP 2013, for the purpose of notification and assessment of the request. As far as is permitted by law the applicant hereby indemnifies the Council against any damages or claim arising from the exercise of such a licence. Members of the public may request access and to the application and supporting documentation in accordance with the *Government Information (Public Access) Act 2009*.
- ii. to pay any applicable fees (in accordance with the adopted Operational Plan and Planning Proposal Procedure which may or may not require payment of refundable (unutilised) fees in advance at Council's discretion) and to reimburse Council for those costs that relate to the assessment, reporting and implementation of amendments Gosford LEP 2014 or Wyong LEP 2013; not to contact any Consultant engaged or Sub-consultant approved by the Council to carry out any task associated with the request to amend Gosford LEP 2014 or Wyong LEP 2013.

Signed:  Proponent	Name <b>IAN LYNCH</b> (PACIFIC LINK LEO)	Date <b>21 / 5 / 2020</b>
Signed:  Witness	Name & Address <b>BRETT TOWNSEND</b> <b>27 WOI WOI RD</b> <b>KARIOGA</b>	Date <b>21 / 5 / 20</b>



18 Macleay Ave, Woy Woy

LOT PLAN NO: 16/DP255220

ZONING : RE1

Permitted with consent  
The site is zoned RE1 - Public Recreation. The front portion of the site would be rezoned to a residential zone to permit affordable / social housing.  
A review of the Affordable Housing SEPP and Council's LEP and DCP requirements for the adjoining landholdings has been undertaken to determine possible requirements for the subject site.

HEIGHT : 8.5M (2 STOREYS)

SITE AREA : approx. 3167 m²

ACID SOILS : CLASS 4

DETAILED YIELD ANALYSIS

16 X 69 m² 1 BEDROOM UNITS  
5 X 80 m² 2 BEDROOM UNITS

- 1 BEDROOM UNIT
- 2 BEDROOM UNIT

THESE AREAS ARE EXCLUDING PARKING SPACES

- PRIVATE OPEN SPACE / LANDSCAPED AREA
- BALCONY

TOTAL 21 UNITS

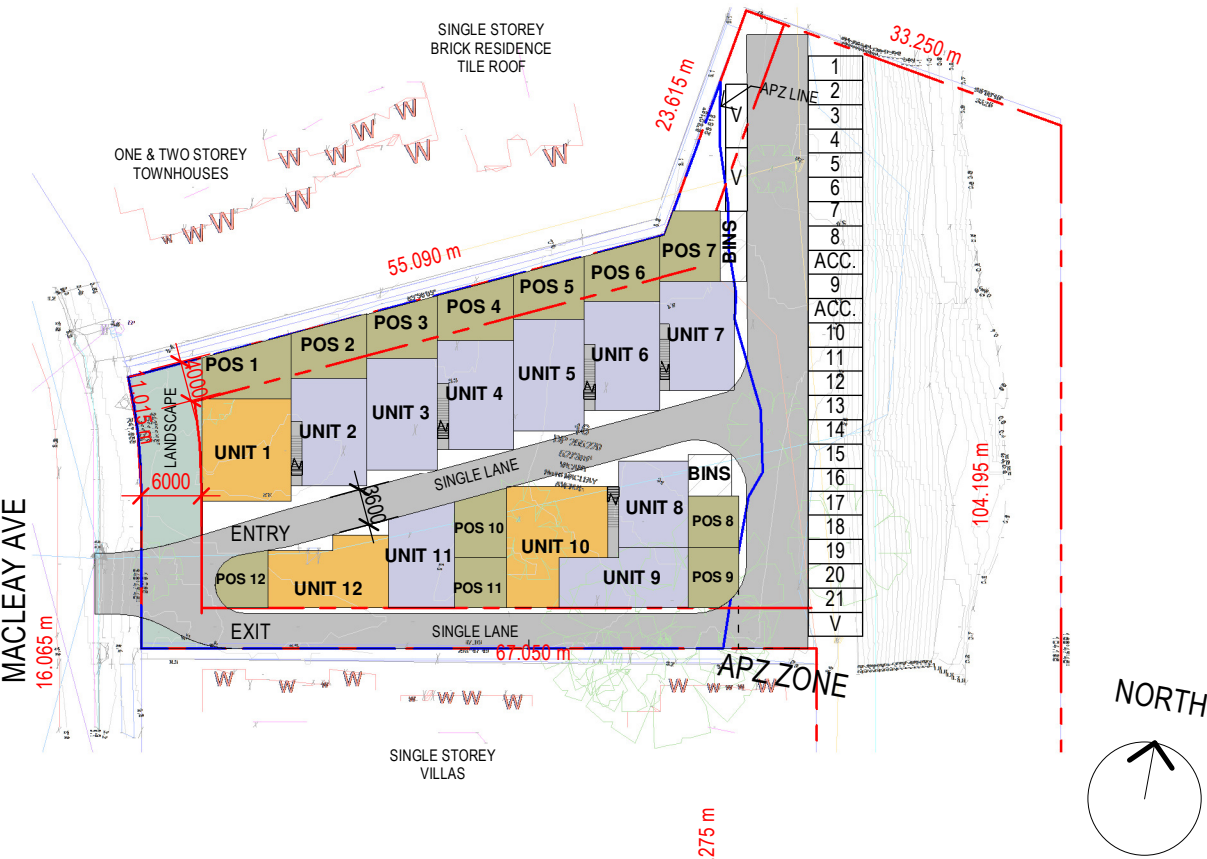
PROPOSED CAR SPACES 24 CAR SPACES (3 VISITORS INCLUDED)

PROPOSED GFA: 1570 m²  
(INCLUDED SHARED STAIRS / CORRIDOR AREAS)

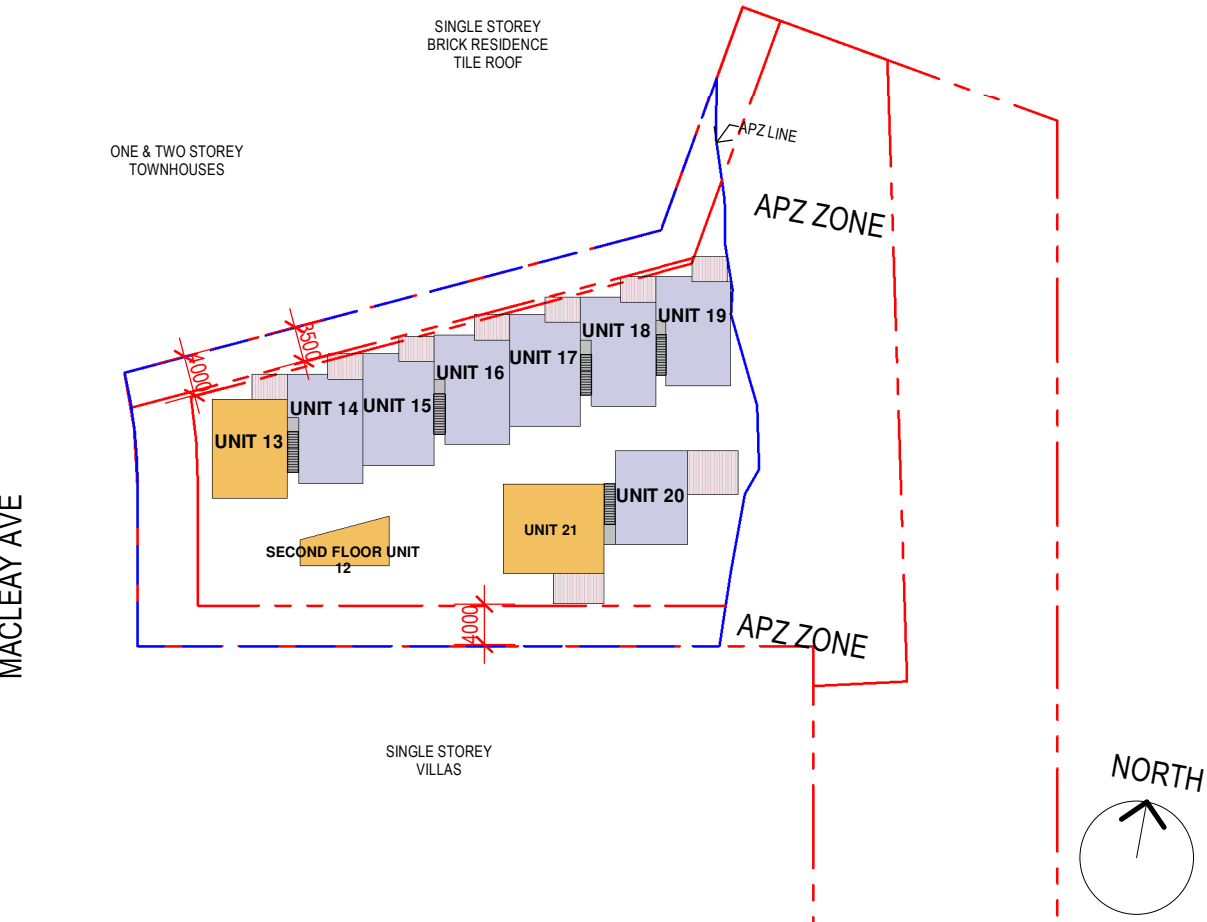
PROPOSED FSR: 0.5:1

PROPOSED HOB: 2 STOREYS

ALL SITE INFORMATION IS INDICATIVE ONLY; SUBJECT TO STCA, AND CONFIRMATION FROM SURVEYOR AND TOWN PLANNER  
NOTE: SEPP 65 not applied due to the scale of the development



1 GROUND FLOOR PLAN  
1 : 750



2 LEVEL 1  
1 : 750

18 Macleay Ave, Woy Woy

PROPOSED HOUSING FEASIBILITY

FEASIBILITY ANALYSIS

FE01

ADG architects

Suite 3.04, Level 3, 107-109 NSW 2250 2020-03-25 3:36:03 PM  
Postal Address P.O. BOX 457 Gosford NSW 2250  
ph: 02 4312 5110 fax: 02 4312 3113 e:info@adgarchitects.com.au

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Woy\_SK\_option 7 200320.rvt



## **BUSHFIRE ASSESSMENT REPORT**

**PROPOSED REZONING  
MACLEAY AVENUE**

**WOY WOY**

**APRIL 2020  
REF: 20062**

**BUSHFIRE ASSESSMENT REPORT**

**PROPOSED REZONING  
MACLEAY AVENUE**

**WOY WOY**

**APRIL 2020**

**Conacher Consulting Pty Ltd**

Environmental and Land Management Consultants

PO Box 4082, East Gosford NSW  
Phone: 02 4324 7888  
conacherconsulting@gmail.com

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Conacher Consulting P.L. ABN 62 166 920 869

## PREFACE

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This document prepared by *Conacher Consulting Pty Ltd* provides a revised assessment of the bushfire attack potential and the necessary bushfire protection strategies for the proposed rezoning and future residential subdivision of land at Macleay Avenue, Woy Woy. Aspects considered in relation to the Bushfire Assessment Report include; vegetation type, slopes, water supplies, entry and egress access, provision of defensible space and construction standards for the proposed buildings.

Report Prepared by:

PHILLIP ANTHONY CONACHER B.Sc.(Hons), Dip.Urb Reg Planning, M.Nat.Res.  
Project Director  
***Conacher Consulting Pty Ltd***

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# SECTION 1 INTRODUCTION

## 1.1 INTRODUCTION

This Revised Bushfire Assessment Report has been prepared by *Conacher Consulting Pty Ltd* for a proposed rezoning and future residential subdivision development of land at Woy Woy.

The objectives of this Report are to:

- i) Detail the assessment of the site in relation to bushfire hazard and attack;
- ii) Address the relevant requirements of Planning for Bushfire Protection (Rural Fire Service, 2019);
- iii) Identify if the development complies with the aims and objectives of Planning for Bushfire Protection (RFS, 2019);
- iv) Prepare a Report that supplies the relevant information for the Rural Fire Service and Council prior to granting a Bushfire Safety Authority (RFS) or development approval (Council).

## 1.2 DESCRIPTION OF THE PROPERTY

The site has frontage to Macleay Avenue to the west with developed residential land to the north and south of the site. Details regarding the subject site are provided in Table 1.1. The eastern part of the site contains an unnamed drainage line and then adjoins a naturally vegetated Council bushland reserve.

TABLE 1.1 SITE DETAILS	
Location	Macleay Avenue, Woy Woy
Description	Lot 16 DP 255220
Local Government Area	Central Coast Council
Existing Land Use	Vacant
Proposed Development	Residential Subdivision

## 1.3 PROPOSED DEVELOPMENT

It is proposed to rezone the land to enable a residential townhouse development to be constructed in the western part of the site. Future development following rezoning will include:

- Residential townhouse units;
- Vehicle access, onsite carparking;
- Bushfire protection zones; and
- Managed riparian vegetation.

## SECTION 2 BUSHFIRE ATTACK ASSESSMENT

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### 2.1 BUSHFIRE ASSESSMENT CRITERIA

#### ***Bushfire Prone Land Map***

Council's Bushfire Prone Land Map shows the vegetation within the eastern part of the subject site as Category 1 Vegetation with the area of future development mapped as Buffer to Category 1 Vegetation. The location of the site in relation to Council's Bushfire Prone Land Map is shown in Figure 1.

#### ***Forest Fire Danger Index***

The subject site is located within the Central Coast Council Local Government Area in the Greater Sydney Region. The Forest Fire Danger Index for the Greater Sydney Region is rated at 100 for use in determining asset protection zone requirements and categories for bushfire attack.

#### ***Vegetation Classification***

The principal vegetation types affecting the bushfire hazard located within 140 metres of the proposed lots is remnant forest vegetation in the eastern parts of the site. The vegetation to be retained in the drainage reserve to the east of the future development area has been determined to be remnant vegetation for the purposes of bushfire hazard. This determination has been made on the basis that the vegetation is a patch of moist, open forest riparian vegetation and has a shape that provides a potential fire run directly towards future buildings not exceeding 50 metres. This definition of remnant vegetation is in compliance with RFS (2019 pg 88) which states that:

“Remnant vegetation is a parcel of vegetation with a size of less than 1 Ha or a shape that provides a potential fire run that could threaten buildings not exceeding 50m. These remnants are considered a low hazard and APZ setbacks and building construction standards for these will be the same as for rainforests”.

As shown in Figure 1 the vegetation to be retained in the eastern parts of the site and further to the east is mapped as Buffer to Category 1.

The drainage line to the east is downslope of the site and separates the site from a larger area of Category 1 Vegetation located above the creekline to the east and upslope of the site. An area of riparian vegetation within the creekline and adjoining riparian buffer area (10 metres wide) is located to the east of the proposed asset protection zone.

Detailed site investigations and distance measurements have confirmed that the greater part of the land to the east has vegetation with a potential fire run of less than 50 metres to the future residential development. Therefore the adjoining vegetation can be classified as 'remnant vegetation' as defined by RFS (2019) because they have a shape that provides a potential fire run directly toward buildings not exceeding 50 metres.

#### ***Development Category***

The proposed development following rezoning is classified as a 'residential subdivision' under Planning for Bushfire Protection (RFS, 2019). Development consent is required from the council for subdivision and a Bushfire Safety Authority is required from the Rural Fire Service. Development Consent, or a Complying Development Certificate is then required for individual dwellings.

***Planning for Bushfire Protection (RFS, 2019)***

Due to the presence of Category 1 and Buffer to Category 1 vegetation and 100 metre Buffer areas on the subject site, the development application is required to include a Bushfire Assessment Report prepared in accordance with the requirements of *Planning for Bushfire Protection* (RFS, 2019)

***State Legislation***

This development is integrated development and is subject to Division 4.15 of the EP&A Act. Section 100 of the Rural Fires Act also applies to the proposed development as it is for a subdivision of land. This will require an application to the RFS for a Bushfire Safety Authority.

***Adjoining and Surrounding Development***

Residential lots adjoin the site to the south and north. Constructed residential roads (Macleay Avenue and Nambucca Drive) adjoin the western and southern boundaries of the site, as shown in Figure 2.



## 2.2 BUSHFIRE HAZARD ASSESSMENT – ASSET PROTECTION ZONES (APZ)

For subdivision purposes an assessment of the bushfire hazard for the land adjoining future development in relation to the adjoining lands, vegetation and slope gradients is provided in Table 2.1. The reasoning for determining the respective vegetation classification are provided in Section 2.1.

<b>TABLE 2.1</b> <b>BUSHFIRE HAZARD ASSESSMENT – SUBDIVISION</b> (from Table A1.12.2 RFS, 2019)					
Direction	Vegetation Classification (within 140m)	Effective Slope (within 100m)	Width of APZ (metres) Recommended		
			APZ	IPA	OPA
North/ North-West	Reduced Vegetation (Developed Land)	0-5° downslope	NR	NR	NR
North-East	Remnant Vegetation (Rainforest)	0-5° downslope	14	14	0
South	Reduced Vegetation Residential lots	Upslope	NR	NR	NR
East	Remnant forest (Rainforest)	0-5° downslope	14	14	0
West	Reduced Vegetation Residential lots	Upslope	NR	NR	NR
NR = No Requirement as no bushfire hazard present in that direction					

## 2.3 BUSHFIRE ATTACK LEVELS – FUTURE DWELLINGS (BAL)

A preliminary assessment in relation to building construction levels (Bushfire Attack Levels) for any future dwellings within the estate is provided in Table 2.2.

<b>TABLE 2.2</b> <b>BUSHFIRE ATTACK LEVEL ASSESSMENT</b> <b>(from Table A1.12.5 of RFS 2019)</b>								
	Direction	Vegetation Classification (greatest threat within 140m)	Effective Slope (within 100m)	Recommended Distance from Bushfire Hazard (metres)				
				BAL Flame Zone	BAL-40	BAL-29	BAL-19	BAL-12.5
	North/ North-West	Reduced Vegetation	0-5° downslope	NR	NR	NR	NR	NR
	North-East	Remnant Vegetation (Rainforest)	0-5° downslope	<11	11-14	14-21	21-29	29-100
	South	Reduced Vegetation Residential lots	Upslope	NR	NR	NR	NR	NR
	East	Remnant forest (Rainforest)	0-5° downslope	<11	11-14	14-21	21-29	29-100
	West	Reduced Vegetation Residential lots	Upslope	NR	NR	NR	NR	NR
NR – No requirement as no bushfire hazard present within 100m BAL – Bushfire Attack Levels								

## **SECTION 3**

### **BUSHFIRE PROTECTION MATTERS**

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#### **3.1 ASSET PROTECTION ZONE AND BUSHFIRE HAZARD MANAGEMENT**

For the proposed development it is recommended that bushfire Asset Protection Zones (APZs) are established and maintained as identified in Table 2.1. APZ width of 14 metres can be incorporated into the proposed development area, outside of any riparian areas.

The area within the bushfire Asset Protection Zones (APZs) are to be maintained as an Inner Protection Area (IPA) in accordance with the standards described in PBP (RFS, 2019), as provided in Appendix 1 of this Report.

#### **3.2 FUTURE BUILDING CONSTRUCTION LEVELS**

Any future dwellings proposed for the subject lots following subdivision will need to be assessed in relation to the Bushfire Attack Level (BAL) applicable to each lot in accordance with the requirements applying at the time of the future assessment. Table 2.2 has provided a preliminary assessment for the BAL requirements.

The preliminary assessment undertaken indicates that the site contains an area where a future dwellings can be constructed to BAL 29 construction standards or below, set back from the retained vegetation by at least 14 metres.

#### **3.3 ACCESS**

Section 5.3.2 of PBP (RFS 2019) outlines the requirements for public roads within a residential subdivision. The objective of the public road system in a bushfire emergency is stated in PBP (RFS 2019) as:

*“To provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from an area.”*

The proposed development will provide suitable ingress and egress routes to enable the safe evacuation of residents while simultaneously enabling access for emergency services.

The proposed vehicle access to the site will be by a public road. Any future vehicle access to the future development from Macleay Avenue is to comply with Table 5.3b and Appendix 3 of Planning for Bushfire Protection (RFS, 2019).

#### **3.4 WATER SERVICES**

The existing urban development in the local area has reticulated water mains. It is expected that the proposed development will extend the existing water reticulation from the surrounding infrastructure therefore a supplementary form of water supply will not be necessary for fire fighting purposes. This water supply arrangement is to be in compliance with Section 5.3.3 of Planning for Bushfire Protection (RFS, 2019).

The reticulated water supply, fire hydrant spacing, sizing and pressure is to comply with the requirements of AS2419.1 – 2005. A certification or test report from the Water Supply Authority is to be provided to demonstrate that the requirements of AS2419.1-2005 can be achieved during a bushfire event.

## SECTION 4

### CONCLUSIONS AND RECOMMENDATIONS

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#### 4.1 AIM AND OBJECTIVES OF PLANNING FOR BUSHFIRE PROTECTION

*“The aim of Planning for Bushfire Protection is to provide for the protection of human life and to minimise impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment” (PBP pg 1).*

The preparation of this Bushfire Assessment Report and subsequent assessment by Council and the Rural Fire Service ensures compliance with the aim of Planning for Bushfire Protection.

The following comments are provided in relation to satisfying the objectives of PBP.

##### *Objective 1*

- (i) *afford buildings and their occupants protection from exposure to a bush fire;*

Measures have been identified which can be implemented within the proposed subdivision development in regard to the establishment and maintenance of bushfire Asset Protection Zones (APZs) – see Sections 2.2 and 3.1 of this document.

The combination of Construction Standards according to AS3959-2009 and separation from the hazard using APZs will afford occupants of any building adequate protection from exposure to a bush fire.

##### *Objective 2*

- (ii) *provide for a defensible space to be located around buildings;*

The establishment and maintenance of bushfire Asset Protection Zones (APZs) and management of the lands within each lot will provide a defensible space located around buildings.

##### *Objective 3*

- (iii) *provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;*

Appropriate separation will be provided by the establishment and maintenance of adequate APZs as described in Sections 2.2 and 3.1.

Other measures to be used in conjunction with the APZs include:

- Construction Standards AS3959-2009;
- Adequate Water Services – see Section 3.4.

These strategies in combination are required to prevent flame spread to buildings and material ignition.

#### *Objective 4*

- (iv) *ensure that appropriate operational access and egress for emergency service personnel and occupants is available;*

Existing and proposed access and egress infrastructure is described in Section 3.3. This will ensure safe operational ingress for emergency services and also simultaneous safe egress for residents during a bushfire emergency.

#### *Objective 5*

- (v) *provide for ongoing management and maintenance of bush fire protection measures;*

The requirements for management and maintenance of bushfire protection measures including fuel loads in the Asset Protection Zone (APZ) are provided in Section 3.1 and Appendix 1 of this document.

#### *Objective 6*

- (vi) *ensure that utility services are adequate to meet the needs of fire fighters;*

The adequacy of utility services such as water supply is discussed in Section 3.4 of this document. The utility services are adequate to meet the needs of fire fighters.

## **4.2 CONCLUDING COMMENTS**

The 'Deemed to Comply' requirements for the proposed subdivision include bushfire Asset Protection Zones (APZs) of width as identified in Table 2.1(14 metres wide). This APZ is to be established and maintained as Inner Protection Areas (IPAs) in accordance with the standards described in Appendix 4 of PBP (RFS, 2019).

With the implementation of the combination of measures recommended in this report, the overall aims and objectives of Planning for Bushfire Protection (RFS, 2019) can be achieved for the proposed development.

## **4.3 RECOMMENDATIONS**

The following recommendations are provided in relation to reducing the potential for loss of life and property by the impact of bushfire.

- i. Establish and maintain minimum width Asset Protection Zones (APZs) of 14 metres to the riparian buffer to the east.
- ii. All APZs should be maintained as described in Appendix 4 of PBP (RFS, 2019) as inner protection areas within the lots;
- iii. Undertake regular inspections and maintenance of the APZs within the subject site is to be undertaken by the owners / managers (or their agents) according to PBP (RFS, 2019);
- iv. Construct future dwellings to the relevant construction standards in accordance with AS3959-2018.
- v. Any future vehicle access to the future developments is to comply with Section 5.3.2 of Planning for Bushfire Protection RFS (2019).
- vi. The future water supply to the development is to comply with Section 5.3.3 of Planning for Bushfire Protection RFS (2019).
- vii. This report should be referred to the Rural Fire Service for their review and issue of a Bushfire Safety Authority.

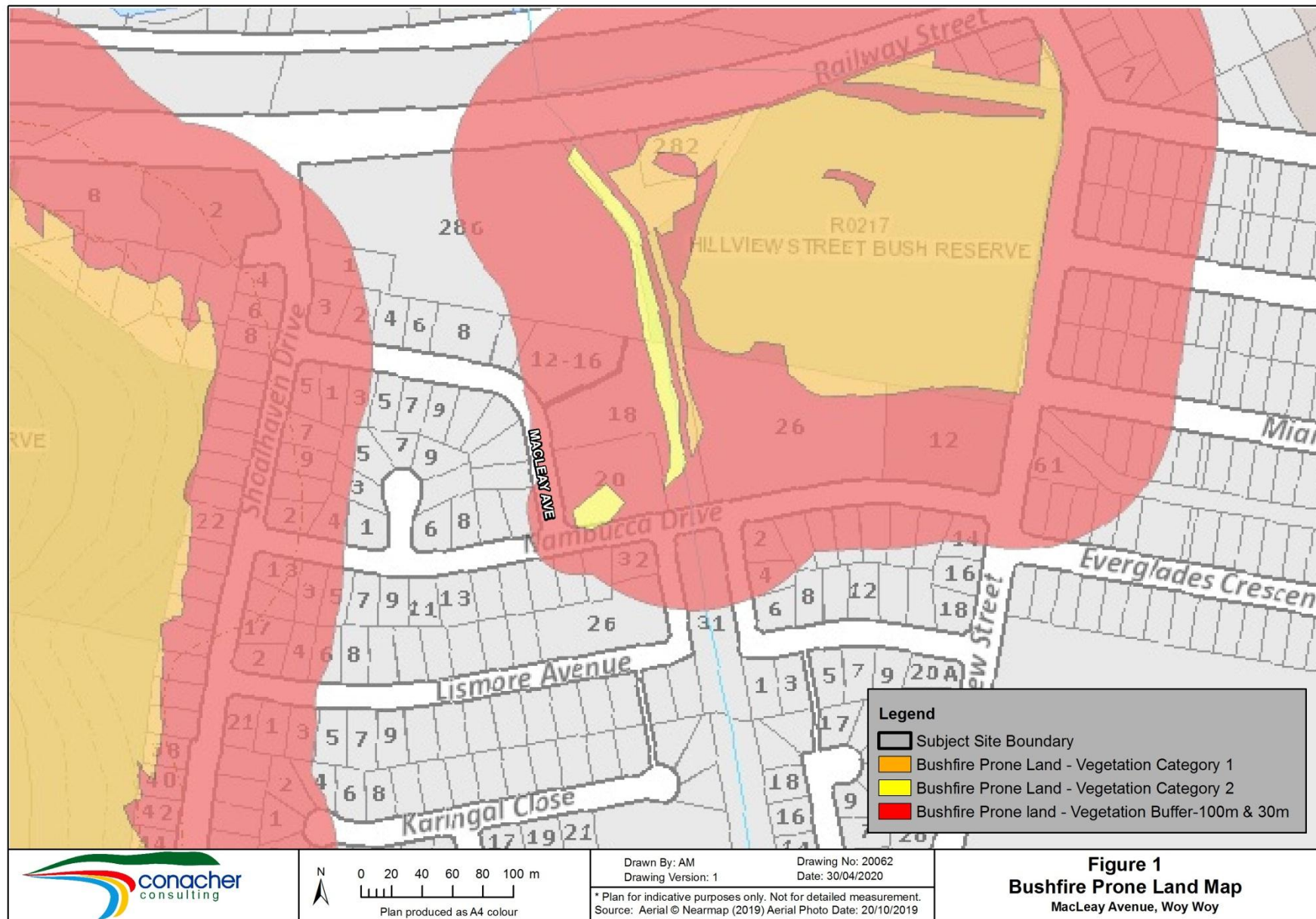
## REFERENCES

Rural Fire Service (2019) Planning for Bushfire Protection.

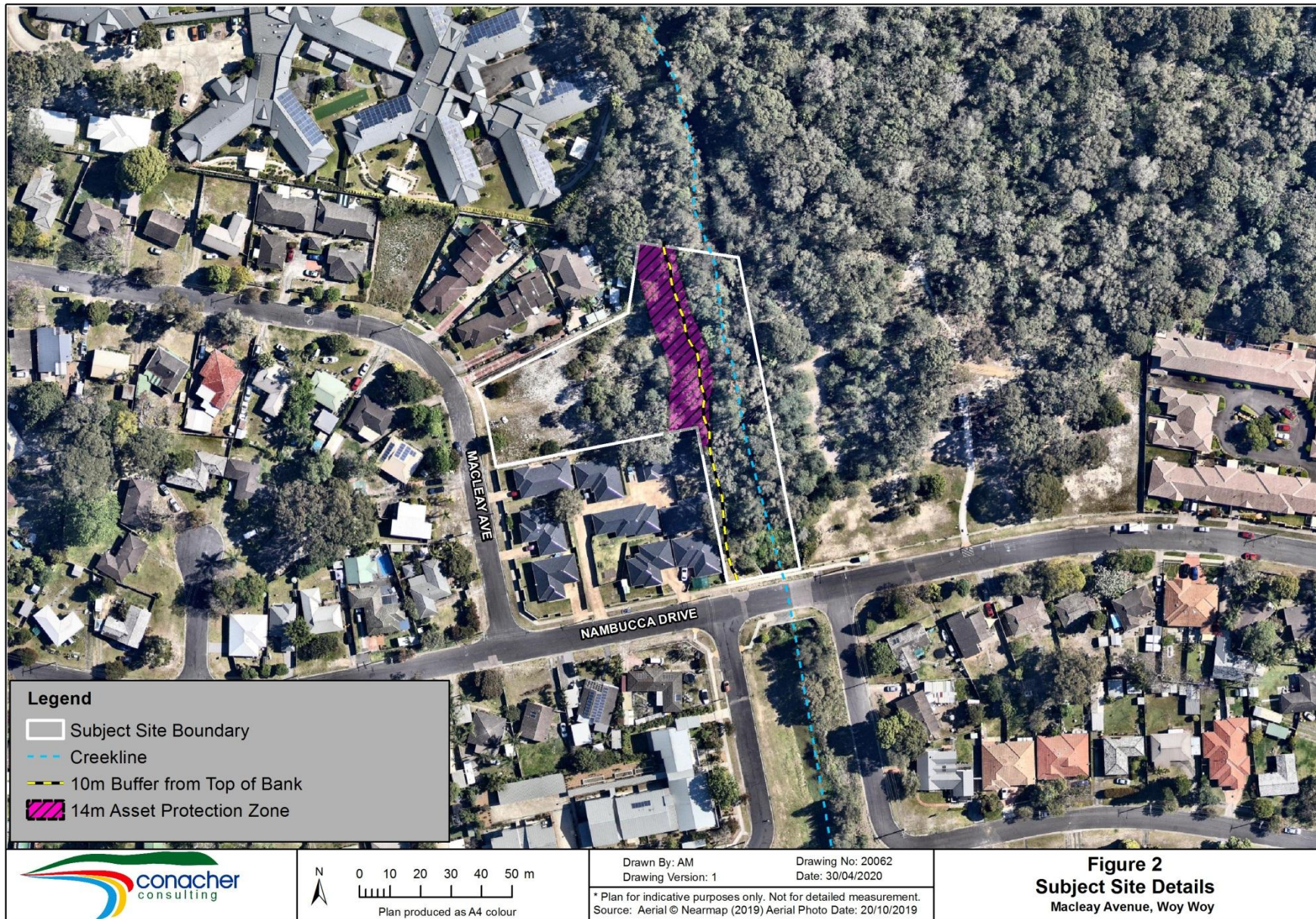
Standards Australia (2018) Australian Standard (AS3959-2018) Construction of Buildings in Bushfire Prone Areas.

## FIGURES

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## **APPENDIX 1**

### **ASSET PROTECTION ZONE STANDARDS**

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# APPENDIX 4

## ASSET PROTECTION ZONE REQUIREMENTS

In combination with other BPMs, a bush fire hazard can be reduced by implementing simple steps to reduce vegetation levels. This can be done by designing and managing landscaping to implement an APZ around the property.

Careful attention should be paid to species selection, their location relative to their flammability, minimising continuity of vegetation (horizontally and vertically), and ongoing maintenance to remove flammable fuels (leaf litter, twigs and debris).

This Appendix sets the standards which need to be met within an APZ.

### A4.1 Asset Protection Zones

An APZ is a fuel-reduced area surrounding a building or structure. It is located between the building or structure and the bush fire hazard.

For a complete guide to APZs and landscaping, download the NSW RFS document *Standards for Asset Protection Zones* at the NSW RFS Website [www.rfs.nsw.gov.au](http://www.rfs.nsw.gov.au).

An APZ provides:

- a buffer zone between a bush fire hazard and an asset;
- an area of reduced bush fire fuel that allows for suppression of fire;
- an area from which backburning or hazard reduction can be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Bush fire fuels should be minimised within an APZ. This is so that the vegetation within the zone does not provide a path for the spread of fire to the building, either from the ground level or through the tree canopy.

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the building;
- damage to the building asset from intense radiant heat; and
- ember attack.

The methodology for calculating the required APZ distance is contained within Appendix 1. The width of the APZ required will depend upon the development type and bush fire threat. APZs for new development are set out within Chapters 5, 6 and 7 of this document.

In forest vegetation, the APZ can be made up of an Inner Protection Area (IPA) and an Outer Protection Area (OPA).

#### A4.1.1 Inner Protection Areas (IPAs)

The IPA is the area closest to the building and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and act as a defensible space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

In practical terms the IPA is typically the curtilage around the building, consisting of a mown lawn and well maintained gardens.

When establishing and maintaining an IPA the following requirements apply:

##### Trees

- tree canopy cover should be less than 15% at maturity;
- trees at maturity should not touch or overhang the building;
- lower limbs should be removed up to a height of 2m above the ground;
- tree canopies should be separated by 2 to 5m; and
- preference should be given to 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 should be provided;
- shrubs should not be located under trees;
- shrubs should not form more than 10% ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

##### Grass

- grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and
- leaves and vegetation debris should be removed.

#### A4.1.2 Outer Protection Areas (OPAs)

An OPA is located between the IPA and the unmanaged vegetation. It is an area where there is maintenance of the understorey and some separation in the canopy. The reduction of fuel in this area aims to decrease the intensity of an approaching fire and restricts the potential for fire spread from crowns; reducing the level of direct flame, radiant heat and ember attack on the IPA.

Because of the nature of an OPA, they are only applicable in forest vegetation.

When establishing and maintaining an OPA the following requirements apply:

##### Trees

- tree canopy cover should be less than 30%; and
- canopies should be separated by 2 to 5m.

##### Shrubs

- shrubs should not form a continuous canopy; and
- shrubs should form no more than 20% of ground cover.

##### Grass

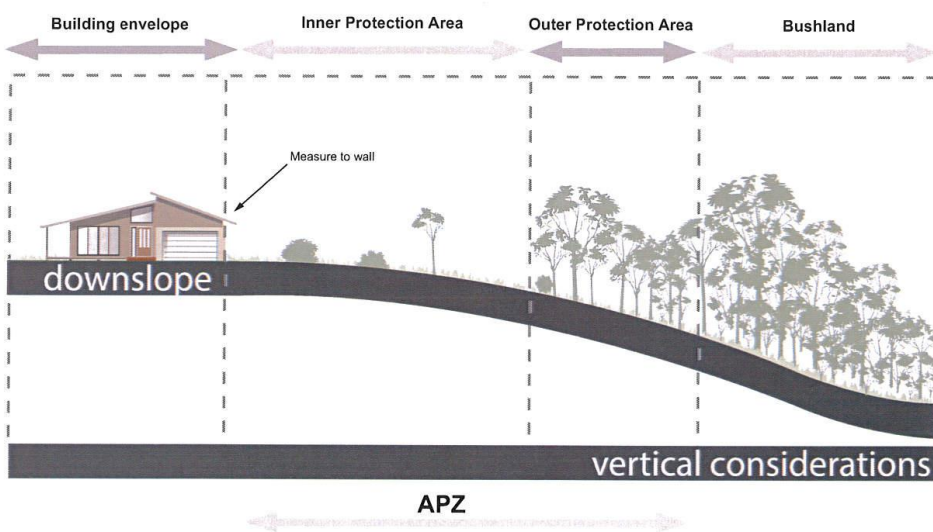
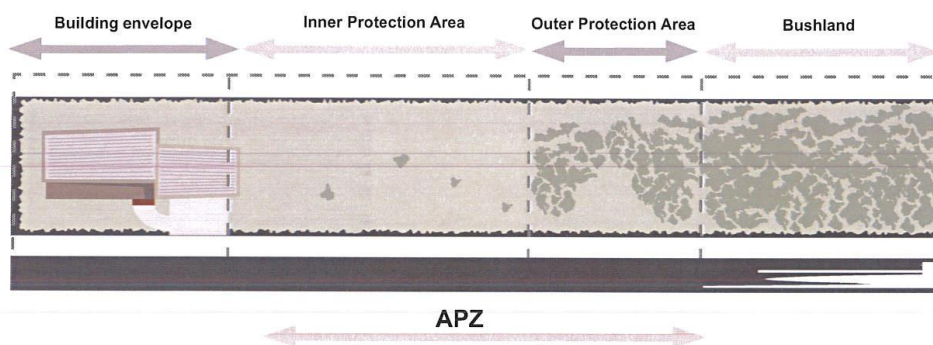
- grass should be kept mown to a height of less than 100mm; and
- leaf and other debris should be removed.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance of the IPA and OPA as described above should be undertaken regularly, particularly in advance of the bush fire season.



**Figure A4.1**

Typical Inner and Outer Protection Areas.





## **THREATENED BIODIVERSITY ASSESSMENT REPORT**

### **PROPOSED REZONING**

**LOT 16 DP 255220  
MACLEAY AVENUE  
WOY WOY**

**THREATENED BIODIVERSITY ASSESSMENT REPORT**

**PROPOSED REZONING**

**LOT 16 DP 255220  
MACLEAY AVENUE  
WOY WOY**

**APRIL 2020**

**Conacher Consulting Pty Ltd**

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## PREFACE

This Threatened Biodiversity Assessment Report has been prepared by *Conacher Consulting* to identify the flora and fauna characteristics of land within Lot 16 DP 255220, Macleay Avenue, Woy Woy.

This report provides an assessment of the proposed impacts to biodiversity in accordance with the *Biodiversity Conservation Act* (2016) and the *Environment Protection and Biodiversity Conservation Act* (1999).

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## SECTION 1

### INTRODUCTION AND BACKGROUND

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#### 1.1 INTRODUCTION

*Conacher Consulting* has been engaged to prepare a Flora and Fauna Assessment Report for a proposed rezoning within Lot 16 DP 255220, Macleay Avenue, Woy Woy.

This report has been prepared to determine whether the proposed rezoning and future development within the site is likely to significantly affect threatened species in accordance with Part 7 of the *Biodiversity Conservation Act (2016)*.

This Report also provides an assessment of whether the future development of the site is likely to constitute a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

#### 1.2 SITE CHARACTERISTICS

The planning and cadastral details of the subject site are provided in Table 1.1. A plan of the subject area is provided as Figure 1.1.

TABLE 1.1 SITE DETAILS	
Location	Lot 16 DP 255220, Macleay Avenue, Woy Woy.
Area	Approximately 0.53 hectares
LGA	Central Coast Council
Existing Land Use	Vacant Land

#### 1.3 PLANNING PROPOSAL

The planning proposal assessed within this Report is a rezoning to enable future residential development within the site.

Detailed plans of the planning proposal have been provided as separate documentation to this report.

#### 1.4 IMPACT AVOIDANCE AND MITIGATION MEASURES

The following recommendations are made in relation to impact avoidance and mitigation measures:

- Provision of appropriate setbacks to the watercourse within the site in accordance with the NSW Office of Water Guidelines;
- Future management of the retained vegetation areas within the site to reduce weed growth and encourage natural regeneration.

#### 1.5 BIODIVERSITY OFFSET SCHEME THRESHOLD ASSESSMENT

The following considerations are provided in relation to the Biodiversity Offset Scheme Threshold:

- The proposed development footprint assessed in this Report will disturb approximately 0.2 ha of native vegetation, which is less than the 0.25ha native vegetation area clearing threshold that exceeds the Biodiversity Offset Scheme Threshold for this site;
- The subject site is not located on the biodiversity values map, a BOSET Report is provided in Appendix 1;

- The proposed development is not likely to significantly affect threatened species, ecological communities or their habitats as determined by the Test of Significance prepared in accordance with s7.3 of the BC Act (2016) is provided in Section 4.2 of this Report.
- The proposed development will not be carried out in a declared area of outstanding biodiversity value; and
- Future development is not likely to be required to be accompanied by a Biodiversity Development Assessment Report.

## SECTION 2

### FLORA CHARACTERISTICS

#### 2.1 THREATENED FLORA SPECIES

A search of the Bionet Atlas of NSW Wildlife (NSW DPIE 2020) was undertaken to identify records of threatened flora species located within 10 km of the site. This allowed for a specific search for threatened flora to be undertaken to determine if any threatened flora species are present within the subject site. Details on threatened flora species as listed in Schedule 1 of the BC Act (2016) with a known or possible occurrence within the local area are provided in Table 2.1.

TABLE 2.1 THREATENED FLORA SPECIES OF THE AREA				
Name	BC Act	EP&BC Act	Habitat Requirements	Comments
<i>Acacia pubescens</i>	V	V	Open woodland and forest, in Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland on alluviums, shales and at the intergrade between shales and sandstones on gravelly soils, often with ironstone (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Acacia terminalis</i> subsp. <i>terminalis</i>	E	E	Coastal scrub and dry sclerophyll woodland on sandy soils in near-coastal areas from the northern shores of Sydney Harbour S to Botany Bay.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Ancistrachne maidenii</i>	V	-	Habitats with transitional geology between the Hawkesbury and Watagan soil landscapes. Grows in sandstone-derived soils.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Astrotricha crassifolia</i>	V	V	Dry sclerophyll woodland on sandstone.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Baloskion longipes</i>	V	V	Swamps or depressions in sandy alluvium.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Callistemon linearifolius</i>	V	-	Sclerophyll Forest in moist gullies on coast and adjacent ranges (Fairley and Moore 1995).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Chamaesyce psammogeton</i>	E	-	Coastal dunes (NSW DPIE 2017b).	No suitable habitat present.  Not observed during surveys / not likely to occur.

TABLE 2.1 THREATENED FLORA SPECIES OF THE AREA				
Name	BC Act	EP&BC Act	Habitat Requirements	Comments
<i>Cryptostylis hunteriana</i>	V	V	Within the Central Coast LGA this species is known from Coastal Plains Scribbly Gum Woodland and Coastal Plains Smooth-Barked Apple Woodland habitats (Bell 2001).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Darwinia glaucophylla</i>	V	-	Heath and woodlands associated with sandstone rock platforms (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Darwinia peduncularis</i>	V	-	Open Forest and Woodlands on rocky hillsides on sandy soils on upper slope, bench and gully topographies and on creek banks.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Dendrobium melaleucaphilum</i>	E	-	Epiphytic orchid growing frequently on <i>Melaleuca styphelioides</i> , rainforest trees and rocks in coastal districts (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Diuris bracteata</i>	E	Ext	Known only from the original collection near Gladesville, on the Parramatta R., before 1889. Mistakenly recorded on the NSW Central Coast (NSW RBG 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V	-	Moist habitats with strong shale influence (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Eucalyptus camfieldii</i>	V	V	Coastal shrub heath at exposed sandy locations over Hawkesbury Sandstone (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Eucalyptus glaucina</i>	V	V	Stony hillsides and valley floors in grassy and shrubby woodland on clay and alluvial soils.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Grevillea shiressii</i>	V	V	Shrub 2-5 m high. Flowers mainly spring. Grows along creek banks in wet sclerophyll forest in sandy soil on Hawkesbury sandstone.	No suitable habitat present.  Not observed during surveys / not likely to occur.

TABLE 2.1 THREATENED FLORA SPECIES OF THE AREA				
Name	BC Act	EP&BC Act	Habitat Requirements	Comments
<i>Hibbertia procumbens</i>	E	-	Heath on skeletal sandy soils on the Somersby Plateau. May also be found associated with 'hanging swamp' vegetation communities on sandy deposits.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Kunzea rupestris</i>	V	V	Shallow depressions on large flat sandstone rock outcrops in short to tall shrubland or heathland habitats.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Lindsaea fraseri</i>	E	-	Swamp forest or open forest. Known primarily from the Far North Coast of NSW (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Maundia triglochinoides</i>	V	-	Swamp, creek and wetland habitats on deep heavy low nutrient clays soils.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Melaleuca biconvexa</i>	V	V	Wet and moist low sites near streams in association with swamp and alluvial soils (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Melaleuca deanei</i>	V	V	Flat broad ridgetops and saddles in Coastal Sandstone Ridgetop Woodland vegetation (NSW DECCW 2010).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Micromyrtus blakelyi</i>	V	V	Heathlands in shallow sandy soil in cracks and depressions of sandstone rock platforms.	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Persoonia hirsuta</i>	E	E	Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Prostanthera askania</i>	E	E	Moist sclerophyll forest and warm temperate rainforest communities, as well as the ecotone between them. Habitats are characterised by undulating to moderately steep slopes of the Watagan and Erina soil landscapes and intersecting areas on alluvial soils of the Yarramalong soil landscape (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.

TABLE 2.1 THREATENED FLORA SPECIES OF THE AREA				
Name	BC Act	EP&BC Act	Habitat Requirements	Comments
<i>Prostanthera junonis</i>	E	E	Sclerophyll forest and heath in shallow soil on sandstone on the Somersby Plateau (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Rhodamnia rubescens</i>	CE	-	Wet sclerophyll forest and rainforest.	No suitable habitat present.
<i>Rhodomyrtus psidioides</i>	CE	-	Wet sclerophyll forest and rainforest.	No suitable habitat present.
<i>Syzygium paniculatum</i>	E	V	Subtropical and littoral rainforest on sandy soil (Fairley and Moore 1995).	Suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Tetratheca glandulosa</i>	V	-	Strongly associated with areas of shale-sandstone transition habitat (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
<i>Tetratheca juncea</i>	V	V	Typically found in low open forest and woodland habitats on low nutrient soils associated with the Awaba Soil Landscape. Occasionally found in heath and moist forest (NSW DPIE 2020).	No suitable habitat present.  Not observed during surveys / not likely to occur.
Ext = Extinct P. Ext = Presumed Extinct CE = Critically Endangered E = Endangered V = Vulnerable Species				

No threatened flora species were observed within the subject site during surveys and none are considered to have potential to occur within the subject site.

## 2.2 THREATENED FLORA POPULATIONS & THREATENED ECOLOGICAL COMMUNITIES

### 2.2.1 Threatened Flora Populations

Details of the endangered populations known to occur within the local government area are provided in Table 2.2.

TABLE 2.2 ENDANGERED POPULATIONS OF THE AREA		
Endangered Population	Habitat Requirements	Comments
<i>Eucalyptus oblonga</i> DC. at Bateau Bay, Forrester's Beach and Tumbi Umbi in the Wyong local government	Dry open forest with infertile sandy soils on sandstone (NSW DPIE 2020)	No suitable habitat present.  Not observed during surveys / not likely to occur.

TABLE 2.2 ENDANGERED POPULATIONS OF THE AREA		
Endangered Population	Habitat Requirements	Comments
<i>Eucalyptus parramattensis</i> C. Hall. subsp. <i>parramattensis</i> in Wyong and Lake Macquarie local government areas	Sandy alluvium within floodplain vegetation which also supports <i>Eucalyptus robusta</i> (Swamp Mahogany), <i>E. tereticornis</i> (Forest Red Gum), <i>Corymbia gummifera</i> (Sydney Bloodwood) as well as <i>Melaleuca</i> (Paperbark) species (NSW DPIE 2020)	No suitable habitat present.  Not observed during surveys / not likely to occur.

### 2.2.2 Threatened Ecological Communities

Details regarding the habitat attributes and indicative species for the threatened ecological communities listed in Schedule 2 of the BC Act (2016), known to be present in the local government area, are provided in Table 2.3.

TABLE 2.3 ENDANGERED ECOLOGICAL COMMUNITIES OF THE AREA				
Name	BC Act	EPBC Act	Habitat Requirements	Comments
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	V	<b>Geology / Soils:</b> Estuarine mud flats. <b>Topography:</b> Intertidal zone on the shores of estuaries and lagoons. <b>Characteristic Species:</b> <i>Sarcocornia quinqueflora</i> , <i>Sporobolus virginicus</i> , <i>Juncus kraussii</i> and <i>Baumea juncea</i> .	No suitable habitat present.
Coastal Upland Swamp in the Sydney Basin Bioregion	E	E	<b>Geology / Soils:</b> Periodically waterlogged acidic soils on Hawkesbury Sandstone. <b>Topography:</b> Impermeable sandstone plateaus in the headwater valleys of streams and on sandstone benches with abundant moisture seepage. <b>Characteristic Species:</b> Highly diverse and variable, includes scrubs, heaths, sedgelands and fernlands.	No suitable habitat present.
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	<b>Geology / Soils:</b> Silts, muds or humic loams. <b>Topography:</b> Depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains. <b>Characteristic Species:</b> Composition is variable and dependent on water regime. May include amphibious grasses and sedges, emergent floating herbs and emergent tall sedges and floating and submerged aquatic herbs.	No suitable habitat present.



TABLE 2.3 ENDANGERED ECOLOGICAL COMMUNITIES OF THE AREA				
Name	BC Act	EPBC Act	Habitat Requirements	Comments
Kincumber Scribbly Gum Forest in the Sydney Basin Bioregion	CE	-	<p><b>Geology / Soils:</b> Terrigal Formation of the Narrabeen Group. Soils are characterised by Yellow Podzolic Soils and Yellow Earths of the Erina Soil Landscape.</p> <p><b>Topography:</b> Footslopes, gently inclined crests and ridges.</p> <p><b>Characteristic Species:</b> <i>Eucalyptus racemosa</i>, <i>Angophora costata</i>, <i>Corymbia gummifera</i>, <i>Syncarpia glomulifera</i>, <i>Eucalyptus piperita</i> and <i>Allocasuarina littoralis</i>.</p>	No suitable habitat present.
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	CE	<p><b>Geology / Soils:</b> Sand dunes and on soils derived from underlying rocks</p> <p><b>Topography:</b> Located near the seaoin coastal dunes, headland or riparian habitats.</p> <p><b>Characteristic Species:</b> Comprises the <i>Cupaniopsis anacardioides</i> - <i>Acmena</i> spp. alliance of Floyd (1990).</p>	No suitable habitat present.
Low woodland with heathland on indurated sand at Norah Head	E	-	<p><b>Geology / Soils:</b> Indurated (hard setting) sands with a range of local variation in drainage conditions.</p> <p><b>Topography:</b> low rolling sandy hills – east of Wilfred Barrett Drive near Norah Head.</p> <p><b>Characteristic Species:</b> <i>Eucalyptus camfieldii</i>, <i>Corymbia gummifera</i>, <i>Melaleuca</i> spp. <i>Lambertia formosa</i>, <i>Acacia longifolia</i>, <i>Banksia oblongifolia</i> and <i>Allocasuarina distyla</i>.</p>	No suitable habitat present.
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E	CE	<p><b>Geology / Soils:</b> High nutrient geological substrates, notably basalts and fine-grained sedimentary rocks.</p> <p><b>Topography:</b> Coastal plains and plateaux, footslopes and foothills up to 600m ASL and within the Sydney basin below 350m ALS</p> <p><b>Characteristic Species:</b> Principally encompasses the following groupings of Floyd (1990): <i>Argyrodendron trifoliatum</i> alliance (suballiances 1, 5 &amp; 6); <i>Dendrocnide excelsa</i> - <i>Ficus</i> spp. alliance (suballiances 14 &amp; 15); and <i>Drypetes australasica</i> – <i>Araucaria cunninghamii</i> alliance (suballiances 21 &amp; 22).</p>	No suitable habitat present.

TABLE 2.3 ENDANGERED ECOLOGICAL COMMUNITIES OF THE AREA				
Name	BC Act	EPBC Act	Habitat Requirements	Comments
Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion	E	-	<b>Geology / Soils:</b> Shale-derived soils from Narrabeen series geology <b>Topography:</b> Undulating to rolling hills. <b>Characteristic Species:</b> <i>Corymbia maculata</i> and <i>Eucalyptus paniculata</i> .	No suitable habitat present.
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	<b>Geology / Soils:</b> Silts, clay-loams and sandy loams. <b>Topography:</b> Periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. <b>Characteristic Species:</b> Eucalypt canopy with species belonging to the genus <i>Angophora</i> or the sections <i>Exsertaria</i> or <i>Transversaria</i> of the genus <i>Eucalyptus</i> . Has low abundance of <i>E. robusta</i> , <i>Casuarina</i> and <i>Melaleuca</i> species and a groundcover of soft-leaved forbs and grasses.	No suitable habitat present.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	E	<b>Geology / Soils:</b> Waterlogged or periodically inundated grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline. <b>Topography:</b> Flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. <b>Characteristic Species:</b> <i>Casuarina glauca</i> .	Observed during surveys.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	<b>Geology / Soils:</b> Waterlogged or periodically inundated humic clay loams and sandy loams. <b>Topography:</b> Alluvial flats and drainage lines associated with coastal floodplains. <b>Characteristic Species:</b> <i>Eucalyptus robusta</i> , <i>E. longifolia</i> , <i>E. botryoides</i> , <i>Melaleuca quinquenervia</i> and <i>M. ericifolia</i> .	No suitable habitat present.
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	E	-	<b>Geology / Soils:</b> Generally on the Warriewood and Tuggerah Soil Landscapes. <b>Topography:</b> Freshwater swamps in swales and depressions on sand dunes and low nutrient sand plain sites in coastal areas. <b>Characteristic Species:</b> <i>Eleocharis sphacelata</i> , <i>Baumea juncea</i> , <i>B. rubiginosa</i> , <i>B. articulata</i> , <i>Gahnia sieberiana</i> , <i>Ludwigia peploides</i> and <i>Persicaria</i> sp.	No suitable habitat present.

TABLE 2.3 ENDANGERED ECOLOGICAL COMMUNITIES OF THE AREA				
Name	BC Act	EPBC Act	Habitat Requirements	Comments
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E	-	<b>Geology / Soils:</b> Found on a range of substrates including old sand dunes above cliffs and on basalt headlands, and less frequently on sandstone. <b>Topography:</b> Sea cliffs and coastal headlands. <b>Characteristic Species:</b> <i>Themeda australis</i> .	No suitable habitat present.
Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion	E	-	<b>Geology / Soils:</b> Holocene sediments of coastal sand. Iron podzols on the Woy Woy Soil Landscape. <b>Topography:</b> Sand plains on the Woy Woy Peninsula at Umina and Pearl Beach. <b>Characteristic Species:</b> <i>Eucalyptus botryoides</i> and <i>Angophora floribunda</i> with a diverse understorey of sclerophyllous shrubs.	Observed during surveys.
<b>Key to BC Act and EP&amp;BC Act Status</b> CE = Critically Endangered Ecological Community E = Endangered Ecological Community V = Vulnerable Ecological Community E = Endangered				

The following endangered ecological communities occur within the site:

- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (SOFF EEC)
- Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion (UCSW EEC)

These EECs are mapped in Figure 2.1.

## 2.3 VEGETATION SURVEY METHODOLOGY

To determine the likely and actual occurrence of flora species and plant communities on the subject site field survey work was undertaken to supplement literature reviews and previous flora surveys of the area. The methods utilised for the flora survey are outlined below.

### **Literature Review**

- A review of available literature for the area was undertaken to obtain reference material and background information for this study. These documents are listed in the References section of this Report.
- A search of the Bionet Atlas of NSW Wildlife (NSW DPIE 2020) was undertaken to identify records of threatened flora species located within 10 km of the site. This enabled the preparation of a predictive list of threatened flora species that could possibly occur within the habitats found on the site.

### **Aerial Photograph Interpretation**

- Aerial photographs were utilised to identify the extent of vegetation with respect to the site and surrounding areas.

## **Field Survey**

### **Current Flora Surveys**

- A field survey was conducted to identify the occurrence of flora species and the extent and location of vegetation communities present across the subject site.
- A 20x 20m floristic plot and a 100m floristic transect was completed within the site in the location shown in Figure 2.1.
- Searches for threatened flora species were completed as belt transects in the locations mapped in Figure 2.1.
- Specimens of plants not readily identified in the field were collected for identification.
- Specimens of plants tentatively identified as threatened species are sent to the Sydney Royal Botanic Gardens for confirmation of the identification.
- All vascular plants were identified using keys, nomenclature and information in The Royal Botanic Gardens and Domain Trust (2020), Harden *et al.*, (2014) and Richardson *et al.*, (2016). Wherever they were known, changes to nomenclature and classification have been incorporated into the results.

### **Vegetation Community Nomenclature**

- Native vegetation communities were classified and described according to condition and the dominant floristics and the structural formation of the dominant vegetative growth.
- Corresponding units of available vegetation mapping have been identified where available.
- Corresponding Endangered Ecological Communities listed on both the *BC Act* (2016) and *EP&BC Act* (1999) are also provided if relevant.

### **Searches for Cryptic Flora Species**

Parallel transect searches of approximately 5m width were completed across the site for threatened flora species, in accordance with the requirements of Central Coast Council (2019).

As many threatened flora species are best observed during their flowering period, this survey was unable to detect species which flower at various other times of the year. The subject site does not contain suitable habitat for seasonally flowering cryptic threatened flora species, and additional seasonal searches are considered not necessary.

## **2.4 FLORA SPECIES AND VEGETATION COMMUNITIES DESCRIPTIONS**

The following vegetation communities were observed within the subject site during surveys:

- PCT 1232 Swamp Oak Floodplain Forest, Sydney Basin Bioregion and South East Corner Bioregion;
- PCT 1645 Old Man Banksia – Rough-barked Apple – Bangalay shrubby open forest on coastal sands of the Central Coast; and
- Cleared Land.

Vegetation community descriptions are provided below and a detailed species list is provided in Table 2.4. The locations of vegetation communities are shown in Figure 2.1.

No threatened flora species were observed within the subject site during surveys.

## **PCT 1232 SWAMP OAK FLOODPLAIN FOREST, SYDNEY BASIN BIOREGION AND SOUTH EAST CORNER BIOREGION**

### **Structure:**

Upper Stratum: To 15 metres high, with 70% PFC.

Mid Stratum (lower layer) To 2 metres high, with 5% PFC

Lower Stratum: To 0.2 metres high, with 5% PFC.

### **Floristics: (Characteristic Species)**

Native Upper Stratum: *Casuarina glauca* and *Melaleuca quinquenervia*.

Native Mid Stratum (upper) *Glochidion ferdinandi* and *Breynia oblongifolia*.

Native Lower Stratum: *Histiopteris incisa*, *Commelina cyanea* and *Pteridium esculentum*.

Exotics: *Cinnamomum camphora*, *Lantana camara*, *Alternanthera philoxeroides*, *Briza maxima* and *Ehrharta erecta*.

### **Variation:**

The southern section of this community has no tree cover.

### **Disturbance:**

This vegetation type has been disturbed by weed invasion, rubbish dumping, soil disturbances and historical clearing.

### **Weed Invasion:**

Weed invasion is high particularly in the shrub and ground layers. An area of mostly exotic water plants is also present within the southern section of this community.

### **Location and Distribution:**

This community occupies approximately 0.17 hectares of the subject site and along the eastern site boundary in association with a first order watercourse, as shown in Figure 2.1. A photograph of this PCT is provided as Plate 1.

### **Classification:**

This vegetation community corresponds to the endangered ecological community, Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, as listed under the *BC Act* (2016).

This vegetation community does not correspond to the endangered ecological community Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community, as listed under the EPBC Act (1999). This is due to the vegetation present not meeting the condition threshold patch size requirements or requirement of having a predominantly native understorey.

This vegetation community also corresponds to Map Unit E40i– Estuarine Swamp Oak Forest, as mapped and described by Bell (2013).



**Plate 1. PCT 1232 Swamp Oak Floodplain Forest, Sydney Basin Bioregion and South East Corner Bioregion**

**PCT 1645 OLD MAN BANKSIA – ROUGH-BARKED APPLE – BANGALAY SHRUBBY OPEN FOREST ON COASTAL SANDS OF THE CENTRAL COAST**

**Structure:**

Upper Stratum: To 25 metres high, with 10-20% Projected Foliage Cover (PFC).

Mid Stratum: To 4-6 metres high, with 0-60% PFC

Lower Stratum: To 0.2 metres high, with 10% PFC.

**Floristics: (Characteristic Species)**

Native Upper Stratum: *Angophora floribunda* and *Eucalyptus botryoides*.

Native Mid Stratum: *Allocasuarina littoralis*, *Monotoca elliptica*, *Banksia oblongifolia*, *Acacia longifolia*, *Acacia oxycedrus* and *Leptospermum laevigatum*.

Native Lower Stratum: *Lomandra longifolia*, *Eragrostis brownii*, *Commelina cyanea*, *Dianella caerulea*, *Pteridium esculentum* and *Pomax umbellata*.

Exotics: *Eragrostis brownii*, *Eragrostis curvula*, *Ehrharta erecta*, *Stenotaphrum secundatum*, *Paspalum dilatatum*.

**Variation:**

The shrub and ground cover density is patchy across this community.

**Disturbance:**

This vegetation type has been disturbed by historical clearing, soil disturbances and weed invasion.



**Weed Invasion:**

High levels of weed invasion were observed within the ground layer stratum.

**Location and Distribution:**

This community occupies approximately 0.25 hectares of the subject site and occurs mostly within the central section of the site, as shown in Figure 2.1. A photograph of this PCT is provided as Plate 2.

**Classification:**

This vegetation community corresponds to the endangered ecological community, Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion, listed under the *BC Act* (2016).

This vegetation community also corresponds to Map Unit E33bi– Umina Coastal Sands Woodland, as mapped and described by Bell (2013).



**Plate 2. PCT 1645 Old Man Banksia – Rough-Barked Apple – Bangalay shrubby open forest on coastal sands of the Central Coast**



### **CLEARED LAND**

The western section of the site predominantly contains cleared land devoid of native vegetation as mapped in Figure 2.1. This area does not correspond to any threatened ecological communities listed within the *BC Act* (2016) or the *EPBC Act* (1999). Approximately 0.1 hectares of Cleared Land is present within the site, a photograph of the Cleared Land is provided as Plate 3.



**Plate 3. Cleared Land.**



**TABLE 2.4**  
**FLORA SPECIES OBSERVED**

Family Name	Scientific Name	Common Name	Plot 1		Transect 1
			Abundance	Cover	
NATIVE TREES					
Casuarinaceae	<i>Allocasuarina littoralis</i>	Black She-Oak	5	10	x
Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak			x
Fabaceae (Mimosoideae)	<i>Acacia elata</i>	Mountain Cedar Wattle			x
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple	20	10	x
Myrtaceae	<i>Eucalyptus botryoides</i>	Bangalay Broad-leaved Paperbark			x
Myrtaceae	<i>Melaleuca quinquenervia</i>	Paperbark			x
Phyllanthaceae	<i>Glochidion ferdinandi</i>		1	5	
Phyllanthaceae	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Cheese Tree			x
Proteaceae	<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>	Coastal Banksia	2	1	x
NATIVE SHRUBS					
Ericaceae	<i>Monotoca elliptica</i>	Tree Broom-heath	5	5	
Euphorbiaceae	<i>Homalanthus populifolius</i>	Bleeding Heart			x
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>		15	1	x
Fabaceae (Mimosoideae)	<i>Acacia oxycedrus</i>	Spike Wattle	10	5	
Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>		0.1		x
Myrtaceae	<i>Leptospermum laevigatum</i>	Coast Teatree	5	5	
Phyllanthaceae	<i>Breynia oblongifolia</i>	Coffee Bush	1	0.1	x
Proteaceae	<i>Banksia oblongifolia</i>		3	5	
NATIVE MONOCOTS					
Cyperaceae	<i>Carex appressa</i>	Tall Sedge			x
Cyperaceae	<i>Cyperus polystachyos</i>				x
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	10	1	x
Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass	500	10	
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass			x

TABLE 2.4 FLORA SPECIES OBSERVED					
Family Name	Scientific Name	Common Name	Plot 1		Transect 1
			Abundance	Cover	
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	100	5	
<b>NATIVE FORBS</b>					
Apiaceae	<i>Centella asiatica</i>	Indian Pennywort			x
Commelinaceae	<i>Commelina cyanea</i>	Native Wandering Jew	1	0.1	x
Lobeliaceae	<i>Lobelia anceps</i>				x
Phormiaceae	<i>Dianella caerulea</i>	Blue Flax-lily	3	0.1	
Phormiaceae	<i>Dianella caerulea</i> var. <i>producta</i>	Blue Flax-lily			x
Rubiaceae	<i>Pomax umbellata</i>	Pomax	5	0.1	
<b>NATIVE FERNS AND ALLIES</b>					
Davalliaceae	<i>Nephrolepis cordifolia</i>	Fishbone Fern			x
Dennstaedtiaceae	<i>Histiopteris incisa</i>	Bat's Wing Fern			x
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken	500	1	x
<b>OTHER NATIVE PLANTS</b>					
Arecaceae	<i>Archontophoenix cunninghamiana</i>	Bangalow Palm			x
Cyatheaceae	<i>Cyathea australis</i>	Rough Treefern			x
<b>HIGH THREAT EXOTIC PLANTS</b>					
Amaranthaceae	<i>Alternanthera philoxeroides</i>	Alligator Weed			x
Asparagaceae	<i>Asparagus plumosus</i>	Climbing Asparagus Fern			x
Asteraceae	<i>Ageratina adenophora</i>	Crofton Weed			x
Asparagaceae	<i>Asparagus aethiopicus</i>	Asparagus Fern	5	0.1	x
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs			x
Bignoniaceae	<i>Tecoma stans</i>	Yellow Bignonia			x
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed			x
Fabaceae (Faboideae)	<i>Erythrina x sykesii</i>	Coral Tree			x
Lauraceae	<i>Cinnamomum camphora</i>	Camphor Laurel			x

TABLE 2.4 FLORA SPECIES OBSERVED					
Family Name	Scientific Name	Common Name	Plot 1		Transect 1
			Abundance	Cover	
Ochnaceae	<i>Ochna serrulata</i>	Mickey Mouse Plant			x
Poaceae	<i>Andropogon virginicus</i>	Whisky Grass	10	0.1	
Poaceae	<i>Eragrostis curvula</i>	African Love Grass	500	10	x
Poaceae	<i>Ehrharta erecta</i>	Panic Veldt-grass	1000	10	x
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo Grass	1000	5	x
Poaceae	<i>Paspalum dilatatum</i>	Paspalum			x
Verbenaceae	<i>Lantana camara</i>	Lantana	1	0.1	x
<b>OTHER EXOTIC PLANTS</b>					
Agavaceae	<i>Yucca aloifolia</i>	Spanish Bayonet	1	0.1	
Apiaceae	<i>Hydrocotyle bonariensis</i>				x
Apiaceae	<i>Hydrocotyle bowlesioides</i>		5	0.1	
Asphodelaceae	<i>Aloe sp.</i>		2	0.1	
Asteraceae	<i>Coreopsis lanceolata</i>	Coreopsis	100	0.1	
Asteraceae	<i>Hypochaeris radicata</i>	Catsear	1	0.1	
Fabaceae (Caesalpinioideae)	<i>Senna pendula var. glabrata</i>				x
Onagraceae	<i>Ludwigia longifolia</i>				x
Passifloraceae	<i>Passiflora caerulea</i>	Blue Passionflower			x
Poaceae	<i>Briza maxima</i>	Quaking Grass			x
Poaceae	<i>Bromus catharticus</i>	Prairie Grass			x
Poaceae	<i>Lolium perenne</i>	Perennial Ryegrass			x
Poaceae	<i>Paspalum urvillei</i>	Vasey Grass	1000	10	
Rubiaceae	<i>Richardia brasiliensis</i>	Mexican Clover	20	1	
Solanaceae	<i>Solanum nigrum</i>	Black-berry Nightshade	1	0.1	x

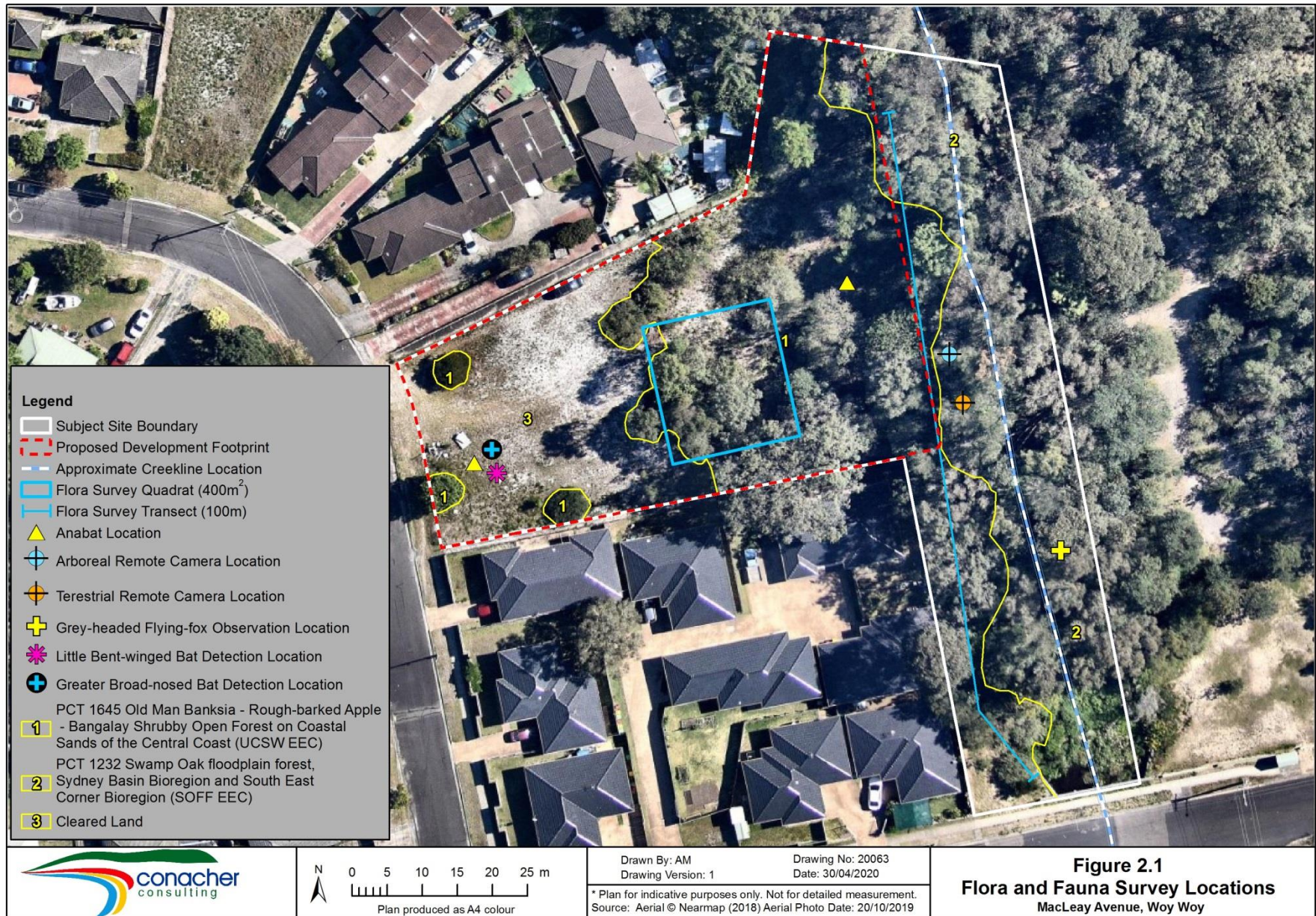
## **2.5 LOCATION AND DISTRIBUTION OF ADJOINING AND CONTIGUOUS HABITATS**

An inspection of the available aerial imagery for the local area, review of available vegetation mapping (Bell 2013) and field surveys were undertaken to determine the extent and condition of vegetation within the subject site and surrounding vicinity. The following assessment of connectivity is provided:

The site adjoins the Hillview Street Bush Reserve (R0217) to the north and a Council managed playground to the east. The land to the south and west of the site is cleared.

The native vegetation within the development footprint is part of a local occurrence of the endangered ecological community Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion, as listed under the *BC Act* (2016). Based on site investigations and mapping undertaken by Bell (2013), the UCSW EEC has a local occurrence of approximately 23.96 ha. A map of the local occurrence of this EEC is provided in the test of significance in Section 4.2 of this Report.





## SECTION 3

### FAUNA AND FAUNA HABITATS

#### 3.1 THREATENED FAUNA SPECIES

A search of the Bionet Atlas of NSW Wildlife (NSW DPIE 2020) was conducted for threatened fauna species recorded within 10km of the subject site. This revealed a number of threatened species that have been recorded in the area. Details on threatened fauna species as listed in Schedule 1 of the *BC Act* (2016) with a known or possible occurrence within the local area are provided in Table 3.1. Species which exclusively inhabit marine, estuarine and beach environments have been omitted due to a lack of suitable habitat within the study area.

TABLE 3.1 THREATENED FAUNA SPECIES OF THE AREA				
Common Name Scientific Name	BC Act	EP&BC Act	Preferred Habitat	Comments
Superb Fruit-Dove <i>Ptilinopus superbus</i>	V	-	Rainforests, adjacent mangroves, wet sclerophyll eucalypt forests, scrublands with native fruits (Higgins and Davies 1996).	Suitable habitat present.  Low potential to occur on site.
Rose-crowned Fruit-Dove <i>Ptilinopus regina</i>	V	-	Occurs in dense rainforests with a substantial understorey where it feeds entirely on fruit (Higgins and Davies 1996).	Suitable habitat present.  Low potential to occur on site.
Bush Stone-curlew <i>Burhinus grallarius</i>	E	-	Open forests, savannah woodlands, dune scrub, savannah and mangrove fringes (Marchant and Higgins 1993).	Suitable habitat present.  Not observed with site during surveys.  Moderate potential to occur on site.
Black-necked Stork <i>Ephippiorhynchus asiaticus</i>	E	-	Shallow freshwater terrestrial wetlands, floodplains, watercourses, dams and paddocks. (Marchant and Higgins 1990).	No suitable habitat present.  Not likely to occur.
Black Bittern <i>Ixobrychus flavicollis</i>	V	-	Permanent freshwater wetlands with tall, dense vegetation (Lindsey 1992).	No suitable habitat present.  Not likely to occur.
Black-breasted Buzzard <i>Hamirostra melanosternon</i>	V	-	Riverine and tropical eucalypt woodlands, shrub steppes, arid scrubs, grassy plains and sandy deserts.	No suitable habitat present.  Not likely to occur.
Square-tailed Kite <i>Lophoictinia isura</i>	V	-	Coastal and sub-coastal open forest, woodland or lightly timbered habitats and inland habitats along watercourses and Mallee that are rich in passerine birds.	Suitable habitat present.  Low potential to occur on site infrequently.



**TABLE 3.1  
THREATENED FAUNA SPECIES OF THE AREA**

<b>Common Name Scientific Name</b>	<b>BC Act</b>	<b>EP&amp;BC Act</b>	<b>Preferred Habitat</b>	<b>Comments</b>
Little Eagle <i>Hieraaetus morphnoides</i>	V	-	Various habitats including woodland, open forest, partially cleared areas, along watercourses and around wetlands (Marchant and Higgins 1993).	Suitable habitat present.  Low potential to occur on site infrequently.
Eastern Osprey <i>Pandion cristatus</i>	V	-	Utilises waterbodies including coastal waters, inlets, lakes, estuaries and offshore islands with a dead tree for perching and feeding.	No suitable habitat present.  Not likely to occur.
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	V	-	Coastal areas and inland rivers and wetlands. Nests in large emergent eucalypts (Marchant and Higgins 1993).	No suitable habitat present.
Little Lorikeet <i>Glossopsitta pusilla</i>	V	-	Forests and woodlands feeding mostly on nectar and pollen particularly in profusely-flowering eucalypts (Courtney and Debus 2006).	Suitable habitat present.  Potential to occur on site infrequently.
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	-	Open forests with <i>Allocasuarina</i> species and hollows for nesting (Higgins 1999).	Suitable habitat present.  Low potential to occur on site infrequently.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	-	Open forests, woodlands, and urban areas (Higgins 1999).	Suitable habitat present.  Vagrant, not likely to occur.
Powerful Owl <i>Ninox strenua</i>	V	-	Mature forests containing large hollows for breeding & densely vegetated gullies for roosting (Higgins 1999).	Suitable habitat present.  Low potential to occur on site infrequently.
Masked Owl <i>Tyto novaehollandiae</i>	V	-	Open forest & woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting (Higgins 1999).	Suitable habitat present.  Very low potential to occur on site infrequently.
Sooty Owl <i>Tyto tenebricosa</i>	V	-	Tall, dense, wet forests containing trees with very large hollows for roosting and breeding (Higgins 1999).	No suitable habitat present.  Not likely to occur.
Barking Owl <i>Ninox connivens</i>	V	-	Woodlands, open forests and partially cleared land where prey is available. Nests in tree hollows (Higgins 1999).	Suitable habitat present.  Very low potential to occur on site infrequently.
Turquoise Parrot <i>Neophema pulchella</i>	V	-	Coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands (Higgins 1999).	No suitable habitat present.  Not likely to occur.

**TABLE 3.1  
THREATENED FAUNA SPECIES OF THE AREA**

<b>Common Name Scientific Name</b>	<b>BC Act</b>	<b>EP&amp;BC Act</b>	<b>Preferred Habitat</b>	<b>Comments</b>
Swift Parrot <i>Lathamus discolor</i>	E	CE	NSW eucalypt forests and woodlands with winter flowering eucalypts between March and October (Saunders and Tzaros 2011).	Suitable habitat present.  Low potential to occur on site infrequently.
Scarlet Robin <i>Petroica boodang</i>	V	-	Dry eucalypt forest and woodlands during breeding season, dispersing during autumn–winter into open habitats including urban areas (Higgins and Peter 2002).	Suitable habitat present.  Very low potential to occur on site infrequently.
Eastern Bristlebird <i>Dasyornis brachypterus</i>	E	E	Coastal woodland, dense scrub and heath, often near taller forest (Higgins and Peter 2002).	No suitable habitat present.
White-fronted Chat <i>Epthianura albifrons</i>	V	-	Estuarine and damp open grassland habitats on the coast and open grassy plains, salt lakes and saltpans near rivers and waterways in inland areas (Higgins et al., 2001).	No suitable habitat present.  Not likely to occur.
Regent Honeyeater <i>Anthochaera phrygia</i>	CE	CE	Box-Ironbark dry open forest and woodland and riparian River Sheoak forests. Also Coastal Swamp Forest and Spotted Gum Forest during winter. May occasionally forage within planted or remnant eucalypts (Higgins et al., 2001).	Suitable habitat present.  Very low potential to occur on site infrequently.
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	-	Inhabits a variety of habitats including forest, woodland, shrubland, heath and disturbed environments. Widespread species which inhabits inland and coastal areas (NSW DPIE 2018).	Suitable habitat present.  Potential to occur on site infrequently.
Diamond Firetail <i>Stagonopleura guttata</i>	V	-	Eucalypt woodlands, forests and mallee where there is grassy understorey west of the Great Div. also drier coastal woodlands (Higgins et al., 2006).	No suitable habitat present.  Not likely to occur.
Speckled Warbler <i>Chthonicola sagittata</i>	V	-	Temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts (Higgins and Peter 2002).	No suitable habitat present.  Not likely to occur.
Varied Sittella <i>Daphoenositta chrysoptera</i>	V	-	Open eucalypt woodlands forests and scrubs. May also forage within planted rough-barked trees (Higgins and Peter 2002).	Suitable habitat present.  Potential to occur on site infrequently.



**TABLE 3.1  
THREATENED FAUNA SPECIES OF THE AREA**

<b>Common Name Scientific Name</b>	<b>BC Act</b>	<b>EP&amp;BC Act</b>	<b>Preferred Habitat</b>	<b>Comments</b>
Grey-crowned Babbler (eastern subspecies) <i>Pomatostomus temporalis temporalis</i>	V	-	Found in dry open forests, woodland scrubland, and farmland with isolated trees. Occurs mostly west of the Great Divide except Hunter Valley (Higgins and Peter 2002).	No suitable habitat present.  Not likely to occur.
Flame Robin <i>Petroica phoenicea</i>	V	-	Upland moist Eucalypt forests and woodlands during breeding season, disperses to open lowland habitats during winter (Higgins and Peter 2002).	Suitable habitat present.  Vagrant to the area, not likely to occur.
Eastern Pygmy- possum <i>Cercartetus nanus</i>	V	-	Occurs in sandstone heath and adjoining rainforest habitats. (Turner and Ward 1995).	No suitable habitat present, site area is too small, fragmented and disturbed.  Not likely to occur.
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Shelters in hollow-bearing trees, fallen logs, small caves and rock crevices (NSW NPWS 1999).	No suitable habitat present.  Not likely to occur.
Parma Wallaby <i>Macropus parma</i>	V	-	Rainforests and wet and dry sclerophyll forests with a dense understorey and associated grassy patches (Menkhorst 2001).	No suitable habitat present.  Not likely to occur.
New Holland Mouse <i>Pseudomys novaehollandiae</i>	-	V	Within NSW occurs in a variety of structural vegetation types including heathland and woodland, dry sclerophyll forest with a dense shrub layer and on vegetated sand dunes (Wilson and Laidlaw 2003).	No suitable habitat present.  Not likely to occur.
Eastern Chestnut Mouse <i>Pseudomys gracilicaudatus</i>	V	-	Recently burnt (1.5-4yrs) dense, wet heath and swamps (NSW DPIE 2020).	No suitable habitat present.  Not likely to occur.
Southern Brown Bandicoot (eastern) <i>Isodon obesulus obesulus</i>	E	E	Open forest, woodland, heath, cleared land, urbanised areas and regenerating bushland with thick ground cover for shelter south of the Hawkesbury River (NSW DPIE 2020).	No suitable habitat present.  Not likely to occur.

**TABLE 3.1  
THREATENED FAUNA SPECIES OF THE AREA**

<b>Common Name Scientific Name</b>	<b>BC Act</b>	<b>EP&amp;BC Act</b>	<b>Preferred Habitat</b>	<b>Comments</b>
Yellow-bellied Glider <i>Petaurus australis</i>	V	-	Tall productive mature eucalypt forests with high nectar producing species. Shelters in large hollow bearing trees (Goldingay and Kavanagh 1991).	No suitable habitat present.  Not likely to occur.
Squirrel Glider <i>Petaurus norfolcensis</i>	V	-	Box-Ironbark and River Red Gum forest west of the Great Dividing Range and coastal forest with heath understorey. Shelters in tree hollows (Suckling 1995).	No suitable habitat present.  Not likely to occur.
Koala <i>Phascolarctos cinereus</i>	V	V	Wet & dry eucalypt forest on high nutrient soils containing preferred feed trees (Reed <i>et al.</i> , 1991).	Site is isolated from areas of historically reported habitat.  Not likely to occur.
Greater Glider <i>Petauroides volans</i>	-	V	Inhabits eucalypt forests and shelters in large hollow sections of eucalypt trees.	No suitable habitat present.
Long-nosed Potoroo <i>Potorous tridactylus</i>	V	V	Coastal heath and dry and wet sclerophyll forests with a dense understorey (Seebeck <i>et al.</i> , 1989).	No suitable habitat present.  Not likely to occur.
Yellow-bellied Sheathtail-bat <i>Saccolaimus flaviventris</i>	V	-	Wet and dry sclerophyll forest, open woodland, shrubland, mallee, grassland and desert. Roosts in tree hollows (Churchill 2008).	Suitable habitat present.  Potential to occur on site.
Eastern Coastal Free-tailed Bat <i>Micronomus norfolkensis</i>	V	-	Eucalypt forest and woodland on the coastal side of the Great Dividing Range. Roosts in tree hollows, under bark and in various man-made structures (Churchill 2008).	Suitable habitat present.  Potential to occur on site.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Roosts in trees in gullies, riparian habitats and urban areas (Tidemann 1995).	Suitable habitat present.  Observed flying over the site during surveys.
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies (Churchill 2008).	No suitable habitat present.
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V	-	Wet sclerophyll forest, open forest, rainforest and coastal mallee. Roosts in hollow trunks of eucalypts, caves and man-made structures (Churchill 2008).	Suitable habitat present.  Potential to occur on site.

TABLE 3.1 THREATENED FAUNA SPECIES OF THE AREA				
Common Name Scientific Name	BC Act	EP&BC Act	Preferred Habitat	Comments
Golden-tipped Bat <i>Kerivoula papuensis</i>	V	-	Rainforest and adjoining moist open forest habitats. Roosts in tree hollows, dense vegetation and Scrub Wren and Gerygone nests (Churchill 2008).	No suitable habitat present.  Not likely to occur.
Little Bent-winged Bat <i>Miniopterus australis</i>	V	-	Coastal forests, vine thickets and adjoining cleared areas. Roosts in caves, tree hollows and man-made structures (Churchill 2008).	Suitable habitat present.  Observed during surveys.
Large Bent-winged Bat <i>Miniopterus orianae oceanensis</i>	V	-	Coastal forests, vine thickets and adjoining cleared areas. Roosts in caves and man-made structures (Churchill 2008).	Suitable habitat present.  Potential to occur on site.
Southern Myotis <i>Myotis macropus</i>	V	-	Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water (Churchill 2008).	Suitable habitat present.  Potential to occur on site.
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	V	-	Moist gullies in mature coastal forest, rainforest, open woodland, sclerophyll forest and cleared areas with remnant trees. Roosts in tree hollows, under bark and in man-made structures (Churchill 2008).	Suitable habitat present.  Observed during surveys.
Eastern Cave Bat <i>Vespadelus troughtoni</i>	V	-	Inhabits woodland and wet and dry sclerophyll forest in areas with rock outcrops and caves for roosting (Churchill 2008).	Suitable habitat present.  Potential to occur on site.
CE = Critically Endangered Species Ext. = Presumed Extinct Species V = Vulnerable Species E = Endangered Species				

The locations of threatened fauna species observed during surveys are shown in Figure 2.1. The Grey-headed Flying-fox, Little Bent-winged Bat and Greater Broad-nosed Bat were observed during surveys.

The threatened fauna species which are considered to have suitable habitat within the subject have been assessed under the assessment of significance, as detailed in Section 4 of this report.

### 3.2 THREATENED FAUNA POPULATIONS

There are no threatened fauna populations listed within the local government area.

### 3.3 FAUNA HABITATS

The fauna habitats present consist of Dry Sclerophyll Forest (Umina Coastal Sandplain Woodland), Forest Wetlands (Swamp Oak Floodplain Forest) and Cleared Land / Disturbed habitats.

#### *Amphibians*

There is a watercourse present along the eastern boundary of the site. Common amphibian species may utilise vegetated areas within the site as shelter and foraging habitat, however this areas appears too disturbed for locally occurring threatened amphibian species.

#### *Reptiles*

The site provides suitable foraging and shelter habitat for reptile species. Microhabitats present include areas of accumulated leaf litter, a watercourse and debris including fallen timber.

#### *Birds*

The flower, nectar, fruit and seed producing tree and shrub species provide a seasonal foraging resource for bird species. No hollow bearing trees were observed.

#### *Mammals*

The flower, nectar, fruit and seed producing tree and shrub species provide a seasonal foraging resource for arboreal mammals and bat species. Understorey habitats for mammals consist of cleared land as well as native and exotic vegetation within the forested sections of the site. No hollow bearing trees were observed.

#### *Tree Hollows*

No hollow bearing trees were observed.

### 3.4 FAUNA SURVEY METHODOLOGY

In order to detect the possible occurrence of threatened fauna species specific methods targeting these species were employed.

#### ***Literature Review***

- Review of local resource documents;
- A search of the Bionet Atlas of NSW Wildlife (NSW DPIE 2020) was undertaken to identify records of threatened fauna species located within 10 km of the site. This enabled the preparation of a predictive list of threatened fauna species that could possibly occur within the habitats found on the site.

An fauna survey of the subject site was undertaken generally incorporating the methodologies outlined in Central Coast Council (2019). The fauna survey methods and effort applied was reduced to compensate for the highly disturbed nature of the site. The methods that were utilised consisted of:

- Targeted nocturnal and diurnal reptile and amphibian searches;
- Diurnal and nocturnal bird surveys;
- Diurnal and nocturnal mammal surveys;
- Recorded call playback for threatened nocturnal amphibian, bird and mammal species;
- Spotlighting / nocturnal watching of tree hollows;
- Microchiropteran bat echolocation call detection;
- Koala habitat assessment;
- Habitat searches and opportunistic observations during the completion of method specific fauna surveys; and
- Hollow bearing tree survey.

Fauna survey details are shown in Table 3.3 and fauna survey locations are shown in Figure 2.1.

TABLE 3.2 CURRENT FAUNA SURVEY DETAILS				
Survey Type	Date	Weather Conditions	Survey Method	Survey Effort/Time
Diurnal Surveys	6 November 2019	8/8 cloud, light ESE breeze, 25°C, no rain	Diurnal census	1530-1615 (0.75hrs)
	8 November 2019	8/8 cloud, SSW breeze, 25°C, no rain	Diurnal census	0745-0815 (0.5hrs)
	22 November 2019	8/8 cloud, light southerly breeze, 20°C, no rain	Amphibian habitat search Reptile habitat search Mammal census Bird census Hollow bearing tree survey Opportunistic observation	1500-1630 (1.5hrs)
Nocturnal Surveys	21 November 2019	8/8 cloud, calm, 23°C, no rain	Spotlight search  Quiet listening & Call playback for threatened nocturnal fauna  Ultrasonic microbat call recording survey x 2 detectors	2015-2115 (1 hr)
	2 December 2019	1/8 cloud, W breeze, 19°C, no rain	Spotlight search  Quiet listening & Call playback for threatened nocturnal fauna  Ultrasonic microbat call recording survey x 2 detectors	2000-2100 (1 hr)

### 3.5 FAUNA OBSERVED

The fauna species observed within the subject site are listed in Table 3.3.

The following threatened fauna species were observed within the subject site during current of previous surveys:

- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Little Bent-winged Bat (*Miniopterus australis*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

The Grey-headed Flying-fox was observed flying over the site on 2 December 2019 during nocturnal surveys, no roost or camp sites were observed within the site.

The Little Bent-winged Bat (*Miniopterus australis*) was detected during ultrasonic call recording surveys from three calls on 2 December 2019 and the Greater Broad-nosed Bat (*Scoteanax rueppellii*) was detected from 2 calls on 2 December 2019.

All other fauna species observed are considered relatively common within the local area.

**TABLE 3.3**  
**FAUNA OBSERVED WITHIN THE SUBJECT SITE**

Common Name	Scientific Name	Payne (2006)	Current Surveys
<b>Reptiles</b>	<i>Physignathus lesueurii</i>		O
Eastern Water Dragon	<i>Alectura lathamii</i>		O
<b>Birds</b>			
Australian Brush-turkey	<i>Threskiornis molucca</i>		O
Australian White Ibis	<i>Trichoglossus haematodus</i>		OW
Rainbow Lorikeet	<i>Cacatua galerita</i>		OW
Sulphur-crested Cockatoo	<i>Dacelo novaeguineae</i>		OW
Laughing Kookaburra	<i>Todiramphus sanctus</i>		W
Sacred Kingfisher	<i>Eudynamys orientalis</i>		OW
Eastern Koel	<i>Hirundo neoxena</i>		O
Welcome Swallow	<i>Rhipidura albiscapa</i>		OW
Grey Fantail	<i>Rhipidura leucophrys</i>		O
Willie Wagtail	<i>Eopsaltria australis</i>		W
Eastern Yellow Robin	<i>Acanthiza nana</i>		OW
Yellow Thornbill	<i>Malurus cyaneus</i>		OW
Superb Fairy-wren	<i>Pardalotus punctatus</i>		W
Spotted Pardalote	<i>Meliphaga lewinii</i>		OW
Lewin's Honeyeater	<i>Anthochaera carunculata</i>		OW
Red Wattlebird	<i>Ptilonorhynchus violaceus</i>		OW
Satin Bowerbird	<i>Cracticus torquatus</i>		OW
Grey Butcherbird	<i>Cracticus tibicen</i>		OW
Australian Magpie	<i>Anthochaera chrysoptera</i>		OW
Little Wattlebird	<i>Corvus coronoides</i>		OW
Australian Raven	<i>Streptopelia chinensis</i>		O
Spotted Dove*	<i>Sturnus tristis</i>		OW
Common Myna *	<i>Canis lupus familiaris</i>		O
<b>Mammals</b>			
Black Rat	<i>Rattus rattus</i>		Q
Dog *	<i>Pteropus poliocephalus</i>		O
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>		U
Little Bent-winged Bat	<i>Miniopterus australis</i>		U
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>		U
Grey-headed Flying-fox <sup>TS</sup>	<i>Physignathus lesueurii</i>		O
<b>Key to Observation Type</b>			
E - Nest / Roost		O - Observed	
F - Tracks / Scratchings / Chew Marks		OW - Observed and Heard Call	
FB - Burrow		P - Scat	
G - Crushed Cones		Q - Camera	
H - Hair / Feathers / Skin		T - Trapped	
K - Dead		U - Ultrasonic Recording	
M - Miscellaneous Record		W - Heard	
Note: * indicates introduced species. <sup>TS</sup> indicates listed threatened species			

## SECTION 4

### ASSESSMENTS AND CONCLUSIONS

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#### 4.1 ENVIRONMENTAL PROTECTION & BIODIVERSITY CONSERVATION ACT (1999) ASSESSMENT

The *Environment Protection and Biodiversity Conservation Act*, (1999) requires that Commonwealth approval be obtained for certain actions. The Act provides an assessment and approvals systems for actions that have a significant impact on matters of National Environment Significance (NES). These may include:-

- Wetlands protected by international treaty (the Ramsar Convention);
- Nationally listed threatened species and ecological communities;
- Nationally listed migratory species.

Actions are projects, developments, undertakings, activities, series of activities or alteration of any of these. An action that needs Commonwealth approval is known as a controlled action. A controlled action needs approval where the Commonwealth decides the action would have a significant effect on a NES matter.

Where a proposed activity is located in an area identified to be of NES, or such that it is likely to significantly affect threatened species, ecological communities, migratory species or their habitats, the matter needs to be referred to the Australian Government Department of Agriculture, Water and the Environment (DAWE).

The following assessment in accordance with the EP&BC Act Policy Statement 1.1 *Significant Impact Guidelines* (AGDE 2013) is provided:

**i. Are there any Matters of National Environmental Significance located in the area of the proposed action?**

A search of the Protected Matters Search Tool (DAWE 2020) was conducted for EPBC Listed threatened and migratory species recorded within 5 km of the subject site. The Protected Matters Search Report is attached as Appendix 2.

Suitable habitat is present for the following nationally listed threatened or migratory species recorded from the Protected Matters Search (DAWE 2020) which occur or which may occur within 5 km of the subject site:

**Threatened Species**

- *Syzygium paniculatum*
- Regent Honeyeater (*Anthochaera phrygia*)
- Swift Parrot (*Lathamus discolor*); and
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox was observed flying over the site during surveys.

**Migratory Species**

- Oriental Cuckoo (*Cuculus optatus*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Black-faced Monarch (*Monarcha melanopsis*)
- Satin Flycatcher (*Myiagra cyanoleuca*)
- Rufous Fantail (*Rhipidura rufifrons*)

No nationally listed migratory species were observed within the subject site during surveys.

### **Threatened Ecological Communities**

No nationally listed threatened ecological communities have suitable habitat present within the subject site.

**ii. Considering the proposed action at its broadest scope, is there potential for impacts on Matters of National Environmental Significance?**

Yes, the proposal will require the removal or modification of approximately 0.2 hectares of vegetated habitats within the site which are suitable for nationally listed threatened and migratory species.

**iii. Are there any proposed measures to avoid or reduce impacts on Matters of National Environmental Significance?**

Yes, the proposed development areas have been situated to minimise impacts including removal of vegetation and habitats for nationally listed threatened and migratory biodiversity.

**iv. Are any impacts of the proposed action on Matters of National Environmental Significance likely to be significant impacts?**

Assessments are provided as follows for nationally listed threatened species and ecological communities and nationally listed migratory species which were not observed during surveys, however have suitable habitat present within the subject site.

### **Nationally Listed Threatened Species (Vulnerable)**

With regard to nationally listed vulnerable species with suitable habitat present which were not observed during surveys, it is considered that the proposal is not likely to:

- lead to a long-term decrease in the size of an important population of a species;
- reduce the area of occupancy of an important population;
- fragment an existing important population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of an important population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat;
- introduce disease that may cause a species to decline; or
- interfere with the recovery of the species.

The following reasons are provided:

- There are larger areas of higher quality habitat for locally occurring nationally listed threatened species present within the locality, including lands reserved for conservation such as Brisbane Water National Park;
- No Grey-headed Flying-fox camp sites are located within the site; and
- The area of proposed habitat loss is relatively small in area, and the majority of the intact habitats present will be retained.

### **Nationally Listed Threatened Species (endangered and critically endangered)**

With regard to nationally listed endangered and critically endangered species with suitable habitat present, it is considered that the proposal is not likely to:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat;



- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

The following reasons are provided:

- There are larger areas of higher quality habitat for locally occurring nationally listed threatened species present within the locality, including lands reserved for conservation such as Brisbane Water National Park; and
- The area of proposed habitat loss is relatively small in area, and the majority of the intact habitats present will be retained.

#### **Nationally Listed Migratory Species**

With regard to nationally listed migratory species it is considered that the proposal is not likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The following reasons are provided:

- No nationally listed migratory species were observed during surveys
- The subject site does not contain important habitat for a nationally listed migratory species;
- The area of proposed habitat loss is relatively small in area; and
- The area of proposed habitat loss is relatively small in area, and the majority of the intact habitats present will be retained.

#### **Nationally Listed Endangered Ecological Communities**

It is considered that the proposal is not likely to have a significant impact on nationally listed endangered or critically ecological communities as the proposal is not likely to:

- reduce the extent of an ecological community
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
- adversely affect habitat critical to the survival of an ecological community
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
  - assisting invasive species, that are harmful to the listed ecological community, to become established, or
  - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
- interfere with the recovery of an ecological community.

The following reasons are provided:

- The vegetation within the subject site does not correspond to a nationally listed endangered or critically endangered ecological community.

### **CONCLUSION**

It is considered that the proposed action is not likely to have a significant impact on nationally listed threatened or migratory species or nationally listed threatened ecological communities. It is considered that the future development of the site is not likely to require a referral to DAWE for impacts to threatened or migratory biodiversity currently listed under the *EPBC Act 1999*.

## 4.2 BC ACT (2016) TEST OF SIGNIFICANCE

The following Test of Significance has been completed in accordance with Section 7.3 of the *Biodiversity Conservation Act* (2016) to determine whether the proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.

This Assessment has been completed in accordance with the Threatened Species Test of Significance Guidelines (NSW OEH 2018), for those threatened species, populations and ecological communities listed within the BC Act (2016) observed during surveys or identified as having suitable habitat contained within the subject site.

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

### THREATENED FLORA SPECIES

#### ***Syzygium paniculatum***

This species is usually found growing in or near subtropical and littoral rainforests on sandy soils, stabilised dunes near the sea or sheltered gullies, especially near watercourses (Fairly and Moore 1995).

This species was not observed within the subject site during surveys and is not likely to occur within the site.

The proposal is not likely to directly impact an area of known habitat for this species and

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

### THREATENED FAUNA SPECIES

#### ***Superb Fruit-dove (Ptilinopus superbus)***

This species inhabits mostly closed forests, occasionally near streams or lakes within rainforest. Breeding most commonly occurs within dense forests. They are a regular autumn and winter migrant to the Hunter, Sydney, Illawarra and South Coast regions. This species is frugivorous, taking fruits of many species of rainforest trees, vines and palms (Higgins & Davies 1996).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised on occasion.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

#### ***Rose-crowned Fruit-dove (Ptilinopus regina)***

The Rose-crowned Fruit-dove inhabits tall tropical and subtropical, evergreen or semi-deciduous rainforest, especially with dense growth of vines. In NSW this species is widespread in north-east, in Northern Rivers, Northern Tablelands, and Mid-North Coast Regions. This species is frugivorous, taking fruits of many species of rainforest trees, palms, and vines, feeding mainly in the canopy but also in low trees and undergrowth (Higgins & Davies 1996).

This species was not observed within the subject site during surveys. The site contains a

small area of suitable foraging habitat for this species which may be utilised on occasion.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Bush Stone-curlew (*Burhinus grallarius*)**

The Bush Stone-curlew occurs in open woodland with fallen branches, leaf-litter, sparse grass, timber along dry watercourses, sand plains with spinifex and mallee, sandy scrub near beaches, mangrove-fringes, country golf courses, timber remnants on roadsides, plantations and urban areas (Marchant and Higgins 1993). They are loyal to breeding sites and may abandon nesting and foraging areas if the grass becomes unmanaged and over approximately 15cm in height.

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger home range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Square-tailed Kite (*Lophoictinia isura*)**

The Square-tailed Kite inhabits the coastal forested and wooded lands of tropical and temperate Australia. The Square-tailed Kite is a specialist hunter of passerines, especially honeyeaters, and insects in the tree canopy, picking most prey items from the outer foliage (Marchant & Higgins 1993).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Little Eagle (*Hieraaetus morphnoides*)**

This species forages in a variety of habitats including woodland open forest, partially cleared areas, along watercourses and around wetlands, avoiding large areas of dense forest. This species nests in mature living trees in open forest, woodland and remnant areas including farmland and areas close to urban development (Marchant and Higgins 1993).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview

Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Little Lorikeet (*Glossopsitta pusilla*)**

Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Lorikeets are gregarious, usually foraging in small flocks, often with other species of lorikeet. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including, melaleucas and mistletoes (Courtney & Debus 2006).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Glossy Black-Cockatoo (*Calyptrorhynchus lathamii*)**

The Glossy Black-Cockatoo inhabits woodlands and open sclerophyll forests dominated by or with a middle stratum of *Allocasuarina*. They choose trees with larger cone crops, concentrating foraging in trees with a high ratio of total seed weight to cone weight. They breed in hollow trees or stumps usually in Eucalypts (Higgins 1999).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Gang-gang Cockatoo (*Callocephalon fimbriatum*)**

The Gang-gang Cockatoo is associated with a variety of woodland and forest habitats, and occasionally more open areas in south-eastern New South Wales and Victoria. This species utilises eucalypt forests and exotic trees, and is known to feed on the seeds of native shrubs and trees, in addition to some exotic species such as the Hawthorn and Cupressus species (Higgins 1999).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of

this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Powerful Owl (*Ninox strenua*)**

The Powerful Owl breeds in open or closed sclerophyll forests and woodlands, including wet sclerophyll forest and dry sclerophyll forest and woodlands. They nest in hollows in large old trees; usually living Eucalyptus, within or below canopy in stumps or broken-off trunks. Powerful Owls are sedentary within home ranges of about 1,000 hectares within open eucalypt, casuarina or Callitris pine forest and woodlands, though they often roost in denser vegetation, including rainforest or exotic pine plantations. Powerful Owls feed mainly on medium-sized arboreal marsupials (Higgins 1999).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger home range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Masked Owl (*Tyto novaehollandiae*)**

The Masked Owl is widespread through forests and woodlands. The Masked Owl is known to utilise forest margins and isolated stands of trees within agricultural land. This species is often found in heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained. The Masked Owl is dependent upon hollow bearing trees all year round requiring old mature trees with large hollows for breeding and as diurnal roosting sites (Higgins 1999).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger home range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Barking Owl (*Ninox connivens*)**

The Barking Owl utilises dry sclerophyll forests and woodlands of tropical, temperate and semi-arid zones, particularly those associated with watercourses, wetlands and forest edges. Nests in large hollows in live eucalypts, often near open country (Higgins 1999).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger home range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Swift Parrot (*Lathamus discolor*)**

This species feeds mainly on nectar and lerp from eucalypt flowers, particularly Blue Gum (*Eucalyptus globulus*). On the mainland, the Swift Parrot congregates where winter flowering species such as Yellow Gum, Red Ironbark, Mugga Ironbark, Box Gums and Swamp Gum. This species also occurs within Blackbutt, Forest Red Gum, Swamp Mahogany and Spotted Gum dominated communities along the coast. The Swift Parrot is a migratory species that breeds in Tasmania and its offshore islands in summer. In late March almost the entire population migrates to mainland Australia spreading from Victoria through to central and coastal NSW and south east Queensland (Saunders and Tzaros 2011).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Scarlet Robin (*Petroica boodang*)**

This species inhabits mainly dry eucalypt forest and woodlands with open shrubby and grassy understorey on ridges and slopes during the spring-summer breeding season, dispersing during autumn–winter into open habitats including urban areas (Higgins and Peter 2002).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Regent Honeyeater (*Anthochaera phrygia*)**

The Regent Honeyeater inhabits mostly dry eucalypt woodlands and forests dominated by box ironbark eucalypts; on inland slopes of Great Divide, especially associations in moister more fertile sites, along creeks, broad river valleys and on lower slopes of foothills. Nectar is the principle food but sugary exudates from insects are also used. The Regent Honeyeater is known to breed along the western Slopes of the Great Dividing Range in New South Wales (Higgins et al., 2001).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)**

This species inhabits a variety of habitats including forest, woodland, shrubland, heath and disturbed environments. Widespread species which inhabits inland and coastal areas (OEH 2017).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Varied Sittella (*Daphoenositta chrysoptera*)**

This species inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland (Higgins & Peter 2002).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Flame Robin (*Petroica phoenicea*)**

This species inhabits upland wet to moist eucalypt forests and woodlands with an open understorey, often on ridges and slopes to 1800m above sea level during the spring-summer breeding season. During the autumn to winter non breeding season this species disperses to open lowland habitats including grasslands, farmland dry sclerophyll forests and woodlands (Higgins and Peter 2002).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Grey-headed Flying-fox (*Pteropus poliocephalus*)**

Grey-headed Flying-foxes roost in camps during the day, which may contain tens of thousands of individuals, and then disperse to surrounding areas to forage at night. This species inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and urbanised and agricultural areas. Camps are commonly formed in gullies, typically not far from water and usually in vegetation with a dense canopy. Camps may also be formed in urban parkland areas (Tidemann 1995).

This species not observed within the subject site during surveys. The proposed development area contains 0.2 ha of highly disturbed potential foraging habitat for this species which may be utilised occasionally as part of a larger range. No roost or camp sites were observed within the site.

Approximately 0.23 ha of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*)**

The Yellow-bellied Sheath-tail-bat inhabits a wide variety of habitats from wet and dry sclerophyll forest, to open woodland, shrubland, mallee, grassland and desert. They fly fast and straight usually over the canopy, and lower over open spaces and at forest edges. This species roosts in large tree hollows (Churchill 2008).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)**

The Eastern Free-tail-bat utilises dry eucalypt forest and woodland on the coastal side of the Great Dividing Range. They show a preference for open spaces in woodland or forest, and are more active in the upper slopes of forest areas rather than in riparian zones. They also forage over large waterways. This species roosts in hollow trees (usually in hollow spouts), under exfoliating bark and in various man-made structures (Churchill 2008).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)**

The Eastern False Pipistrelle inhabits wet sclerophyll forest, open forest, rainforest and coastal mallee. They generally prefer tall and wet forests where the trees are more than 20 metres high and the understorey is dense. This species predominantly roosts in hollow trunks of eucalypts, however have also been reported to roost in caves and old buildings (Churchill 2008).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.



An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Little Bent-winged Bat (*Miniopterus australis*)**

The Little Bent-winged Bat forages below the canopy within well-timbered areas including rainforest, vine thicket, wet and dry melaleuca swamps and coastal forests. This species is a cave dweller with individuals congregating during the summer months in maternity colonies and disperse during the winter. Other roost sites used by this species include abandoned mines, tunnels, stormwater drains and occasionally in buildings, banana trees and tree hollows (Churchill 2008).

This species was observed within the subject site during surveys. The proposed development area contains 0.2 ha of highly disturbed potential foraging habitat for this species which may be utilised occasionally as part of a larger range. No hollow bearing trees were observed within the proposed development area.

Approximately 0.23 ha of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve which will not be impacted by the proposal.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Large Bent-winged Bat (*Miniopterus orianae oceanensis*)**

Preferred habitats for this species include rainforest, wet and dry sclerophyll forest, open woodland, Melaleuca forests and open grassland. The Large Bent-winged Bat forages high in forested areas from just above canopy height to many times canopy height. In more open areas such as grasslands, flight may be within a few metres of the ground. Eastern Bent-winged Bats are cave dwellers, but will also roost in man-made structures such as road culverts and mines (Churchill 2008).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Southern Myotis (*Myotis macropus*)**

The Large-footed Myotis has a strong association with streams and permanent waterways, most commonly within vegetated areas at lower elevations and in flat undulating country. This species forages over water for small insects, fish and invertebrates and have a preference for large pools rather than flowing streams. Roost habitats for this species are near water and include caves, tree hollows, abandoned fairy martin nests, among vegetation, in clumps of Pandanus, and man-made structures including under bridges, in mines, tunnels, road culverts and stormwater drains (Churchill 2008).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as

part of a larger range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Greater Broad-nosed Bat (*Scoteanax rueppellii*)**

A wide variety of habitats are utilised by this species including moist gullies in mature coastal forest, rainforest, open woodland, Melaleuca swamp woodland, wet and dry sclerophyll forest, cleared areas with remnant trees and tree-lined creeks in open areas. The Greater Broad-nosed Bat forages about 5m from the edge of isolated trees, forest remnants or along forest crowns with a slow direct flight pattern. This species is known to roost in tree hollows, cracks and fissures in trunks and dead branches, under exfoliating bark, as well as in man-made structures including roofs of old buildings (Churchill 2008).

This species was observed within the subject site during surveys. The proposed development area contains 0.2 ha of highly disturbed potential foraging habitat for this species which may be utilised occasionally as part of a larger range. No hollow bearing trees were observed within the proposed development area.

Approximately 0.23 ha of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve which will not be impacted by the proposal.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

**Eastern Cave Bat (*Vespadelus troughtoni*)**

Records for this species are in close proximity to sandstone and volcanic escarpments. They inhabit tropical mixed woodland and wet and dry sclerophyll forest along the coast and the Great Dividing Range, extending into the western slopes and inland areas. This species roost in small groups in sandstone overhang caves, boulder piles, mines and occasionally buildings. They also roost in abandoned fairy martin nests under bridges and in culverts (Churchill 2008).

This species was not observed within the subject site during surveys. The site contains a small area of suitable foraging habitat for this species which may be utilised occasionally as part of a larger home range.

An area of suitable habitat for this species will be retained within the eastern section of the site and there are larger areas of suitable habitat present offsite within the adjoining Hillview Street Bush Reserve.

It is considered that the proposed action will not have an adverse effect on the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

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

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

**Swamp Oak Floodplain Forest**

The Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SOFF) endangered ecological community (EEC) occupies approximately

0.17 ha of the subject site. This EEC corresponds with PCT 1232 and is mapped in Figure 2.1.

The proposal will result in the removal of approximately 0.01 ha of the SOFF EEC. Approximately 0.16 ha of the SOFF EEC will be retained as part of the proposal.

It is therefore considered that the proposed action is not likely to have an adverse effect on the extent of the SOFF EEC such that its local occurrence is likely to be placed at risk of extinction.

#### **Umina Coastal Sandplain Woodland**

The Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion (UCSW) EEC occupies approximately 0.25 ha of the subject site. This EEC corresponds with PCT 1645 and is mapped in Figure 2.1.

Based on mapping undertaken by Bell (2013), the UCSW EEC has a local occurrence of approximately 23.96 ha, as mapped in Figure 4.1. The proposal will require the removal of approximately 0.19 ha of the UCSW EEC. The local occurrence remaining following clearing for the proposed future development of the site will be approximately 23.77 ha, including approximately 0.06 ha within the subject site.

It is therefore considered that the proposed action is not likely to have an adverse effect on the extent of the UCSW EEC, such that its local occurrence is likely to be placed at risk of extinction.

#### **ii. *Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***

##### **Swamp Oak Floodplain Forest**

The Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SOFF) endangered ecological community (EEC) occupies approximately 0.17 ha of the subject site. This EEC corresponds with PCT 1232 and is mapped in Figure 2.1.

The proposal will result in the removal of approximately 0.01 ha of the SOFF EEC and approximately 0.16 ha of this EEC will be retained and managed for conservation on the subject site as part of the proposal.

It is therefore considered that the proposed action is not likely to substantially and adversely modify the composition of the SOFF EEC such that its local occurrence is likely to be placed at risk of extinction.

##### **Umina Coastal Sandplain Woodland**

The Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion endangered ecological community (UCSW EEC) occupies approximately 0.25 hectares of the subject site.

Based on mapping undertaken by Bell (2013), the UCSW EEC has a local occurrence of approximately 23.96 ha, as mapped in Figure 4.1. The proposal will require the removal of approximately 0.19 ha of the UCSW EEC. The local occurrence remaining following clearing for the proposed future development of the site will be approximately 23.77 ha, including approximately 0.06 ha within the subject site.

It is therefore considered that the proposed action is not likely to substantially and adversely modify the composition of the UCSW EEC such that its local occurrence is likely to be placed at risk of extinction.







**c) *In relation to the habitat of a threatened species or ecological community:***

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

The proposal will result in the removal or modification of approximately 0.2 hectares of vegetation and habitats mapped in Figure 2.1, including 0.01 hectares of the SOFF EEC, 0.19 ha of the UCSW EEC and approximately 0.1 ha of Cleared Land.

A total of 0.16 ha of Swamp Oak Floodplain Forest EEC 0.06 ha of Umina Coastal Sandplain Woodland EEC and will be retained and managed within the site.

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

The proposed development footprint is surrounded by cleared and developed areas to the north, south and west. A riparian corridor will be retained within the eastern section of the site which will continue to provide connectivity.

It is therefore considered that the proposal is not likely to result in an area of habitat becoming fragmented or isolated from other areas of habitat.

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

With regard to the habitats to be impacted, the following considerations are provided:

- Due to the position of the development footprint in the context of the site and surrounding landscape it is considered that the habitats to be removed and modified do not provide an important linkage for threatened species, populations of ecological communities;
- Larger areas of higher quality habitats are proposed to be retained and managed within the site.

It is therefore concluded that the habitats within the site are not likely to be of significant importance to the long-term survival of the threatened species, populations or ecological community within the locality.

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

The subject site has not been listed as a declared area of outstanding biodiversity value. The proposed development is not likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

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

The proposal is likely to increase the impact of the key threatening process 'Clearing of native vegetation'. It is considered that the proposal is unlikely to increase the operation of this key threatening process to the extent that a significant effect on threatened biodiversity will occur.

**BC ACT (2016) TEST OF SIGNIFICANCE CONCLUSION**

Based on the ecological surveys completed and assessments undertaken above it is concluded that the proposed development is not likely to have a significant effect on threatened species, ecological communities or their habitats as listed within the *BC Act* (2016).

#### 4.3 STATE ENVIRONMENTAL PLANNING POLICIES

##### **SEPP Coastal Management (2018)**

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

The subject site is mapped within the Coastal Environment Area under this SEPP and it is considered that the proposal is appropriately designed and sited and will be managed to minimise impacts to the matters identified in Clause 13 (1) of the SEPP.

##### **SEPP (Koala Habitat Protection) 2019**

The subject site does not have an area of more than 1 hectare in size, therefore this SEPP does not apply.

#### 4.4 CONCLUSIONS

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

- i. No threatened flora species listed within the *BC Act* or the *EPBC Act* were observed within the subject site.
- ii. The following threatened fauna species were observed within the subject site during surveys:
  - Grey-headed Flying-fox (*Pteropus poliocephalus*)
  - Little Bent-winged Bat (*Miniopterus australis*);
  - Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- iii. The endangered ecological communities, Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion and Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, as listed within the *BC Act* (2016), was observed within the subject site.
- iv. No migratory species listed within the *EPBC Act* (1999), were observed within the subject site.
- v. The proposed rezoning and future development of the site is not likely to significantly affect threatened species, in accordance with Section 7.2 of the Biodiversity Conservation Act (2016);
- vi. The rezoning and future development of the site is not likely to trigger the Biodiversity Offset Threshold identified in Part 7 of the Biodiversity Conservation Regulation (2017); and
- vii. A Biodiversity Development Assessment Report is not likely to be required for a future development application following rezoning;
- viii. The rezoning and future development of the site is not likely to require a referral under the *Environment Protection and Biodiversity Conservation Act* (1999).

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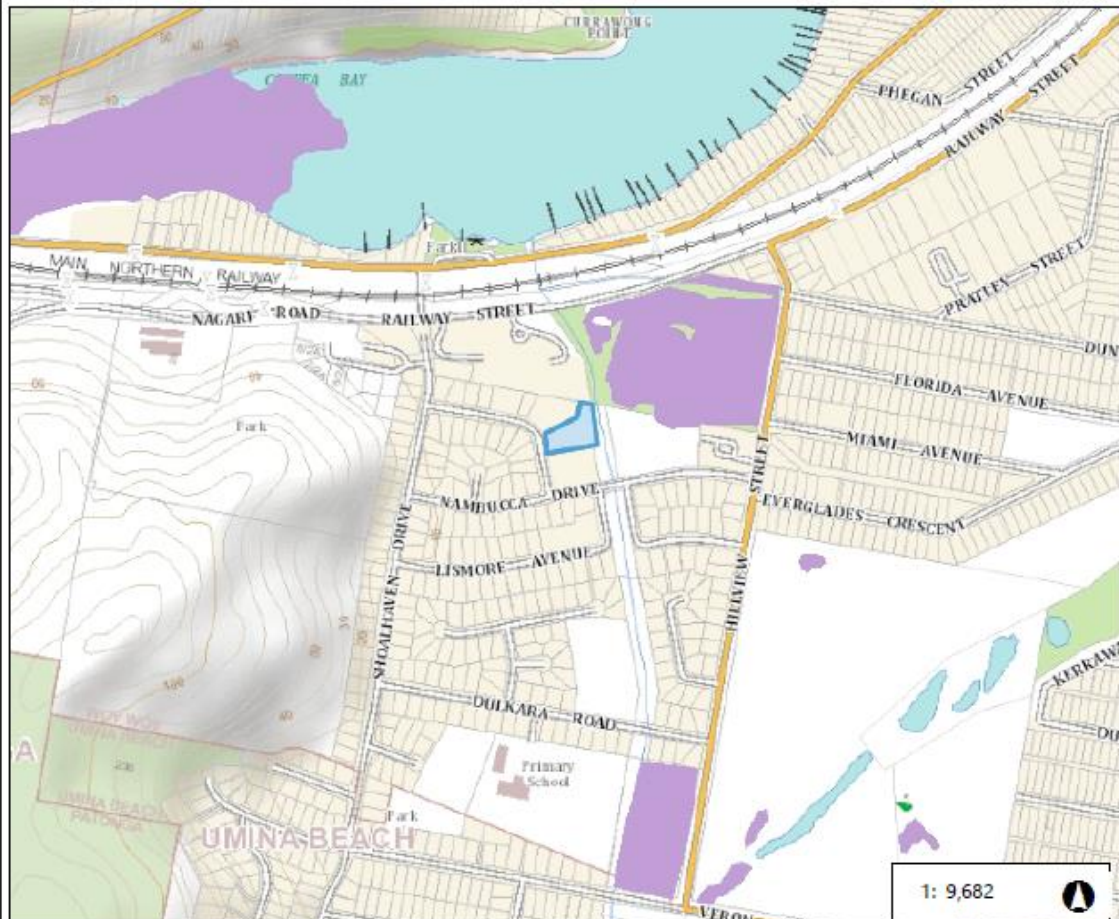
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## APPENDIX 1

### BOSET REPORT

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## Biodiversity Offset Scheme (BOS) Entry Threshold Map



491.8 0 245.91 491.8 Metres  
WGS\_1984\_Web\_Mercator\_Auxiliary\_Sphere

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

THIS MAP IS NOT TO BE USED FOR NAVIGATION

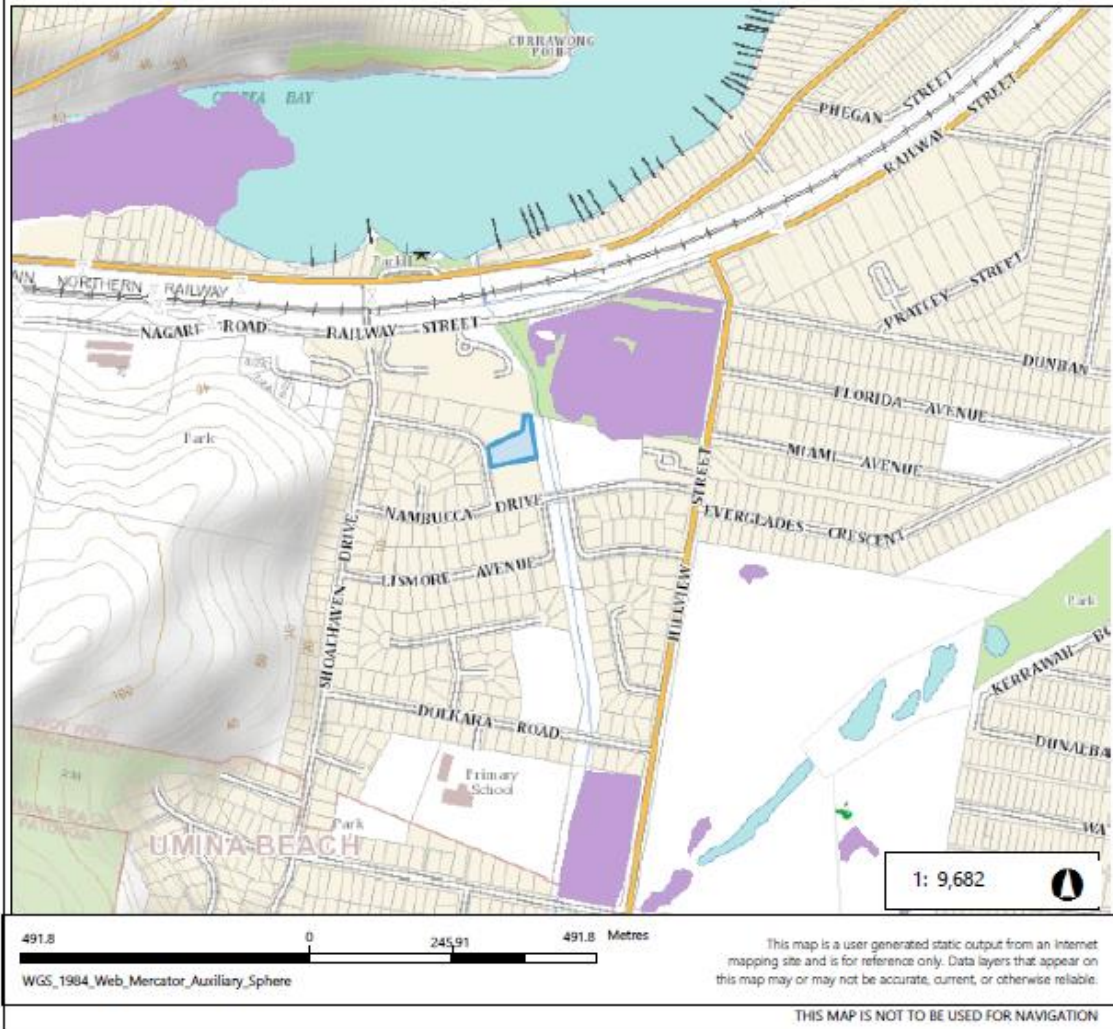
### Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days

### Notes

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## Biodiversity Offset Scheme (BOS) Entry Threshold Map



### Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days

### Notes

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## Biodiversity Values Map and Threshold Report

### Results Summary

<b>Date of Calculation</b>	30/04/2020 4:30 PM	<b>BDAR Required*</b>
<b>Total Digitised Area</b>	0.31 ha	
<b>Minimum Lot Size Method</b>	Lot size	
<b>Minimum Lot Size</b>	0.35 ha	
<b>Area Clearing Threshold</b>	0.25 ha	
<b>Area clearing trigger</b> Area of native vegetation cleared	Unknown #	Unknown #
<b>Biodiversity values map trigger</b> Impact on biodiversity values map(not including values added within the last 90 days)?	no	no
<b>Date of the 90 day Expiry</b>	N/A	

\*If BDAR required has:

- at least one "Yes": you have exceeded the BOS threshold. You are now required to submit a Biodiversity Development Assessment Report with your development application. Go to <https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor> to access a list of assessors who are accredited to apply the Biodiversity Assessment Method and write a Biodiversity Development Assessment Report
- "No": you have not exceeded the BOS threshold. You may still require a permit from local council. Review the development control plan and consult with council. You may still be required to assess whether the development is "likely to significantly affect threatened species" as determined under the test in s. 7.3 of the Biodiversity Conservation Act 2016. You may still be required to review the area where no vegetation mapping is available.

# Where the area of impact occurs on land with no vegetation mapping available, the tool cannot determine the area of native vegetation cleared and if this exceeds the Area Threshold. You will need to work out the area of native vegetation cleared - refer to the BOSET user guide for how to do this.

On and after the 90 day expiry date a BDAR will be required.

## Disclaimer

This results summary and map can be used as guidance material only. This results summary and map is not guaranteed to be free from error or omission. The State of NSW and Office of Environment and Heritage and its employees disclaim liability for any act done on the information in the results summary or map and any consequences of such acts or omissions. It remains the responsibility of the proponent to ensure that their development application complies with all aspects of the *Biodiversity Conservation Act 2016*.

The mapping provided in this tool has been done with the best available mapping and knowledge of species habitat requirements. This map is valid for a period of 30 days from the date of calculation (above).

## Acknowledgement

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

Signature \_\_\_\_\_ Date: 30/04/2020 04:30 PM



## Biodiversity Values Map and Threshold Report

### Results Summary

Date of Calculation	03/12/2019 1:35 PM	BDAR Required*
Total Digitised Area	0.26 ha	
Minimum Lot Size Method	Lot size	
Minimum Lot Size	0.35 ha	
Area Clearing Threshold	0.25 ha	
Area clearing trigger Area of native vegetation cleared	Unknown #	Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	no	no
Date of the 90 day Expiry	N/A	

\*If BDAR required has:

- at least one 'Yes': you have exceeded the BOS threshold. You are now required to submit a Biodiversity Development Assessment Report with your development application. Go to <https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor> to access a list of assessors who are accredited to apply the Biodiversity Assessment Method and write a Biodiversity Development Assessment Report
  - 'No': you have not exceeded the BOS threshold. You may still require a permit from local council. Review the development control plan and consult with council. You may still be required to assess whether the development is "likely to significantly affect threatened species" as determined under the test in s. 7.3 of the Biodiversity Conservation Act 2016. You may still be required to review the area where no vegetation mapping is available.
- # Where the area of impact occurs on land with no vegetation mapping available, the tool cannot determine the area of native vegetation cleared and if this exceeds the Area Threshold. You will need to work out the area of native vegetation cleared - refer to the BOSET user guide for how to do this.

On and after the 90 day expiry date a BDAR will be required.

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The mapping provided in this tool has been done with the best available mapping and knowledge of species habitat requirements. This map is valid for a period of 30 days from the date of calculation (above).

### Acknowledgement

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

Signature \_\_\_\_\_ Date: 03/12/2019 01:35 PM

## **APPENDIX 2**

### **EPBC ACT PROTECTED MATTERS SEARCH REPORT**

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## EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 30/04/20 16:34:22

### [Summary](#)

### [Details](#)

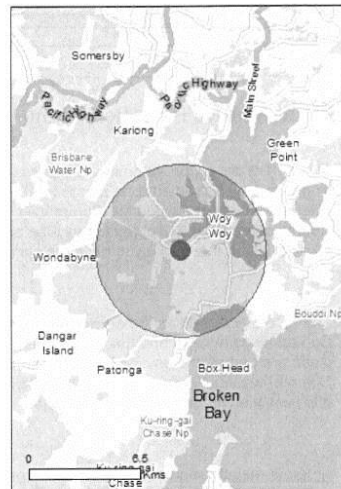
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

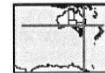
### [Caveat](#)

### [Acknowledgements](#)



This map may contain data which are  
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[Coordinates](#)  
[Buffer: 5.0Km](#)





## Summary

### Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<u>World Heritage Properties:</u>	None
<u>National Heritage Places:</u>	None
<u>Wetlands of International Importance:</u>	None
<u>Great Barrier Reef Marine Park:</u>	None
<u>Commonwealth Marine Area:</u>	None
<u>Listed Threatened Ecological Communities:</u>	4
<u>Listed Threatened Species:</u>	82
<u>Listed Migratory Species:</u>	63

### Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<u>Commonwealth Land:</u>	2
<u>Commonwealth Heritage Places:</u>	None
<u>Listed Marine Species:</u>	85
<u>Whales and Other Cetaceans:</u>	11
<u>Critical Habitats:</u>	None
<u>Commonwealth Reserves Terrestrial:</u>	None
<u>Australian Marine Parks:</u>	None

### Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<u>State and Territory Reserves:</u>	5
<u>Regional Forest Agreements:</u>	1
<u>Invasive Species:</u>	47
<u>Nationally Important Wetlands:</u>	1
<u>Key Ecological Features (Marine):</u>	None

## Details

### Matters of National Environmental Significance

#### Listed Threatened Ecological Communities [ Resource Information ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
<a href="#">Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community</a>	Endangered	Community likely to occur within area
<a href="#">Coastal Upland Swamps in the Sydney Basin Bioregion</a>	Endangered	Community likely to occur within area
<a href="#">Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion</a>	Endangered	Community likely to occur within area
<a href="#">Subtropical and Temperate Coastal Saltmarsh</a>	Vulnerable	Community likely to occur within area

#### Listed Threatened Species [ Resource Information ]

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Dasyornis brachypterus</a> Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea antipodensis gibsoni</a> Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
<u>Diomedea sanfordi</u> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Fregetta grallaria grallaria</u> White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
<u>Grantiella picta</u> Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
<u>Hirundapus caudacutus</u> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
<u>Lathamus discolor</u> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
<u>Limosa lapponica baueri</u> Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
<u>Limosa lapponica menzbieri</u> Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
<u>Macronectes giganteus</u> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<u>Macronectes halli</u> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<u>Numenius madagascariensis</u> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<u>Pachyptila turtur subantarctica</u> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
<u>Pterodroma leucoptera leucoptera</u> Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
<u>Pterodroma neglecta neglecta</u> Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
<u>Rostratula australis</u> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
<u>Sternula nereis nereis</u> Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche bulleri</u> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche bulleri platei</u> Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche cauta cauta</u> Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
<u>Thalassarche cauta</u> <u>steadii</u> White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche eremita</u> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche impavida</u> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche melanophris</u> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche salvini</u> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Thinornis rubricollis</u> <u>rubricollis</u> Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat likely to occur within area
<b>Fish</b>		
<u>Epinephelus daemeli</u> Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
<u>Macquaria australasica</u> Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
<u>Prototroctes maraena</u> Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
<b>Frogs</b>		
<u>Heleioporus australiacus</u> Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area
<u>Litoria aurea</u> Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
<u>Litoria littlejohni</u> Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat likely to occur within area
<u>Mixophyes balbus</u> Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
<u>Mixophyes iteratus</u> Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat known to occur within area
<b>Mammals</b>		
<u>Balaenoptera musculus</u> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<u>Chalinolobus dwyeri</u> Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
<u>Dasyurus maculatus</u> <u>maculatus</u> (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
<u>Eubalaena australis</u> Southern Right Whale [40]	Endangered	Species or species

Name	Status	Type of Presence habitat likely to occur within area
<u>Megaptera novaeangliae</u> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<u>Petauroides volans</u> Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
<u>Petrogale penicillata</u> Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
<u>Phascolarctos cinereus</u> (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
<u>Potorous tridactylus tridactylus</u> Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
<u>Pseudomys novaehollandiae</u> New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
<u>Pteropus poliocephalus</u> Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
<u>Acacia bynoeana</u> Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
<u>Asterolasia elegans</u> [56780]	Endangered	Species or species habitat may occur within area
<u>Astrotricha crassifolia</u> Thick-leaf Star-hair [10352]	Vulnerable	Species or species habitat known to occur within area
<u>Baloskion longipes</u> Dense Cord-rush [68511]	Vulnerable	Species or species habitat may occur within area
<u>Caladenia tessellata</u> Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
<u>Cryptostylis hunteriana</u> Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
<u>Cynanchum elegans</u> White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
<u>Darwinia biflora</u> [14619]	Vulnerable	Species or species habitat may occur within area
<u>Eucalyptus camfieldii</u> Camfield's Stringybark [15460]	Vulnerable	Species or species habitat likely to occur within area
<u>Genoplesium baueri</u> Yellow Gnat-orchid [7528]	Endangered	Species or species habitat likely to occur within area
<u>Grevillea shiressii</u> [19186]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence within area
<u>Haloragis exalata</u> subsp. <u>exalata</u> Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
<u>Melaleuca biconvexa</u> Biconvex Paperbark [5583]	Vulnerable	Species or species habitat likely to occur within area
<u>Melaleuca deanei</u> Deane's Melaleuca [5818]	Vulnerable	Species or species habitat may occur within area
<u>Persicaria elatior</u> Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
<u>Persoonia hirsuta</u> Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat likely to occur within area
<u>Pimelea curviflora</u> var. <u>curviflora</u> [4182]	Vulnerable	Species or species habitat likely to occur within area
<u>Prostanthera askania</u> Tranquillity Mintbush, Tranquillity Mintbush [64958]	Endangered	Species or species habitat may occur within area
<u>Prostanthera junonis</u> Somersby Mintbush [64960]	Endangered	Species or species habitat may occur within area
<u>Syzygium paniculatum</u> Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
<u>Thesium australe</u> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
<b>Reptiles</b>		
<u>Caretta caretta</u> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<u>Chelonia mydas</u> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<u>Dermochelys coriacea</u> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
<u>Eretmochelys imbricata</u> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
<u>Hoplocephalus bungaroides</u> Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area
<u>Natator depressus</u> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<b>Sharks</b>		
<u>Carcharias taurus</u> (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
<u>Carcharodon carcharias</u> White Shark, Great White Shark [64470]	Vulnerable	Species or species

Name	Status	Type of Presence habitat known to occur within area
<u>Rhincodon typus</u> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
<b>Listed Migratory Species</b>		<b>[ Resource Information ]</b>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<u>Anous stolidus</u> Common Noddy [825]		Species or species habitat may occur within area
<u>Apus pacificus</u> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<u>Ardenna carneipes</u> Flesh-footed Shearwater, Flesh-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
<u>Ardenna grisea</u> Sooty Shearwater [82651]		Species or species habitat likely to occur within area
<u>Calonectris leucomelas</u> Streaked Shearwater [1077]		Species or species habitat known to occur within area
<u>Diomedea antipodensis</u> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea epomophora</u> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea exulans</u> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea sanfordi</u> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Fregata ariel</u> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
<u>Fregata minor</u> Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
<u>Macronectes giganteus</u> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<u>Macronectes halli</u> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<u>Sternula albifrons</u> Little Tern [82849]		Species or species habitat may occur within area
<u>Thalassarche bulleri</u> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche cauta</u> Shy Albatross [89224]	Vulnerable*	Foraging, feeding or

Name	Threatened	Type of Presence related behaviour likely to occur within area
<u>Thalassarche eremita</u> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche impavida</u> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche melanophris</u> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche salvini</u> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche steadi</u> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Marine Species</b>		
<u>Balaena glacialis australis</u> Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
<u>Balaenoptera edeni</u> Bryde's Whale [35]		Species or species habitat may occur within area
<u>Balaenoptera musculus</u> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<u>Caperea marginata</u> Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
<u>Carcharodon carcharias</u> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
<u>Caretta caretta</u> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<u>Chelonia mydas</u> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<u>Dermochelys coriacea</u> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
<u>Dugong dugon</u> Dugong [28]		Species or species habitat may occur within area
<u>Eretmochelys imbricata</u> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
<u>Lagenorhynchus obscurus</u> Dusky Dolphin [43]		Species or species habitat may occur within area
<u>Lamna nasus</u> Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
<u>Manta alfredi</u> Reef Manta Ray, Coastal Manta Ray, Inshore		Species or species



Name	Threatened	Type of Presence
Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994] <u>Manta birostris</u>		habitat may occur within area
Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
<u>Megaptera novaeangliae</u> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<u>Natator depressus</u> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<u>Rhincodon typus</u> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
<u>Sousa chinensis</u> Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
<u>Cuculus optatus</u> Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
<u>Hirundapus caudacutus</u> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
<u>Monarcha melanopsis</u> Black-faced Monarch [609]		Species or species habitat known to occur within area
<u>Monarcha trivirgatus</u> Spectacled Monarch [610]		Species or species habitat may occur within area
<u>Motacilla flava</u> Yellow Wagtail [644]		Species or species habitat likely to occur within area
<u>Myiagra cyanoleuca</u> Satin Flycatcher [612]		Species or species habitat known to occur within area
<u>Rhipidura rufifrons</u> Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
<u>Actitis hypoleucos</u> Common Sandpiper [59309]		Species or species habitat known to occur within area
<u>Calidris acuminata</u> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<u>Calidris canutus</u> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<u>Calidris ferruginea</u> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<u>Calidris melanotos</u> Pectoral Sandpiper [858]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
<u><i>Charadrius bicinctus</i></u> Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
<u><i>Gallinago hardwickii</i></u> Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
<u><i>Gallinago megala</i></u> Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
<u><i>Gallinago stenura</i></u> Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
<u><i>Limosa lapponica</i></u> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<u><i>Numenius madagascariensis</i></u> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<u><i>Numenius minutus</i></u> Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
<u><i>Numenius phaeopus</i></u> Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
<u><i>Pandion haliaetus</i></u> Osprey [952]		Species or species habitat known to occur within area
<u><i>Pluvialis fulva</i></u> Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
<u><i>Tringa brevipes</i></u> Grey-tailed Tattler [851]		Foraging, feeding or related behaviour known to occur within area
<u><i>Tringa nebularia</i></u> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

#### Other Matters Protected by the EPBC Act

##### Commonwealth Land

[ Resource Information ]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

##### Name

Commonwealth Land - Australian Telecommunications Commission  
Commonwealth Land - Director of War Service Homes

##### Listed Marine Species

[ Resource Information ]

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
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##### Birds

*Actitis hypoleucos*

Common Sandpiper [59309]

Species or species habitat known to occur within area

Name	Threatened	Type of Presence
<u>Anous stolidus</u> Common Noddy [825]		Species or species habitat may occur within area
<u>Apus pacificus</u> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<u>Ardea alba</u> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
<u>Ardea ibis</u> Cattle Egret [59542]		Species or species habitat may occur within area
<u>Calidris acuminata</u> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<u>Calidris canutus</u> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<u>Calidris ferruginea</u> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<u>Calidris melanotos</u> Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<u>Calonectris leucomelas</u> Streaked Shearwater [1077]		Species or species habitat known to occur within area
<u>Charadrius bicinctus</u> Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
<u>Diomedea antipodensis</u> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea epomophora</u> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea exulans</u> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea gibsoni</u> Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<u>Diomedea sanfordi</u> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Fregata ariel</u> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
<u>Fregata minor</u> Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
<u>Gallinago hardwickii</u> Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area

Name	Threatened	Type of Presence
<u>Gallinago megala</u> Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
<u>Gallinago stenura</u> Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
<u>Haliaeetus leucogaster</u> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<u>Heteroscelus brevipes</u> Grey-tailed Tattler [59311]		Foraging, feeding or related behaviour known to occur within area
<u>Himantopus himantopus</u> Pied Stilt, Black-winged Stilt [870]		Foraging, feeding or related behaviour known to occur within area
<u>Hirundapus caudacutus</u> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
<u>Lathamus discolor</u> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
<u>Limosa lapponica</u> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<u>Macronectes giganteus</u> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<u>Macronectes halli</u> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<u>Merops ornatus</u> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<u>Monarcha melanopsis</u> Black-faced Monarch [609]		Species or species habitat known to occur within area
<u>Monarcha trivirgatus</u> Spectacled Monarch [610]		Species or species habitat may occur within area
<u>Motacilla flava</u> Yellow Wagtail [644]		Species or species habitat likely to occur within area
<u>Myiagra cyanoleuca</u> Satin Flycatcher [612]		Species or species habitat known to occur within area
<u>Numenius madagascariensis</u> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<u>Numenius minutus</u> Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
<u>Numenius phaeopus</u> Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
<u>Pachyptila turtur</u> Fairy Prion [1066]		Species or species habitat known to occur within area
<u>Pandion haliaetus</u> Osprey [952]		Species or species habitat known to occur within area
<u>Pluvialis fulva</u> Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
<u>Puffinus carneipes</u> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
<u>Puffinus griseus</u> Sooty Shearwater [1024]		Species or species habitat likely to occur within area
<u>Rhipidura rufifrons</u> Rufous Fantail [592]		Species or species habitat known to occur within area
<u>Rostratula benghalensis (sensu lato)</u> Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
<u>Sterna albifrons</u> Little Tern [813]		Species or species habitat may occur within area
<u>Thalassarche bulleri</u> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche cauta</u> Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche eremita</u> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche impavida</u> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche melanophrys</u> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche salvini</u> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche sp. nov.</u> Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
<u>Thalassarche steadyi</u> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<u>Thinornis rubricollis rubricollis</u> Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat likely to occur within area
<u>Tringa nebularia</u> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		

Name	Threatened	Type of Presence
<u><i>Acentronura tentaculata</i></u> Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
<u><i>Festucalex cinctus</i></u> Girdled Pipefish [66214]		Species or species habitat may occur within area
<u><i>Filicampus tigris</i></u> Tiger Pipefish [66217]		Species or species habitat may occur within area
<u><i>Heraldia nocturna</i></u> Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
<u><i>Hippichthys penicillus</i></u> Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
<u><i>Hippocampus abdominalis</i></u> Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
<u><i>Hippocampus whitei</i></u> White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat likely to occur within area
<u><i>Histiogamphelus briggsii</i></u> Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
<u><i>Lissocampus runa</i></u> Javelin Pipefish [66251]		Species or species habitat may occur within area
<u><i>Maroubra perserrata</i></u> Sawtooth Pipefish [66252]		Species or species habitat may occur within area
<u><i>Notiocampus ruber</i></u> Red Pipefish [66265]		Species or species habitat may occur within area
<u><i>Phyllopteryx taeniolatus</i></u> Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
<u><i>Solegnathus spinosissimus</i></u> Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
<u><i>Solenostomus cyanopterus</i></u> Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
<u><i>Solenostomus paradoxus</i></u> Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
<u><i>Stigmatopora argus</i></u> Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
<u><i>Stigmatopora nigra</i></u> Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
<u><i>Syngnathoides biaculeatus</i></u> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<u>Trachyrhynchus bicoarctatus</u> Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
<u>Urocampus carinirostris</u> Hairy Pipefish [66282]		Species or species habitat may occur within area
<u>Vanacampus margaritifer</u> Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
<b>Mammals</b>		
<u>Arctocephalus forsteri</u> Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
<u>Arctocephalus pusillus</u> Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
<u>Dugong dugon</u> Dugong [28]		Species or species habitat may occur within area
<b>Reptiles</b>		
<u>Caretta caretta</u> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<u>Chelonia mydas</u> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<u>Dermochelys coriacea</u> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
<u>Eretmochelys imbricata</u> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
<u>Natator depressus</u> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<u>Pelamis platurus</u> Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area
<b>Whales and other Cetaceans</b>		
<b>Name</b>	<b>Status</b>	<b>[ Resource Information ] Type of Presence</b>
<b>Mammals</b>		
<u>Balaenoptera edeni</u> Bryde's Whale [35]		Species or species habitat may occur within area
<u>Balaenoptera musculus</u> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<u>Caperea marginata</u> Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
<u>Delphinus delphis</u> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<u>Eubalaena australis</u> Southern Right Whale [40]	Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence within area
<u>Lagenorhynchus obscurus</u> Dusky Dolphin [43]		Species or species habitat may occur within area
<u>Megaptera novaeangliae</u> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<u>Sousa chinensis</u> Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
<u>Stenella attenuata</u> Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
<u>Tursiops aduncus</u> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<u>Tursiops truncatus s. str.</u> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

#### Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Bouddi	NSW
Brisbane Water	NSW
Pelican Island	NSW
Rileys Island	NSW
Saratoga Island	NSW

Regional Forest Agreements	[ Resource Information ]
Note that all areas with completed RFAs have been included.	
Name	State
North East NSW RFA	New South Wales

Invasive Species	[ Resource Information ]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.	

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area



Name	Status	Type of Presence
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Frogs</b>		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
<b>Plants</b>		
<i>Alternanthera philoxeroides</i> Alligator Weed [11620]		Species or species habitat likely to occur within area
<i>Anredera cordifolia</i> Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
<i>Asparagus aethiopicus</i> Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
<i>Asparagus asparagoides</i> Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
<i>Asparagus plumosus</i> Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
<i>Asparagus scandens</i> Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
<i>Cabomba caroliniana</i> Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
<i>Chrysanthemoides monilifera</i> Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i> Boneseed [16905]		Species or species habitat likely to occur within area
<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i> Bitou Bush [16332]		Species or species habitat likely to occur within area
<i>Cytisus scoparius</i> Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
<i>Eichhornia crassipes</i> Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
<i>Genista monspessulana</i> Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
<i>Genista</i> sp. X <i>Genista monspessulana</i> Broom [67538]		Species or species habitat may occur within area
<i>Lantana camara</i> Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
<i>Lycium ferocissimum</i> African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
<i>Nassella neesiana</i> Chilean Needle grass [67699]		Species or species habitat likely to occur within area
<i>Pinus radiata</i> Radiata Pine Monterey Pine, Insignis Pine, Wilding		Species or species

Name	Status	Type of Presence
Pine [20780]		habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area
<b>Nationally Important Wetlands</b>		<b>[ Resource Information ]</b>
<b>Name</b>	<b>State</b>	
<u>Brisbane Water Estuary</u>	NSW	

## Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

## Coordinates

-33.4991 151.30474

## Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Department of Land and Resource Management, Northern Territory](#)
- [Department of Environmental and Heritage Protection, Queensland](#)
- [Department of Parks and Wildlife, Western Australia](#)
- [Environment and Planning Directorate, ACT](#)
- [Birdlife Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- [Natural history museums of Australia](#)
- [Museum Victoria](#)
- [Australian Museum](#)
- [South Australian Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [Geoscience Australia](#)
- [CSIRO](#)
- [Australian Tropical Herbarium, Cairns](#)
- [eBird Australia](#)
- [Australian Government – Australian Antarctic Data Centre](#)
- [Museum and Art Gallery of the Northern Territory](#)
- [Australian Government National Environmental Science Program](#)
- [Australian Institute of Marine Science](#)
- [Reef Life Survey Australia](#)
- [American Museum of Natural History](#)
- [Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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**Douglas Partners**  
*Geotechnics | Environment | Groundwater*

Report on  
Preliminary Site Investigation for Contamination

Proposed Community Housing  
18 Macleay Avenue, Woy Woy

Prepared for  
Pacific Link Housing Ltd

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# Douglas Partners

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## **Report on Preliminary Site Investigation for Contamination Proposed Community Housing 18 Macleay Avenue, Woy Woy**

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### **1. Introduction**

This report presents the results of a preliminary site investigation for contamination undertaken for proposed community housing at 18 Macleay Avenue, Woy Woy. The investigation was commissioned in an email dated 10 May 2018 by Mr Mark Glew of Pacific Link Housing Ltd and was undertaken in accordance with Douglas Partners' proposal CCT180154 dated 2 May 2018.

It is understood that the future development of the site may comprise the construction of two or three storey townhouses and / or group homes with associated car parking and landscaping.

This assessment was limited to the western portion of Lot 16 of Deposited Plan 255220 which is proposed to be rezoned from RE1 (public recreation) to either R1 (general residential) or R2 (low density residential), covering approximately 2,700 m<sup>2</sup>. The remaining eastern portion of the lot (approximately 2,800 m<sup>2</sup>) is understood to remain zoned as RE1.

The objective of this PSI was to assess the suitability of the site for the proposed residential land use, from a site contamination standpoint. The scope of work comprised a desktop site history review and a site walkover, followed by sampling and testing of the site soils.

This PSI was carried out in conjunction with a geotechnical investigation, which has been reported separately.

Waste classification of the site soils has also been undertaken with reference to *Waste Classification Guidelines, Part 1: Classifying of Waste* (Ref 2).

### **2. Scope of Work**

The scope of work comprised:

- ) Review of information obtained from the following sources:
  - o Published data, including topographical, geological and hydrogeological maps;
  - o Registered groundwater bore licence search;
  - o Historical land titles;
  - o Central Coast Council (CCC) property enquiry information;
  - o NSW EPA Contaminated Land and Protection of Environment Operations databases; and
  - o Historical aerial photographs.
- ) Site walkover to assess potential contamination sources and receptors;

- ) Drilling of four boreholes to depths of between 1.1 m and 2.8 m using a utility mounted push tube rig fitted with 60 mm diameter sampling tubes;
- ) Samples were collected from each soil stratum and upon signs of contamination;
- ) All samples were screened in DP's laboratory for acid sulfate soils and total photoionisable compounds (TOPIC);
- ) Selected primary soil samples and a QA sample were dispatched to a NATA registered laboratory for testing of potential contaminants of concern, those being heavy metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethyl-benzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorinated pesticides (OCP) and asbestos;
- ) Selected soil samples were dispatched to NATA registered laboratory for Chromium Reducible Suite (Scr) testing to quantify the levels of acidity and sulfidity; and
- ) Preparation of this report.

### **3. Site Identification and Location**

The site is identified as part of Lot 16 of Deposited Plan 255220 and has a street address of 18 Macleay Avenue, Woy Woy. The irregular shaped site is currently zoned RE1 (public recreation) and covers an area of approximately 2,700 m<sup>2</sup>.

The site location and boundaries are shown on Drawing 1, Appendix A, which also shows the extent of the current assessment.

The site is bounded by Macleay Avenue to the west, residential development to the north and south and undeveloped bushland / public reserve to the east.

The site is located within the local government area of Central Coast Council, formerly Gosford City Council.

### **4. Geology, Topography and Hydrogeology**

Reference to the 1:100,000 scale Geology Sheet for Gosford-Lake Macquarie indicates the site is underlain by Quaternary aged sands.

Soil Landscape mapping (1:100,000 Sydney-Newcastle-Wyong Soils Landscape Series Sheet) indicates that the site is underlain Aeolian soils (sands) of the Tuggerah landscape group.

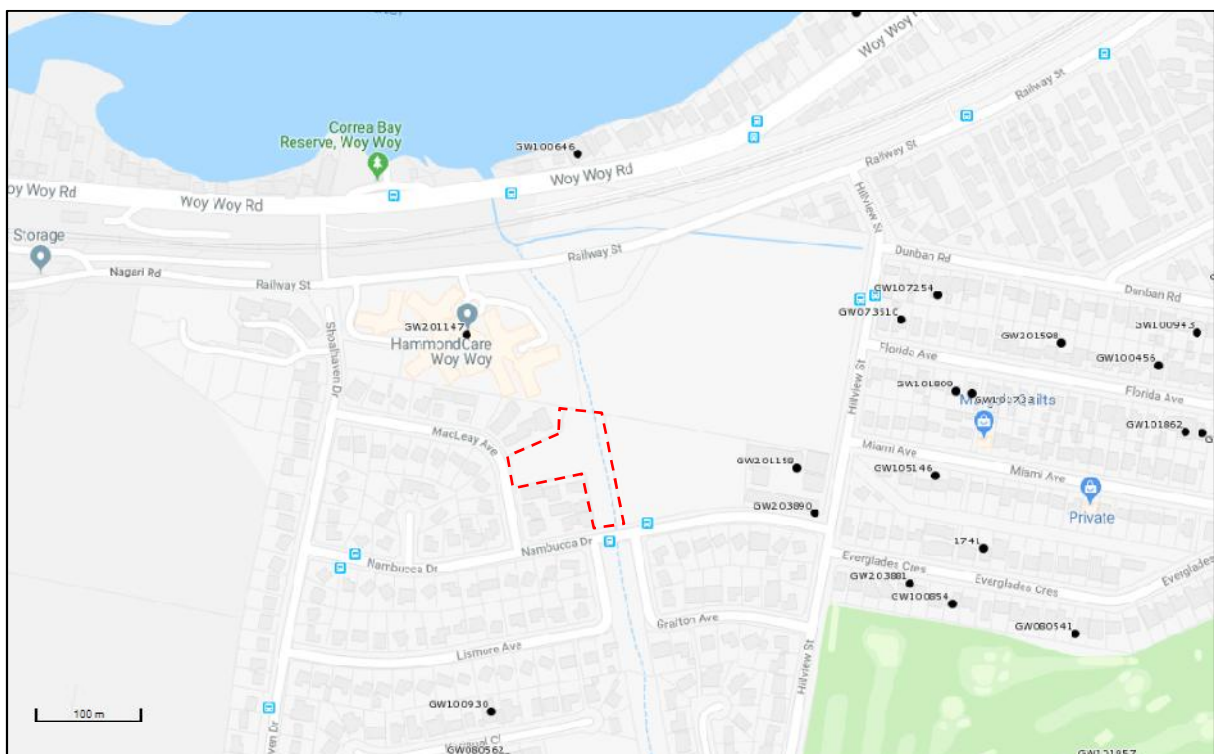
A property search via the Central Coast Council website reveals that site is identified as acid sulfate soil Class 3 and Class 4. Review of the Acid Sulfate Soil Risk Map for Broken Bay indicates that the site is mapped as having a low probability of acid sulfate soils at depths greater than 3 m.

Review of the local topographical mapping indicates that the site levels are typically in the order of RL 4 m to 5 m AHD. Beyond the site, but still within the lot, surface levels fall to about RL 2 m AHD at the drainage channel just inside the eastern boundary of the lot.

The drainage channel directs surface water runoff to the north, discharging into Woy Woy Bay (Brisbane Waters).

A search of the NSW Department of Primary Industries Office of Water database was undertaken on 11 May 2018. A total of three registered groundwater bores were identified within an approximate 500 m radius of the site. The authorised purposes for the nearest five groundwater bores were commercial (1), irrigation (1) and domestic purposes (3). The bores were drilled to depths of between 4 m and 6.5 m and encountered water at depths of between 2.1 m and 2.75 m. Driller logs, where available, indicated the ground conditions comprised sand soils.

Figure 1 below, shows the registered groundwater bores within the vicinity of the site. Copies of the available data are provided in Appendix B. Based on the local topography, it is considered unlikely that site contamination (if present) would impact the nearby registered bores.



**Figure 1 – Nearby registered groundwater bores**

## 5. Site History

The desktop component of this investigation involved a review of historical information relating to potential contamination sources at the site. Relevant findings are provided below and are based on a review of:

- ) Aerial photographs;
- ) Historical land titles;
- ) Regulatory notices; and
- ) Council records.

The site history documents reviewed are provided in Appendix B.

## 5.1 Aerial photographs

Historical aerial photographs were reviewed dating back to the earliest readily available record (1954) and then at varying intervals after 1975, to assess any major changes to the site and surrounding areas during this period. Google Earth imagery dating back to 2005 was also reviewed.

Extracts of the historical aerial photographs are included in Drawing 2 in Appendix B.

Table 1 below summarises the observations made during the aerial photograph review.

**Table 1: Aerial Photograph Review**

Year	Site	Adjacent Land Use
1954	Some clearing observed, for unknown purposes. No development identified. Possible rural grazing use.	Typically rural development. Nagari Road present.
1975	Site cleared, watercourse realigned to traverse eastern boundary of lot.	Macleay Avenue present and infill residential development undertaken.
1985	As per 1975.	Similar to 1975, with some unknown development to the north.
1991	As per 1985.	Possible treatment ponds in property to the north (existing Hammond Care development)
2002	As per 1991.	Further infill residential development to the north. Ponds no longer present.
2003	As per 2002.	Construction commenced on Hammond Care development (completed by 2005). Subdivision / unit development to south of site.
2018	Generally as per 2003.	Generally as per 2003/2005.

The aerial photographs appear to indicate that past site usage may have been limited to a rural grazing use circa 1954, and then further vegetation clearance and possible filling circa 1975 when the adjacent watercourse was realigned. No further specific development or usage of the site was identified.

## 5.2 Historical Land Titles

A historical title search for the site indicates that the prior to 1971, the site was Crowne land and has since been owned by the Housing Commission of New South Wales. The results of the title search are provided in Appendix B.

One easement for drainage is recorded for the site. Review of the services plans received from a Dial Before You Dig (DBYD) enquiry indicates that a sewer main also traverses the eastern area of the site.

## 5.3 Regulatory Notices

The EPA publishes records of contaminated sites under Section 58 of the CLM Act on a public database, accessible via the internet. The notices relate to investigation and / or remediation of significant contaminated as defined under the CLM Act. More specifically the notices relate to the following:

- ) Actions taken by the EPA under Sections 15, 17, 19, 21, 23, 26 or 28 of the CLM Act;
- ) Actions taken by the EPA under Sections 35 or 36 of the Environmentally Hazardous Chemicals Act 1985; and
- ) Site audit statements provided to the EPA under section 52 of the CLM Act on sites subject to an in-force remediation order.

The search of the database on 5 June 2018 revealed that the subject site is not listed. It should be noted that the EPA record of notices for contaminated land does not provide a record of all contaminated land in NSW.

The NSW EPA also issues environmental protection licenses under Section 308 of the POEO Act. The register contains:

- ) Environmental protection licenses;
- ) Applications for new licenses and to transfer or vary or extend licenses;
- ) Environment protection and noise control licenses;
- ) Convictions and prosecutions under the POEO Act;
- ) The result of civil proceedings;
- ) License review information;
- ) Exemptions and provisions of the POEO Act or Regulations;
- ) Approvals granted under Clause 9 of the POEO (Control of Burning) Regulation; and
- ) Approvals granted under Clause 7a of the POEO (Clean Air) Regulation.

A search of the public register on the 5 June 2018 indicated that no licenses were listed for the site.

## 5.4 Council Property Information

A search for Council property information was undertaken on 5 June 2018 and identified the following information:

- ) The land is zoned Re1 Public Recreation;
- ) The land is classed as being acid sulfate soil Classes 3 and 4;
- ) The land is bush fire prone; and
- ) The land has flood related development controls.

An enquiry was made through CCC's (or GCC) web site. The enquiry identified that no development applications were recorded. No other applicable information was obtained from CCC. A copy of the CCC Property Report is provided in Appendix B.

## 6. Site Walkover / Description

A site walkover was completed on 15 May 2018. At the time of the inspection, the site was vacant and generally grass covered. Toward the eastern end of the site, vegetation became denser, with mature trees.

A drainage channel was located inside of the eastern boundary of the lot (east of the 'site') and, at the time of the walkover, water within the drainage channel was flowing to the north.

Some domestic and building waste was present over the surface of the site including plastic oil containers, concrete, tile, brick, glass, cans, plastic bags etc. Other than the dumped waste, no staining or signs of significant contamination were observed.

At the top of the bank of the drainage channel, toward the eastern end of the lot, a levelled area appeared to have been constructed in the past by pushing out vegetation and near surface soils.

Surface levels over the majority of the site were relatively flat, at about RL 4 m to 5 m AHD. At the eastern end of the lot and east of the 'site', however, the surface levels fall to the east toward a drainage channel at approximately 30°.

Figures 2 to 5 below, show photographs of the site taken at the time of the walkover.





**Figure 2 – View of the site from the western boundary**



**Figure 3 – View of eastern area of the site, looking southeast**





**Figure 4 – View of drainage channel near eastern boundary of the lot**



**Figure 5 – Typical view of domestic waste scattered throughout the site**

## **7. Preliminary Conceptual Model**

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or in the future i.e. it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

## 7.1 Potential Contamination Sources and Contaminants of Concern

Importation of substantial filling is unlikely based on site history and observations. However, some filling and/or illegal dumping may be present at the site

Based on the current investigation, the following potential sources of contamination and associated contaminants of potential concern (COPC) have been identified:

- ) S1 – Filling: Contaminated filling (imported filling or fly-tipping)

COPC include metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorine pesticides (OCP) and asbestos.

## 7.2 Potential Receptors

### 7.2.1 Human Health Receptors

- ) R1 – Future construction, operations and maintenance workers;
- ) R2 – Pedestrians within and in the vicinity of the project site;
- ) R3 – Residents;

### 7.2.2 Environmental Receptors

- ) R4 – Terrestrial fauna and flora;
- ) R5 – Surface water during inundation; and
- ) R6 – Groundwater.

## 7.3 Potential Pathways

Potential pathways for contamination include the following:

- ) P1 – Ingestion and dermal contact;
- ) P2 – Inhalation of dust and/or vapours;
- ) P3 – Leaching of contaminants into groundwater and lateral migration of groundwater;
- ) P4 – Surface water runoff; and
- ) P5 – Contact with terrestrial fauna and flora (including uptake from soil by plants).

## 7.4 Summary of Potential Complete Pathways

A 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human or environmental receptors from the identified contaminants via exposure pathways.

The possible pathways between the above source (S1) and receptors (R1 to R6) are provided in Table 2 below.

**Table 2: Conceptual Site Model**

Source	Pathway	Receptor
S1 – Contaminated filling (imported filling or fly-tipping)	P1 – Ingestion and dermal contact	R1 – Future construction and maintenance workers R2 – Pedestrians on pathways in road corridor R3 – Residents
	P2 – Inhalation of dust and/or vapours	R1 – Future construction and maintenance workers R2 – Pedestrians on pathways in road corridor R3 – Residents
	P3 – Leaching of contaminants into groundwater and lateral migration of groundwater	R4 – Surface water R5 – Groundwater
	P4 – Surface water runoff	R4 – Surface water
	P5 – Contact with terrestrial fauna and flora	R3 – Terrestrial fauna and flora

## 8. Field Work and Analysis

### 8.1 Data Quality and Objectives

The investigation has been devised broadly in accordance with the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended 2013* (NEPC 2013 – Ref 1), hereinafter referred to as “the NEPM”. The DQO process is outlined as follows:

- ) Stating the Problem;
- ) Identifying the Decision;
- ) Identifying Inputs to the Decision;
- ) Defining the Boundary of the Assessment;
- ) Developing a Decision Rule;
- ) Specifying Acceptable Limits on Decision Errors; and
- ) Optimising the Design for Obtaining Data.

The DQOs have been addressed within the report as shown Appendix F.



## 8.2 Data Quality Indicators

The performance of the assessment in achieving the DQO was assessed through the application of data quality indicators (DQI) as defined by:

<b>Precision:</b>	A quantitative measure of the variability (reproducibility) of data;
<b>Accuracy:</b>	A quantitative measure of the closeness of reported data to the “true” value;
<b>Representativeness:</b>	The confidence (expressed qualitatively) that data are representative of each media present on the site;
<b>Completeness:</b>	A measure of the useable data from a data collection activity; and
<b>Comparability:</b>	The confidence (expressed qualitatively) that data can be considered equivalent for each sampling and analytical event.

Further comments on the DQIs are presented in Appendix F.

## 8.3 Soil Sampling Locations and Rationale

Table A of NSW EPA *Sampling Design Guidelines* (1995) recommends a minimum of nine sampling points for a site of 0.3 ha for site characterisation based on the detection of circular hot spots using a systemic grid sampling pattern.

A total of five sampling points (56% of the recommended) were completed to provide preliminary information on the contamination status of the soils at the site.

Intrusive works were conducted on 16 May 2018 at the locations shown in Drawing 1, Appendix A.

## 8.4 Soil Sampling Procedures

Environmental sampling was performed with respect to the standard operating procedures outlined in the DP *Field Procedures Manual*. All sampling data was recorded on borehole logs (or sample register) presented in Appendix D and selected samples for laboratory analysis were recorded on DP chain-of-custody (COC) sheets provided in Appendix E. The general soil sampling procedure comprised:

- ) Use of disposable sampling equipment including nitrile gloves;
- ) Transfer of samples into laboratory prepared glass jars and bottles (with appropriate preservatives for analytes) and capping immediately with Teflon lined lids;
- ) Acid sulfate soil samples were placed in airtight plastic bags, and were hand-pressed to remove all excess air, before being snap-locked;
- ) Labelling of sampling containers with individual and unique identification, including project number, sample identification and sample depth;
- ) Placement of sample containers and bags into a cooled, insulated and sealed container for transport to the laboratory; and

- ) COC was maintained at all times and countersigned by the receiving laboratory on transfer of the samples.

Envirolab Services Pty Ltd (ELS), accredited by NATA, was employed to conduct the sample analysis. ELS is required to carry out in-house procedures.

## 8.5 Analytical Rationale

The analytical scheme was designed to obtain an indication of the potential presence and possible distribution of identified contaminants of concern (COC) based on information obtained in the preliminary CSM. The primary contaminants of concern as identified in Section 7 are heavy metals, TRH, BTEX, PAH, OCP and asbestos.

Soil samples were selected for analysis based on site observations (i.e. odour, staining etc.), and their location within the subsoil strata (i.e. surface, filling or natural), with an emphasis on near surface samples where it would be expected that the bulk of identified COC would be present.

## 8.6 Field Quality Assurance and Quality Control

The field QC procedures for sampling were completed with respect to the Douglas Partners' *Field Procedure Manual*, and are outlined in Appendix F.

Field replicates were recovered and analysed for a limited suite of contaminants by means of intra-laboratory analysis. These samples were collected in accordance with standard industry practice and guidelines.

## 8.7 Laboratory QA / QC

The analytical laboratory, accredited by NATA, is required to conduct in-house QA/QC procedures. These are normally incorporated into every analytical run and include reagent blanks, spike recovery, surrogate recovery and duplicate samples. These results are included in the laboratory certificates in Appendix E.

The results of the DP assessment of laboratory QA/QC are shown in Appendix F, with the full laboratory certificates of analysis included in Appendix E.

## 9. Assessment Criteria

The assessment criteria have been sourced from the National Environment Protection Council (NEPC) *National Environment Protection Measure (Assessment of Site Contamination)* 1999, as amended 2013 (NEPC 2013, Ref 1).

The site assessment criteria (SAC) comprise health-based investigation levels (HILs), health screening levels (HSLs) and management limits for TRH. The laboratory Practical Quantitation Limit (PQL) has also been adopted as a screening level for some contaminants.

The HILs and HSLs applied in the current investigation comprise levels adopted for a Residential A land use (HIL A / HSL A), which is considered most appropriate in this situation. These adopted SAC are listed on the analytical results in Table 3 and have been derived as outlined in Appendix C.

## 10. Field Work Observations

The borehole / sampling locations are shown in Drawing 1, Appendix A. The borehole logs and sample register are provided in Appendix D along with notes on descriptive terms and symbols.

The subsurface conditions encountered in the boreholes generally comprised brown and grey, fine grained sand to depths ranging from 0.8 m to 1.0 m, underlain by brown or dark brown, medium or coarse grained sand over the remaining depth of the boreholes (max depth 2.8m).

No free groundwater was observed at the time of the investigation. It should be noted that groundwater levels are dependent on climatic conditions and soil permeability and therefore vary with time.

Other than the waste materials observed at the surface, no other obvious indications of gross contamination (e.g. staining or odours) were observed in the boreholes. Furthermore, no asbestos containing material (ACM) was observed on the site's surface during the site walkover.

Replicates for the near surface soil samples were collected in plastic bags and allowed to equilibrate under ambient temperatures before testing for volatile organic compounds (VOCs) using a photoionisation detector (PID).

Field measurement with the PID indicated results of less than 1 ppm in vapour. The recorded readings were not considered to be indicative of potentially significant volatile organic compound contamination, and are considered to fall within background levels. It is noted that the PID results were consistent with general observations made during the field work.

## 11. Laboratory Testing

### 11.1 Soil Contaminants

The soil laboratory test results are summarised and compared against the adopted *Site Assessment Criteria* (SAC) in Table 3. The Laboratory Certificates are contained within Appendix E, together with the chain of custody despatch sheets.

In addition to the primary samples tested, soil Quality Control (QC) testing was undertaken and is discussed in Appendix F.

Furthermore, given the initial concentrations of TRH recorded in a surface soil sample with abundant organic matter (i.e. Location 5), this sample was further tested for TRH using a silica gel cleanup method which removes non-anthropogenic polar compounds.

The results of the testing for asbestos in soil indicated that no asbestos was present within the soil samples collected.

**Table 3 - Results of Soil Analysis (All results in mg/kg unless otherwise stated)**

Sample ID	PID	Depth (m)	Metals								PAH				TRH				BTEX				OCP				PCB
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	B(a)P	B(a)P TEQ	Naphthalene	total <sup>10</sup>	F1 [TRH C6-C10 less BTEX]	F2 [TRH >C10-C16 less naphthalene]	F3 (>C14-C17)	F4 (>C18-C21)	Benzene	Toluene	Ethyl benzene	Total Xylene	DDT + DDD + DDE	Aldrin + Dieldrin	Chlordane	Heptachlor	
1/0.1	<1	0.1	<PQL	<PQL	2	5	23	<PQL	1	12	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	
2/0.5	<2	0.5	<PQL	<PQL	3	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	
3/0.1	<3	0.1	<PQL	<PQL	3	<PQL	1	<PQL	1	1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	
4/0.1	<4	0.1	<PQL	<PQL	4	<PQL	1	<PQL	2	1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	
5/0.1	<5	0.1	<PQL	<PQL	2	6	7	<PQL	1	45	<PQL	<PQL	<PQL	<PQL	<PQL (<PQL)	50 (<PQL)	560 (<PQL)	250 (<PQL)	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	
QA1	<6	0.1	<PQL	<PQL	5	<PQL	2	<PQL	2	3	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	-	-	-	-	
PQL			4	0.4	1	1	1	0.1	1	1	0.05	0.5	0.1	2.15	25	50	100	100	0.2	0.5	1	3	0.1	0.1	0.1	0.1	0.7
Assessment Criteria <sup>1</sup>																											
HIL A <sup>2</sup>			100	20	100	6000	300	40	400	7400	NC	3	NC	300	NC	NC	NC	NC	NC	NC	NC	240	6	50	6	1	
HSL A <sup>3</sup>			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	3	NC	45	110	NC	NC	0.5	160	55	55	NC	NC	NC	NC	NC
EIL / ESL <sup>4</sup>			50	NC	200	90	270	NC	55	130	0.7	NC	170	NC	180	120	300	2800	50	85	70	105	180	NC	NC	NC	NC
Management Limits (Residential) <sup>5</sup>			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	700	1000	2500	10000	NC	NC	NC	NC	NC	NC	NC	NC	NC
Direct Contact HSL A <sup>6</sup>			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	1400	NC	4400	3300	4500	6300	100	14000	4500	12000	NC	NC	NC	NC	NC
General Solid Waste <sup>8</sup>			100	20	100	NC	100	4	40	NC	0.8	NC	NC	200	650	10000		NC	10	288	600	1000	50				50

**Notes:**

- <sup>1</sup> The assessment criteria adopted are sourced from NEPM 2013 amendment and are considered to be conservative.
  - <sup>2</sup> Health based investigation levels for residential use (NEPM - 2013)
  - <sup>3</sup> Soil Health Screening Level for vapour intrusion for sand at 0m to <1m depth in soil for residential use (NEPM - 2013)
  - <sup>4</sup> Ecological Investigation Levels (EIL) and Ecological Screening Levels (ESL) for residential use (NEPM - 2013)
  - <sup>5</sup> Management Limits for TRH fractions F1-F4 in Soil for residential use (coarse soil) (NEPM - 2013)
  - <sup>6</sup> Soil Health Screening Level for direct contact for Residential A use (CRC Care Technical Report No.10 Part 2, 2011)
  - <sup>7</sup> Where analytical results below laboratory practical quantitation limit (PQL) for all compounds, results quoted as <PQL
  - <sup>8</sup> Waste Classification Guidelines - Part 1: Classification of Waste (EPA 2014) - General Solid Waste
- PQL Practical Quantitation limits  
 - not analysed / not applicable  
 NC No Criteria  
 PID Photoionisation Detector screening result (ppm)  
**Shade** Exceeds Adopted Site Assessment Guidelines  
 NR Not reported due to high concentrations of analytes



## 11.2 Acid Sulfate Soils

To assess for the presence of acid sulfate soils, 24 soil samples collected from the boreholes were tested in DP's laboratory using a calibrated pH meter for measurement of pH in water ( $\text{pH}_F$ ) and pH following oxidation in hydrogen peroxide ( $\text{pH}_{\text{FOX}}$ ) in accordance with the ASSMAC Guidelines (Ref 3).

Based on the results of the screening tests, two samples were selected and forwarded to Envirolab Services Pty Ltd to undergo Chromium Reducible Sulfur Suite ( $\text{S}_{\text{Cr}}$ ) testing. The results of these tests are summarised in Table 4.

**Table 4: Results of Acid Sulfate Soil Screening and Laboratory Testing**

Bore	Depth (m)	Sample Description	Soil Textural Classification	Screening Test Results				Laboratory Results						
				pH			Strength of Reaction <sup>b</sup>	pH <sub>KCL</sub>	S <sub>cr</sub> (%S)	Titratable Actual Acidity (TAA) [%sulfur]	Acid Neutralising Capacity (ANC) [%sulfur]	s-S <sub>NAS</sub> (%sulfur)	Net Acidity (%sulfur)	Net Acidity (Moles H <sup>+</sup> /t)
				pH <sub>F</sub>	pH <sub>FOX</sub>	pH <sub>F</sub> - pH <sub>FOX</sub>								
Current Investigation - 83385														
1	0.1	Brow n and grey SAND	Coarse	6.6	4.7	1.9	S	-	-	-	-	-	-	-
	0.5	Brow n and grey SAND	Coarse	6.3	3.4	2.9	S	4.4	<0.005	<0.01	<0.05	<0.005	0.006	<5
	1	Brow n and grey SAND	Coarse	6.2	3.3	2.9	S	-	-	-	-	-	-	-
	1.5	Dark brow n SAND	Coarse	5.6	4.3	1.3	S	-	-	-	-	-	-	-
	2	Dark brow n SAND	Coarse	5.3	4.6	0.7	S	-	-	-	-	-	-	-
	2.5	Dark brow n SAND	Coarse	5.2	4.5	0.7	S	-	-	-	-	-	-	-
	2.8	Dark brow n SAND	Coarse	5.3	3.9	1.4	S	4.7	0.01	0.07	<0.05	<0.005	0.086	53
2	0.1	Brow n and grey SAND	Coarse	5.5	4.4	1.1	S	-	-	-	-	-	-	-
	0.5	Brow n and grey SAND	Coarse	5.8	4.8	1.0	S	-	-	-	-	-	-	-
	1	Dark brow n SAND	Coarse	4.6	4.1	0.5	S	-	-	-	-	-	-	-
	1.5	Dark brow n SAND	Coarse	4.7	4.1	0.6	S	-	-	-	-	-	-	-
	2	Dark brow n SAND	Coarse	4.6	5.1	-0.5	S	-	-	-	-	-	-	-
	2.5	Dark brow n SAND	Coarse	4.8	5.3	-0.5	S	-	-	-	-	-	-	-
	2.8	Dark brow n SAND	Coarse	5.3	4.1	1.2	S	-	-	-	-	-	-	-
3	0.1	Brow n and grey SAND	Coarse	5.4	3.2	2.2	S	-	-	-	-	-	-	-
	0.5	Brow n and grey SAND	Coarse	5.6	4.3	1.3	S	-	-	-	-	-	-	-
	1	Dark brow n SAND	Coarse	5.3	4.9	0.4	S	-	-	-	-	-	-	-
4	0.1	Brow n and grey SAND	Coarse	5.5	4.4	1.1	S	-	-	-	-	-	-	-
	0.5	Brow n and grey SAND	Coarse	5.8	5.7	0.1	S	-	-	-	-	-	-	-
	1	Dark brow n SAND	Coarse	5.6	5.2	0.4	S	-	-	-	-	-	-	-
	1.5	Dark brow n SAND	Coarse	5.7	5.7	0.0	S	-	-	-	-	-	-	-
	2	Dark brow n SAND	Coarse	5.7	5.6	0.1	S	-	-	-	-	-	-	-
	2.5	Dark brow n SAND	Coarse	5.7	5.2	0.5	S	-	-	-	-	-	-	-
	2.8	Dark brow n SAND	Coarse	5.7	5.3	0.4	S	-	-	-	-	-	-	-
ASSMAC Indicators		Coarse Texture: 'Sands to loamy sands'	<4	<3.5	>1	-	-	-	-	-	-	0.03	18	
		Medium Texture: 'Sandy loams to light clays'										0.06	36	
		Fine Texture: 'Medium to heavy clays'										0.1	62	

**Legend:**

a Depth below ground surface

b Strength of Reaction

S denotes no or slight reaction

M denotes moderate reaction

V denotes violent reaction

Bold notates exceedance of net acidity action criteria or ASSMAC indicator

## 12. Discussion

### 12.1 Contamination

The laboratory results (Table 3) reported that all contaminant concentrations in the soil samples analysed were less than the adopted SAC with the exception of total recoverable hydrocarbons (TRH) F3 reported for the surface sample (5/0.1). The TRH F3 (560 mg/kg) result marginally exceeded the ecological screening level (ESL) (300 mg/kg), however, is within the limits of the other SAC.

Based on the initial result, the sample was submitted for a silica gel cleanup TRH analysis, which removes non-anthropogenic polar compounds (i.e. naturally occurring organic compounds), the results from the surface sample (5/0.1) was below the ecological based criteria.

Asbestos was not detected in the samples tested.

### 12.2 Acid Sulfate Soils

The results of the screening tests for pH in  $H_2O$  ( $pH_F$ ) were in the range 4.6 to 6.6 pH units. ASSMAC (Ref 3) suggests that actual acid sulfate soils (AASS) may be present if  $pH_F$  is less than 4 pH units. This condition did not occur in any of the samples screened.

The results of the screening tests for pH following the addition of  $H_2O_2$  ( $pH_{Fox}$ ) were in the range of 3.2 to 5.7 pH units. ASSMAC (Ref 3) suggests that potential acid sulfate soil (PASS) conditions may be present where pH in  $H_2O_2$  ( $pH_{Fox}$ ) is less than 3.5 pH units. This occurred in three of the samples tested.

ASSMAC (Ref 3) also suggests that potential acid sulfate soil conditions may be present where the difference between pH in  $H_2O$  ( $pH_F$ ) and pH in  $H_2O_2$  ( $pH_{Fox}$ ) is greater than 1 pH unit. This condition occurred in 11 of the 24 samples screened. It is noted that near surface samples were logged as having traces of organics which are likely to indicate a false positive screening result.

Screening tests are generally considered as indicative only and can be affected by the presence of organic material. Definitive and quantitative results are obtained from laboratory testing by either Suspension Peroxide Oxidation Combined Acidity and Sulfur (SPOCAS) or Chromium Reducible Sulfur Suite ( $S_{Cr}$ ) methods.  $S_{Cr}$  testing was carried out on four samples that exceeded the above indicators of acid sulfate soils. The results of these tests are presented in Table 4.

As outlined in *The Soil Management Guidelines* (SMG, Ref 4) the action criteria which define the requirement for management of acid sulfate soils vary depending on the amount of soil disturbed and the textural classification of the soil.

The method for determining net acidity (or existing and potential acidity) has been derived from SMG (Ref 4) and *Acid Sulfate Soils Laboratory Methods Guidelines* (LMG, Ref 5) and can be summarised as follows:

- ) When  $4.5 < \text{pH}_{\text{KCL}} < 5.5$ , Sum of existing and potential acidity =  $\text{Scr} + \text{s-TAA}$
- ) When  $\text{pH}_{\text{KCL}} < 4.5$ , Sum of existing and potential acidity =  $\text{Scr} + \text{s-TAA} + \text{a-S}_{\text{NAS}}$

Where:  $\text{S}_{\text{Cr}}$  = Chromium Reducible Sulfur  
 $\text{pH}_{\text{KCL}}$  = Potassium chloride suspension pH  
 $\text{s-TAA}$  = *Titratable Actual Acidity*  
 $\text{S}_{\text{NAS}}$  = Net acid Soluble sulphur

It is anticipated that less than 1,000 tonnes of soil would be disturbed during any future construction activities at the site.

Based on the conditions encountered in the boreholes, the results of the screening and laboratory tests indicate that the dark brown sand below 2.5 m depth in Bore 1 is considered to be an acid sulfate soil. The brown and grey sands above approximately 1 m depth were confirmed to be not acid sulfate soils.

In the event that excavation into the dark brown and brown sand soils (below approximately 1 m depth), then excavation should be carried out in accordance with an acid sulfate soil management plan (beyond the scope of the current assessment). Furthermore, given the variable results for the dark brown and brown sands, further testing is recommended to help delineate the acid sulfate soils from the non-acid sulfate soils.

### 12.3 Waste Classification

The inorganic and organic concentrations of the samples collected from the near surface and underlying soils, as reported in Table 3 were considered to be generally indicative of background concentrations and do not indicate the presence of contamination.

The following Table 5 presents the results of the six step procedure outlined in the *Waste Classification Guidelines* (Ref 2) for determining the type of waste and the waste classification. This process applies to the near surface soils (i.e. upper 0.2 m of the soil profile) and any filling materials (if encountered), which do not meet the definition of Virgin Excavated Natural Material (VENM).

**Table 5: Six step classification procedure**

Step	Comments	Rationale
1. Is the waste special waste?	No	No asbestos or other clinical / related waste or waste tyres were observed on the surface or in the boreholes.
2. Is the waste liquid waste?	No	<i>In situ</i> material comprised a soil matrix.
3. Is the waste "pre-classified"?	No	The <i>in situ</i> material is not pre-classified with reference to EPA (2014).
4. Does the waste possess hazardous waste characteristics?	No	The waste was not observed to contain or considered at risk to contain explosives, gases, flammable solids, oxidising agents, organic peroxides, toxic substances, corrosive substances, coal tar, batteries, lead paint or dangerous goods containers.
5. Determining a waste classification using chemical assessment	Conducted	Refer to Table 3.
6. Is the waste putrescible or non-putrescible?	Non-putrescible	The <i>in situ</i> material does not contain materials considered to be putrescible.

Based on the observations at the time of sampling and the reported analytical results the near surface soils (i.e. to a depth of 200 mm) described as brown and grey sand within the area subject to classification as shown on Drawing 1 (Appendix A) would be provisionally classified as **General Solid Waste (non-putrescible)** as defined in the *Waste Classification Guidelines* (Ref 2).

Table 6 presents the results of the assessment of the underlying natural soils at the site with reference to the VENM definition and EPA advice.

**Table 6: VENM Classification Procedure**

Item	Comments	Rationale
1. Is the material natural?	Yes	Natural materials logged in the test bores comprising brown and grey or dark brown sand below 0.2 m depth.
2. Is the material impacted by manufactured chemicals or process residues?	No	The waste was not observed to contain or considered at risk to contain explosives, gases, flammable solids, oxidising agents, organic peroxides, toxic substances, corrosive substances, coal tar, batteries, lead paint or dangerous goods containers
3. Are the materials acid sulfate soils?	Yes in-part.	Screening and testing results indicated that some of the dark brown sands encountered below depths ranging from 0.8 m to 1.0 m depth are acid sulfate soils.  The grey and brown sands above are considered to be not acid sulfate soils.
4. Does the materials meet the definition of Virgin Excavated Natural Material (VENM)?	Yes in-part.	Previous land uses indicate a relatively low potential for impact to the natural soils. Receipt of low chemical concentrations indicates no likely impact on the natural soils.

Natural soils described as brown and grey sand from 0.2 m to depths ranging from 0.8 m to 1.0 m would therefore be classified as **Virgin Excavated Natural Material (VENM)**.

The Virgin Excavated Natural Material (VENM) classification as identified above is subject to appropriate segregation and inspection such that the material is not mixed/cross contaminated with non-VENM materials (e.g. overlying filling/topsoil and acid sulfate soil). Any on-site mixing of acid sulfate soils (i.e. soils below approximately 1.0 m depth) would void the VENM classification for this material.

Based on the results of the current investigation, the underlying dark brown and brown sands are considered to be acid sulfate soils and would be classified as **General Solid Waste (non-putrescible)** as defined in *Waste Classification Guidelines* (Ref 2), subject to the appropriate management of acid sulfate soil. Given the variability of the results of the current laboratory testing, however, additional testing may further delineate/characterise the presence of acid sulfate soils.

Given the preliminary nature of the assigned waste classification, which was based on limited sampling, it is recommended that the waste classification be confirmed by a qualified environmental consultant prior to and during excavation.

Please note that Part 5.6, Section 143 of the POEO Act 1997 states that is an offence for waste to be transported to a place that cannot lawfully be used as a facility to accept that waste. It is the duty of the owner and transporter of the waste to ensure that the waste is disposed of appropriately and that suitable records are obtained and kept. DP accepts no liability for the unlawful disposal of waste materials from any site. DP accepts no responsibility for the material tracking, loading, management, transport or disposal of waste from the site. It is the duty of the owner and transporter of the waste to ensure that the waste is disposed of appropriately.

Both the receiving site and the site disposing of the material should satisfy the requirements of the licence before disposal of the material is undertaken. Note that appropriate prior arrangement with the receiving site/relevant authorities should be obtained prior to the disposal of any material off site. The receiving site should check to ensure that the material received matches the description provided in this report and contains no cross contamination.

### 13. Conclusions and Recommendations

Based on the findings of the desktop review and site walkover, DP considers that there is a low risk of potential contamination given the past on-site land uses, adjacent site activities and the existing site conditions.

Some potential contamination sources were identified as indicated in Section 7. The site walkover did not identify any significant signs of contamination, other than fly-tipped waste materials. Furthermore, there was no apparent degradation to the environment, with flora and fauna thriving at the site.

As indicated in Section 13.1 above, the results of the soil analysis reported all contaminant concentrations in the soil samples analysed less than the adopted SAC. The results also confirmed

that the detectable TRH concentrations in near surface soils at test location S5 (5/0.1) were naturally occurring organic hydrocarbons and therefore did not warrant further assessment or remediation.

In summary, the PSI indicates that the site is compatible (from a site contamination perspective) with the proposed sensitive (residential land uses), subject to the following condition:

- ) Appropriate clean-up and landfill disposal of the fly-tipped materials observed at the ground surface and scattered across the site. An assessment (inspection and possible confirmation testing) of the clean-up areas should be completed by a qualified consultant; and
- ) An *Unexpected Finds Protocol* to manage any asbestos, or other unexpected contamination, encountered at the ground surface or within soils during any future development works at the site. Given the presence of isolated anthropogenic materials the possibility of encountering areas of contamination during any future development cannot be ruled out.

Groundwater testing was not completed, however, given that no significant soil contamination was found, groundwater is unlikely to be contaminated as a result of the known status of site soils. If extraction of groundwater is planned, then, further investigation will be necessary to determine its suitability for use.

## 14. References

1. National Environment Protection Council (NEPC) *National Environment Protection (Assessment of Site Contamination) Measure* 1999 (amended 2013) (NEPC, 2013).
2. *NSW Environment Protection Authority (EPA) Waste Classification Guidelines (2014) 'Part 1 – Classification of waste'.*
3. *Acid Sulfate Soil Manual*, NSW Acid Sulfate Soil Management Advisory Committee (ASSMAC), August 1998
4. Dear SW, Ahern CR, O'Brien LE, Dobos SK, McElnea AE, Moore NG and Watling KM *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines*. Department of Science, Information, Technology, Innovation and the Arts, Queensland Government, Version 4.0, 2014
5. Ahern CR, McElnea AE and Sullivan LA, *Acid Sulfate Soils Laboratory Methods Guidelines*, Department of Natural Resources, Mines and Energy, Indooroopilly, June 2004.

## 15. Limitations

Douglas Partners (DP) has prepared this report for this project at 18 Macleay Avenue, Woy Woy in accordance with DP's proposal dated CCT180154 and acceptance received from Mr Mark Glew of Pacific Link Housing Ltd dated 10 May 2018. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Pacific Link Housing Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP,



does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has not been detected by observation or by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Building demolition materials, such as concrete, brick, tile [list as appropriate to the field work findings], were, however, located in previous below-ground filling and/or above-ground stockpiles [as appropriate], and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints (as discussed above), or to parts of the site being inaccessible and not available for inspection/sampling [where appropriate], or to vegetation preventing visual inspection and reasonable access [where appropriate]. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the environmental

components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

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**Douglas Partners Pty Ltd**

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## **Appendix A**

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Report Notes  
Drawing 1 – Site and Test Location Plan

# About this Report

# Douglas Partners



## Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

## Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

## Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

## Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

## Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

# *About this Report*

## **Site Anomalies**

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

## **Information for Contractual Purposes**

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

## **Site Inspection**

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.



## Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

## Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

## Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

## Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low

reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

## Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

## Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

## Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:  
4,6,7  
N=13
- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:  
15, 30/40 mm

# *Sampling Methods*

The results of the SPT tests can be related empirically to the engineering properties of the soils.

## **Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests**

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.





## Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

## Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

## Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

## Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 - 5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

# *Soil Descriptions*

## **Soil Origin**

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

# Symbols & Abbreviations

## Douglas Partners



### Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

### Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

### Water

▷	Water seep
▽	Water level

### Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U <sub>50</sub>	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

### Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

### Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

### Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

### Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

### Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

### Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

### Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

### Other

fg	fragmented
bnd	band
qtz	quartz

# Symbols & Abbreviations

## Graphic Symbols for Soil and Rock

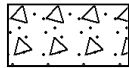
### General



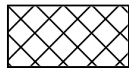
Asphalt



Road base



Concrete



Filling

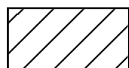
### Soils



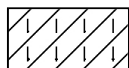
Topsoil



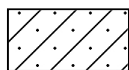
Peat



Clay



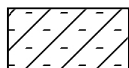
Silty clay



Sandy clay



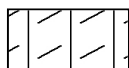
Gravelly clay



Shaly clay



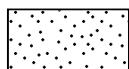
Silt



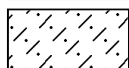
Clayey silt



Sandy silt



Sand



Clayey sand



Silty sand



Gravel



Sandy gravel



Cobbles, boulders



Talus

### Sedimentary Rocks



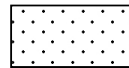
Boulder conglomerate



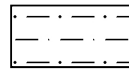
Conglomerate



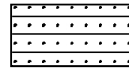
Conglomeratic sandstone



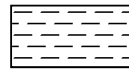
Sandstone



Siltstone



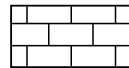
Laminite



Mudstone, claystone, shale

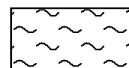


Coal

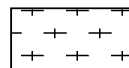


Limestone

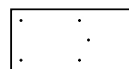
### Metamorphic Rocks



Slate, phyllite, schist

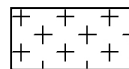


Gneiss

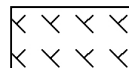


Quartzite

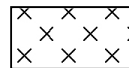
### Igneous Rocks



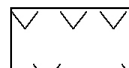
Granite



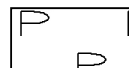
Dolerite, basalt, andesite



Dacite, epidote



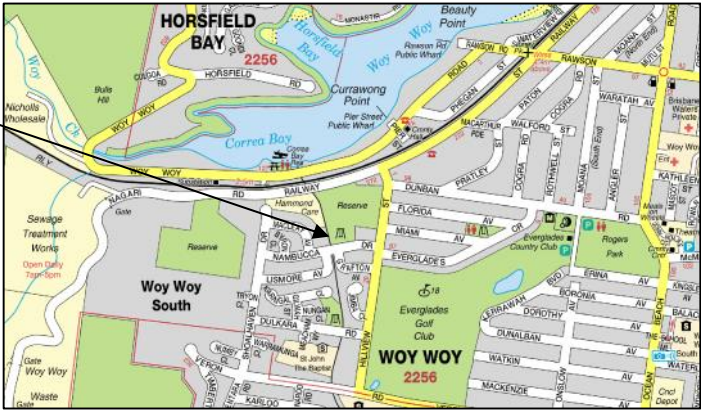
Tuff, breccia



Porphyry



- Notes:
- 1. Drawing adapted from Google Earth imagery



LOCALITY

The 'site' to be rezoned and developed

Area to remain zoned as RE1 – Public Recreation and excluded from current assessment

 <b>Douglas Partners</b> <i>Geotechnics   Environment   Groundwater</i>	CLIENT: Pacific Link Housing Ltd		TITLE: <b>Site and Test Location Plan</b> <b>Proposed Community Housing</b> <b>18 Macleay Avenue, Woy Woy</b>	PROJECT No: 83390.00
	OFFICE: Tuggerah	DRAWN BY: TDM		DRAWING No: 1
	SCALE: As Shown	DATE: 06.06.2018		REVISION: 0



---

## **Appendix B**

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Site History Information

Drawing 2 – Historical Aerial Photographs

# NSW Office of Water

## Work Summary

GW201147

Licence: 20BL170333

Licence Status: ACTIVE

Authorised Purpose IRRIGATION  
(s):

Intended Purpose(s): IRRIGATION

Work Type: Spear

Work Status: Supply Obtained

Construct.Method: Auger - Hollow Flight

Owner Type: Private

Commenced Date:

Completion Date: 28/06/2006

Final Depth: 5.70 m

Drilled Depth: 5.70 m

Contractor Name:

Driller: Warren Paul Greenway

Assistant Driller:

Property: NA 286 RAILWAY STREET  
WOY WOY 2256

Standing Water Level: 2.200

GWMA:  
GW Zone:

Salinity:  
Yield:

### Site Details

Site Chosen By:

County  
Form A: NORTH  
Licensed:

Parish  
NORTH.48

Cadastre  
1//591958

Region: 20 - Hunter

CMA Map: 9131-2S

River Basin: 211 - MACQUARIE -  
TUGGERAH LAKES

Grid Zone:

Scale:

Area/District:

Elevation: 0.00 m (A.H.D.)  
Elevation Unknown  
Source:

Northing: 6292184.0  
Easting: 342485.0

Latitude: 33°29'53.8"S  
Longitude: 151°18'15.6"E

GS Map: -

MGA Zone: 0

Coordinate GIS - Geographic  
Source: Information System

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	5.70	90			Auger - Hollow Flight
1	1	Casing	Pvc Class 9	0.00	4.20	90	86		Seated on Bottom
1	1	Opening	Screen - Gauze/Mesh	4.20	4.80	40		1	PVC Class 9, A: 0.60mm

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)



2.20	5.40	3.20	Unknown	2.20			00:45:00
------	------	------	---------	------	--	--	----------

**Geologists Log****Drillers Log**

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	Topsoil	Topsoil	
0.50	1.00	0.50	Sand, compact, light brown	Sand	
1.00	1.40	0.40	Sand/Coffee Rock, very hard, black	Sand	
1.40	2.20	0.80	Sand, lighth brown, marbled	Sand	
2.20	5.00	2.80	Sand, fine, river sand, light brown	Sand	
5.00	5.40	0.40	Sand, fine, river sand, white	Sand	
5.40	5.70	0.30	Sand, fine, in Clay	Sand	

**Remarks**

28/06/2006: Form A Remarks:

Nat Carling, 15-Dec-2011: No location was provided, based in the centre of the authorised land. Map sent to client for true location.

10/02/2012: Nat Carling, 10-Feb-2012; Owner advised the location is correct.

\*\*\* End of GW201147 \*\*\*

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

# NSW Office of Water

## Work Summary

GW201158

Licence: 20BL171300

Licence Status: ACTIVE

Authorised Purpose COMMERCIAL  
(s):

Intended Purpose(s): COMMERCIAL

Work Type: Spear

Work Status: Supply Obtained

Construct.Method: Auger - Hollow Flight

Owner Type: Private

Commenced Date:

Completion Date: 22/05/2007

Final Depth: 5.50 m

Drilled Depth: 5.50 m

Contractor Name:

Driller: Warren Paul Greenway

Assistant Driller:

Property: N/A 12 HILLVIEW STREET  
WOY WOY 2256

Standing Water Level: 2.100

GWMA:  
GW Zone:

Salinity:  
Yield:

### Site Details

Site Chosen By:

County  
Form A: NORTH  
Licensed:

Parish  
NORTH.48

Cadastre  
//62084

Region: 20 - Hunter

CMA Map: 9131-2S

River Basin: 211 - MACQUARIE -  
TUGGERAH LAKES  
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Unknown  
Source:

Northing: 6292065.0  
Easting: 342795.0

Latitude: 33°29'57.9"S  
Longitude: 151°18'27.5"E

GS Map: -

MGA Zone: 0

Coordinate GIS - Geographic  
Source: Information System

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	5.50	90			Auger - Hollow Flight
1	1	Casing	Pvc Class 9	0.00	5.20	90			
1	1	Opening	Screen - Gauze/Mesh	5.20	5.50	40		1	PVC Class 9, Glued, A: 50.00mm

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

2.10	5.50	3.40	Unknown	2.10					
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**Geologists Log****Drillers Log**

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	Fill, black Sand	Fill	
0.50	3.30	2.80	Sand, light brown, fine	Sand	
3.30	5.50	2.20	Sand, grey, shell particles	Sand	

**Remarks**

22/05/2007: Form A Remarks:

Nat Carling, 11-Jan-2012; Coordinates based on location map provided with the Form-A.

\*\*\* End of GW201158 \*\*\*

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

# NSW Office of Water

## Work Summary

GW100930

Licence: 20BL156881

Licence Status: ACTIVE

Authorised Purpose DOMESTIC  
(s):  
Intended Purpose(s):

Work Type: Bore

Work Status:

Construct.Method:

Owner Type:

Commenced Date:

Completion Date: 01/01/1990

Final Depth: 4.00 m

Drilled Depth:

Contractor Name:

Driller:

Assistant Driller:

Property: N/A

GWMA: -

GW Zone: -

Standing Water Level:

Salinity:

Yield: 0.238

### Site Details

Site Chosen By:

County	Parish	Cadastre
Form A: NORTH	NORTH.48	37//245727
Licensed: NORTHUMBERLAND	PATONGA	Whole Lot
		37//245727

Region: 10 - Sydney South Coast

CMA Map:

River Basin: - Unknown  
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)

Elevation Unknown

Source:

Northing: 6291834.0

Easting: 342513.0

Latitude: 33°30'05.2"S

Longitude: 151°18'16.5"E

GS Map: -

MGA Zone: 0

Coordinate Unknown  
Source:

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Galvanised Steel	0.00	0.00	50			

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
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### Geologists Log

**Drillers Log**

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
-------------	-----------	------------------	----------------------	---------------------	----------

**Remarks**

---

01/01/1990: Form A Remarks:  
DATA FROM AG APPLICATION ONLY.

\*\*\* End of GW100930 \*\*\*

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

# NSW Office of Water

## Work Summary

GW080562

Licence: 20BL169122

Licence Status: ACTIVE

Authorised Purpose DOMESTIC  
(s):

Intended Purpose(s): DOMESTIC

Work Type: Bore

Work Status:

Construct.Method:

Owner Type:

Commenced Date:

Completion Date: 01/01/2002

Final Depth:

Drilled Depth:

Contractor Name:

Driller:

Assistant Driller:

Property: N/A 19 KARINGAL CLOSE  
WOY WOY 2256

GWMA: -

GW Zone: -

Standing Water Level  
(m):

Salinity Description:

Yield (L/s):

### Site Details

Site Chosen By:

County	Parish	Cadastre
Form A: NORTH	NORTH.048	LT55 DP245727
Licensed: NORTHUMBERLAND	PATONGA	Whole Lot 55//245727

Region: 20 - Hunter

CMA Map: 9130-1N

River Basin: 212 - HAWKESBURY RIVER  
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)

Elevation (Unknown)

Source:

Northing: 6291792.0

Easting: 342529.0

Latitude: 33°30'06.6"S

Longitude: 151°18'17.0"E

GS Map: -

MGA Zone: 0

Coordinate Unknown  
Source:

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

### Geologists Log

### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
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## Remarks

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01/01/2002: Form A Remarks:

Usage every 2 to 3 days in summer to keep lawn alive

\*\*\* End of GW080562 \*\*\*

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.



# NSW Office of Water

## Work Summary

GW202043

Licence: 20BL170504

Licence Status: ACTIVE

Authorised Purpose DOMESTIC  
(s):

Intended Purpose(s): DOMESTIC

Work Type: Spear

Work Status: Supply Obtained

Construct.Method: Auger - Hollow Flight

Owner Type: Private

Commenced Date:

Completion Date: 05/10/2006

Final Depth: 6.50 m

Drilled Depth: 6.50 m

Contractor Name:

Driller: Warren Paul Greenway

Assistant Driller:

Property:

GWMA:

GW Zone:

Standing Water Level: 2.750

Salinity:

Yield: 0.500

### Site Details

Site Chosen By:

County  
Form A: NORTH  
Licensed:

Parish  
NORTH.48

Cadastre  
54/245727

Region: 20 - Hunter

CMA Map: 9130-1N

River Basin: 211 - MACQUARIE -  
TUGGERAH LAKES

Grid Zone:

Scale:

Area/District:

Elevation: 0.00 m (A.H.D.)

Elevation Unknown

Source:

Northing: 6291780.0

Easting: 342515.0

Latitude: 33°30'07.0"S

Longitude: 151°18'16.5"E

GS Map: -

MGA Zone: 0

Coordinate GIS - Geographic  
Source: Information System

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	6.50	90			Auger - Hollow Flight
1	1	Casing	Pvc Class 9	0.00	5.80	40	36		Seated on Bottom, Glued
1	1	Casing	Pvc Class 9	0.00	3.00	90	86		
1	1	Opening	Screen - Gauze/Mesh	5.80	6.50	40		1	PVC Class 9, Glued, A: 0.60mm

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

2.75	6.50	3.75	Unknown	2.75	0.50	128.00
------	------	------	---------	------	------	--------

**Geologists Log****Drillers Log**

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	6.50	6.50	Sand	Sand	

**Remarks**

05/10/2006: Form A Remarks:

Nat Carling, 18-May-2012; Coordinates based on location map provided with the Form-A.

\*\*\* End of GW202043 \*\*\*

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

# **Cadastral Records Enquiry Report : Lot 16 DP 255220**

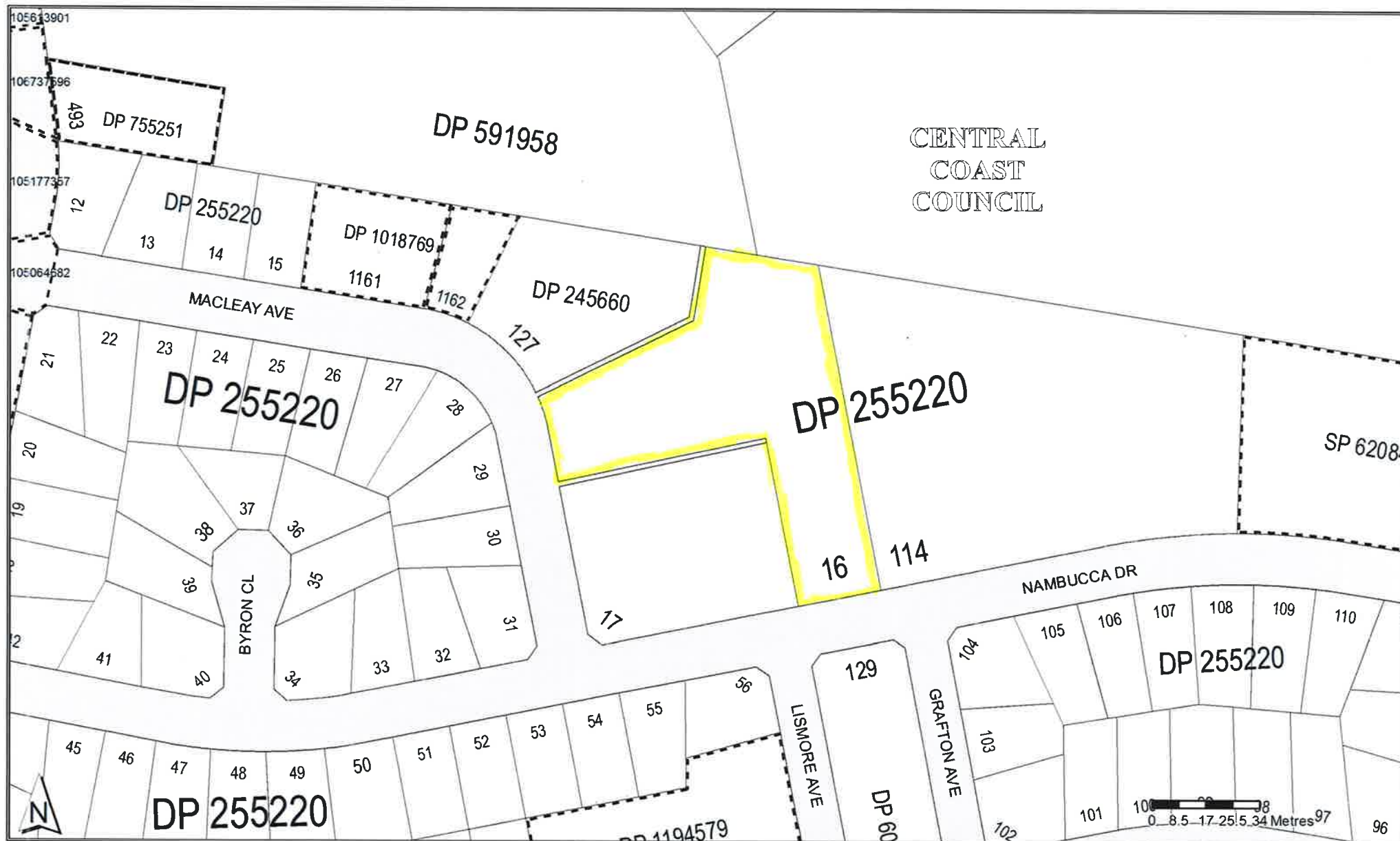
Locality : WOY WOY

LGA : CENTRAL COAST

Parish : PATONGA

County : NORTHUMBERLAND

Ref : CMapIT



PLAN FORM 2

Signatures and seal only.

Plan Drawing only to appear in this space

REFERENCE ONLY

Scale 1:1000

North Arrow

SHEET 14

D P 255220

FOR 50

245660

Registration 101 4-1-1978

Scale 1:1000

245660

Registration 101 4-1-1978

Scale 1:1000

245660

Registration 101 4-1-1978

Scale 1:1000

245660

Registration 101 4-1-1978

Scale 1:1000

245660

Registration 101 4-1-1978

Scale 1:1000

245660

Registration 101 4-1-1978

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Registration 101 4-1-1978</



I, Bruce Richard Dawkins, Registrar General for New South Wales, certify that this negative is a photograph made of a permanent record of a document in my custody this 5th day of January, 1978.

*Bruce Richard Dawkins*



Reg:R596130 /Doc:DP 0255220 P /Rev:18-Jun-1992 /Sts:OK OK /Pgs:ALL /Prt:15-May-2018 10:40 /Seq:4 of 4  
 Ref:Woy Woy /Sec:N

PLAN FORM 3 To be used in conjunction with Plan Form 2

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

OFFICE USE ONLY

PERMANENT MARKS				FD (D.P. 245660)
LINE	READING	DISTANCE		
1	180° 00'	2.59	TO INTN	DH & W IN CONC.
2	270° 00'	2.59		
3	0° 00'	3.2		
4	270° 00'	3.05		
5	0° 00'	4.57 & 11.885		
6	340° 00'	4.57 & 11.885		
7	240° 00'	3.355 & 11.13	TO INTN	
8	160° 00'	3.44		
9	20° 00'	3.2		
10	160° 00'	3.96		
11	150° 00'	3.96		
12	180° 00'	3.96		
13	150° 00'	3.96		
14	180° 00'	4.57 & 11.885		
15	180° 00'	4.57 & 11.885		
16	90° 00'	3.05 & 12.485	TO INTN	
17	177° 57'	3.255		
18	89° 55' 35"	3.96 & 11.9		
19	180° 00'	12.555	TO INTN	
20	340° 00'	3.055	TO INTN	
21	70° 00'	3.355		
22	160° 00'	3.96		
23	170° 00'	3.96		
24	182° 02'	3.96		
25	172° 02'	3.96		
26	183° 02' 30"	3.355		
27	92° 02'	3.21		
28	90° 02' 30"	2.775 & 12.58		
29	92° 02' 30"	0.455		CONC BLOCK
30	90° 02' 30"	0.47		
31	0° 02' 30"	0.455		
32	70° 00'	0.455		
33	160° 00'	0.455		
34	262° 58'	0.455		
35	262° 58'	0.455		
36	88° 55' 10"	0.455		

Registered: **D P 255220**

This is sheet **4** of my plan in **4** sheets

This is sheet **4** of the plan of **Woy Woy** covered by my Certificate No. **10**

Council Clerk

Signatures and seal only

Reduction Ratio 1

	I, Bruce Richard Davies, Registrar General for New South Wales, certify that this negative is a photograph made on a permanent record of a document in my custody this 5th day of January, 1978.
--	--



NEW SOUTH WALES



**CERTIFICATE OF TITLE**  
LAND PROPERTY ACT, 1900.



11532123

Prior Title (Crown Grant)

Vol.2073 Fol.29

Vol. **11532** Fol. **123**

Edition issued 1-3-1971

M117169

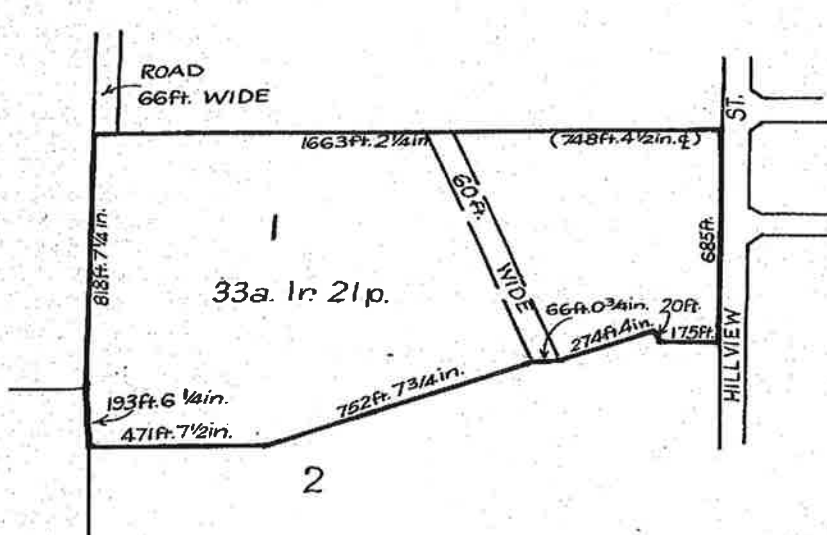


I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

*Lawton*  
Registrar General.



PLAN SHOWING LOCATION OF LAND



M117169 *Lawton*

Scale: 400 feet to one inch

**CANCELLED**

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 1 in Deposited Plan 545014 in the Shire of Gosford Parish of Patonga and County of Northumberland. EXCEPTING THEREOUT the minerals reserved by the Crown Grant.

FIRST SCHEDULE

**THE HOUSING COMMISSION OF NEW SOUTH WALES.**

SECOND SCHEDULE

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
2. Easement for Drainage created by Resumption No. J481970 affecting the part of the land above described 60 feet wide shown in the plan hereon.

*Lawton*  
Registrar General

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(Page 2 of 2 pages)

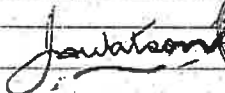

REGISTERED PROPRIETOR

*Jawatson*  
REGISTRAR GENERAL

[illegible]

PR. dedicated as part of  
highway Cor D-47B  
Vol. 1785

INSTRUMENT		
NATURE	NUMBER	DATE

INSTRUMENT			PARTICULARS	ENTERED	Signature of Registrar-General	CANCELLATION	
NATURE	NUMBER	DATE					
			<p>The interests of the Council of the Shire of Gisborne in the new roads shown in D.P. 24566</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <p>The residue of land in this folio comprises road in D.P. 24566.</p> <p style="text-align: center;">   </p> <p style="text-align: center;">REGISTRAR GENERAL</p> </div>				

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR-GENERAL ARE CANCELLED

Reg. Gen.  
21-1-1979



12711124

NEW SOUTH WALES

# CERTIFICATE OF TITLE

PROPERTY ACT, 1900



Crown Grant Vol.2073 Fol.29

Vol. **12711** Fol. **124**

Prior Title Vol.11532 Fol.123

Edition issued 11-2-1975.



I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

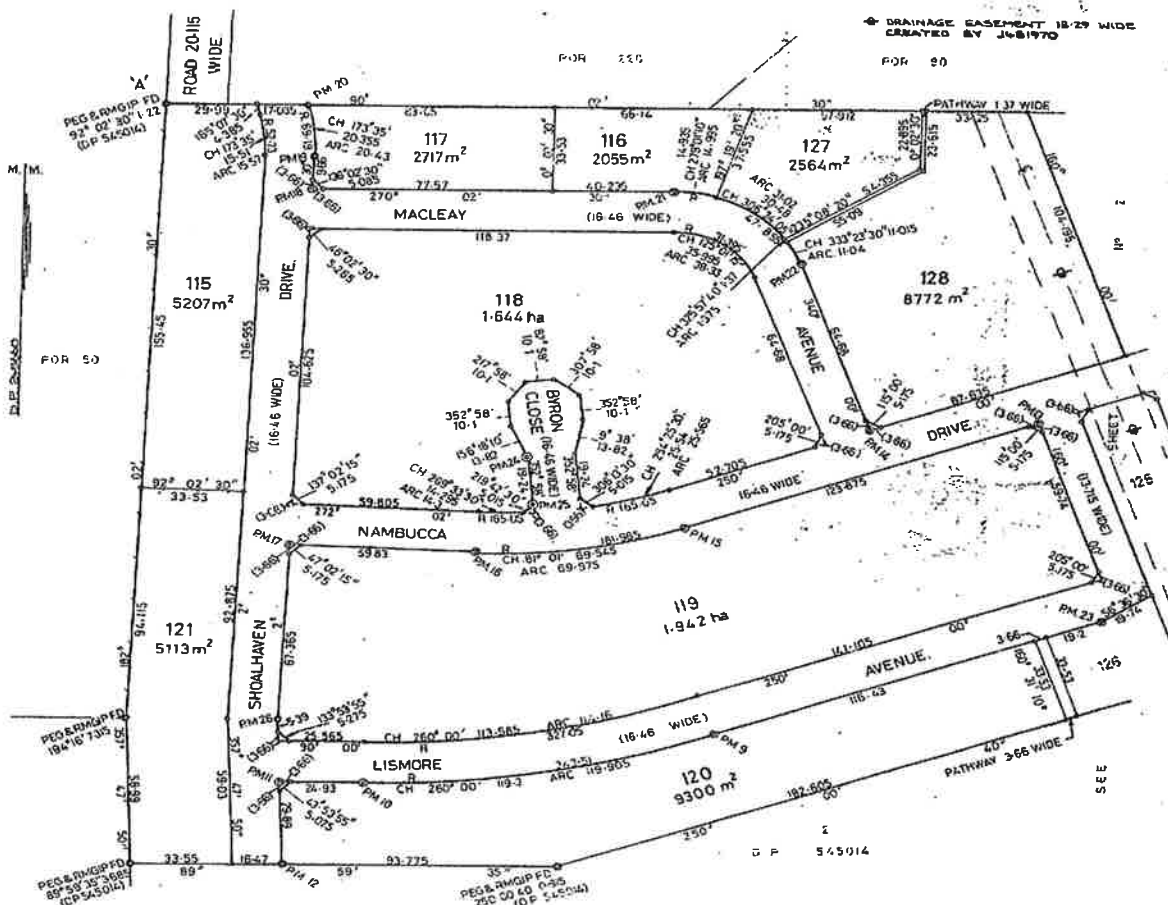
*Lawson*  
Registrar General.



## PLAN SHOWING LOCATION OF LAND

LENGTHS ARE IN METRES

**CANCELLED**



### ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 128 in Deposited Plan 245660 at Woy Woy in the Shire of Gosford Parish of Patonga and County of Northumberland. EXCEPTING THEREOUT the minerals reserved by the Crown Grant.

### FIRST SCHEDULE

THE HOUSING COMMISSION OF NEW SOUTH WALES.

### SECOND SCHEDULE

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
2. Easement for Drainage created by Resumption No. J481970 affecting the piece of land 18.29 metres wide shown in the plan hereon.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED.

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12711 Fol. 124





(Page 1) Vol.

DP 255220  
6/1/78

REGISTERED PROPRIETOR

[illegible]

INSTRUMENT		
NATURE	NUMBER	DATE

SECOND SCHEDULE (continued)						
INSTRUMENT			PARTICULARS	ENTERED	Signature of Registrar General	CANCELLATION
NATURE	NUMBER	DATE				
			<div>This deed is cancelled as to <u>Whole (enfranchised)</u> New Certificates of Title have issued on <u>9/2/19</u> for lots in <u>Deposited</u> Plan No. <u>255220</u> as follows:- Lots <u>4 to 114</u> Vol. <u>13798</u> Fol. <u>16 III</u> respectively.</div> <div> REGISTRAR GENERAL</div>		<div>The residue of land in this for <u>the pathway</u></div> <div> REGISTRAR GENERAL</div>	

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

NEW SOUTH WALES



# CERTIFICATE OF TITLE

REAL PROPERTY ACT, 1900



13798013

Crown Grant Vol. 2073 Fol. 29

Prior Title Vol.12711 Fol.124

Vol. 13798 Fol. 13

EDITION ISSUED

8 2 1979



I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

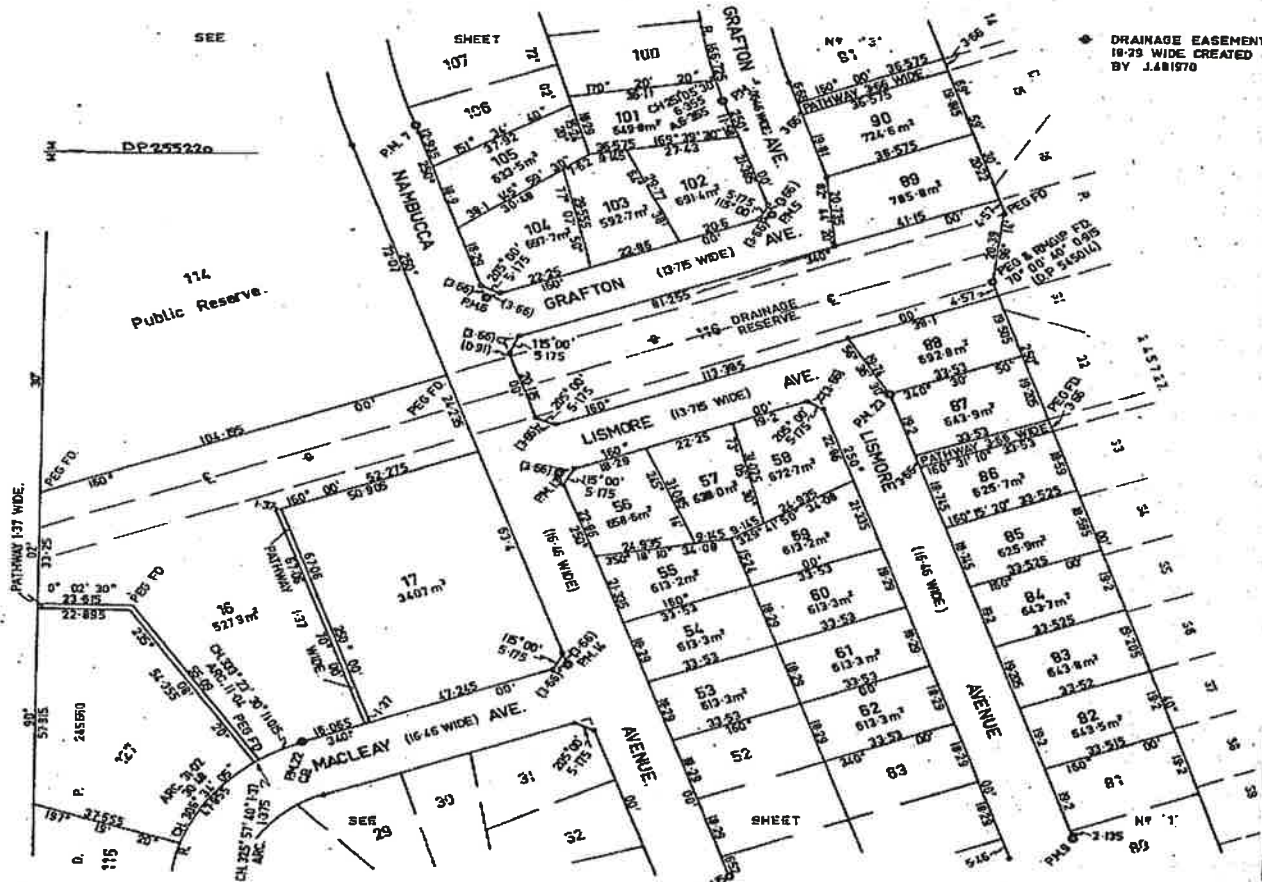
**CANCELLED**

Registrar General.  
SEE AUTO FOLIO



## PLAN SHOWING LOCATION OF LAND

LENGTHS ARE IN METRES



### ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 16 in Deposited Plan 255220 at Woy Woy in the Shire of Gosford Parish of Patonga and County of Cumberland. EXCEPTING THEREOUT the minerals reserved by the Crown Grant.

### FIRST SCHEDULE

THE HOUSING COMMISSION OF NEW SOUTH WALES.

### SECOND SCHEDULE

- GRM  
ED(SB)
1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
  2. J481970 Easement for Drainage affecting the part of the land above described shown so burdened in Deposited Plan 255220.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

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(Page 1) Vol. 13798 Fol. 13



Vol. 13798 Fol. 13

**FIRST SCHEDULE (continued)**[illegible]

## SECOND SCHEDULE (continued)

[illegible]

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED



LAND  
REGISTRY  
SERVICES

# Historical Title



NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE

11/5/2018 11:54AM

FOLIO: 16/255220

First Title(s): SEE PRIOR TITLE(S)

Prior Title(s): VOL 13798 FOL 13

Recorded	Number	Type of Instrument	C.T. Issue
5/6/1987		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
2/10/1987		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED

\*\*\* END OF SEARCH \*\*\*

Woy Woy

PRINTED ON 11/5/2018

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Received: 11/05/2018 11:54:11





LAND  
REGISTRY  
SERVICES

# Title Search



NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 16/255220

SEARCH DATE

TIME

EDITION NO

DATE

11/5/2018

12:02 PM

-

-

VOL 13798 FOL 13 IS THE CURRENT CERTIFICATE OF TITLE

LAND

LOT 16 IN DEPOSITED PLAN 255220

AT WOY WOY

LOCAL GOVERNMENT AREA CENTRAL COAST

PARISH OF PATONGA COUNTY OF NORTHUMBERLAND

TITLE DIAGRAM DP255220

FIRST SCHEDULE

THE HOUSING COMMISSION OF NEW SOUTH WALES

SECOND SCHEDULE (2 NOTIFICATIONS)

- 1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)
- 2 J481970 EASEMENT FOR DRAINAGE AFFECTING THE PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM

NOTATIONS

UNREGISTERED DEALINGS: NIL

\*\*\* END OF SEARCH \*\*\*

Woy Woy

PRINTED ON 11/5/2018

\* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

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## 18 Macleay AVE WOY WOY NSW 2256

Details

18 Macleay AVE WOY WOY NSW 2256  
Property Number: 67936

Titles

LOT 16 DP 255220  
Lot / Deposited Plan  
Land Area 5273.00

Map

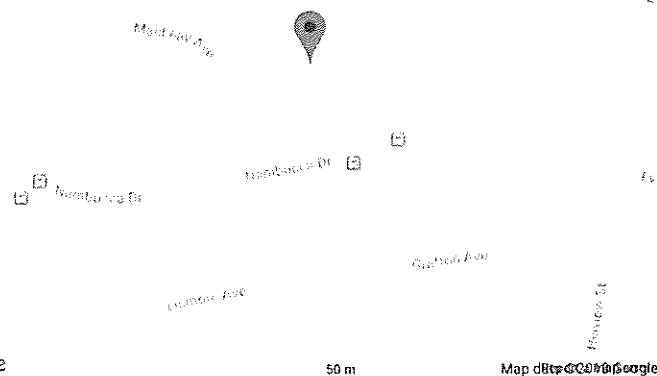
Location

Applications

Show All

Hammondcare  
Woy Woy

Macleay Ave



Applications

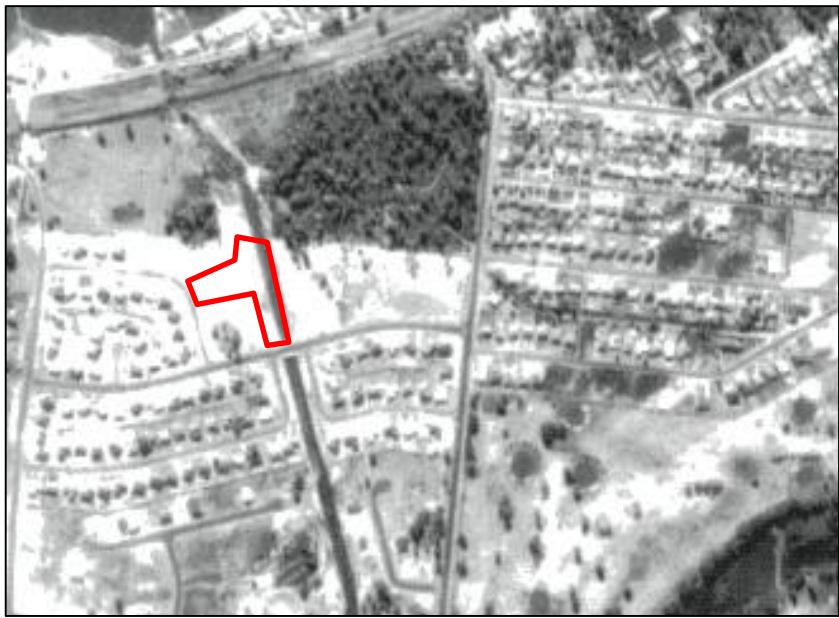
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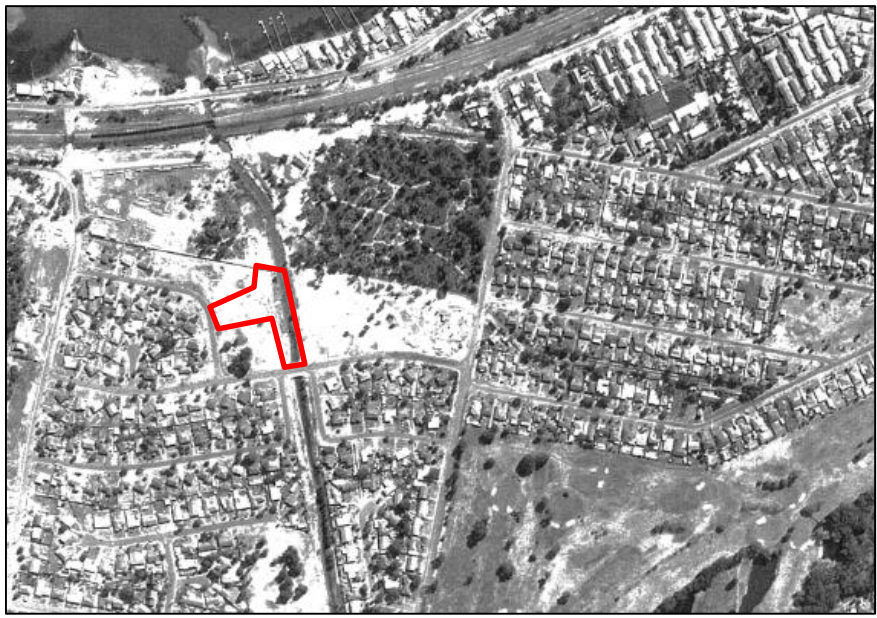




1954 Aerial Photograph



1975 Aerial Photograph



1985 Aerial Photograph



1991 Aerial Photograph



2002 Aerial Photograph



2003 Google Earth Imagery

Legend:  
 — Approximate site boundary



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## Appendix C

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### Site Assessment Criteria

## Appendix C – Site Assessment Criteria

It is understood that the future development of the site may comprise the construction of two or three storey townhouses and / or group homes with associate car parking and landscaping.

This assessment was limited to the western portion of Lot 16 of Deposited Plan 255220, which is to be rezoned from RE1 (public recreation) to either R1 (general residential) or R2 (low density residential), covering approximately 2,700 m<sup>2</sup>. The remaining eastern area of the lot (approximately 2,800 m<sup>2</sup>) is to remain zoned as RE1.

The Site Assessment Criteria (SAC) applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination on the site (refer to Section 7). Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013).

The investigation and screening levels applied in the current investigation comprise levels adopted for a Residential A land use scenario.

### Health-based Investigation Levels (Non-petroleum Chemical Contaminants)

Table 3 shows the HILs that have been adopted by NEPC (2013) Schedule B1, Table 1A(1) for assessing the human health risk from a contaminant via relevant pathways of exposure, as detailed in the CSM. Table C1 only includes contaminants analysed during this assessment, not the full list provided in NEPC (2013).

Given the objective of the PSI, the proposed residential land use and the potential receptors identified in the CSM, the adopted SAC were for a 'Residential A' land use.

**Table C1: Health Investigation Levels (Non-petroleum Chemical Contaminants)**

<b>Contaminant</b>	<b>HIL A (mg/kg)</b>
<b>Metals and Inorganics</b>	
Arsenic	100
Cadmium	20
Chromium (IV)	100
Copper	6000
Lead	300
Mercury (inorganic)	40
Nickel	400
Zinc	7400
<b>PAH</b>	
Carcinogenic PAH (as benzo(a)pyrene TEQ)	3
Total PAH	300
<b>OCP</b>	
DDT + DDD + DDE	240
Aldrin + Dieldrin	6
Chlordane	50
Endosulfan (total)	270
Endrin	10
Heptachlor	6
HCB	10
Methoxychlor	300
<b>OPP</b>	
Chlorpyrifos	160
<b>Other Organics</b>	
PCB	1

## Petroleum Contaminants (Health Screening Levels and Management Limits)

### Health Screening Levels

Table C2 shows petroleum hydrocarbon compounds adopted from NEPC (2013) Schedule B1, Table 1A(3) and are based on the exposure to petroleum hydrocarbons through the dominant vapour inhalation exposure pathway. The screening levels are adopted given the exposure risk identified during the CSM.

The HSLs are based on overlying soil type and depth. HSLs for sand have been used given the conditions encountered. Using the most conservative values, the depth range of 0 m to <1 m has been used.

**Table C2: Soil Health Screening Levels for Vapour Intrusion**

Contaminant	Soil Type	HSL A (mg/kg)
		Depth 0 m to <1m
Toluene	Sand	160
Ethylbenzene		55
Xylenes		40
Naphthalene		3
Benzene		0.5
TRH C <sub>6</sub> -C <sub>10</sub> less BTEX [F1]		45
TRH >C <sub>10</sub> -C <sub>16</sub> less naphthalene [F2]		110

### Direct Contact Screening Levels

Direct contact HSLs have also been considered for the future land use, considering that some parts of the site will not be occupied by buildings and may be available for direct contact such as grassed areas or in garden beds and vegetated areas. These are provided in Table C3.

**Table C3: Direct Contact Health Screening Levels (mg/kg)**

Contaminant	HSL A	Intrusive Maintenance Worker
Toluene	14,000	120,000
Ethylbenzene	4,500	85,000
Xylenes	12,000	130,000
Naphthalene	1,400	29,000
Benzene	100	1,100
C <sub>6</sub> -C <sub>10</sub>	4,400	82,000
>C <sub>10</sub> -C <sub>16</sub>	3,300	62,000
>C <sub>16</sub> -C <sub>34</sub>	4,500	85,000
>C <sub>34</sub> -C <sub>40</sub>	6,300	120,000

### Management Limits (TRH Only)

NEPC (2013) Table 1B(7) provides 'management limits' for TRH fractions, which are applied after consideration of relevant HSLs. The management limits have been adopted to avoid or minimise the following potential effects of petroleum hydrocarbons:

- ) Formation of non-aqueous phase liquids (NAPL);
- ) Fire and explosive hazards; and
- ) Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services by hydrocarbons.

The presence of TRH contamination at the site below the management limits does not imply that there is no need for administrative notification or controls in accordance with jurisdictional requirements. The adopted management limits are shown in Table C4 and have been selected based on the CSM.



Management limits for coarse material are presented in Table C4, since the coarse texture management limits are more conservative of the two management limits available.

**Table C4: Management Limits for TRH Fractions in Soil**

TRH Fraction	Soil Texture	Management Limit: (mg/kg)
C <sub>6</sub> -C <sub>9</sub> [F1]	Coarse	700
>C <sub>10</sub> -C <sub>16</sub> [F2]	Coarse	1,000
>C <sub>16</sub> -C <sub>34</sub> [F3]	Coarse	2,500
>C <sub>34</sub> -C <sub>40</sub> [F4]	Coarse	10,000

## Ecological Investigation Levels

Ecological Investigation Levels (EIL) have been derived for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems (NEPC, 2013). EIL depend on specific soil physiochemical properties and land use scenarios and generally apply to the top 2 m of soil, which corresponds to the root zone and habitation zone of many species. The EIL is determined for a contaminant based on the sum of the ambient background concentration (ABC) and an added contaminant limit (ACL). The ABC of a contaminant is the soil concentration in a specific locality that is the sum of naturally occurring background levels and the contaminants levels that have been introduced from diffuse or non-point sources (e.g. motor vehicle emissions). The ACL is the added concentration (above the ABC) of a contaminant above which further appropriate investigation and evaluation of the impact on ecological values is required.

The EIL is calculated using the following formula:

$$\text{EIL} = \text{ABC} + \text{ACL}$$

The ABC is determined through direct measurement at an appropriate reference site (preferred) or through the use of methods defined by Olszowy et al *Trace element concentrations in soils from rural and urban areas of Australia*, Contaminated Sites monograph no. 4, South Australian Health Commission, Adelaide, Australia 1995 (Olszowy, 1995) or Hamon et al, *Geochemical indices allow estimation of heavy metal background concentrations in soils*, Global Biogeochemical Cycles, vol. 18, GB1014, (Hamon, 2004). ACL is based on the soil characteristics of pH, CEC and clay content.

EIL (and ACLs where appropriate) have been derived in NEPC (2013) for only a short list of contaminants comprising As, Cu, Cr (III), DDT, naphthalene, Ni, Pb and Zn. An *Interactive (Excel) Calculation Spreadsheet* may be used for calculating site-specific EIL for these contaminants, and has been provided in the ASC NEPM Toolbox available on the SCEW (Standing Council on Environment and Water) website (<http://www.scew.gov.au/node/941>).

The adopted EIL, derived from Tables 1B(1) to 1B(5), Schedule B1 of NEPC (2013) the *Interactive (Excel) Calculation Spreadsheet* are shown in the following Table C5. The following site specific data and assumptions have been used to determine the EILs:

) The EILs will apply to the top 2 m of the soil profile;

- ) Given the likely source of soil contaminants (i.e. dumped waste) the contamination is considered as ranging from “aged” (>2 years) to ‘fresh’. As such values for ‘fresh’ have been adopted; and
- ) ABCs have been derived using the *Interactive (Excel) Calculation Spreadsheet* using input parameters of fresh soil, average CEC of 8 and average pH of 5.5 for the State in which the site is located, and high for traffic volumes.

**Table C5: Ecological Investigation Levels (EIL) in mg/kg**

	Analyte	EIL	Comments
<b>Metals</b>	Arsenic	50	Adopted pH of 6.8 and CEC of 8 cmol <sub>c</sub> /kg]; assumed clay content less than 5%
	Copper	90	
	Nickel	55	
	Chromium III	200	
	Lead	270	
	Zinc	130	
<b>PAH</b>	Naphthalene	170	
<b>OCP</b>	DDT	180	

Ecological Screening Levels (ESL) are also used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. ESL apply to the top 2 m of the soil profile as for EIL.

ESL have been derived in NEPC (2013) for petroleum fractions F1 to F4 as well as BTEX and Benzo(a)pyrene. Site specific data and assumptions as summarised in Table C6 have been used to determine the ESL. The adopted ESL, from Table 1B(6), Schedule B1 of NEPC (2013) are shown in Table C7.

**Table C6: Inputs to the Derivation of ESL**

Variable	Input	Rationale
Depth of ESL application	Top 2 m of the soil profile	The top 2 m depth below ground level corresponds to the root zone and habitation zone of many species.
Land use	Residential	Based on a more conservative approach
Soil Texture	Coarse	Soil profile encountered

**Table C7: Ecological Screening Levels (ESL) in mg/kg**

	<b>Analyte</b>	<b>ESL</b>	<b>Comments</b>
<b>TRH</b>	C6 – C10 (less BTEX) [F1]	180*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	>C10-C16 (less Naphthalene) [F2]	120*	
	>C16-C34 [F3]	300	
	>C34-C40 [F4]	2800	
<b>BTEX</b>	Benzene	50	
	Toluene	85	
	Ethylbenzene	70	
	Xylenes	105	
<b>PAH</b>	Benzo(a)pyrene	0.7	

## Asbestos

Presence / absence testing for asbestos in soil was carried out on eight soil samples as a screening assessment using the laboratory detection limit of 0.1 g / kg.

## Contaminants with No Assessment Criteria

Where no guidance is provided in NEPC (2013) for a specific analyte, the PQL was used as the initial screening criteria.

If concentrations are recorded above the PQL, reference criteria were sourced from other national and international guidance as relevant and used to determine the significance of the detected analyte.

The referenced criteria are provided in Table 3 in Section 11.

---

## **Appendix D**

---

Results of Field Work

# BOREHOLE LOG

**CLIENT:** Pacific Link Housing Ltd  
**PROJECT:** Proposed Community Housing  
**LOCATION:** 18 Macleay Avenue, Woy Woy

**SURFACE LEVEL:** 4.0 AHD  
**EASTING:** 342539  
**NORTHING:** 6292046  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 1  
**PROJECT No:** 83390.00  
**DATE:** 16/5/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SAND: Medium dense, brown and grey, fine grained, sand with abundant rootlets, humid - no rootlets after 0.1m		D	0.1		PID<1					
		- medium grained after 0.35m		D	0.5		PID<1					
-1	1.0	SAND: Very dense (indurated), dark brown, medium grained sand with trace clay and trace silt, damp		D	1.0		PID<1	-1				
		- very hard from drilling after 1.5m		D	1.5		PID<1					
-2	2.0			D	2.0		PID<1	-2				
				D	2.5		PID<1					
	2.8	Bore discontinued at 2.8m. Limit of investigation		D	2.8		PID<1					
-3								-3				

**RIG:** Toyota 4WD

**DRILLER:** M Harrison

**LOGGED:** M Harrison

**CASING:**

**TYPE OF BORING:** 60mm  $\phi$  Dynamic Push Tube (continuous sample)

**WATER OBSERVATIONS:** No Free Groundwater Observed

**REMARKS:**

☒ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Pacific Link Housing Ltd  
**PROJECT:** Proposed Community Housing  
**LOCATION:** 18 Macleay Avenue, Woy Woy

**SURFACE LEVEL:** 4.0 AHD  
**EASTING:** 342548  
**NORTHING:** 6292074  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 2  
**PROJECT No:** 83390.00  
**DATE:** 16/5/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SAND: Loose to medium dense, grey, medium grained, sand, humid - with some rootlets to 0.1m		D	0.1		PID<1					
				D	0.5		PID<1					
0.9		SAND: Very dense, dark brown, medium grained, slightly cemented (indurated) sand with some silt, damp		D	1.0		PID<1	1				
		- difficult to drill from 1.5m		D	1.5		PID<1					
		- coarse grained brown and dark brown from 1.8m		D	2.0		PID<1	2				
				D	2.5		PID<1					
2.8		Bore discontinued at 2.8m. Limit of investigation		D	2.8		PID<1					
3												

**RIG:** Toyota 4WD

**DRILLER:** M Harrison

**LOGGED:** M Harrison

**CASING:**

**TYPE OF BORING:** 60mm  $\phi$  Dynamic Push Tube (continuous sample)

**WATER OBSERVATIONS:** No Free Groundwater Observed

**REMARKS:**

☒ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Pacific Link Housing Ltd  
**PROJECT:** Proposed Community Housing  
**LOCATION:** 18 Macleay Avenue, Woy Woy

**SURFACE LEVEL:** 4.0 AHD  
**EASTING:** 342582  
**NORTHING:** 6292067  
**DIP/AZIMUTH:** 90°/--

**BORE No: 3**  
**PROJECT No: 83390.00**  
**DATE: 16/5/2018**  
**SHEET 1 OF 1**

[illegible]

**RIG:** Toyota 4WD

**DRILLER:** M Harrison

**LOGGED:** M Harrison

**CASING:**

**TYPE OF BORING:** 60mm $\phi$  Dynamic Push Tube (continuous sample)

**WATER OBSERVATIONS:** No Free Groundwater Observed

REMARKS:

☒ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test (s(50) (MPa)
		PL(D)	Point load diametral test (s(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)





# BOREHOLE LOG

**CLIENT:** Pacific Link Housing Ltd  
**PROJECT:** Proposed Community Housing  
**LOCATION:** 18 Macleay Avenue, Woy Woy

**SURFACE LEVEL:** 4.0 AHD  
**EASTING:** 342576  
**NORTHING:** 6292110  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 4  
**PROJECT No:** 83390.00  
**DATE:** 16/5/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SAND: Medium dense to very dense, grey, medium grained, sand, humid - some rootlets to 0.1m		D	0.1		PID<1					
				D	0.5		PID<1					
	0.75	SAND: Very dense, brown and dark brown, slightly cemented (indurated) sand, damp										
	1	- brown sand and trace silt and clay up to 1.15m		D	1.0		PID<1					
				D	1.5		PID<1					
	2	- becoming more cemented at 2.3m		D	2.0		PID<1					
				D	2.5		PID<1					
	2.8	Bore discontinued at 2.8m. Limit of investigation		D	2.8		PID<1					
	3											

**RIG:** Toyota 4WD

**DRILLER:** M Harrison

**LOGGED:** M Harrison

**CASING:**

**TYPE OF BORING:** 60mm  $\phi$  Dynamic Push Tube (continuous sample)

**WATER OBSERVATIONS:** No Free Groundwater Observed

**REMARKS:**

☒ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

<b>Project:</b> Proposed Community Housing	<b>Project No:</b> 83390.00
<b>Client:</b> Pacific Link Housing Ltd	<b>Date:</b> 16.5.18
<b>Location:</b> 18 Macleay Avenue, Woy Woy	<b>Sampled By:</b> MJH

[illegible]

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## Appendix E

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### Laboratory Test Results

## CERTIFICATE OF ANALYSIS 192182

### Client Details

<b>Client</b>	Douglas Partners Tuggerah
<b>Attention</b>	Troy McClelland
<b>Address</b>	Unit 5, 3 Teamster Close, Tuggerah, NSW, 2259

### Sample Details

<b>Your Reference</b>	<b>83390, Woy Woy</b>
<b>Number of Samples</b>	8 Soil
<b>Date samples received</b>	22/05/2018
<b>Date completed instructions received</b>	22/05/2018

### Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

**Please refer to the last page of this report for any comments relating to the results.**

### Report Details

<b>Date results requested by</b>	29/05/2018
<b>Date of Issue</b>	29/05/2018
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. <b>Tests not covered by NATA are denoted with *</b>	

#### Asbestos Approved By

Analysed by Asbestos Approved Identifier: Lucy Zhu  
 Authorised by Asbestos Approved Signatory: Lucy Zhu

#### Results Approved By

Dragana Tomas, Senior Chemist  
 Leon Ow, Chemist  
 Lucy Zhu, Asbestos Analyst  
 Nick Sarlamis, Inorganics Supervisor  
 Steven Luong, Senior Chemist

#### Authorised By



Jacinta Hurst, Laboratory Manager

## vTRH(C6-C10)/BTEXN in Soil

Our Reference		192182-3	192182-4	192182-5	192182-6	192182-7
Your Reference	UNITS	1/0.1	2/0.5	3/0.1	4/0.1	5/0.1
Date Sampled		16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Date analysed	-	24/05/2018	24/05/2018	24/05/2018	24/05/2018	24/05/2018
TRH C <sub>6</sub> - C <sub>9</sub>	mg/kg	<25	<25	<25	<25	<25
TRH C <sub>6</sub> - C <sub>10</sub>	mg/kg	<25	<25	<25	<25	<25
vTPH C <sub>6</sub> - C <sub>10</sub> less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	119	121	121	121	115

## vTRH(C6-C10)/BTEXN in Soil

Our Reference		192182-8
Your Reference	UNITS	QA1
Date Sampled		16/05/2018
Type of sample		Soil
Date extracted	-	23/05/2018
Date analysed	-	24/05/2018
TRH C <sub>6</sub> - C <sub>9</sub>	mg/kg	<25
TRH C <sub>6</sub> - C <sub>10</sub>	mg/kg	<25
vTPH C <sub>6</sub> - C <sub>10</sub> less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	122

## svTRH (C10-C40) in Soil

Our Reference		192182-3	192182-4	192182-5	192182-6	192182-7
Your Reference	UNITS	1/0.1	2/0.5	3/0.1	4/0.1	5/0.1
Date Sampled		16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Date analysed	-	24/05/2018	24/05/2018	24/05/2018	24/05/2018	24/05/2018
TRH C <sub>10</sub> - C <sub>14</sub>	mg/kg	<50	<50	<50	<50	<50
TRH C <sub>15</sub> - C <sub>28</sub>	mg/kg	<100	<100	<100	<100	230
TRH C <sub>29</sub> - C <sub>36</sub>	mg/kg	<100	<100	<100	<100	440
TRH >C <sub>10</sub> -C <sub>16</sub>	mg/kg	<50	<50	<50	<50	50
TRH >C <sub>10</sub> - C <sub>16</sub> less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	50
TRH >C <sub>16</sub> -C <sub>34</sub>	mg/kg	<100	<100	<100	<100	560
TRH >C <sub>34</sub> -C <sub>40</sub>	mg/kg	<100	<100	<100	<100	250
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	850
Surrogate o-Terphenyl	%	100	94	96	97	110

## svTRH (C10-C40) in Soil

Our Reference		192182-8
Your Reference	UNITS	QA1
Date Sampled		16/05/2018
Type of sample		Soil
Date extracted	-	23/05/2018
Date analysed	-	24/05/2018
TRH C <sub>10</sub> - C <sub>14</sub>	mg/kg	<50
TRH C <sub>15</sub> - C <sub>28</sub>	mg/kg	<100
TRH C <sub>29</sub> - C <sub>36</sub>	mg/kg	<100
TRH >C <sub>10</sub> -C <sub>16</sub>	mg/kg	<50
TRH >C <sub>10</sub> - C <sub>16</sub> less Naphthalene (F2)	mg/kg	<50
TRH >C <sub>16</sub> -C <sub>34</sub>	mg/kg	<100
TRH >C <sub>34</sub> -C <sub>40</sub>	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	98

PAHs in Soil						
Our Reference		192182-3	192182-4	192182-5	192182-6	192182-7
Your Reference	UNITS	1/0.1	2/0.5	3/0.1	4/0.1	5/0.1
Date Sampled		16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Date analysed	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate <i>p</i> -Terphenyl-d14	%	99	97	98	96	102



PAHs in Soil		
Our Reference		192182-8
Your Reference	UNITS	QA1
Date Sampled		16/05/2018
Type of sample		Soil
Date extracted	-	23/05/2018
Date analysed	-	23/05/2018
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate <i>p</i> -Terphenyl-d14	%	106

Organochlorine Pesticides in soil						
Our Reference		192182-3	192182-4	192182-5	192182-6	192182-7
Your Reference	UNITS	1/0.1	2/0.5	3/0.1	4/0.1	5/0.1
Date Sampled		16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Date analysed	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	103	105	103	103	114

PCBs in Soil						
Our Reference		192182-3	192182-4	192182-5	192182-6	192182-7
Your Reference	UNITS	1/0.1	2/0.5	3/0.1	4/0.1	5/0.1
Date Sampled		16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Date analysed	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Surrogate TCLMX	%	103	105	103	103	114

## Acid Extractable metals in soil

Our Reference		192182-3	192182-4	192182-5	192182-6	192182-7
Your Reference	UNITS	1/0.1	2/0.5	3/0.1	4/0.1	5/0.1
Date Sampled		16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Date analysed	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	2	3	3	4	2
Copper	mg/kg	5	<1	<1	<1	6
Lead	mg/kg	23	<1	1	1	7
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	1	<1	1	2	1
Zinc	mg/kg	12	<1	1	1	45

## Acid Extractable metals in soil

Our Reference		192182-8
Your Reference	UNITS	QA1
Date Sampled		16/05/2018
Type of sample		Soil
Date prepared	-	23/05/2018
Date analysed	-	23/05/2018
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	5
Copper	mg/kg	<1
Lead	mg/kg	2
Mercury	mg/kg	<0.1
Nickel	mg/kg	2
Zinc	mg/kg	3

Moisture						
Our Reference		192182-3	192182-4	192182-5	192182-6	192182-7
Your Reference	UNITS	1/0.1	2/0.5	3/0.1	4/0.1	5/0.1
Date Sampled		16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Date analysed	-	24/05/2018	24/05/2018	24/05/2018	24/05/2018	24/05/2018
Moisture	%	2.2	5.6	3.7	4.5	14

Moisture		
Our Reference		192182-8
Your Reference	UNITS	QA1
Date Sampled		16/05/2018
Type of sample		Soil
Date prepared	-	23/05/2018
Date analysed	-	24/05/2018
Moisture	%	3.3

Asbestos ID - soils						
Our Reference	UNITS	192182-3	192182-4	192182-5	192182-6	192182-7
Your Reference		1/0.1	2/0.5	3/0.1	4/0.1	5/0.1
Date Sampled		16/05/2018	16/05/2018	16/05/2018	16/05/2018	16/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	28/05/2018	28/05/2018	28/05/2018	28/05/2018	28/05/2018
Sample mass tested	g	Approx. 35g	Approx. 30g	Approx. 40g	Approx. 30g	Approx. 25g
Sample Description	-	Brown sandy soil	Brown sandy soil	Brown sandy soil	Brown sandy soil	Brown sandy soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Chromium Suite			
Our Reference		192182-1	192182-2
Your Reference	UNITS	1/0.5	1/2.8
Date Sampled		16/05/2018	16/05/2018
Type of sample		Soil	Soil
Date prepared	-	23/05/2018	23/05/2018
Date analysed	-	23/05/2018	23/05/2018
pH <sub>KCl</sub>	pH units	4.4	4.7
s-TAA pH 6.5	%w/w S	<0.01	0.07
TAA pH 6.5	moles H <sup>+</sup> /t	<5	46
Chromium Reducible Sulfur	%w/w	<0.005	0.01
a-Chromium Reducible Sulfur	moles H <sup>+</sup> /t	<3	7
S <sub>HCl</sub>	%w/w S	<0.005	<0.005
S <sub>KCl</sub>	%w/w S	<0.005	0.011
S <sub>NAS</sub>	%w/w S	<0.005	<0.005
ANC <sub>BT</sub>	% CaCO <sub>3</sub>	<0.05	<0.05
s-ANC <sub>BT</sub>	%w/w S	<0.05	<0.05
s-Net Acidity	%w/w S	0.0060	0.086
a-Net Acidity	moles H <sup>+</sup> /t	<5	53
Liming rate	kg CaCO <sub>3</sub> /t	<0.75	4.0
a-Net Acidity without ANCE	moles H <sup>+</sup> /t	<5	53
Liming rate without ANCE	kg CaCO <sub>3</sub> /t	<0.75	4.0
s-Net Acidity without ANCE	%w/w S	0.0060	0.086



Method ID	Methodology Summary
<b>ASB-001</b>	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
<b>Inorg-008</b>	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
<b>Inorg-068</b>	Chromium Reducible Sulfur - Hydrogen Sulfide is quantified by iodometric titration after distillation to determine potential acidity. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.
<b>Metals-020</b>	Determination of various metals by ICP-AES.
<b>Metals-021</b>	Determination of Mercury by Cold Vapour AAS.
<b>Org-003</b>	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
<b>Org-003</b>	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.  F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.  Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
<b>Org-005</b>	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
<b>Org-005</b>	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
<b>Org-006</b>	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
<b>Org-006</b>	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PCBs" is simply a sum of the positive individual PCBs.

Method ID	Methodology Summary
<b>Org-012</b>	<p>Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.</p> <p>For soil results:-</p> <ol style="list-style-type: none"> <li>1. 'EQ PQL' values are assuming all contributing PAHs reported as &lt;PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present.</li> <li>2. 'EQ zero' values are assuming all contributing PAHs reported as &lt;PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL.</li> <li>3. 'EQ half PQL' values are assuming all contributing PAHs reported as &lt;PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above.</li> </ol> <p>Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.</p>
<b>Org-014</b>	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
<b>Org-016</b>	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
<b>Org-016</b>	<p>Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.</p> <p>Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.</p>

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Date analysed	-			24/05/2018	[NT]	[NT]	[NT]	[NT]	24/05/2018	[NT]
TRH C <sub>6</sub> - C <sub>9</sub>	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	115	[NT]
TRH C <sub>6</sub> - C <sub>10</sub>	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	115	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	[NT]	[NT]	109	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	[NT]	[NT]	114	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	117	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	118	[NT]
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	121	[NT]
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	126	[NT]	[NT]	[NT]	[NT]	118	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			24/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Date analysed	-			24/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
TRH C <sub>10</sub> - C <sub>14</sub>	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	102	[NT]
TRH C <sub>15</sub> - C <sub>28</sub>	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	97	[NT]
TRH C <sub>29</sub> - C <sub>36</sub>	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
TRH >C <sub>10</sub> -C <sub>16</sub>	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	102	[NT]
TRH >C <sub>16</sub> -C <sub>34</sub>	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	97	[NT]
TRH >C <sub>34</sub> -C <sub>40</sub>	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
Surrogate o-Terphenyl	%		Org-003	102	[NT]	[NT]	[NT]	[NT]	111	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Date analysed	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	[NT]	[NT]	91	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	101	[NT]	[NT]	[NT]	[NT]	98	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Date analysed	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	93	[NT]
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-005	104	[NT]	[NT]	[NT]	[NT]	127	[NT]

Client Reference: 83390, Woy Woy

QUALITY CONTROL: PCBs in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Date analysed	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCLMX	%		Org-006	104	[NT]	[NT]	[NT]	[NT]	102	[NT]



**Client Reference: 83390, Woy Woy**

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Date analysed	-			23/05/2018	[NT]	[NT]	[NT]	[NT]	23/05/2018	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	118	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	111	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]

QUALITY CONTROL: Chromium Suite						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			23/05/2018	1	23/05/2018	23/05/2018		23/05/2018	[NT]
Date analysed	-			23/05/2018	1	23/05/2018	23/05/2018		23/05/2018	[NT]
pH <sub>KCl</sub>	pH units		Inorg-068	[NT]	1	4.4	4.4	0	94	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-068	<0.01	1	<0.01	<0.01	0	[NT]	[NT]
TAA pH 6.5	moles H <sup>+</sup> /t	5	Inorg-068	<5	1	<5	<5	0	95	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
a-Chromium Reducible Sulfur	moles H <sup>+</sup> /t	3	Inorg-068	<3	1	<3	<3	0	98	[NT]
S <sub>HCl</sub>	%w/w S	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
S <sub>KCl</sub>	%w/w S	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
S <sub>NAS</sub>	%w/w S	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
ANC <sub>BT</sub>	% CaCO <sub>3</sub>	0.05	Inorg-068	<0.05	1	<0.05	<0.05	0	[NT]	[NT]
s-ANC <sub>BT</sub>	%w/w S	0.05	Inorg-068	<0.05	1	<0.05	<0.05	0	[NT]	[NT]
s-Net Acidity	%w/w S	0.005	Inorg-068	<0.005	1	0.0060	0.0070	15	[NT]	[NT]
a-Net Acidity	moles H <sup>+</sup> /t	5	Inorg-068	<5	1	<5	<5	0	[NT]	[NT]
Liming rate	kg CaCO <sub>3</sub> /t	0.75	Inorg-068	<0.75	1	<0.75	<0.75	0	[NT]	[NT]
a-Net Acidity without ANCE	moles H <sup>+</sup> /t	5	Inorg-068	<5	1	<5	<5	0	[NT]	[NT]
Liming rate without ANCE	kg CaCO <sub>3</sub> /t	0.75	Inorg-068	<0.75	1	<0.75	<0.75	0	[NT]	[NT]
s-Net Acidity without ANCE	%w/w S	0.005	Inorg-068	<0.005	1	0.0060	0.0070	15	[NT]	[NT]

## Result Definitions

<b>NT</b>	Not tested
<b>NA</b>	Test not required
<b>INS</b>	Insufficient sample for this test
<b>PQL</b>	Practical Quantitation Limit
<b>&lt;</b>	Less than
<b>&gt;</b>	Greater than
<b>RPD</b>	Relative Percent Difference
<b>LCS</b>	Laboratory Control Sample
<b>NS</b>	Not specified
<b>NEPM</b>	National Environmental Protection Measure
<b>NR</b>	Not Reported

## Quality Control Definitions

<b>Blank</b>	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
<b>Duplicate</b>	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
<b>Matrix Spike</b>	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
<b>LCS (Laboratory Control Sample)</b>	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
<b>Surrogate Spike</b>	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	

## Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

## Report Comments

PCBs in Soil (sample 7) - PQL has been raised due to interference from analytes(other than those being tested) in the sample/s.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

Note: Samples 192182-3 to 7 were sub-sampled from jars provided by the client.

## **CERTIFICATE OF ANALYSIS 192182-A**

### **Client Details**

<b>Client</b>	Douglas Partners Tuggerah
<b>Attention</b>	Troy McClelland
<b>Address</b>	Unit 5, 3 Teamster Close, Tuggerah, NSW, 2259

### **Sample Details**

<b>Your Reference</b>	<b><u>83390, Woy Woy</u></b>
<b>Number of Samples</b>	Additional Testing on 1 Soil
<b>Date samples received</b>	22/05/2018
<b>Date completed instructions received</b>	05/06/2018

### **Analysis Details**

Please refer to the following pages for results, methodology summary and quality control data.  
Samples were analysed as received from the client. Results relate specifically to the samples as received.  
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

### **Report Details**

<b>Date results requested by</b>	07/06/2018
<b>Date of Issue</b>	07/06/2018
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. <b>Tests not covered by NATA are denoted with *</b>	

#### **Asbestos Approved By**

Analysed by Asbestos Approved Identifier: Lucy Zhu  
Authorised by Asbestos Approved Signatory: Lucy Zhu

#### **Results Approved By**

Steven Luong, Senior Chemist

#### **Authorised By**



Jacinta Hurst, Laboratory Manager

sTPH in Soil (C10-C40)-Silica		
Our Reference		192182-A-7
Your Reference	UNITS	5/0.1
Type of sample		Soil
Date extracted	-	06/06/2018
Date analysed	-	06/06/2018
TPH C <sub>10</sub> - C <sub>14</sub>	mg/kg	<50
TPH C <sub>15</sub> - C <sub>28</sub>	mg/kg	<100
TPH C <sub>29</sub> - C <sub>36</sub>	mg/kg	<100
TPH >C <sub>10</sub> -C <sub>16</sub>	mg/kg	<50
TPH >C <sub>16</sub> -C <sub>34</sub>	mg/kg	<100
TPH >C <sub>34</sub> -C <sub>40</sub>	mg/kg	<100
Surrogate o-Terphenyl	%	100



Method ID	Methodology Summary
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.

Client Reference: 83390, Woy Woy

QUALITY CONTROL: sTPH in Soil (C10-C40)-Silica					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			06/06/2018	[NT]	[NT]	[NT]	[NT]	06/06/2018	[NT]
Date analysed	-			06/06/2018	[NT]	[NT]	[NT]	[NT]	06/06/2018	[NT]
TPH C <sub>10</sub> - C <sub>14</sub>	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	117	[NT]
TPH C <sub>15</sub> - C <sub>28</sub>	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TPH C <sub>29</sub> - C <sub>36</sub>	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
TPH >C <sub>10</sub> -C <sub>16</sub>	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	117	[NT]
TPH >C <sub>16</sub> -C <sub>34</sub>	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TPH >C <sub>34</sub> -C <sub>40</sub>	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
Surrogate o-Terphenyl	%		Org-003	80	[NT]	[NT]	[NT]	[NT]	111	[NT]

## Result Definitions

<b>NT</b>	Not tested
<b>NA</b>	Test not required
<b>INS</b>	Insufficient sample for this test
<b>PQL</b>	Practical Quantitation Limit
<b>&lt;</b>	Less than
<b>&gt;</b>	Greater than
<b>RPD</b>	Relative Percent Difference
<b>LCS</b>	Laboratory Control Sample
<b>NS</b>	Not specified
<b>NEPM</b>	National Environmental Protection Measure
<b>NR</b>	Not Reported

## Quality Control Definitions

<b>Blank</b>	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
<b>Duplicate</b>	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
<b>Matrix Spike</b>	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
<b>LCS (Laboratory Control Sample)</b>	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
<b>Surrogate Spike</b>	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	

## Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Project Name: Woy Woy .....  
Project No: 83390 .....  
DP Contact Person: Troy McClelland .....  
Prior Storage: esky / fridge / shelved (bold) .....

To: Envirolab Services Pty Ltd

Ph: 02 9910 6200

Sample ID	Sample Type S-soil W-water	Lab ID	Analytes								Notes
			Scr Suite	Combo 5A	Combo 3						
1/0.5	S	1	✓								Soil sampled by MJH 16/5/18  Envirolab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200  Job No: 192182 Date Received: 22/5/18 Time Received: 10:15 Received By: MT Temp: Cool/Ambient 15°C Packaging: Ice/Icepack Security: intact/Broken/None
1/2.8	S	2	✓								
1/0.1	S	3		✓							
2/0.5	S	4		✓							
3/0.1	S	5		✓							
4/0.1	S	6		✓							
5/0.1	S	7		✓							
QA1	S	8			✓						
PQL (S)	mg/kg										
PQL (W)	mg/L										

PQL = practical quantitation limit, \*As per Laboratory Method Detection Limit

Date relinquished: 21/5/18.....

Total number of samples in container: 8 .....

Results required by: Fastest turnaround .....

**SAMPLES RECEIVED**

Please sign and date to acknowledge receipt of samples and return by fax

Signature: ..... MT .....  
Date: 22/5/18 10:15 Lab Ref: 192182...

Send results to:  
Douglas Partners Pty Ltd  
Address: Unit 5 3 Teamster Close  
Tuggerah NSW 2259  
Fax: .....

**Aileen Hie**

---

**From:** Ken Nguyen  
**Sent:** Tuesday, 5 June 2018 4:08 PM  
**To:** Troy McClelland  
**Cc:** Aileen Hie  
**Subject:** RE: Results for Registration 192182 83390, Woy Woy

Hi Troy,

The cost are as follows:

Silica gel clean up = \$70  
Surcharge 2 day turnaround = \$17.5  
Admin Fee \$25 + GST

Kind Regards,  
Ken

Envirolab Ref: 192182A

Due: 7/6/18

2day T/A.

Regards,

Ken Nguyen | Chemist | Envirolab Services Pty Ltd  
(Monday to Friday 1pm to 9pm)

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12 Ashley Street Chatswood NSW 2067  
T 612 9910 6200 F 612 9910 6201  
E [knguyen@envirolab.com.au](mailto:knguyen@envirolab.com.au) | W [www.envirolab.com.au](http://www.envirolab.com.au)

Please note that all samples submitted to the Envirolab Group laboratories will be analysed under the Envirolab Group Terms and Conditions. The Terms and Conditions are accessible by clicking this link

---

**From:** Troy McClelland [mailto:Troy.McClelland@douglaspartners.com.au]  
**Sent:** Tuesday, 5 June 2018 4:05 PM  
**To:** Ken Nguyen <KNguyen@envirolab.com.au>  
**Subject:** RE: Results for Registration 192182 83390, Woy Woy

Yes, please proceed with 2 day turnaround and confirm cost.

Regards

---

**Troy McClelland | Associate**  
**Douglas Partners Pty Ltd** | ABN 75 053 980 117 | [www.douglaspartners.com.au](http://www.douglaspartners.com.au)  
Unit 5 3 Teamster Close Tuggerah NSW 2259  
P: 02 4351 1422 | F: 02 4351 1410 | M: 0431 496 719 | E: [Troy.McClelland@douglaspartners.com.au](mailto:Troy.McClelland@douglaspartners.com.au)

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---

**From:** Ken Nguyen [<mailto:KNguyen@envirolab.com.au>]  
**Sent:** Tuesday, 5 June 2018 4:03 PM  
**To:** Troy McClelland  
**Subject:** RE: Results for Registration 192182 83390, Woy Woy

Hi Troy,

Standard turnaround is 5 days.

We can put this on 2 day turnaround for results to be reported on the Thursday.

Please let me know how you would like us to proceed.

Kind Regards,  
Ken

Regards,

Ken Nguyen | Chemist | Envirolab Services Pty Ltd  
(Monday to Friday 1pm to 9pm)

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12 Ashley Street Chatswood NSW 2067  
T 612 9910 6200 F 612 9910 6201  
E [knguyen@envirolab.com.au](mailto:knguyen@envirolab.com.au) | W [www.envirolab.com.au](http://www.envirolab.com.au)

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---

**From:** Troy McClelland [<mailto:Troy.McClelland@douglaspartners.com.au>]  
**Sent:** Tuesday, 5 June 2018 3:34 PM  
**To:** Ken Nguyen <[KNguyen@envirolab.com.au](mailto:KNguyen@envirolab.com.au)>  
**Subject:** RE: Results for Registration 192182 83390, Woy Woy

Hi Ken,

Can I please get a silica gel cleanup done for the TRH on sample 5/0.1.

What is the standard turnaround for this? Hoping to get result back by this Thursday/Friday.

Regards

---

**From:** Ken Nguyen [<mailto:KNguyen@envirolab.com.au>]  
**Sent:** Tuesday, 29 May 2018 5:50 PM  
**To:** Troy McClelland  
**Subject:** Results for Registration 192182 83390, Woy Woy

Please refer to attached for:  
a copy of the Certificate of Analysis  
a copy of the COC/paperwork received from you  
ESDAT Extracts  
an Excel or .csv file containing the results  
Please note that a hard copy will not be posted.

We have a new reporting format and would welcome your feedback. [Sydney@envirolab.com.au](mailto:Sydney@envirolab.com.au)

Enquiries should be made directly to:  
[customerservice@envirolab.com.au](mailto:customerservice@envirolab.com.au)

Regards,

Ken Nguyen | Chemist | Envirolab Services Pty Ltd  
(Monday to Friday 1pm to 9pm)

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## Appendix F

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### Data Quality Assessment

## Appendix F – Data Quality Assessment

### Data Quality Objectives

The contamination assessment was prepared with reference to the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure* 1999 as amended 2013 (NEPC, 2013). The DQO process is outlined as follows:

- ) Stating the Problem;
- ) Identifying the Decision;
- ) Identifying Inputs to the Decision;
- ) Defining the Boundary of the Assessment;
- ) Developing a Decision Rule;
- ) Specifying Acceptable Limits on Decision Errors; and
- ) Optimising the Design for Obtaining Data.

The DQOs have been addressed within the report as shown in Table F1.

**Table F1: Data Quality Objectives**

Data Quality Objective	Report Section where Addressed
State the Problem	S1 Introduction
Identify the Decision	S1 Introduction (objective) S12 & S13 Discussion, Recommendations & Conclusions
Identify Inputs to the Decision	S1 Introduction S2 Scope of Works S3 Site Identification S9 Assessment Criteria S10 to S12 Results of Investigation
Define the Boundary of the Assessment	S3 & S6 Site Identification and Description Site Drawings – Appendix A
Develop a Decision Rule	S9 Site Assessment Criteria
Specify Acceptable Limits on Decision Errors	S8 Fieldwork and Analysis S9 Site Assessment Criteria QA/QC Procedures and Results (Appendix F)
Optimise the Design for Obtaining Data	S2 Scope of Works S8.3 Sampling Locations and Rationale QA/QC Procedures and Results (Appendix F)

## Field and Laboratory Quality Control

The field and laboratory quality control (QC) procedures and results are summarised in Tables F2 and F3. Reference should be made to the fieldwork and analysis procedures in Section 8 and the laboratory results certificates in Appendix D for further details.

**Table F2: Field QC**

Item	Frequency	Acceptance Criteria	Achievement
Intra-laboratory replicates	5% primary samples	RPD <30% (inorganics), <50% (organics)	yes <sup>1</sup>

NOTES: 1 qualitative assessment of RPD results overall; refer Section Q2.1

**Table F3: Laboratory QC**

Item	Frequency	Acceptance Criteria	Achievement
Analytical laboratories used		NATA accreditation	yes
Holding times		In accordance with NEPC (2013) which references various Australian and international standards	yes
Laboratory / Reagent Blanks	1 per lab batch	<PQL	yes
Laboratory duplicates	10% primary samples	Laboratory specific <sup>1</sup>	yes
Matrix Spikes	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Surrogate Spikes	organics by GC	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Control Samples	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes

NOTES: 1 ELS: <5xPQL – any RPD; >5xPQL – 0-50%RPD

In summary, the QC data is considered to be of sufficient quality to be acceptable for the assessment.

## Intra-Laboratory Replicates

One intra-laboratory replicate was analysed as an internal check of the reproducibility within the primary laboratory ELS and as a measure of consistency of sampling techniques. The comparative results of analysis between original and intra-laboratory replicate samples are summarised in Table F4.

Note that, where both samples are below LOR/PQL the difference and RPD has been given as zero. Where one sample is reported below LOR/PQL, but a concentration is reported for the other, the LOR/PQL value has been used for calculation of the RPD for the less than LOR/PQL sample.

**Table F4: Relative Percentage Difference Results – Intra-laboratory Replicate**

Sample ID	PID	Depth	Metals								PAH				TRH				Benzene	Toluene	Ethylbenzene	Total Xylene
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	B(a)P	B(a)P TEQ	Naphthalene	total <sup>2</sup>	F1 (C <sub>6</sub> -C <sub>10</sub> )	F2 (>C <sub>10</sub> -C <sub>16</sub> )	F3 (>C <sub>16</sub> -C <sub>34</sub> )	F4 (>C <sub>34</sub> -C <sub>40</sub> )				
3/0.1	<3	0.1	< PQL	< PQL	3	< PQL	1	< PQL	1	1	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL
QA1	<6	0.1	< PQL	< PQL	5	< PQL	2	< PQL	2	3	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL	< PQL
RPD (%)	-	-	N/A	N/A	50	N/A	67	N/A	67	100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PQL			4	0.4	1	1	1	0.1	1	1	0.05	0.5	0.1	2.15	25	50	100	100	0.2	0.5	1	3

**Notes:**

<PQL Where analytical results below laboratory practical quantitation limit (PQL) for all compounds, results quoted as <PQL

RPD (%) Releative Percentage Difference

NA Not applicable (RPD% not calculated)

PID Photoionisation Detector screening result (ppm)

The calculated RPD values were generally higher than the acceptable range of +/-30% for inorganic analytes and +/-50% for organics, however, this is attributable to the relatively low analyte concentrations reported and hence is considered acceptable.

Overall, the intra-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable.

## Data Quality Indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQIs):

- )] Completeness – a measure of the amount of usable data from a data collection activity;
- )] Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- )] Representativeness – the confidence (qualitative) of data representativeness of media present on-site;
- )] Precision – a measure of variability or reproducibility of data; and
- )] Accuracy – a measure of closeness of the data to the 'true' value.

The DQIs were assessed as outlined in the following Table F5.

**Table F5: Data Quality Indicators**

<b>Data Quality Indicator</b>	<b>Method(s) of Achievement</b>
Completeness	Planned systematic and selected target locations sampled; Preparation of field logs, sample location plan and chain of custody (COC) records; Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody; Samples analysed for contaminants of potential concern (COPC) identified in the Conceptual Site Model (CSM); Completion of COC documentation; NATA endorsed laboratory certificates provided by the laboratory; Satisfactory frequency and results for field and laboratory QC samples as discussed in Section F2.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project; Works undertaken by appropriately experienced and trained DP environmental scientist / engineer / geologist;

Data Quality Indicator	Method(s) of Achievement
	Use of a NATA registered laboratory, Satisfactory results for field and laboratory QC samples.
Representativeness	Target media sampled; Spatial and temporal distribution of sample locations; Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs; Samples were extracted and analysed within holding times; Samples were analysed in accordance with the analysis request.
Precision	Acceptable RPD between the original sample and the replicate; Satisfactory results for all other field and laboratory QC samples.
Accuracy	Satisfactory results for all field and laboratory QC samples.

Based on the above, it is considered that the DQIs have been complied with. As such, it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.



**Douglas Partners**  
Geotechnics | Environment | Groundwater

Report on  
Geotechnical Investigation

Proposed Community Housing  
18 Macleay Avenue, Woy Woy

Prepared for  
Pacific Link Housing Ltd

Project 83390.00  
June 2018

Integrated Practical Solutions





# Douglas Partners

Geotechnics | Environment | Groundwater

## Document History

### Document details

Project No.	83390.00	Document No.	R.002.Rev0
Document title	Report on Geotechnical Investigation Proposed Community Housing		
Site address	18 Macleay Avenue, Woy Woy		
Report prepared for	Pacific Link Housing Ltd		
File name	83390.00.R.002.Rev0.Geotechnical Report		



### Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Troy McClelland	John Harvey	12 June 2018

### Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	0	Mr Mark Glew, Pacific Link Housing Ltd

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		12 June 2018
Reviewer	 For John Harvey	12 June 2018



Douglas Partners Pty Ltd  
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Unit 5, 3 Teamster Close  
Tuggerah NSW 2259  
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Fax (02) 4351 1410



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## **Report on Geotechnical Investigation**

### **Proposed Community Housing**

### **18 Macleay Avenue, Woy Woy**

---

## **1. Introduction**

This report presents the results of a geotechnical investigation undertaken for a proposed community housing project at 18 Macleay Avenue, Woy Woy. The investigation was commissioned in an email dated 10 May 2018 by Mr Mark Glew of Pacific Link Housing Ltd and was undertaken in accordance with Douglas Partners' proposal CCT180154 dated 2 May 2018.

It is understood that the future development of the site may comprise the construction of two or three storey townhouses and / or group homes with associated car parking and landscaping. The proposed development will be limited to the flat area of the site, west of an existing drainage channel.

The exact location / extent of the proposed development are not known at this stage.

The aim of the investigation was to assess the subsurface soil and groundwater conditions across the site in order to provide:

- ) Assessment of the geotechnical suitability of the site for the proposed development;
- ) Site classification in accordance with the requirements of AS2870;
- ) Appropriate foundation system for the proposed development, including an assessment of allowable bearing pressures and likely settlements;
- ) Pavement thickness design for access and car parking pavements; and
- ) Recommendations on site preparation and earthworks.

The geotechnical investigation was carried out in conjunction with a preliminary site investigation (PSI) for contamination, which included assessment of the presence of acid sulfate soils. The results of the PSI have been reported separately.

The geotechnical investigation included the drilling of four boreholes. The details of the field work are presented in this report, together with comments and recommendations on the matters listed above.

## **2. Site Description and Regional Geology**

The site is identified as Lot 16 of Deposited Plan 255220 and has a street address of 18 Macleay Avenue, Woy Woy. The irregular shaped site covers an area of approximately 5500 m<sup>2</sup> and is bounded by Macleay Avenue to the west, residential development to the north and south and undeveloped bushland / public reserve to the east.

The site location and boundaries are shown on Drawing 1, Appendix A, which also shows the extent of the current assessment.

At the time of the investigation, the site was vacant and generally grass covered. Toward the eastern end of the site, vegetation became denser, with mature trees. A drainage channel was located inside of the eastern boundary and, at the time of the walkover, water within the drainage channel was flowing to the north.

Some domestic and building waste was present over the surface of the site including plastic oil containers, concrete, tile, brick, glass, cans, plastic bags etc.

Figures 1 to 4 below, show photographs of the site taken at the time of the walkover.



**Figure 1 – View of the site from the western boundary**



**Figure 2 – View of eastern area of the site, looking southeast**





**Figure 3 – View of drainage channel in eastern area of the site**



**Figure 4 – Typical view of domestic waste**

Surface levels over the majority of the site were relatively flat, at about RL 4 m to 5 m AHD. At the eastern end of the site, however, the surface levels fall to the east toward a drainage channel at about 30°.

Reference to the 1:100,000 scale Geology Sheet for Gosford-Lake Macquarie indicates the site is underlain by Quaternary aged sands.

### 3. Field Work Methods

The field work was undertaken on 16 May 2018 and comprised the drilling of four boreholes to depths ranging from 1.1 m to 2.8 m. The boreholes were drilled using a utility-mounted push tube rig fitted with 60 mm diameter sampling tubes.

Dynamic penetrometer tests (DPTs) were carried out adjacent to the boreholes to confirm the relatively densities of the sands encountered.

The boreholes were set out by a geotechnical engineer from Douglas Partners Pty Ltd (DP), with reference to existing site features. Drilling was carried out by an engineering geologist who also logged the subsurface profile in each borehole and took regular samples for identification purposes.

The test locations were recorded using a hand-held GPS which generally has an accuracy of  $\pm 5$  m, depending on satellite coverage, to Map Grid of Australia (MGA). The surface levels for the bores were inferred from local topographical mapping.

### 4. Field Work Results

Details of the subsurface conditions encountered in the boreholes are presented in the borehole logs in Appendix B. These should be read in conjunction with the accompanying explanatory notes which define the descriptive terms and classification methods used in the report.

The subsurface conditions encountered in the boreholes generally comprised medium dense, brown and grey, fine grained sand to depths ranging from 0.8 m to 1.0 m, underlain by very dense / slightly cemented (indurated), brown or dark brown, medium or coarse grained sand over the remaining depth of the boreholes.

No free groundwater was observed at the time of the investigation. It should be noted that groundwater levels are dependent on climatic conditions and soil permeability and therefore vary with time.

### 5. Proposed Development

At this stage, the client is looking at acquiring the land for community housing development. The exact location / extent of the proposed development is not known at this stage, however, it is understood that the future development of the site may comprise the construction of two or three storey townhouses and / or group homes with associate car parking and landscaping.

It is expected that excavations would be limited to that required for high level footings and installation of services.

Structural loads have not been provided, however, are expected to similar to that of normal residential dwellings.

## 6. Comments

### 6.1 Site Preparation Measures

Site preparation for ground floor slabs and pavements should be carried out in general accordance with the following methodology:

- ) Strip existing vegetation and remove domestic/building waste from site;
- ) Excavate to design subgrade level;
- ) Roll the surface with at least six passes of a minimum 10 tonne deadweight roller, with a final proof rolling pass accompanied by careful visual inspection by an experienced geotechnical consultant to allow detection and treatment of any soft or compressible zones. Unsuitable materials should be over-excavated and replaced with suitable filling;
- ) Moisture recondition the upper 300 mm of the exposed subgrade and compact to at least 100% Standard compaction or 80% density Index;
- ) Protect the area after subgrade preparation to maintain moisture content close to the equilibrium as far as practicable. The placement of subbase gravel would normally provide adequate protection; and

Density testing should be carried out on all pavement layers (subgrade, subbase and basecourse) immediately after placement and compaction and in accordance with AS3798 (Ref 2).

### 6.2 Site Classification

Site classification of residential sites, as described in AS 2870 – 2011 Residential Slabs and Footings (Ref 1), is partly based on ground movement limits, which are defined by the characteristic surface movement ( $y_s$ ), applicable to sites containing cohesive (clay) soils. Site classification also has to consider other factors such as the presence of uncontrolled filling, or weak soils.

Based on the presence of deep sands, the site is considered to have a site classification of 'Class A' in accordance with AS 2870 (Ref 1).

Articulation joints should be provided within masonry walls in accordance with TN61 (Ref 3) in order to reduce the effects of differential movement.

### 6.3 High Level Footings

High level footings are considered appropriate for the support of the proposed development.

High level footings or deeper strip/pad footings should be designed based on the geotechnical design parameters given in Table 1 below.



**Table 1: High Level Footing Parameters**

Strata	Internal Friction Angle ( $\phi$ )	Footing Dimensions (m)	Minimum Depth* (m)	Maximum Allowable Bearing Pressure ( $q_a$ )	Predicted Settlement (mm)
Medium Dense SAND	32°	0.4 m wide strip	0.4	100 kPa	<10
		1.0 x 1.0		150 kPa	<10
		2.0 x 2.0		150 kPa	5 – 15
Slightly Cemented SAND	36°	0.4 m wide strip	1.0	250 kPa	<10
		1.0 x 1.0		300 kPa	<10
		2.0 x 2.0		300 kPa	5 – 15

Notes:

\* Below existing ground surface

It should be noted that for the above parameters, the allowable bearing pressures are highly dependent on the depth and width of the footings. Confirmation of the allowable bearing capacities should be confirmed different to those given above.

Footing excavations should be inspected and tested by a geotechnical engineer to confirm suitable founding conditions and design parameters.

If higher capacities are required, then additional deeper investigation should be carried out. Such deeper investigation would likely include cone penetration testing.

## 6.4 Pavements

### 6.4.1 Subgrade Conditions and Design CBR

Based on the results of the investigation, the subgrade is expected to comprise sand. Provided that the subgrade is prepared in accordance with Section 6.1 and given previous experience in the local area, it is considered that a design CBR value of 8% is appropriate for pavements design.

### 6.4.2 Design Traffic Loading

DP has not been provided with a design traffic loading for the proposed pavements. It is anticipated that car parking pavements would be trafficked by light weight commercial vehicles of less than 3 tonne gross weight, whilst access roads may be occasionally traffic by heavier vehicles such as garbage trucks etc.

For the access roads, based on Central Coast Council's(CCC) *Gosford Civil Works Specification Volume 1 – Design, revision date June 2017*, (Ref 4) a traffic loading of  $3 \times 10^5$  Equivalent Standard Axle repetitions (ESA) has been adopted and is equivalent to an 'Access Street'.

If a different traffic loading is deemed more appropriate, then DP should be asked to reassess the pavement thickness design.

### 6.4.3 Pavement Thickness Design

Table 2, details the minimum pavement thickness design based on the traffic loading in Section 6.4.3, the procedures outlined in AUSTROADS 2017 (Ref 5), Central Coast Council's Gosford Civil Works Specification (Ref 4) and the design subgrade CBR values of 8%. It also assumes that subgrade preparation will be carried out in accordance with Section 6.1 of this report.

**Table 2: Minimum Flexible Pavement Design**

Pavement	Design Traffic Load (ESA)	Subgrade CBR (%)	Total Pavement Thickness (mm)	Layer Component		
				Wearing Course (mm)	Basecourse (mm)	Subbase Course (mm)
Car Parking	<3 tonne	8	180	30AC10 and primer seal	150	-
Internal Access Roads	3 x 10 <sup>5</sup>	8	300	40AC14 and primer seal	150	110

### 6.4.4 Material Properties

Table 3, below, presents the material quality and compaction requirements for respective pavement layers.

**Table 3: Material Quality and Compaction Requirements**

Layer	Material Quality	Compaction
Wearing Course	Conform to RMS Spec R116	
Granular Basecourse	Conform to RMS Spec 3051 for DGB20	Minimum 98% Modified Compaction
Granular Subbase Course	Conform to RMS Spec 3051 for DGS20	Minimum 95% Modified Compaction
Subgrade	Minimum soaked CBR 8%	Minimum 100% Standard or 80% density Index



#### 6.4.5 Pavement Drainage

The vehicular pavement thickness design provided above depends on the provision of adequate surface drainage to protect the subgrade and pavement.

Preparation of subgrade surfaces should be such that adequate crossfalls for surface drainage are achieved across the final pavement.

### 7. References

1. Australian Standard AS2870-2011, *Residential Slabs and Footings*, April 2011, Standards Australia
2. Australian Standard AS3798-2007, *Guidelines on Earthworks for Commercial and Residential Developments*, Standards Australia
3. Cement Concrete and Aggregates Australia, *Technical Note 61, Articulated Walling*, August 2008.
4. Central Coast Council's (CCC) *Gosford Civil Works Specification Volume 1 – Design, revision date June 2017*.
5. Austroads: *Guide to Pavement Technology, Part 2: Pavement Structural Design*, Austroads Ltd, 2017

### 8. Limitations

Douglas Partners (DP) has prepared this report for this project at Woy Woy in accordance with DP's proposal CCT180154 dated 2 May 2018 and acceptance received from Pacific Link Housing Limited dated 10 May 2018. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Pacific Link Housing Limited for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

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**Douglas Partners Pty Ltd**

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## **Appendix A**

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Notes About This Report

Drawing 1 – Site and Test Location Plan

# About this Report

# Douglas Partners



## Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

## Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

## Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

## Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

## Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

# *About this Report*

## **Site Anomalies**

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

## **Information for Contractual Purposes**

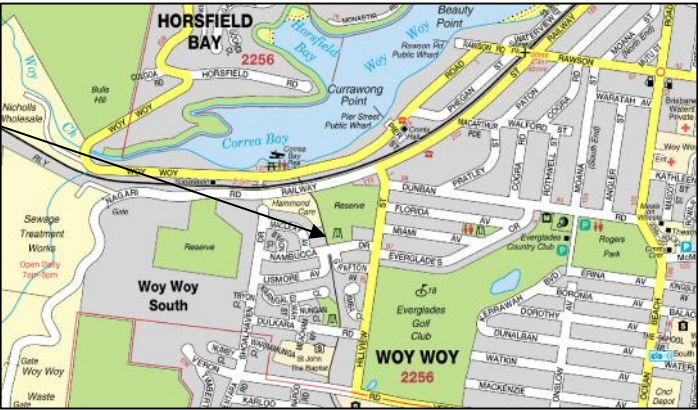
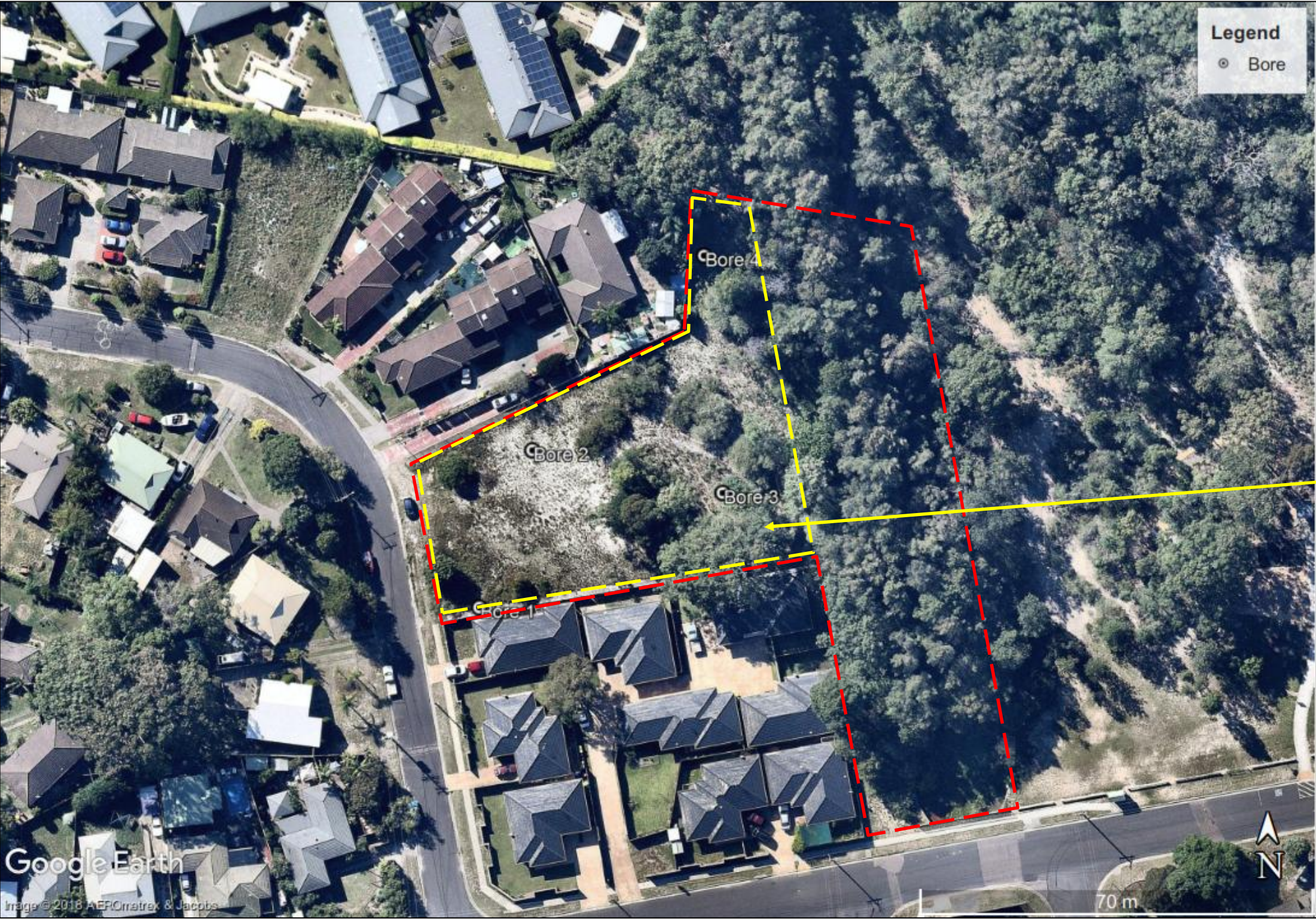
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

## **Site Inspection**

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.



- Notes:
- 1. Drawing adapted from Google Earth imagery



LOCALITY

Area to be rezoned and developed

 <b>Douglas Partners</b> Geotechnics   Environment   Groundwater	CLIENT: Pacific Link Housing Ltd		TITLE: <b>Site and Test Location Plan</b> <b>Proposed Community Housing</b> <b>18 Macleay Avenue, Woy Woy</b>	PROJECT No: 83390.00
	OFFICE: Tuggerah	DRAWN BY: TDM		DRAWING No: 1
	SCALE: As Shown	DATE: 08.06.2018		REVISION: 0



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## Appendix B

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Report Notes

Results of Field Work





## Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

## Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

## Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

## Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low

reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

## Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

## Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

## Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:  
4,6,7  
N=13
- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:  
15, 30/40 mm

# *Sampling Methods*

The results of the SPT tests can be related empirically to the engineering properties of the soils.

## **Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests**

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.



## Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

## Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

## Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

## Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 - 5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

# *Soil Descriptions*

## **Soil Origin**

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

# Symbols & Abbreviations

## Douglas Partners



### Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

### Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

### Water

▷	Water seep
▽	Water level

### Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U <sub>50</sub>	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

### Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

### Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

### Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

### Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

### Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

### Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

### Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

### Other

fg	fragmented
bnd	band
qtz	quartz

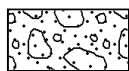
# Symbols & Abbreviations

## Graphic Symbols for Soil and Rock

### General



Asphalt



Road base



Concrete



Filling

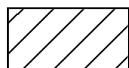
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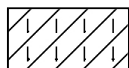
Topsoil



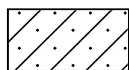
Peat



Clay



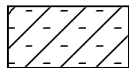
Silty clay



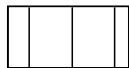
Sandy clay



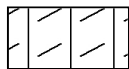
Gravelly clay



Shaly clay



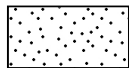
Silt



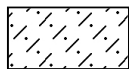
Clayey silt



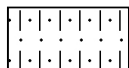
Sandy silt



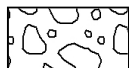
Sand



Clayey sand



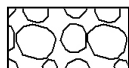
Silty sand



Gravel



Sandy gravel

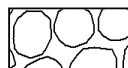


Cobbles, boulders



Talus

### Sedimentary Rocks



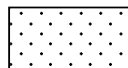
Boulder conglomerate



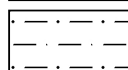
Conglomerate



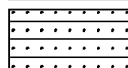
Conglomeratic sandstone



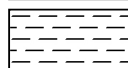
Sandstone



Siltstone



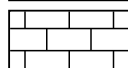
Laminite



Mudstone, claystone, shale

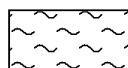


Coal

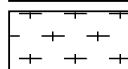


Limestone

### Metamorphic Rocks



Slate, phyllite, schist

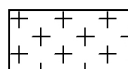


Gneiss

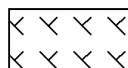


Quartzite

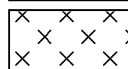
### Igneous Rocks



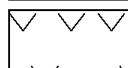
Granite



Dolerite, basalt, andesite



Dacite, epidote



Tuff, breccia



Porphyry

# BOREHOLE LOG

**CLIENT:** Pacific Link Housing Ltd  
**PROJECT:** Proposed Community Housing  
**LOCATION:** 18 Macleay Avenue, Woy Woy

**SURFACE LEVEL:** 4.0 AHD  
**EASTING:** 342539  
**NORTHING:** 6292046  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 1  
**PROJECT No:** 83390.00  
**DATE:** 16/5/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SAND: Medium dense, brown and grey, fine grained, sand with abundant rootlets, humid - no rootlets after 0.1m		D	0.1		PID<1					
		- medium grained after 0.35m		D	0.5		PID<1					
-1	1.0	SAND: Very dense (indurated), dark brown, medium grained sand with trace clay and trace silt, damp		D	1.0		PID<1	-1				
		- very hard from drilling after 1.5m		D	1.5		PID<1					
-2	2.0			D	2.0		PID<1	-2				
				D	2.5		PID<1					
	2.8	Bore discontinued at 2.8m. Limit of investigation		D	2.8		PID<1					
-3								-3				

**RIG:** Toyota 4WD

**DRILLER:** M Harrison

**LOGGED:** M Harrison

**CASING:**

**TYPE OF BORING:** 60mm  $\phi$  Dynamic Push Tube (continuous sample)

**WATER OBSERVATIONS:** No Free Groundwater Observed

**REMARKS:**

☒ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)



# BOREHOLE LOG

**CLIENT:** Pacific Link Housing Ltd  
**PROJECT:** Proposed Community Housing  
**LOCATION:** 18 Macleay Avenue, Woy Woy

**SURFACE LEVEL:** 4.0 AHD  
**EASTING:** 342548  
**NORTHING:** 6292074  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 2  
**PROJECT No:** 83390.00  
**DATE:** 16/5/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SAND: Loose to medium dense, grey, medium grained, sand, humid - with some rootlets to 0.1m		D	0.1		PID<1					
				D	0.5		PID<1					
	0.9	SAND: Very dense, dark brown, medium grained, slightly cemented (indurated) sand with some silt, damp		D	1.0		PID<1	1				
		- difficult to drill from 1.5m		D	1.5		PID<1					
		- coarse grained brown and dark brown from 1.8m		D	2.0		PID<1	2				
				D	2.5		PID<1					
	2.8	Bore discontinued at 2.8m. Limit of investigation		D	2.8		PID<1					
	3											

**RIG:** Toyota 4WD

**DRILLER:** M Harrison

**LOGGED:** M Harrison

**CASING:**

**TYPE OF BORING:** 60mm  $\phi$  Dynamic Push Tube (continuous sample)

**WATER OBSERVATIONS:** No Free Groundwater Observed

**REMARKS:**

☒ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Pacific Link Housing Ltd  
**PROJECT:** Proposed Community Housing  
**LOCATION:** 18 Macleay Avenue, Woy Woy

**SURFACE LEVEL:** 4.0 AHD  
**EASTING:** 342582  
**NORTHING:** 6292067  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 3  
**PROJECT No:** 83390.00  
**DATE:** 16/5/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
+1		SAND: Medium dense, brown and grey, fine to medium grained, sand with some rootlets, humid - grey after 0.1m		D	0.1		PID<1 (QA1)					
	D	0.5			PID<1							
	0.8	SAND: Very desne, brown, coarse grained, slightly cemented (indurated) sand with trace silt and clay, humid		D	1.0		PID<1			1		
1.1	Bore discontinued at 1.1m. Refusal on very dense sand											
-2												
-3												

**RIG:** Toyota 4WD

**DRILLER:** M Harrison

**LOGGED:** M Harrison

**CASING:**

**TYPE OF BORING:** 60mm  $\phi$  Dynamic Push Tube (continuous sample)

**WATER OBSERVATIONS:** No Free Groundwater Observed

**REMARKS:**

☒ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Pacific Link Housing Ltd  
**PROJECT:** Proposed Community Housing  
**LOCATION:** 18 Macleay Avenue, Woy Woy

**SURFACE LEVEL:** 4.0 AHD  
**EASTING:** 342576  
**NORTHING:** 6292110  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 4  
**PROJECT No:** 83390.00  
**DATE:** 16/5/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		SAND: Medium dense to very dense, grey, medium grained, sand, humid - some rootlets to 0.1m		D	0.1		PID<1					
				D	0.5		PID<1					
	0.75	SAND: Very dense, brown and dark brown, slightly cemented (indurated) sand, damp										
	1	- brown sand and trace silt and clay up to 1.15m		D	1.0		PID<1	1				
				D	1.5		PID<1					
	2	- becoming more cemented at 2.3m		D	2.0		PID<1	2				
				D	2.5		PID<1					
	2.8	Bore discontinued at 2.8m. Limit of investigation		D	2.8		PID<1					
	3											

**RIG:** Toyota 4WD

**DRILLER:** M Harrison

**LOGGED:** M Harrison

**CASING:**

**TYPE OF BORING:** 60mm  $\phi$  Dynamic Push Tube (continuous sample)

**WATER OBSERVATIONS:** No Free Groundwater Observed

**REMARKS:**

☒ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

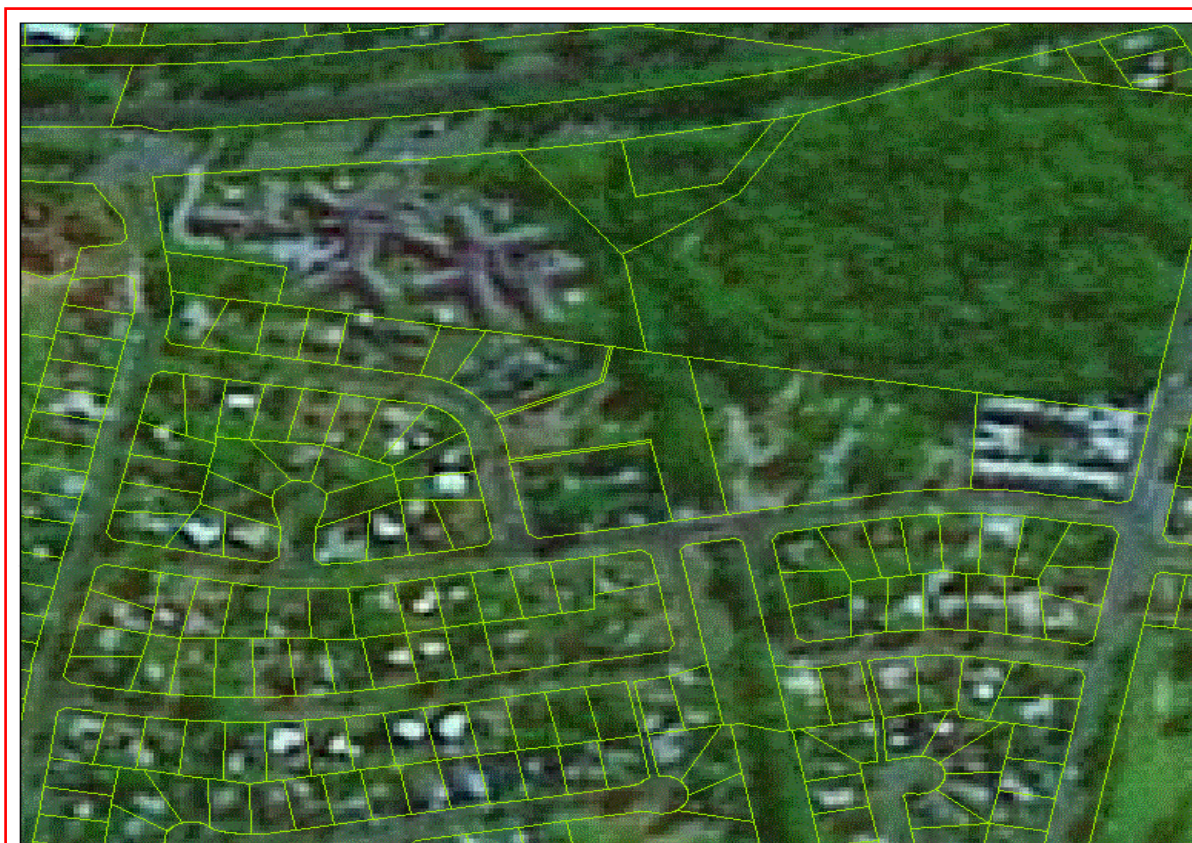
Barker Ryan Stewart  
Suite F 78 York Street  
East Gosford New South Wales 2250  
Attention: Lisa Wrightson  
Email: lisa@barkerryanstewart.com.au

Date: 30 September 2019

Dear Sir or Madam:

**AHIMS Web Service search for the following area at Lot : 16, DP:DP255220 with a Buffer of 200 meters, conducted by Lisa Wrightson on 30 September 2019.**

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

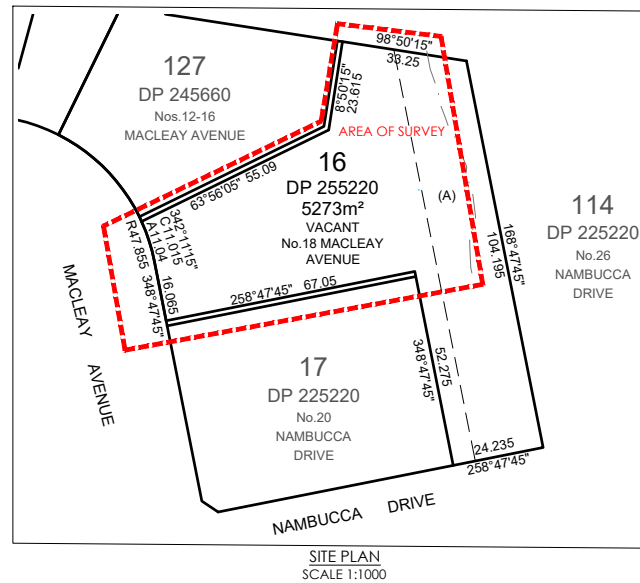
**If your search shows Aboriginal sites or places what should you do?**

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(http://www.nsw.gov.au/gazette\)](http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

**Important information about your AHIMS search**

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.





LEGEND	
	COMMUNICATIONS PIT
	POWER POLE
	LIGHT POLE
	WATER HYDRANT
	GRADED KERB INLET PIT
	DRAINAGE KERB OUTLET
	WATER METER
	SEWER ACCESS CHAMBER
	COMMS MAIN
	OVERHEAD ELECTRICITY CABLE
	STORMWATER DBYD APPROXIMATE LOCATION
	WATER MAIN DBYD APPROXIMATE LOCATION
	SEWER MAIN
	SEWER MAIN DBYD APPROXIMATE LOCATION
	DRAINAGE LINE
	WINDOW
	DOOR
	DOOR HEAD
	WINDOW HEAD
	WINDOW SILL
	FIRST FLOOR WINDOW HEAD
	ROLLER DOOR
	SLIDING DOOR

(A) EASEMENT FOR DRAINAGE 18.29 WIDE CREATED BY J481970

#### NOTES

BOUNDARIES HAVE BEEN CALCULATED FROM DEPOSITED PLANS DP 255220 AND DP 1018769 AND HAVE NOT BEEN FULLY INVESTIGATED.

THIS PLAN INDICATING ORIGINAL DIMENSIONS HAS BEEN PREPARED FOR DETAIL SURVEY PURPOSES ONLY, AND AS SUCH IT HAS NOT BEEN EXAMINED FOR REGISTRATION WITH NSW LAND REGISTRY SERVICES (LRS). NO RESPONSIBILITY CAN THEREFORE BE ACCEPTED FOR ANY FUTURE DIFFERENCE IN BOUNDARY LOCATION WHICH MAY RESULT FROM RE-SURVEY OF ADJOINING LANDS OR THE SUBSEQUENT REGISTRATION OF NEW SURVEY PLANS.

SHOULD FURTHER DEVELOPMENT BE REQUIRED NEAR OR ON BOUNDARIES, FURTHER SURVEY WILL BE REQUIRED AND BOUNDARY MARKS PLACED.

DETAIL SURVEY OF VISUAL FEATURES ONLY.

ORIGIN OF AUSTRALIAN HEIGHT DATUM WAS FROM SSM 55724, R.L. 4.237 FROM SCIMS ON THE 18TH SEPTEMBER 2019.

ANY UNDERGROUND SERVICES SHOWN ON THESE DRAWINGS ARE INDICATIVE ONLY. ANY LOCATION SHOWN HAVE BEEN COMPILED FROM RELEVANT LOCAL AUTHORITIES PLANS AND VISIBLE SURFACE FEATURES. PRIVATE SERVICE LINES AND CROSSINGS ARE NOT SHOWN.

IT IS THE RESPONSIBILITY OF THE CONSTRUCTION TEAM TO CONFIRM DEPTH AND LOCATION WITH THE RELEVANT LOCAL AUTHORITY. ALL EXISTING UNDERGROUND SERVICES SHOULD BE EXPOSED BY HAND PRIOR TO EARTHWORKS COMMENCING.

CONTOURS SHOWN DEPICT THE TOPOGRAPHY, EXCEPT AT SPOT LEVELS SHOWN, THEY DO NOT REPRESENT THE EXACT LEVEL, AT ANY PARTICULAR POINT.

POSITION OF ADJOINING BUILDINGS, ROOF AND RIDGELINE POSITIONS ARE APPROXIMATE ONLY.

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THESE NOTES FORM AN INTEGRAL PART OF THE PLAN.



**DIAL BEFORE YOU DIG**  
www.1100.com.au

Date of Survey: 20/09/2019 & 07/01/2020  
Contour Interval: 0.1m

SURVEY PLAN SET CONSISTS OF TWO PLANS:  
SHEET 1 - DETAIL PLAN  
SHEET 2 - DETAIL PLAN WITH AERIAL

REV	AMENDMENT	ISSUED	DATE
A	INITIAL ISSUE	BDK	30/09/19
B	DBYD DATA ADDED	BDK	06/11/19
C	ADDITIONAL DETAIL ADDED	JMF	14/01/20
D	AMENDMENTS TO DETAIL ADDED	DKH	23/01/20



SYDNEY  
P: 02 9659 0005  
CENTRAL COAST  
P: 02 4325 5295  
HUNTER  
P: 02 4966 8388  
AEN: 26 134 067 842  
www.brs.com.au  
mail@brs.com.au

Client:  
PACIFIC LINK HOUSING

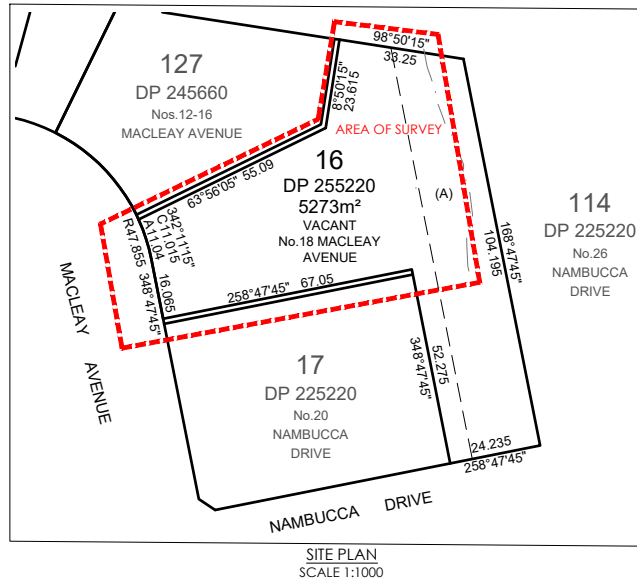
PARTIAL DETAIL PLAN OF LOT 16 DP 255220  
No.18 MACLEAY AVENUE, WOY WOY  
LGA: CENTRAL COAST  
SHEET 1 OF 2

Designed: ---  
Drawn: DKH  
Checked: BDK/JF

Scales: Plan 1:200  
Horiz.  
Vert.  
X-Sect.  
Datum: A.H.D

Plan No.  
CC190073-00-001  
File Ref.  
CC190073  
REV.  
C





LEGEND	
	COMMUNICATIONS PIT
	POWER POLE
	LIGHT POLE
	WATER HYDRANT
	GRADED KERB INLET PIT
	DRAINAGE KERB OUTLET
	WATER METER
	SEWER ACCESS CHAMBER
	COMMS MAIN
	OVERHEAD ELECTRICITY CABLE
	STORMWATER DBYD APPROXIMATE LOCATION
	WATER MAIN DBYD APPROXIMATE LOCATION
	SEWER MAIN
	SEWER MAIN DBYD APPROXIMATE LOCATION
	DRAINAGE LINE
	WINDOW
	DOOR
	DOOR HEAD
	WINDOW HEAD
	WINDOW SILL
	FIRST FLOOR WINDOW HEAD
	ROLLER DOOR
	SLIDING DOOR

(A) EASEMENT FOR DRAINAGE 18.29 WIDE CREATED BY J481970

#### NOTES

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DETAIL SURVEY OF VISUAL FEATURES ONLY.

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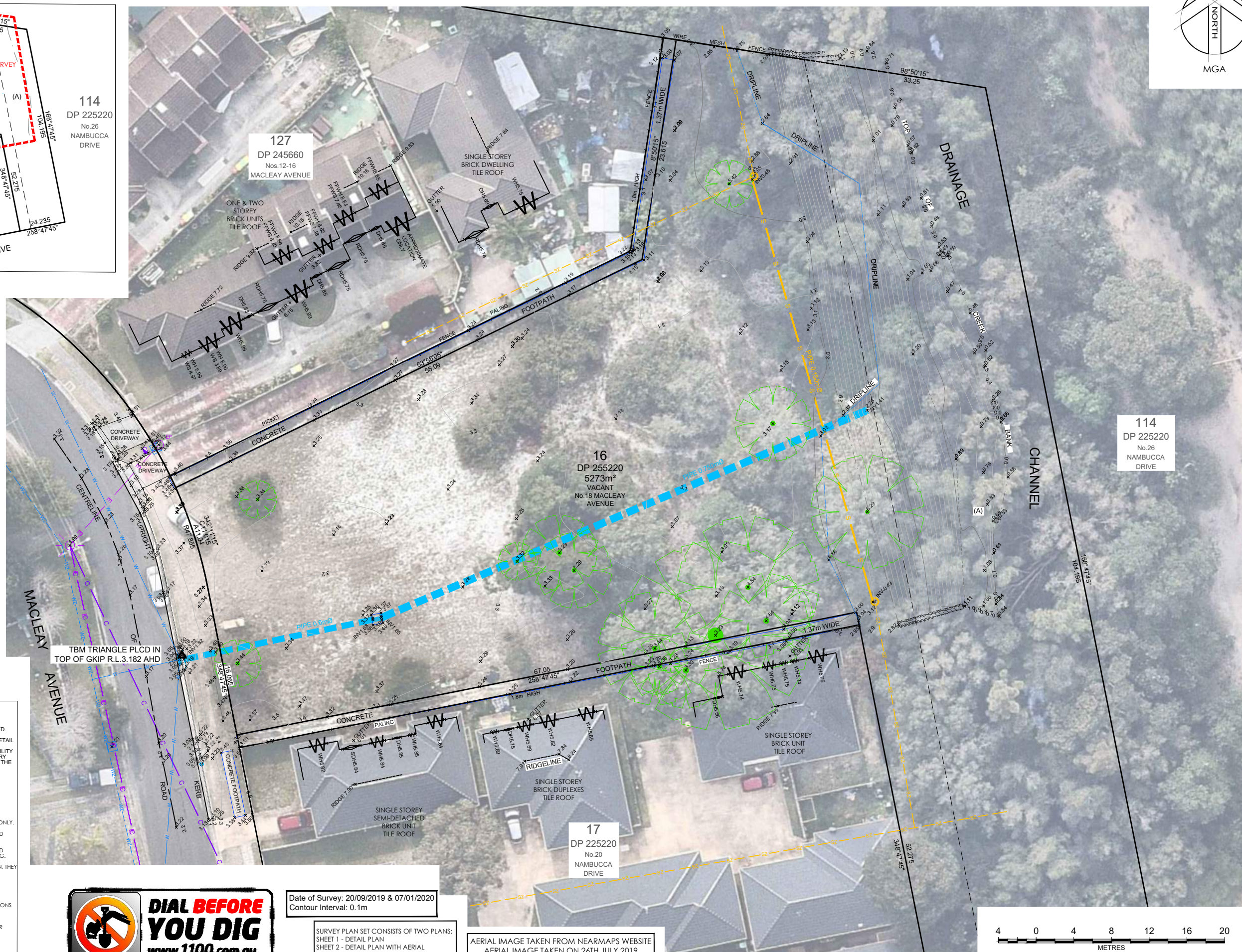
THESE NOTES FORM AN INTEGRAL PART OF THE PLAN.



Date of Survey: 20/09/2019 & 07/01/2020  
Contour Interval: 0.1m

SURVEY PLAN SET CONSISTS OF TWO PLANS:  
SHEET 1 - DETAIL PLAN  
SHEET 2 - DETAIL PLAN WITH AERIAL

AERIAL IMAGE TAKEN FROM NEARMAPS WEBSITE  
AERIAL IMAGE TAKEN ON 26TH JULY 2019



4 0 4 8 12 16 20  
METRES 1:200

REV	AMENDMENT	ISSUED	DATE
A	INITIAL ISSUE	BDK	30/09/19
B	DBYD DATA ADDED	BDK	06/11/19
C	ADDITIONAL DETAIL ADDED	JMF	14/01/20
D	AMENDMENTS TO DETAIL ADDED	DKH	23/01/20



SYDNEY  
P: 02 9659 0005  
CENTRAL COAST  
P: 02 4325 5255  
HUNTER  
P: 02 4966 8388  
ABN: 26 134 067 842  
www.brs.com.au  
mail@brs.com.au

Client:  
PACIFIC LINK HOUSING

PARTIAL DETAIL PLAN OF LOT 16 DP 255220  
No.18 MACLEAY AVENUE, WOY WOY  
LGA: CENTRAL COAST  
SHEET 2 OF 2

Designed: ---  
Drawn: DKH  
Checked: BDK/JF

Scales: Plan 1:200  
Horiz.  
Vert.  
X-Sect.  
Datum: A.H.D

Plan No.  
CC190073-00-001  
File Ref.  
CC190073  
REV.  
D







Figure 1 indicates the flooding is likely a result of high flow in the existing vegetated channel that traverses the site. This channel is likely to be classified as a riparian corridor and will be subject to the requirements of the NSW Office of Water and the Department of Primary Industries.

It is our opinion that this watercourse exhibits characteristics consistent with that of a 1<sup>st</sup> order watercourse under the Strahler Classification System utilised by the Office of Water. This will require a vegetated riparian zone of 10 metres from the top of bank/edge of channel. From existing neighboring developments, it is observed similar offsets has been maintained, may be used as a guide for the likely development extents.

Figure 2 illustrates the expected riparian corridor that will need to be maintained as part of any proposed development.



**Figure 2 – Approximate extent of the expected Riparian Corridor.**

The Office of Water has not provided any information regarding this watercourse and all assumptions discussed are subject to assessment by the Office of Water. There is a risk that during the assessment process, restrictions are implemented for the development which may pose a significant impact on the site layout.

## Localised Flooding

An analysis of the local catchment in combination with a visit to site & surrounding areas indicate that the subject site is affected by localised catchment flooding. Due to the topography of the surrounding area it is observed that the property is located at the low point of the catchment.

This is consistent with the Dial Before You Dig (DBYD) information provided by Central Coast Council as the stormwater drainage network traverses the before discharging to the watercourse. The DBYD drawings are attached to the rear of this correspondence.

During a visit to site it was observed that two sag kerb inlet pits are located in the road at the site frontage (one on either side of Macleay Avenue) as well as a surface pit located within the site boundary. Figure 3 depicts the sag kerb inlet pit along the site frontage and Figure 4 shows the surface pit located within the site boundary.





It was assessed that two sub catchments contribute to the potential stormwater run-off that will affect the subject site. The first catchment consists of the upstream undeveloped hill area to the east of Shoalhaven Drive. Runoff is captured by the inlet pits located in Shoalhaven Drive and is piped to the drainage system, however any additional runoff not captured is expected to be directed north along Shoalhaven Drive towards Railway Street.

The second catchment consists of the local urban catchment bounded by Macleay Avenue, Shoalhaven Drive and Nambucca Drive. Both captured runoff and overland flow will be directed towards the subject site prior to discharge into the watercourse.

A simply hydraulic assessment was performed to assess the conveyance of peak flows through the site. A feasible solution may be to implement a central driveway with a minimum width of 6 metres to act as an overland flow path for the site. The driveway will require typical kerb (or similar) to provide an edge restraint for the surface flows. Estimated peak flows for the 1% AEP storm event results in a flow depth of approximately 120mm, assuming a minimum 1% longitudinal grade is achieved for the driveway. The associated velocity-depth product is within acceptable limits for safety. However, this value is at the upper limit of acceptability and will be highly subject to a detailed assessment.

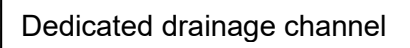
The minimum floor levels will be required to maintain a 500mm freeboard above this flow depth, resulting in required levels being approximately 620 – 700mm above driveway level. Careful consideration should be taken on the impact this may pose on the development layout when considering vehicle movements, carparking & garage arrangement and accessible paths of travel.

There is a risk that Council will not endorse an overland flow route through the centre of the development, as will require a dedicated interallotment drainage & overland flow route. Should this occur, an alternative drainage arrangement could consist of relocating the existing drainage line traversing the site and providing a dedicated drainage channel along one edge of the site with suitable control measures in place.

If required, this channel will likely be 2 – 3 metres in width with a depth of 200 – 300mm. The minimum freeboard of 500mm in addition to the expected maximum flow depth will be required to the minimum floor level for all adjacent developments within the proximity of the channel.

Figure 5 illustrates the likely impact on site layout. Both options will likely involve civil works to relocate the existing interallotment drainage line to suit the proposed driveway location and it is highly likely that the size of the drainage pipe and/or kerb inlet pits will need to be upgraded.





If a basement option is considered, suitable preventable measures will need to be incorporated to ensure that the overland flow is directed around the proposed development, and minimum freeboard & driveway access crest are provided.

## Existing Sewer

The Dial Before You Dig documentation indicates an existing council sewer main traversing the site, parallel to the watercourse. It is unlikely than any diversion works will be required as part of the development due to the expected riparian corridor requirements as discussed in Section 2. If the Council sewer offsets are maintained, there will likely be no works required to modify the existing sewer main. If the development is proposed to be within these building offsets, council's guidelines and requirements for building over sewer will need to be implemented as part of the design.

## Stormwater Management

Given the location of the site within the catchment and its proximity to the outlet, we are of the opinion there will be no significant benefit by providing stormwater detention. However, there is a risk that Council will request this condition which will necessitate the use of above ground storage tanks. We expect that surface ponding detention will be unfeasible for this development given the site constraints and present flooding issues.

If detention storage is conditioned as part of the development, it will be required to limit the peak runoff from the developed site to that of the pre-developed 'greenfield' site. It can be estimated that to achieve this target, 20mm of storage per square metre of impervious area is provided. Assuming an impervious percentage of 80% for the available development footprint, we estimate the storage volume to be approximately 40 kL.

As part of Central Coast Council's DCP requirement retention storage will need to be integrated within the development. Using a similar assumed development footprint, the deemed to comply DCP condition results in a volume of approximately 30 kL.

**Note:** Minimum reuse tank size is subject to BASIX requirements.

## 4. CONCLUSION & RECOMMENDATIONS

Northrop Consulting Engineers have conducted a preliminary investigation of the subject site, located at 18 MacLeay Avenue, Woy Woy. The investigation outlined flooding impacts of the site as well as the likely civil engineering constraints to be expected as part of any new development.

The findings from the investigation are summarised as follows:

- The site boundary contains an existing watercourse consisting of a vegetated drainage channel. It's likely that the NSW Office of Water will identify this watercourse as a 1<sup>st</sup> order Riparian Corridor and will condition to maintain a 10 metre Vegetated Riparian Zone from the edge of the existing channel.
- The site was identified as Flood Prone by Central Coast Council as outlined in the Flood Information Letter with the following:
  - 1% AEP Flood Level: RL 1.82 AHD
  - Flood Planning Level (minimum floor level): RL 2.32m AHD.
- It was identified that an overland flow path provision will be required to convey flood waters through the site due to the local catchment topography and the existing interallotment drainage.

There are two likely options that can be incorporated as part of the new development:

- A central driveway to act as a conveyance channel which will require a minimum 6 metre width and 1% longitudinal grade. Additionally, kerbs (or similar barriers) will be required for the majority of the driveway to contain the surface flows.

Or

- A dedicated drainage channel along the boundary of the site approximately 2 – 3 metres in width with min 300 high hobs and 1% longitudinal grade.

**Note:** Both options will require freeboard of 500mm, in addition to the flow depth for the minimum floor levels of adjacent structures within the proximity of the channel.

- It is expected that detention storage will not be required as part of any proposed development, however there is a risk that council may condition this as a requirement, resulting in approximately 40 kL of storage.





- Approximately 30 kL of retention (reuse) storage will likely be required as part of any new development (DCP requirement).
- It is unlikely that works to Council's sewer mains will be required provided minimum offsets are maintained.

Given the identified potential issues in relation to the subject site, we highly recommend undertaking a more detailed assessment before progressing the project. Our previous experience with negotiations with council in relation to flooding related matters often results in a large investment of time to achieve a resolution. If the project is to progress, we suggest allocating time to allow for the detailed assessment and discussion with council to reach a resolution on the issues identified, as they may result in significant implications for the proposed development.

Please note that the information contained within this correspondence is preliminary in nature and is subject to detailed assessment & discussion with the relevant authorities.

We trust this meets your requirements, however should you require anything further, please do not hesitate to contact the undersigned.

Yours Sincerely,

R. Smith

Robert Suckling  
Civil Engineer  
BE Civil (Hons)

D. Mallin

Daniel Holland  
Civil Engineer  
BE Civil (Hons), Dip Civil, MIEAust, CEng

## APPENDIX A – SUPPLEMENTARY INFORMATION

- Flood Information Letter – Central Coast Council 14/05/18
- Dial Before You Dig – Council Water & Sewer Issued 10/05/18



14 May 2018

Daniel Holland  
Northrop Engineers  
[dholland@northrop.com.au](mailto:dholland@northrop.com.au)

**Minimum Floor Level Enquiry:**  
**LOT: 16 DP: 255220 18 Macleay Avenue WOY WOY**

**Subject: Flood Information L16 DP255220 H18 Macleay Avenue Woy Woy**

The above lot has been identified as being flood prone and affected by flooding from Woy Woy Peninsula. As such, flood related development conditions may be relevant for the property.

<b>ENQUIRY DATE:</b>	10 May 2018
<b>5% AEP FLOOD LEVEL:</b>	RL 1.46m AHD
<b>1% AEP FLOOD LEVEL:</b>	RL 1.82m AHD
<b>MINIMUM FLOOR LEVEL:</b>	RL 2.32m AHD

**DISCLAIMERS:** Council provides you with the above information as general advice only, and you should not rely upon that information when making decisions relating to the purchase or development of the above property. Council **strongly recommends** that you seek site specific flooding advice from a suitably experienced expert prior to making any decisions relating to the purchase or development of the above property. That disclaimer and recommendation is provided for the following reasons:

1. The information in the above table is based on Council's records. Those records do not include a recent flood study or a recent detailed survey of the above property. For example, a recent detailed survey would provide precise ground levels for the subject property as well as identify, with precision, the location of any watercourses, drainage structures and systems, overland flowpaths and built structures that might impact on the extent and degree to which the subject property might flood. Council does not have sufficient information to provide you with accurate prediction of the likelihood and extent to which the above property might flood, and so cannot provide you with accurate



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design levels for potential development of that property.

2. Council does not, and cannot, warrant that it will, in its capacity as a consent authority under the *Environmental Planning and Assessment Act 1979*, grant consent to a development application that seeks to erect or use dwellings or other structures on the above property that conform with the levels set out in the above information. As a consent authority, Council is required to consider the suitability of the above property for the specific development proposed as well as consider the requirements of Council's Development Control Plan 2013 – Chapter 6.7 Water Cycle Management (this is available on Council's website).

## GLOSSARY OF TERMS

Term	Definition
<i>AHD</i>	The Australian Height Datum (AHD) is the reference level for defining reduced levels adopted by the National Mapping Council of Australia. The level of 0.0 m AHD is approximately mean sea level.
<i>AEP</i>	The Annual Exceedance Probability (AEP) is the chance of a flood of a given or larger size occurring in any one year. Usually expressed as a percentage. Eg a 1% AEP flood event has a 1% chance of occurring in any one year. Equally, it is likely to occur on average once every 100 years.
<i>Minimum Floor Level</i>	The minimum floor level (MFL) provides a freeboard to building within flood prone land. This is also referred to as the Flood Planning Level.
<i>Freeboard</i>	A factor of safety usually expressed as a height above the adopted Flood Level. A freeboard tends to compensate for factors such as wave action and historical and modelling uncertainties.

The information provided in this letter is provided only to you, and is not intended to be provided to any third party.

Should you have any enquiries with regard to this letter, please do not hesitate to contact Fazlul Karim on (02) 4325 8222 during the hours of 8.40 am to 5.00 pm Monday to Friday.

Yours faithfully,

*F. Karim*

**Fazlul Karim**

Engineer – Development Assessment

Phone: 02 4325 8222

Internal Reference: 25816120

26 May 2020

General Manager  
Central Coast Council  
PO Box 49  
GOSFORD NSW 2250

Dear Sir/Madam,

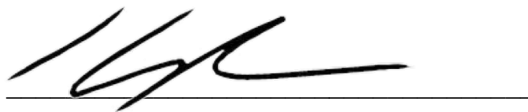
**RE: Application for Planning Proposal – 18 Macleay Avenue, Woy Woy**

As owner of the abovementioned property we consent to Barker Ryan Stewart lodging a planning proposal application on behalf of Pacific Link Housing Pty Ltd for the proposed rezoning.

Signed for and on behalf of

Pacific Link Housing Pty Ltd

ABN / ACN:



Mr Ian Lynch - Chief Executive Officer

ABN 82 074 394 648

Witness:



Witness Name:

Mark Glew

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Registration number: R4577140612  
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Pacific Link Housing

## Planning Proposal

Residential development  
18 Macleay Avenue, Woy Woy

June 2020



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Project No.	CC190073
Author	SH
Checked	IS
Approved	LW

Rev No.	Status	Date	Comments
1	Final	09/06/2020	Submission

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## 1 Executive Summary

The following Planning Proposal has been prepared on behalf of Pacific Link Housing Limited, a Gosford-based tier 1 registered, award-winning Community Housing Provider (CHP). Pacific Link Housing is seeking land suitable to provide social and affordable rental housing outcomes for the residents of the Central Coast.

The proposal supports Council's objectives within its Affordable and Alternative Housing Strategy, and is a positive outcome for the community, Central Coast Council and the region's only locally based tier 1 Community Housing Provider.

### 1.1 The Site

This Planning Proposal report has been prepared in relation to land located at 18 Macleay Avenue, Woy Woy. The subject land is currently zoned RE1 Public Recreation under the Gosford Local Environmental Plan (LEP) 2014 and this proposal seeks approval for rezoning the majority of the site to R1 General Residential. The subject site has been vacant since its creation in 1978 and was owned by NSW Land and Housing Corporation until sold in 2019 to Pacific Link. Pacific Link's understanding is that the RE1 zoning was applied incorrectly at some point in the past. The site has scattered vegetation, classified as disturbed, with an adjacent small watercourse and there is no evidence of any public recreation use by local residents. Instead, it has been used as a space for anti-social behaviour and illegal dumping. Development of the land for affordable housing will discourage these negative behaviours, improve the public safety, lessen the burden of enforcement on Council and achieve Council's objectives under a number of housing and growth strategies and plans, as outlined below.

### 1.2 The Proponent

Pacific Link Housing, a Gosford-based tier 1 registered, award-winning community housing provider is seeking to provide land suitable for medium density affordable rental housing to assist Central Coast Council in achieving the objectives of its Affordable and Alternative Housing Strategy. Pacific Link Housing manages more than 1,000 properties, housing in excess of 2,000 residents in the community who are in the greatest need across the Central Coast and Hunter regions. Pacific Link Housing has achieved very high tenant satisfaction levels (in excess of 90% satisfaction rating) consistently over the last ten years and was an active partner with Council in development, and through the consultation process, of the Affordable and Alternative Housing Strategy.

### 1.3 Meeting Council's Objectives

One of two key aims of Council's Housing Strategy is,

- *To improve access to affordable housing for very low, low and moderate income households, including protecting existing affordable housing, providing new development opportunities and incentives, and providing a broader range of housing options to address affordable housing need in appropriate locations.*

Further, "The initial focus is on strategies that are most likely to have a practical impact on the supply of affordable housing, including partnership projects on surplus or underutilised Council or other public land, and development and service partnerships to address the growing rate of homelessness."

More broadly, this proposal is consistent with the strategic objectives of the Central Coast Council and the Regional Plan 2036 for targeted infill development and delivery of 41,500 new homes by 2036. In noting that, the market is failing to deliver enough affordable housing for the region. The Affordable and Alternative Housing Strategy adopts a target of 7,600 additional rental units by 2036 and proposes that

*"Local government can also choose to play a more proactive role in the creation and retention of affordable housing through active intervention in the market, including through the development of appropriate planning mechanisms and strategies, and the use of its own resources in partnership with others to directly create affordable housing."*

Pacific Link's concept design shows that, with Council's support, the site can yield 21 units of affordable rental housing comprising 1 and 2 bedroom apartments. The site is adjacent to low and medium density, single and two storey housing, including a complex under long term successful management by Pacific Link. The site is well located for amenity and transport links that are suitable for affordable housing residents (a bus stop is within 165 m). There are two public pathways with no connection to adjoining public space that are apparently superfluous to their original intended purpose and for which Pacific Link is seeking to negotiate Council's approval for inclusion within the proposed development site.

The Planning Proposal confirms that:

- A defined portion of the site is intended to remain for the purpose of public recreation in consultation with Council and in connection with the adjoining park.
- The design responds to the asset protection zone required for the purposes of bushfire, and similarly provides suitable protection to the existing watercourse.
- No areas or sites of heritage significance exist within the subject land or adjacent or nearby lands under the Gosford LEP.
- A Biodiversity Review Report concludes that the proposed works are not likely to have a significant impact on nationally listed threatened or migratory species or nationally listed threatened ecological communities. The proposed rezoning allows for the retention of the most valuable environmental attributes of the site by the part retained as RE1 zoned land.
- A Contamination Investigation Report has identified potential minor sources of contamination and provided recommendations to be undertaken following the gateway determination for the remediation of the site.
- An assessment against the applicable Ministerial Directions concludes that the proposal is consistent with all applicable elements.
- A traffic analysis indicates that the development will have no impact on the performance of the local road network and that adequate on-site parking has been provided for in the concept design.

This rezoning would characterise the effective orderly and economic use of a significantly under-utilised site via land supply that can achieve sustainable urban infill development. This is achieved with a dwelling mix designed to meet the demand for demographics of increasing need, including single older women and women escaping domestic violence.

Finally, as stated in the Affordable and Alternative Housing Strategy, *"although strong Council leadership is critical in resolving this worsening regional issue, Council's role is limited in some areas. The strategies will be far more effective when carried out in partnership with other levels of government, local services and those in the private sector with a commitment to affordable housing and reducing housing vulnerability and homelessness."*

Pacific Link Housing stands ready to partner with Council in achieving the Strategy aims and commends this Planning Proposal for approval of the key elements as follows:

1. Amend Gosford Local Environmental Plan 2014 (or the draft CCLEP if adopted) to rezone the subject site (Lot 16 DP 255220) from RE1 Public Recreation to part R1 General Residential.
2. Adoption of a minimum lot size of 550m<sup>2</sup>, maximum height of building of 8.5m, and a maximum FSR 0.7:1 consistent with the surrounding R1 zoned lands.
3. Facilitate the opportunity for Pacific Link to negotiate to acquire the two superfluous pathways from Council at no cost.

## 2 Introduction

### 2.1 Purpose

This Planning Proposal report has been prepared on behalf of Pacific Link Housing in relation to land located at 18 Macleay Avenue, Woy Woy as detailed below:

- Lot 16 DP 255220.

The subject land is currently zoned RE1 Public Recreation under the Gosford Local Environmental Plan (LEP) 2014 and this Planning Proposal seeks to rezone the subject site to part R1 General Residential. The planning proposal seeks to provide land suitable for medium density housing and will retain a portion of the existing public recreation zoned land. See Appendix A for proposed residential scheme including proposed zoning.

This report has been prepared in accordance with Section 3.33(2) of the *Environmental Planning and Assessment Act 1979* and the Department of Planning and Environment's *Guidelines for Preparing Planning Proposals*. It considers the planning implications of the draft LEP amendment as well as outlining the proposed development that is intended to be facilitated by the amendment.

### 2.2 Background

The subject site has traditionally been vacant recreation zoned land, though it has not formally been used for this purpose and is held in private ownership.

The transfer for sale of the land occurred in 2019 whereby the proponent purchased the land from the NSW Land & Housing Corporation.

Prior to the adoption of the Gosford LEP 2014 the site was zoned 6(a) Open Space (Recreation) under the provisions of the Gosford Planning Scheme Ordinance 1970.

### 2.3 Proponent

Pacific Link Housing (PLH), the Applicant, is a Gosford based, government approved, not-for-profit affordable and community housing provider with over 30 years experience. Pacific Link Housing was a founding member of the NSW Federation of Housing Associations and was registered as a public benevolent institution in July 1996.

PLH works to provide and further develop appropriate housing solutions for those in the community who are in the greatest need. They support more than 1,000 properties, housing in excess of 2,000 residents in the Central Coast and Hunter regions. PLH has exceeded tenant satisfaction level in excess of 90% for at least eight years, from 2010-2018.

PLH work to develop housing solutions that are innovative, focused and financially responsible. They develop and directly invest in new housing developments on the Central Coast.

PLH is registered as a Tier 1 Community Housing Provider, which is the highest level of accreditation and they offer tenants a range of award winning support programs to help those who are able regain their independence and return to private housing.

In addition to housing, PLH assist tenants through the provision of additional support/ wraparound services and programs tailored to their individual needs. These are drawn from a range of local support services and partners and are detailed in Figure 1 below.



Aboriginal Mental Health	Coast Shelter	Narara Neighbourhood Centre
Allambie Youth Hope	Coimba Refuge	Neami Hunter Valley
Benevolent Society	Elandra Refuge	New Horizons
Brighter Futures Central Coast	Kara Refuge	New Horizons Boarding House Project
Brighter Futures Newcastle	Maya Refuge	Nova Women and Children
Bungree Aboriginal Association	Neleh House	NSW Health Assertive Outreach Team
Carries Place	Rondelay	Oasis Centre Wyong
Catholic Care	Rumbalara Youth Refuge	Options Disability Support
Catholic Community Services	Woy Woy Youth Refuge	Port Stephens Family Support Service
Central Coast Disability Network	Wyong Youth Refuge	Regional Youth Support Services
Central Coast Family Support	Youth Angle	Safe Pathways
Central Coast Local Health District Mental Health	Department of Ageing Disability and Home Care	Samaritans Early Intervention Family Service
Central Coast Primary Care	Department of Family and Community Services Gosford	Toukley Neighbourhood Centre
Centrelink Support Team	HASI Central Coast – Uniting Church	Ungooroo Aboriginal Corporation
Challenge Disability Services	Horizons Family Support	Uniting
Coast Community Connections	House With No Steps	Wesley Mission Central Coast Family Support Service
	Hunter Partners In Recovery	Wyong Neighbourhood Centre
	Life Without Barriers	
	Meals on Wheels	

Figure 1: List of support service providers working with PLH (Source: PLH)

PLH has delivered several property development projects in various regions of NSW, some of these include:

- Cessnock – 4 townhouses
- Woy Woy – 31 unit new generation boarding house
- Roselands Sydney – 26 unit new generation boarding house
- Canton Beach – 30 unit new generation boarding house
- Glendale – 21 multi storey apartments

Photograph 1 provides examples of the redevelopments undertaken by PLH within the Hunter and Central Coast Regions.



Photograph 1: Image of Glendale Housing Project & Woy Woy Boarding House (Source: PLH, 2020)

In addition to a specialist management team, PLH has a skills-based board of directors with extensive experience in management, finance, property investment and development, social services, public policy and government.



PLH has undertaken a detailed review and analysis of the current registered housing accommodation waiting lists. Access to this database enables PLH to understand the profile and demand for specific dwelling types within a region. This then enables PLH to respond to the demand in the type, scale, size and location of the dwellings developed in a project. Currently there are 1600 applicants on the waiting list for the area where this development is being proposed.

Affordable rental housing is housing that meets the needs of people on very low to moderate incomes and is priced so that tenants can afford basic living costs such as food, clothing, transport, medical care and education. Applicants must meet eligibility criteria to apply. PLH aim to manage affordable housing properties in accordance with the NSW Affordable Housing Guidelines (2014). Allocation of Affordable Housing Tenancies will be allocated from PLH current Affordable Housing Applications process.

## 2.4 Proposed Development

The proposal for the site at 18 Macleay Avenue, Woy Woy is for land to be utilised for the purpose of medium density residential housing and the retention of a portion of the land for public recreation, the future of which is to be discussed further with Council. A concept plan for the proposed development of the site is included in Appendix A and an extract is shown in Figure 2 below. A key objective for the proposed development is to allow for the development of this land for the purposes of affordable housing, in keeping with the proponents focus for this region.

The masterplan incorporates further details of the proposal which will include:

- A proposed residential unit / townhouse development incorporating 21 units;
- A scale and proportion in keeping with the surrounding and nearby development;
- A defined portion of the site to remain to be used for the purpose of public recreation in consultation with Council and in connection with the adjoining park / reserve;
- Vehicle access and parking to be used in association with the proposed housing; and
- Asset protection zone for the purposes of bushfire management for the proposed development.

Primary vehicular access is proposed from Macleay Avenue.

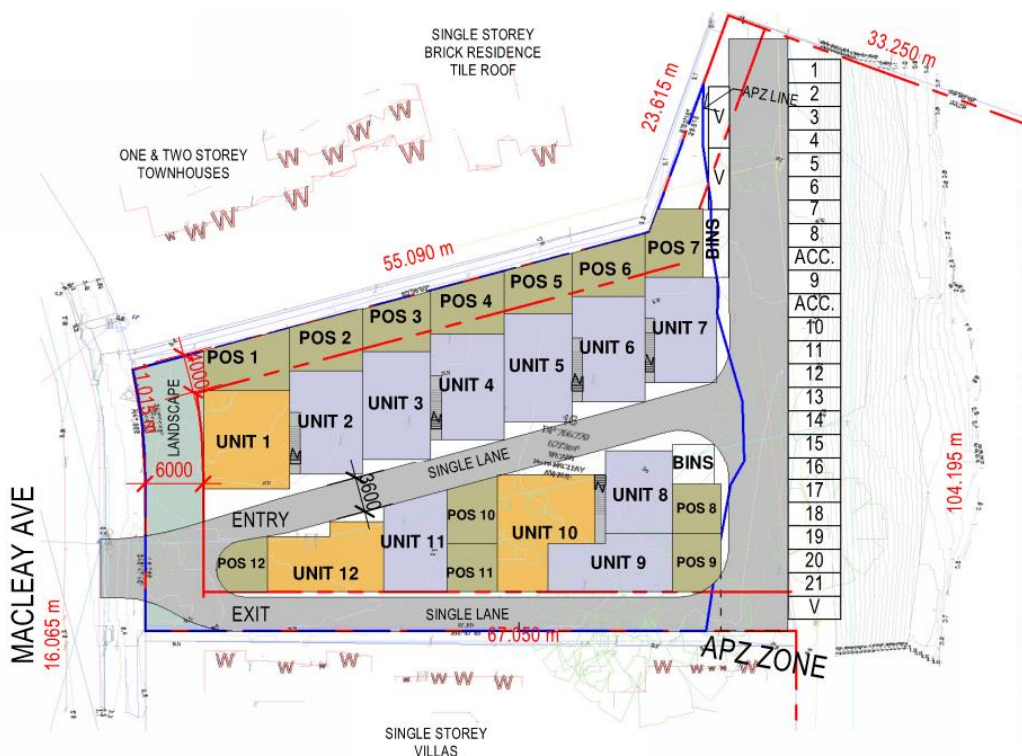


Figure 2: Proposed Masterplan (Source: ADG Architects)

### 3 Site Details

#### 3.1 Site Description

The subject land is located in Woy Woy within the Central Coast Council local government area.

The property address is 18 Macleay Avenue, Woy Woy and the legal description of the property is Lot 16 DP 255220.

The total area of the subject site is 5,273m<sup>2</sup> and is shown in Figure 3 below. The area of the land proposed to be redeveloped ultimately represents approximately 3,167m<sup>2</sup> as it excludes a significant portion of the land to the east of the existing watercourse. The entire site is addressed in the planning proposal, however the land that is proposed to be developed is land west of the watercourse.

The subject site is currently a vacant parcel, with scattered vegetation and a small waterway.



Figure 3: Subject site (Source: Sixmaps)

The site is a flat parcel of land with a gentle fall to the east. There is a watercourse located along the eastern boundary as indicated in Figure 4 below.

The site supports vegetation primarily in the eastern portion of the site and with scattered plantings within the parcel as indicated in Figure 3 above. This vegetation is identified as being disturbed vegetation that is mapped as Umina Coastal Sands Woodland. The land is cleared towards the Macleay Avenue frontage and within the street setback to Nambucca Drive adjacent to the drainage channel.

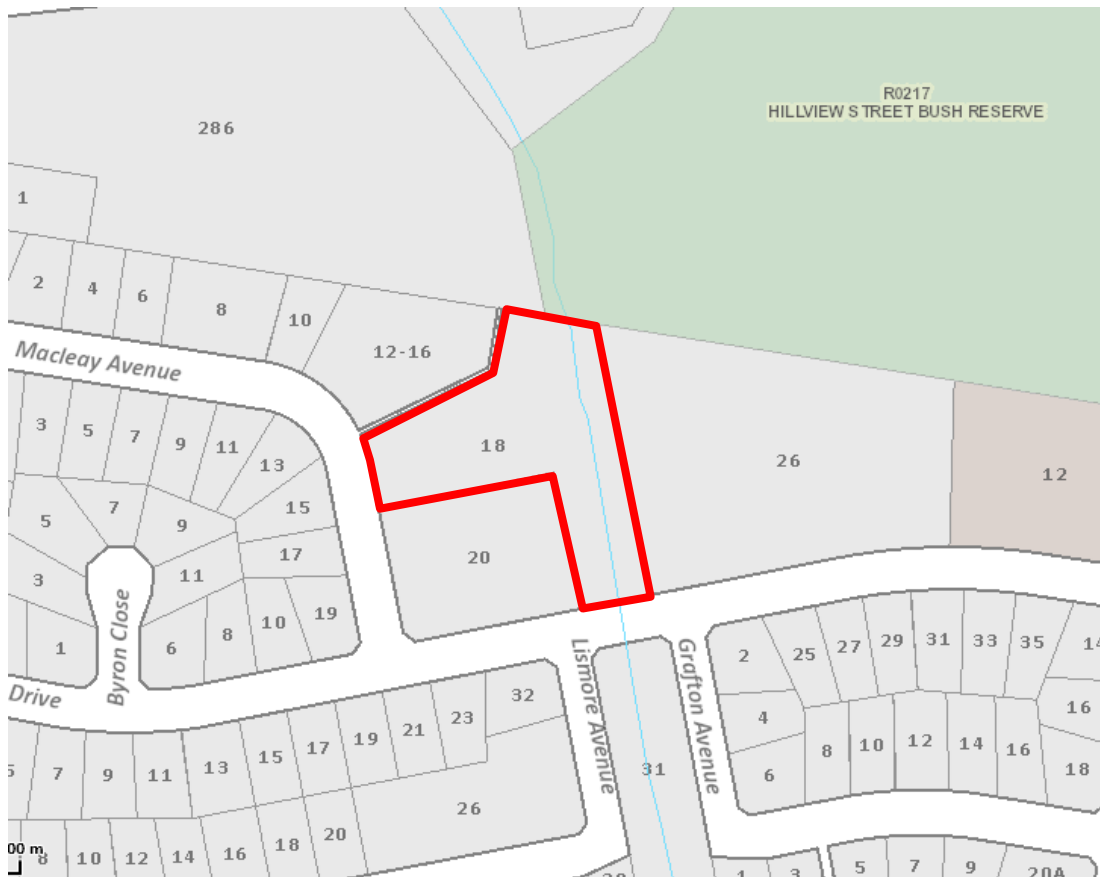


Figure 4: Extract from Gosford LGA online contour mapping (Source: Central Coast Council)

### 3.2 Locality

The site is immediately adjoined at the northern and southern boundaries by publicly owned pedestrian pathways. These public pathways are shown in the survey at Appendix G. The pathways do not provide any connection to the adjoining public open space areas and are apparently superfluous. Consultation is currently occurring with Council with the potential for inclusion with the site. One is zoned RE1 with the site and the other is zoned R1 Residential. These pathways should be considered by Council along with the site as part of this planning proposal.

Surrounding land use is primarily medium and low density residential housing and the adjoining public reserve to the east of the site. These nearby lands are detailed as follows;

- To the east – Hillview Street Bush Reserve and Nambucca Street Park and Playground;
- To the north – Combination of single and two storey medium density developments, and further the Hammond Care Dementia Facility;
- To the west – Properties opposite the site in Macleay Avenue are low density single residential properties, supporting dwellings of single storey height; and
- To the south – This property is known as 20 Nambucca Road and supports single storey residential dwellings on a single parcel of land reflective of medium density housing.





Figure 5: Surrounding land uses (Source: Sixmaps)

The site is located within 2.8km of the Woy Woy railway station.

### 3.3 Photographs

Photographs 2 - 6 below show the sites, including the surrounding development and roads.



Photograph 2: View of the subject site looking East





*Photograph 3: View of the subject site looking north west*



*Photograph 4: View of the subject site looking east towards the existing watercourse*



*Photograph 5: View of existing watercourse*





Photograph 6: View of existing medium density developments adjoining the site at the north and south boundaries

### 3.4 Applicable Planning Provisions

#### 3.4.1 Gosford Local Environmental Plan (LEP) 2014

The site is currently zoned RE1 Public Recreation under Gosford Local Environmental Plan (LEP) 2014, as shown in Figure 6 below. The objectives of this zone are as follows;

##### 1 Objectives of zone

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.
- To identify areas suitable for development for recreation, leisure and cultural purposes.
- To ensure that development is compatible with the desired future character of the zone.

##### 2 Permitted without consent

Environmental facilities; Environmental protection works

##### 3 Permitted with consent

Aquaculture; Camping grounds; Car parks; Caravan parks; Centre-based child care facilities; Community facilities; Kiosks; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Respite day care centres; Restaurants or cafes; Roads; Water recreation structures

##### 4 Prohibited

Any development not specified in item 2 or 3



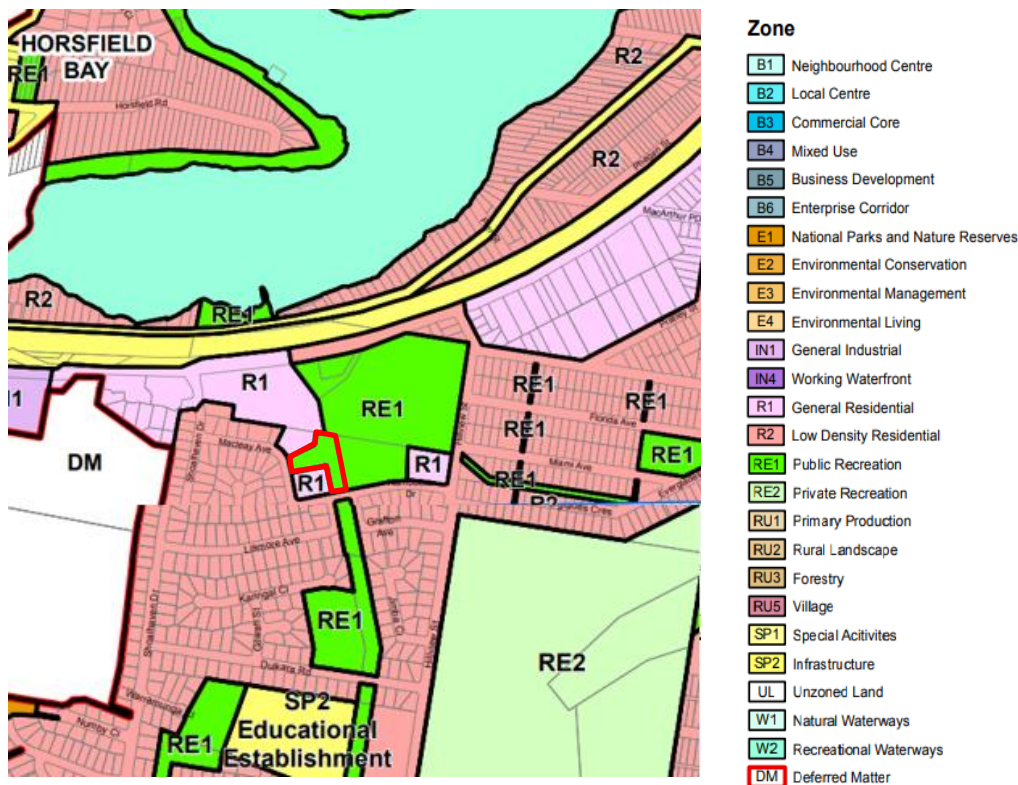


Figure 6: Extract from GLEP 2014 Zoning Map

The R1 General Residential land use table from Gosford LEP 2014 that would apply to the rezoned area is outlined below.

## Zone R1 General Residential

### 1 Objectives of zone

- To provide for the housing needs of the community.
- To provide for a variety of housing types and densities.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.
- To ensure that development is compatible with the desired future character of the zone.
- To promote best practice in the design of multi dwelling housing and other similar types of development.
- To ensure that non-residential uses do not adversely affect residential amenity or place demands on services beyond the level reasonably required for multi dwelling housing or other similar types of development.

### 2 Permitted without consent

Home occupations; Recreation areas

### 3 Permitted with consent

Attached dwellings; Bed and breakfast accommodation; Boarding houses; Car parks; Centre-based child care facilities; Community facilities; Dual occupancies; Dwelling houses; Group homes; Home-based child care; Hostels; Hotel or motel accommodation; Multi dwelling housing; Neighbourhood shops; Oyster aquaculture; Places of public worship; Pond-based aquaculture; Residential flat buildings; Respite day care centres; Roads; Semi-detached dwellings; Seniors housing; Shop top housing; Tank-based aquaculture

### 4 Prohibited

Any development not specified in item 2 or 3

The Gosford LEP 2014 also includes additional provisions that relate to the site, a summary of which is included below.

#### Clause 4.1 Minimum subdivision lot size

The subject site is not identified as having a minimum lot size as shown in Figure 7 below. Surrounding lands are mapped as having a minimum lot size of 550m<sup>2</sup>.

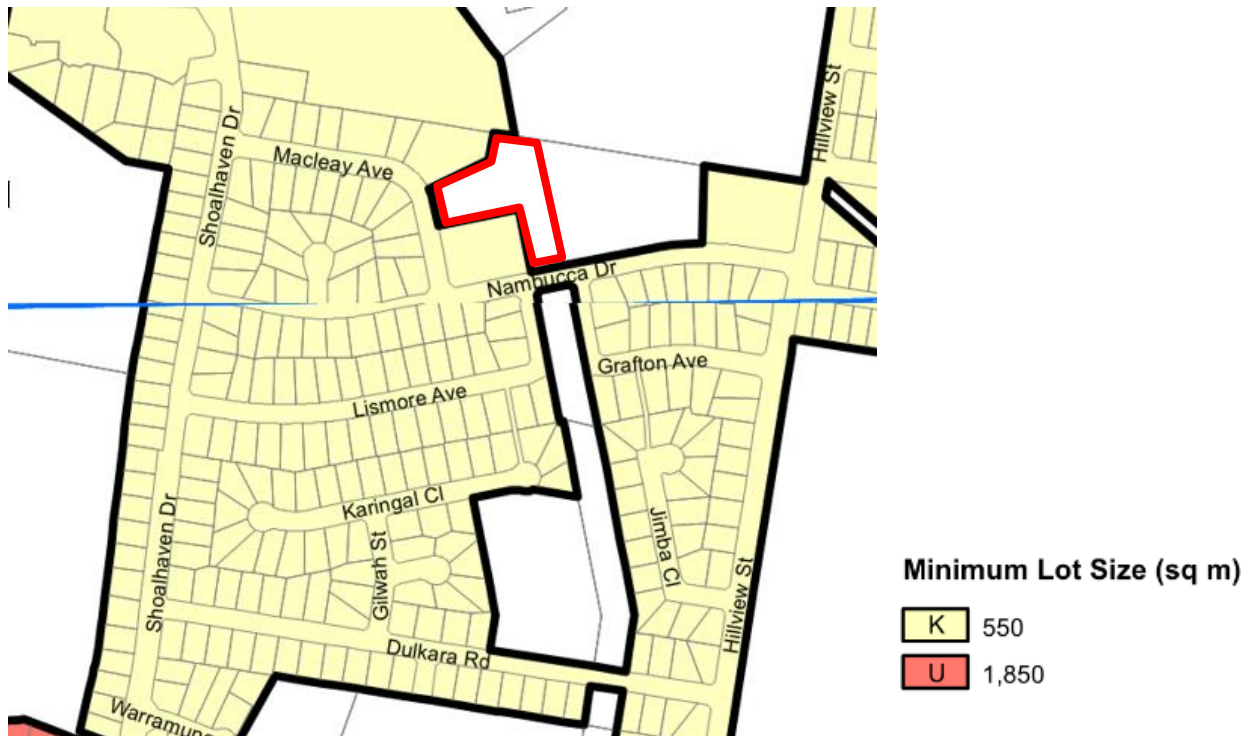


Figure 7: Extract from Gosford LEP 2014 Minimum Lot Size Map

This planning proposal identifies a portion of land to be zoned R1 General Residential and this portion of the site would adopt the minimum lot size standard of surrounding residential lands. The minimum lot size for the surrounding R1 zoned land is 550m<sup>2</sup>.

The proposed option would see the RE1 Public Recreation zoned part of the site subdivided from the R1 zoned land and utilised by Council for recreation purposes, as it is in its current form. A minimum lot size standard is not proposed for the RE1 zoned portion of the site. More details are provided below.

The minimum lot size proposed in the Draft Central Coast LEP reduces the minimum lot size to 450m<sup>2</sup>. See discussion below.

#### Clause 4.3 Height of buildings

This clause and associated mapping identify maximum building heights.

The site currently has no maximum building height under clause 4.3 of the Gosford LEP 2014 and the provisions of clause 4.3 are not applicable. This is replicated in the Draft Central Coast LEP where no building height is mapped for the site.

This planning proposal would seek the adoption of a maximum height of building standard consistent with the surrounding R1 zoned lands of 8.5m for the portion of the land to be rezoned to R1 General Residential.

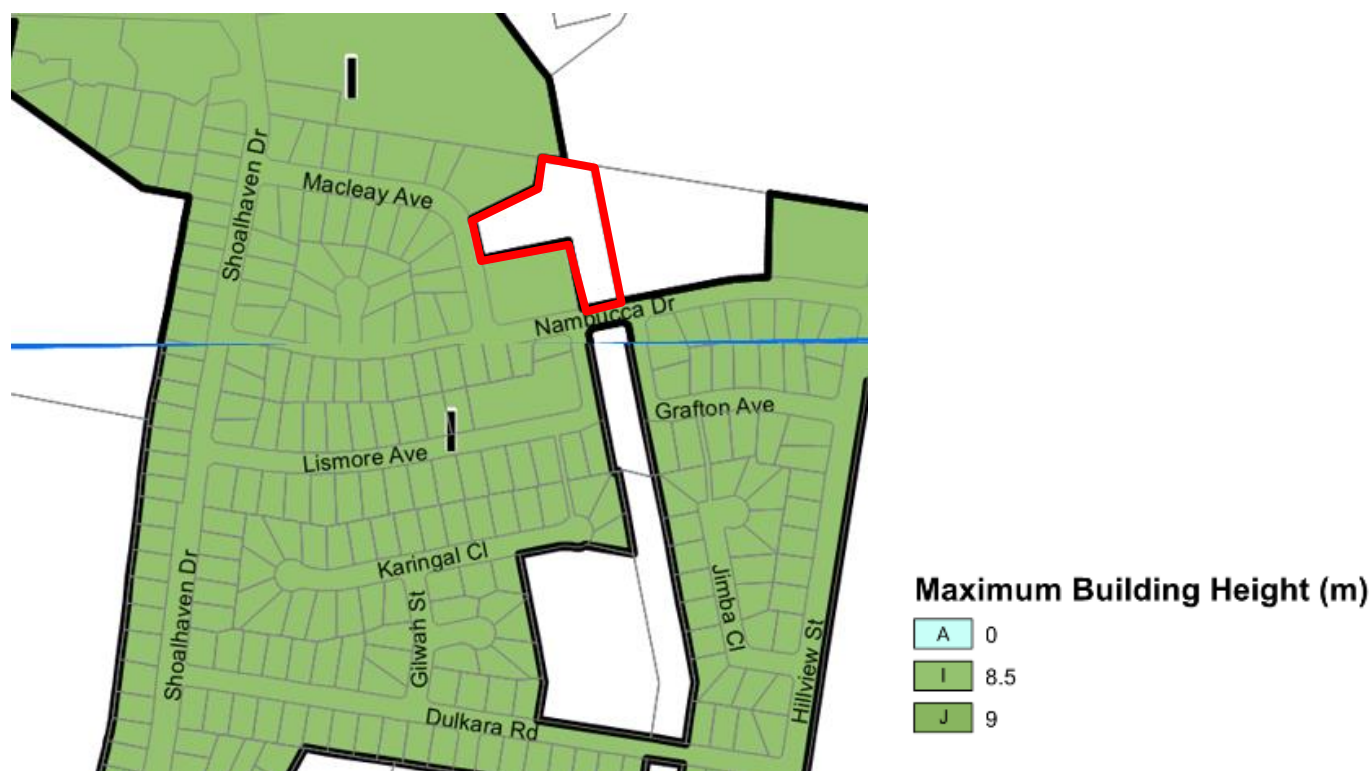


Figure 8: Extract from Gosford LEP 2014 Height of Building Map

#### Clause 4.4 Floor space ratio

This clause and associated mapping provide maximum floor space ratios for development. The site currently has no maximum FSR under clause 4.4 of the Gosford LEP 2014.

This planning proposal would seek the adoption of a maximum FSR standard consistent with the surrounding R1 zoned lands of 0.7:1 (to the proposed R1 zoned part of the site) and the application of the supplementary clauses as shown in Figure 9. The indicative building footprint included in the planning proposal detail proposes a maximum FSR of 0.5:1 which will comply with this standard.

A minimum FSR standard is not proposed for the remaining RE1 zoned portion of the site.

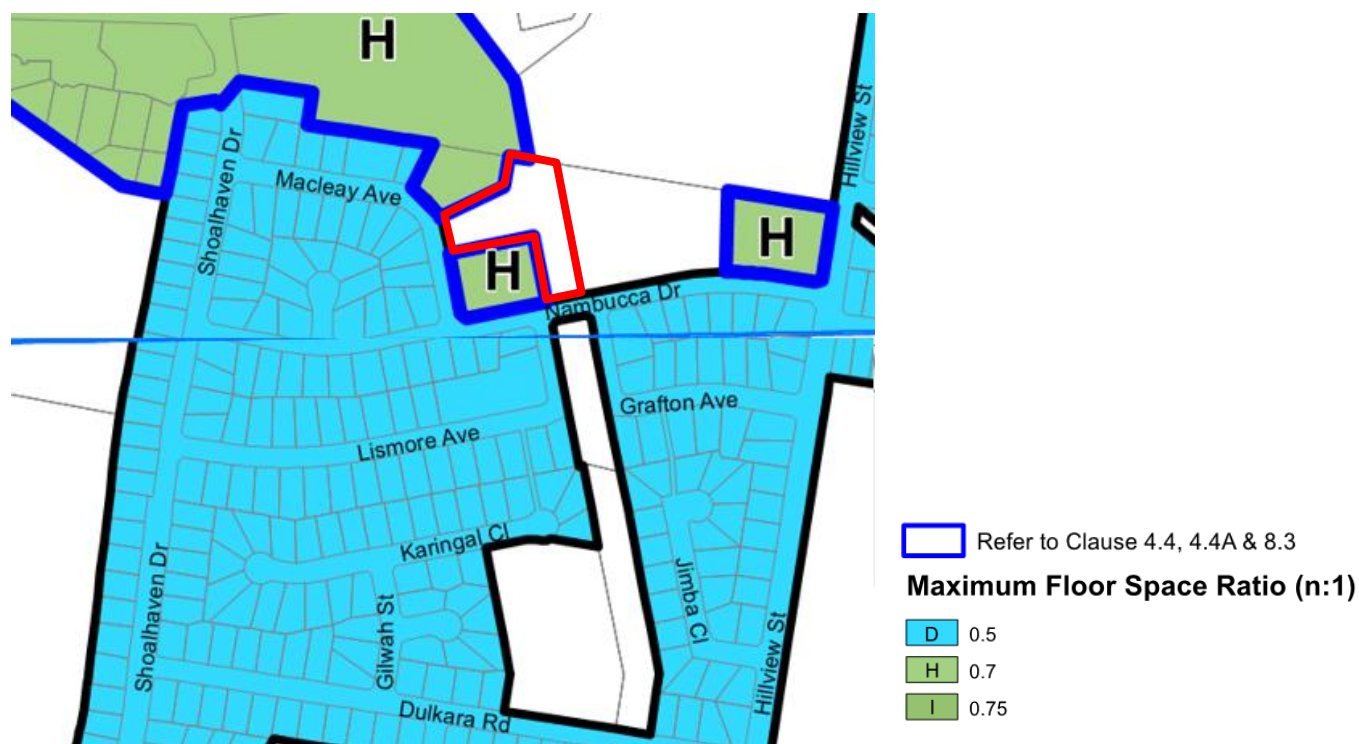


Figure 9: Extract from Gosford LEP 2014 FSR Map

Floor space mapping is provided within the Draft Central Coast LEP for the subject sites with a maximum 0.5:1 (Area 1) and the applicable supplementary provisions. Clause 4.4(5) proposes to allow a FSR of up to 0.7:1 on a site of >1,000m<sup>2</sup> in Area 1, where developed for the purposes of a residential flat building or multi dwelling housing and all on-site parking is located in the basement. Accordingly, this planning proposal will adopt provisions consistent with the existing GLEP that are proposed to be reflected in the Draft CCLEP.

#### Clause 5.10 Heritage conservation

This clause aims to conserve the heritage significance of the Central Coast. As shown in Figure 10 below, no areas or sites of heritage significance exist within the subject land or adjacent or nearby lands under the Gosford LEP. Similarly, no heritage items are proposed under the Draft Central Coast LEP.



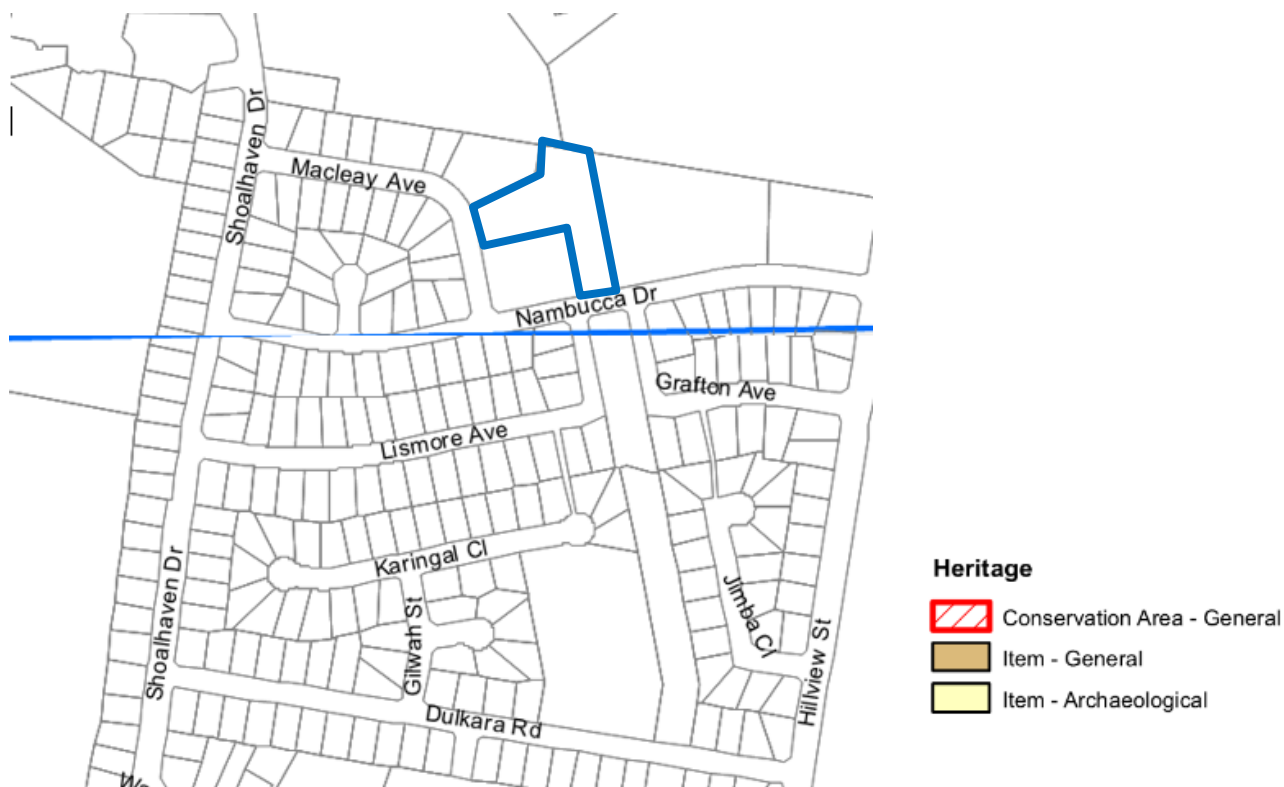


Figure 10: Extract from Gosford LEP 2014 Heritage Map

### Clause 7.1 Acid sulfate soils

This clause aims to ensure that development does not disturb, expose or drain acid sulfate soils. The site is located within areas of Class 3 and Class 4 Acid Sulfate Soils as shown in Figure 11 below. Given that the significant majority of the site is categorised as Class 4 and only a small portion of the northern end is designated as Class 3 (which is proposed to be retained as recreation land), any future medium density residential development is not likely to lower the water table and the site is well suited to rezoning for residential uses.

Further discussion on potential for Acid Sulfate Soils is provided in the Phase 1 Contamination Report attached in Appendix D.

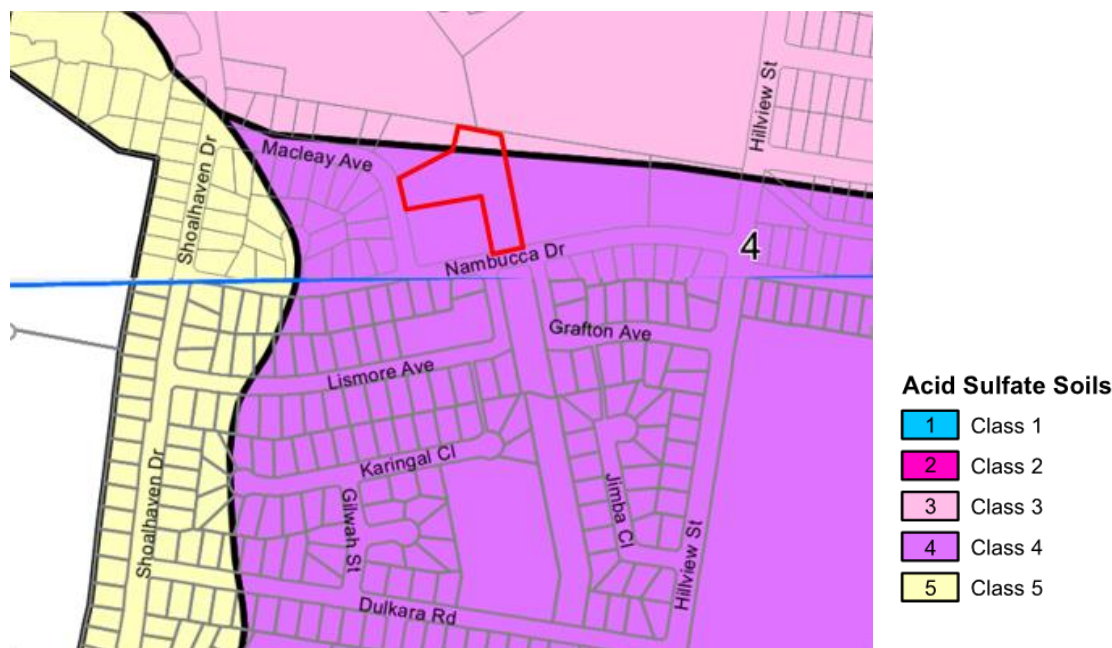


Figure 11: Extract from Gosford LEP 2014 Acid Sulfate Soils Map

## Clause 7.2 Flood Planning

Clause 7.2 aims to minimise any associated flood risk to life and property.

The subject site is affected by the 1:100 yr floor level as indicated on the flood prone land mapping provided in Figure 12 below. The Flood Information letter issued by Council on the 14 May 2018 indicated the 1% AEP Flood Level of RL1.82m AHD and a minimum floor level of RL2.32m AHD (refer Appendix H). To mitigate any risk to life or property associated with flooding or overland flow, the proposed housing development will be constructed to comply with these levels.

It is argued in this instance that minor flood constraints have been mitigated through design of the proposal, by containing all flood affected land in the RE1 zoned portion of the site, and there will be no unacceptable risk to residents or property as a result of the rezoning.



Figure 12: 1:100 Flood Mapping (Source: CC Council online mapping)



### 3.4.2 Draft Central Coast LEP 2018

The exhibition period for the draft Central Coast LEP closed on the 28 February 2019. The plan is not imminent or certain at the time of writing. There are no significant changes as a result of this draft LEP that will impact on the proposed rezoning of the site.



Figure 13: Extract from Draft CCLEP 2018 Zoning Map

The proposed zone under the draft CCLEP is RE1.

Minimum lot size, maximum height of building and FSR standards were not mapped for the subject site. This planning proposal would however propose adoption of the same standards for the surrounding R1 zoned lands for the proposed residential portion of the land. These development standards are summarised as follows;

- Minimum lot size – 450m<sup>2</sup>;
- Height of Building – 8.5m; and
- FSR – 0.5:1 (with additional provisions in Clause 4.4A(5)).

The R1 zoned land surrounding the subject site is marked as Area 1 and this application would recommend inclusion of the subject site within Area 1. Area 1 is referenced in Clause 4.4A(5) and allows development within this area to exceed the mapped 0.5:1 standard to 0.6:1 and 0.7:1 where development achieves the particulars of this clause. These provides are as follows;

- (5) Despite subclause 4.4, the maximum floor space ratio on land identified as “Area 1” is:
- a) 0.7:1 if the building is used for the purpose of residential flat building or multi dwelling housing and all on-site car parking is located in the basement and the site area is 1,000 square metres or more.
  - b) 0.6:1 if the if the building is used for the purpose of residential flat building or multi dwelling housing and all on-site car parking is located in the basement and the site area is less than 1,000 square metres.

The proposed scheme identifies an FSR of 0.5:1 as shown in Appendix A and all carparking is proposed at the ground floor level.

## 4 Part 1 – Objectives and intended outcomes

### **Section 55(2)(a) A statement of the objectives or intended outcomes of the proposed instrument.**

The intended outcome of the Planning Proposal is to amend Gosford Local Environmental Plan 2014 (or the draft CCLEP if adopted) as follows:

- Rezone the subject site from RE1 Public Recreation to part R1 General Residential as shown in Figure 21.
- Apply a minimum lot size of 550m<sup>2</sup> to the portion of the site rezoned residential to retain consistency with medium density residential lots in the surrounding area as shown in Figure 22.
- Apply a maximum height of building of 8.5m to the portion of the site rezoned residential to retain consistency with medium density residential lots in the surrounding area as shown in Figure 23.
- Apply a maximum FSR of 0.7:1 to the portion of the site rezoned residential to retain consistency with medium density residential lots in the surrounding area. Although the provisions of Clause 4.4 of the GLEP 2014 apply to the proposal and reduce the FSR to 0.5:1. The planning proposal and indicative footprint will comply with the reduced FSR.

The objectives of the Planning Proposal are:

- To facilitate future development of the site for residential uses that are compatible with nearby R1 zoned properties in Woy Woy;
- To encourage development that can act as catalyst for regional employment growth during and after construction;
- To provide additional residential opportunities that are accessible and well located to local services and facilities; and
- To allow for the retention of the land with environmental attributes that are worthy of preservation, (including the vegetation and watercourse) and be retained for public recreation purposes.
- Adding to the supply of affordable housing dwellings on the Central Coast in accordance with the Central Coast Council Affordable Housing Strategy.

The planning proposal will not require changes to Gosford (or Central Coast) Development Control Plan (DCP) as the proposed medium density development will achieve the requirements of the existing DCP specific for this development type.

## 5 Part 2 – Explanation and provisions

### **Section 55(2)(b) An explanation of the provisions that are to be included in the proposed instrument.**

### **Section 55(2)(d) If maps are to be adopted by the proposed instrument, such as maps for proposed land use zones, heritage areas, flood prone land map - a version of the maps containing sufficient detail to indicate the substantive effect of the proposed instrument.**

The proposed objectives outlined in Section 4 (Part 1) will be achieved by amending the Gosford LEP 2014 (or Central Coast LEP) through changes outlined below.

*Table 1: Proposed Amendments to Gosford LEP 2014*

Amendment Applies to	Explanation of provision
<b>Land Zoning Map – Sheet LZN_015B</b> The subject land is currently zoned RE1 – Public Recreation.	It is proposed to amend the zoning of the following Lot to part R1 General Residential and part RE1 Public Recreation: <ul style="list-style-type: none"> <li>• Lot 16 DP 255220.</li> </ul>

Amendment Applies to	Explanation of provision
	<p>As discussed in Section 2.2 above, the rezoning of the subject lands for medium density residential development will create positive social and economic impacts, whilst mitigating adverse environmental impacts through the retention of the public recreation zoned land for public open space.</p> <p>Refer to proposed land zoning map included in Section 7 of this planning proposal.</p>
<p><b>Lot Size Map - Sheet LSZ_015B</b> Currently the site has no minimum lot size.</p>	<p>It is proposed to apply a minimum lot size of 550m<sup>2</sup> to the following lot as it relates to the R1 zoned portion of the land:</p> <ul style="list-style-type: none"> <li>• Lot 16 DP 255220.</li> </ul> <p>The proposed amendments to the minimum lot size would promote consistency with surrounding residential sites. Lot sizes of this capacity would promote opportunities for affordable housing.</p> <p>Refer to proposed lot size map included in Section 7 of this planning proposal.</p>
<p><b>FSR Map – Sheet FSR_015B</b> Currently the site has no FSR.</p>	<p>It is proposed to amend the FSR of the following Lot:</p> <ul style="list-style-type: none"> <li>• Lot 16 DP 255220.</li> </ul> <p>The proposed amendments to the FSR would promote consistency with surrounding residential sites. This planning proposal would seek the adoption of a maximum FSR standard consistent with the surrounding R1 zoned lands of 0.7:1 (to the proposed R1 zoned part of the site) and the application of the supplementary clauses as shown in Figure 9.</p> <p>Refer to proposed FSR map included in Section 7 of this planning proposal.</p>

There is no specific Section 7.11 Contributions Plan for this site.

## 6 Part 3 – Justification

**Section 55(2)(c) The justification for those objectives, outcomes and provisions and the process for their implementation (including whether the proposed instrument will comply with relevant directions under section 117).**

### 6.1 Section A – Need for the Planning Proposal

#### 6.1.1 Is the Planning Proposal a result of any strategic study or report?

##### Central Coast Regional Plan 2036

This planning proposal is consistent with the vision of the Central Coast Regional Plan 2036. The Regional Plan seeks to ensure that *there is enough housing to satisfy demand around Gosford City Centre, in growth corridors and local centres across the region, which are well supported by infrastructure, jobs, services and transport. Greater housing supply has helped housing affordability.*

*There is greater housing diversity to suit the changing needs of the community, particularly the ageing population and the needs of weekend and seasonal visitors.*

One of the 4 key goals of the Regional Plan is to provide a variety of housing choice to suit needs and lifestyles. The subject site is indicated on the Regional Plan map in figure 14 below.

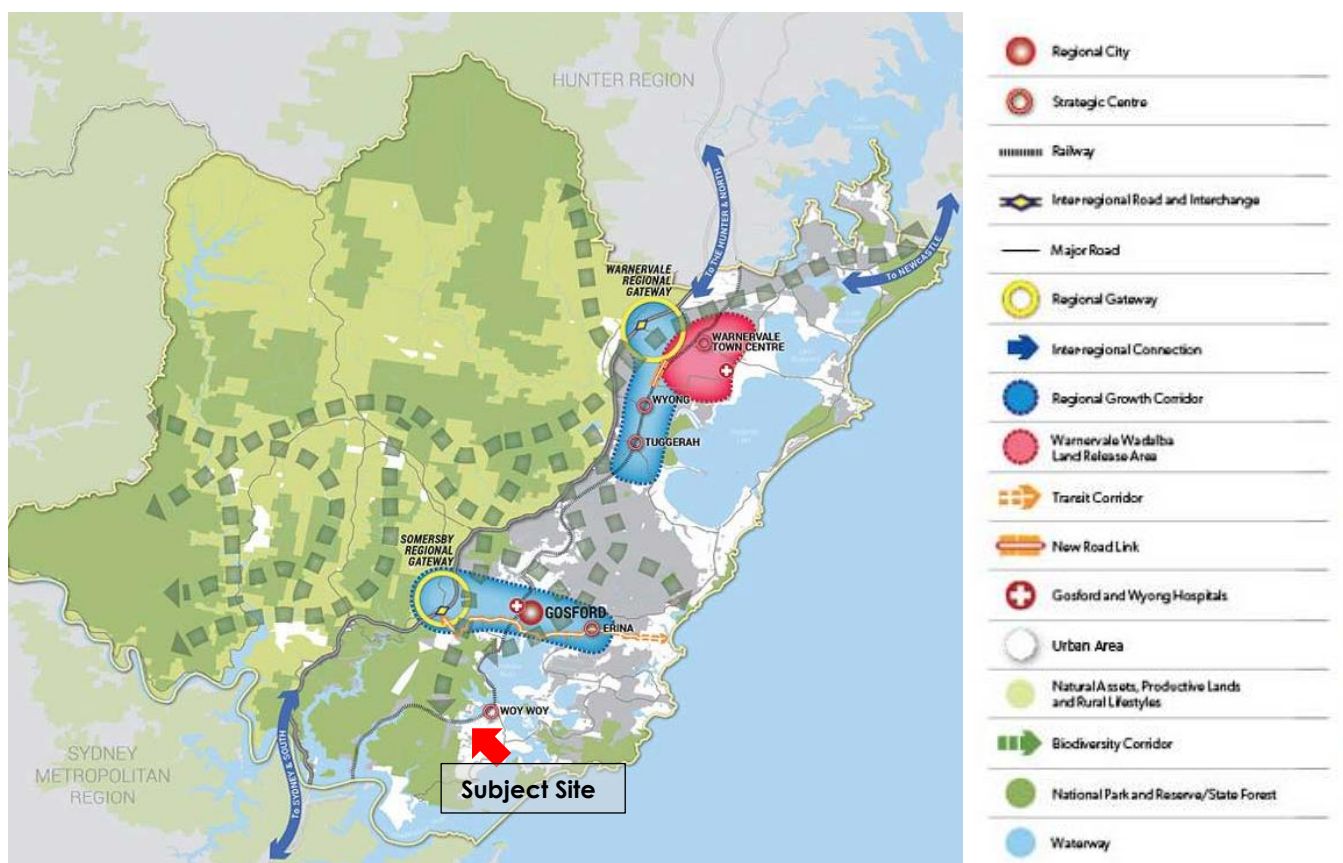


Figure 14: Extract of Central Coast Regional Plan 2036 Map (Source Dept. Planning, Industry & Environment)

The Regional Plan has a clear directive to accelerate housing supply and choice within well planned and compact settlement areas. This is ideally achieved through the in-fill development of established areas and this planning proposal achieves this aim. Goal 4 of the Regional Plan seeks to provide a variety of housing choice to suit the needs and lifestyles of the residents of this area. By 2036 this required is expected to have

36,350 households, requiring 41,500 new homes (NSW DPIE). The planning outcome of this goal, as they apply to the planning proposal results in the following;

- Targeted infill development will be encouraged in and around local centres and other areas with sufficient infrastructure to support growth; and
- New housing in these areas will be encouraged through a combination of strategies including mixed use zones, medium-density development incentives and small-lot construction.

The factors above indicate that medium density residential sites will continue to be popular amongst younger families looking for affordable housing and older persons who require manageable sites for purpose built residential accommodation. Woy Woy is identified as a local centre that has the potential for additional infill housing within the Regional Plan.

The Central Coast Implementation Plan 2018-2020 is the implementation plan for the fulfilment of the vision for the Central Coast Regional Plan 2036. The implementation plan identifies 7 key focus areas to achieve the actions of the Regional Plan. The key focus areas relevant to the proposed development include:

- *Promote economic growth, jobs and development in strategic centres and growth corridors.*
- *Improve knowledge of housing and employment land supply and demand to support better decision making.*
- *Coordinate Strategic Conservation Planning for the region.*

The planning proposal is therefore consistent with the strategic objectives of the Central Coast Council and the Regional Plan 2036.

#### **Future Directions for Social Housing in NSW (NSW Government)**

The NSW Minister for Social Housing published the Future Directions for Social Housing in NSW report ('Future Directions') in January 2016. This report identified a 10 year vision for social housing. This strategy seeks to provide better outcomes for tenants, including provision to enable transition out of housing. The Future Directions provides 3 strategic priorities,

- More social housing
- More opportunities, support and incentives to avoid and/or leave social housing
- A better social housing experience.

The housing system supports a very different demographic to when it was established in the 1950s. Minister for Social Housing Brad Hazzard provided, social housing now,

*"is a safety net for the most vulnerable in the community – including the elderly, people with a disability or severe and chronic mental health illness, carers with long term caring responsibilities and those experiencing drug and alcohol misuse and domestic and family violence.*

*For this to be successful the NSW Government will collaborate with the private sector, the not-for-profit sector and all levels of government to create a social housing system which is sustainable and responsive."*

By 2025 the 'Future Directions' seek to provide greater involvement of private and non-government partners in financing, owning and managing a significantly expanded stock of affordable housing assets. To that end,

*"The NSW Government is committed to a large scale building program to deliver new social, affordable and private housing. This will bring with it significant economic activity estimated at \$22 billion in housing construction to the State. The NSW Government has recently launched Communities Plus - a new approach to delivering integrated communities and improved social outcomes. Communities Plus will be an ongoing program that seeks non-government and private*

*sector partnerships to redevelop Land and Housing Corporation sites throughout metropolitan Sydney and regional NSW." ('Future Directions')*

Pacific Link Housing has been successful in tendering for projects in the Communities Plus program and has an established profile in the industry. The rezoning of the subject site will promote development consistent with the objectives of Future Directions in providing privately funded developments. The PLH model offers housing for vulnerable members of the community, with particular demand across the elderly and women impacted by domestic violence.

PLH provides comprehensive tenant support programs which empower the tenants to transition out of housing. These programs include;

- Education & training;
- Learner Driver Lessons;
- Excursions & events;
- Laptop loans;
- Education Scholarships;
- Sports Scholarships; and
- Garden competitions.

PLH is well placed to provide privately funded community housing in accordance with the objectives of this 10 year plan. PLH has an established relationship with Central Coast Council as an existing local community housing provider and will be a key stakeholder in projects on-going within the Central Coast Council local government area. The Central Coast Affordable Housing Strategy (CCAHS) was adopted in May 2020 and the subject proposal will align with the objectives of this strategy, as well as being the first project that will be the fruition of this document.

#### **6.1.2 Is the Planning Proposal the best means of achieving the objectives or intended outcomes, or is there a better way?**

The intended outcome for the planning proposal is to rezone the subject sites to allow future medium density residential development. Given that the site is currently zoned RE1 Public Recreation the site at present cannot suitably facilitate the residential development that is required to meet expected population growth of Woy Woy and the future strategic documents. Options considered for the site include:

##### **Option 1 - Rezone the site from RE1 to R2 Low Density Residential**

Amend Gosford LEP 2014 to rezone the subject land from RE1 Transition to R2 Low Density Residential. The development of low-density residential housing options on this site would not yield a housing supply in accordance with the strategic objectives for local centres and is inconsistent with the land immediately adjoining the site.

While the rezoning to low density residential development would yield an outcome, the context of the immediately adjoining medium density development, would result in an inconsistent pattern of development and one that does not maximise the efficient and orderly use of this land.

##### **Option 2 - Rezone the site from RE1 to R1 only**

Amend Gosford LEP 2014 to rezone the subject land from RE1 Transition to R1 General Residential. The medium density zoning would allow the site to be subdivided and developed to support multi dwelling residential housing, Seniors Housing and a residential flat building where suitable. This is consistent with surrounding development of land in the immediate vicinity of the site.

Given the natural constraints of the site with the watercourse and bushfire hazard in the eastern portion of the site, retaining a portion of the site for public reserve and zoned for purposes of public recreation is more consistent with the ultimate use of the site given these constraints. The parcel of land is divided naturally by the watercourse on site, the land to the east of the site is zoned RE1 Public Recreation and is used for the purpose on public open space and a playground.



The best planning outcome for the site would be to allow for the natural transition of the land from the residential use of land in the western portion of the site, to a zone that allows for greater protection of the natural attributes of the site. This would enable more consistent zoning mapping with the attributes of the land and the existing adjoining land uses.

### **Option 3 – Leave the site zoned entirely for Public Recreation**

The site has been a vacant parcel of land since its creation in 1978. The viability of the land for medium density development is demonstrated with the emerging development immediately adjoining the land to the north and south.

To retain the land in its current state would not maximise the efficiency of the use of the land, nor be consistent with the strategic planning outcomes identified within the Central Coast Regional Plan 2036. The planning proposal seeks to achieve the maximum yield from the land in a manner that preserves the natural attributes of the site.

### **Option 4 – Rezone part of the site to R1 and part of the site to RE1 (the preferred option)**

Amend Gosford LEP 2014 to rezone the subject land from RE1 to part R1 General Residential and part RE1 Public Recreation. The split zoning of the land allows the on-going protection of the key environmental attributes of the site and the promotion of residential development on land that is currently under utilized in its current circumstances.

This is the preferred option as it promotes the viable use of land in a manner that is consistent with the residential development immediately adjacent to the site.

Given the natural constraints of the site with the watercourse and bushfire hazard in the eastern portion of the site, retaining a portion of the site for public recreation is more consistent with the ultimate use of the site given these constraints.

### **Options for Remnant RE1 portion of land**

- Council acquire remnant parcel and retain RE1 zoning

Where the land retains the zone RE1 Public Recreation this land should be excised from ownership by PLH and acquired by the Council. This will enable the efficient management and maintenance of the land consistent with the management of the land in the adjoining public reserve. This will also allow for the suitable protection of the environmental attributes of the land.

Acquisition of the land will contribute to the amenity of the existing public open space areas, and allow the land to be used for public recreation purposes. This fosters a long term approach to the management of the land, and allows Council to increase the areas of public open space in this location.

Where the land is held in private ownership, this fragments the management of the environmental attributes of the land, and fails to provide public recreation opportunities.

- Rezone remnant portion of the land R1 General Residential

The entire parcel of land could be rezoned R1 General Residential, however this is not a true reflection of the attributes of the land or what it can be used for.

## Options for public pathways

At the time of writing, the proponents are in negotiations with Central Coast Council to acquire the land currently included within the pedestrian pathways located adjacent to the northern and southern side boundaries. Our investigations indicate that these pathways are public land, however they do not provide any real connection to any public land. The land appears to be underutilised in its current form and it is therefore a more orderly use of the land to be captured by this proposal. The land will be incorporated into the developable land area west of the existing watercourse, and therefore can be used for residential purposes. The public pathways are not shown on the submitted concept plan as negotiations are still ongoing with Council.

## 6.2 Section B - Relationship to the Strategic Planning Framework

### 6.2.1 Is the Planning Proposal consistent with the objectives and actions contained within the applicable regional or sub-regional strategy (including exhibited draft strategies)?

Relevant regional and sub-regional strategies include:

- Central Coast Regional Plan 2036; and
- Central Coast Regional Implementation Plan 2018 – 2020;

The proposal is consistent with these strategies in that it will promote important and accessible opportunities for residential housing in an area that is projected for population growth. Each strategy and its implications related specifically to this proposal are outlined below.

A key strategy document that was adopted in May 2020 is the CCAHS. This is discussed in Section 6.2.2 below in greater detail within the context of other local policies, however is a primary policy for the strategic framework of the proposal. While PLH are a private entity, the proposal drives the Central Coast Council community housing initiative established in the CCAHS, and PLH works in direct consultation with Council on achieving their housing objectives in alignment with this strategy.

### Central Coast Regional Plan 2036

The Central Coast Regional Plan 2036 is the key strategic planning document for the NSW Central Coast.

The Regional Plan prioritises a number of elements aimed at increasing housing availability and addressing the changing needs of the community. The Plan acknowledges that greater housing supply has aided housing affordability in the region and the proposed rezoning can effectively service the increasing demand for urban residential lots in the southern region of the Central Coast. Given that the Central Coast population is ageing, and some population groups will require accessible residential sites in close proximity to shops and services, the development of the site for R1 General Residential development is entirely consistent with the government's desire to promote smaller lot construction in accessible urban areas.

The Plan has set four goals for the region. Table 2 below outlines the proposals compliance with relevant goals and directions.

Table 2: Central Coast Regional Plan 2036 Goals and Directions

Relevant Directions / Goals	Comment
Goal 2 - Protect the natural environment and manage the use of agricultural and resource lands	
Direction 12: Protect and manage environmental values	Existing biodiversity values associated with the site have been addressed in the Biodiversity Review Report attached in Appendix C. The report concludes that the proposed works are not likely to have a significant impact on nationally listed threatened or migratory species or nationally listed threatened ecological communities.

Relevant Directions / Goals	Comment
	The inclusion of a defined biodiversity corridor within the concept plan strengthens the open space elements of the site through future management of the remnant portion of the RE1 zoned land.
<i>Direction 13: Sustain water quality and security</i>	The site can be connected to appropriate services for water, sewer, drainage / stormwater, electricity and communications.
<i>Direction 14: Protect the coast and manage natural hazards and climate change</i>	<p>The site is not significantly impacted by flooding and this will be managed in the development of the site in accordance with the flood and floor levels previously identified.</p> <p>The integration of Asset Protection Zones within the site identifies a distinct commitment to management of natural hazards and accordingly, the proposed rezoning is entirely consistent with this direction. Refer to the Preliminary Bushfire Assessment Report attached in Appendix B for further information.</p>
<b>Goal 3 – Well-connected communities and attractive lifestyles</b>	
<i>Direction 15: Create a well-planned, compact settlement pattern.</i>	The proposal is within an established residential area and will not encroach on sensitive lands. The existing residential area is well connected to the public transport network in this location, as well as integrated cycleways and pedestrian pathways.
<i>Direction 17: Align land use and infrastructure planning</i>	The site is well located within an existing residential setting that is easily accessed by pedestrians, cyclists, motor vehicles and public transport.
<i>Direction 18: Create places that are inclusive, well-designed and offer attractive lifestyles.</i>	The concept plan proposes retention of a portion of the RE1 zoned land that is adjacent to the existing reserve and children's playground. The retention of this space supports the on-going use of the adjoining land for public open space and recreational infrastructure.
<b>Goal 4: A variety of housing choice to suit needs and lifestyles</b>	
<i>Direction 19: Accelerate housing supply and improve housing choice</i>	The proposed rezoning is entirely consistent with direction 19 in that R1 zoned land will significantly increase opportunities for additional dwellings within an established residential area. This rezoning would characterise the effective utilisation of a significantly underutilised site via land supply that can achieve sustainable urban infill development.
<i>Direction 20: Grow housing choice in and around local centres</i> <i>Action 20.1 Improve housing choice by supporting housing delivery in and near the growth corridors and local centres.</i> <i>Action 20.3 Implement policies, plans and investment options that will support greater housing diversity in centres.</i>	<p>The subject site is located within Woy Woy which is an identified local centre in the Plan. The proposal will introduce in-fill housing development within an established, well serviced residential area.</p> <p>The proposal to rezone the land to part R1 General Residential will allow for the continuation of the medium density residential development on this side of Macleay Avenue. This will create diversity in the housing options available in this location.</p>
<i>Direction 21: Provide housing choice to meet community needs</i>	The Central Coast is experiencing a distinct ageing of its population. The Regional Plan encourages the implementation of changes to address the housing needs

Relevant Directions / Goals	Comment
<p>Action 21.1 Provide greater housing choice by delivering diverse housing, lot types and sizes, including small-lot housing in infill and greenfield housing locations.</p> <p>Action 21.4 Encourage housing diversity including studio, and one and two-bedroom dwellings, to match forecast changes in household sizes and provide greater housing choice.</p> <p>Action 21.5 Identify the discrete housing needs of each community, including for social and affordable housing, and develop appropriate planning responses.</p>	<p>of specific population groups and from a planning perspective, this can be achieved via dwelling mix and housing choice. The medium density housing proposed under this planning proposal will cater for the smaller dwellings that are targeted in this Plan to cater for the changing needs of the population. The subject site lends itself well to accessible housing given the topography of the land and the proximity to pedestrian pathways and convenient public transport.</p> <p>PLH identifies an increased demand for community housing for vulnerable groups within the community, including the elderly and women who are victims of domestic violence. These displaced members of the community can be supported in the proposed residential development.</p>

### Central Coast Regional Implementation Plan 2018 – 2020

The Central Coast Regional Implementation Plan 2018 – 2020 delivers the actions of the Central Coast Regional Plan 2036. The Implementation Plan identifies 7 implementation focus areas to best articulate the priorities of the Regional Plan. These being;

1. Promote economic growth, jobs and development in strategic centres and growth corridors.
2. Address land use needs west of the M1 Pacific Motorway
3. Improve knowledge of housing and employment land supply and demand to support better decision making
4. Improve planning outcomes for the Darkinjung Local Aboriginal Land Council
5. Revitalise Gosford City Centre
6. Support integration of implementation priorities in Council's work program
7. Coordinate Strategic Conservation Planning for the region.

The proposed rezoning will support the increase supply of residential land and particularly responds to Focus area 3. The proposal is undertaken on behalf of a key local community housing provider to the Central Coast and is considered to be consistent with the 7 focus areas identified above.

The planning proposal has identified key environmental attributes of the site to be protected by the mechanisms available by the RE1 zone. This is achieved for this site while keeping in balance the need for available land for housing.

Goal 4 seeks to accelerate housing delivery as the immediate and on-going actions of this plan. Rezoning the current RE1 zoned land to R1 General Residential will achieve this objective. The planning proposal is particularly consistent with Action 21.4 that seeks to encourage housing diversity with a priority to studio, one and two bedroom units in response to the forecast housing changes. The concept plan attached in Appendix A promotes this housing mix. Action 21.5 encourages the development of housing for community needs, including social and affordable housing and the proponent for this rezoning seeks to establish this site within its established portfolio of local community housing.

The proposal is therefore considered to be consistent with the focus areas that apply.

#### 6.2.2 Is the Planning Proposal consistent with the local Council's community strategic plan or other local strategic plan?

Council has a number of strategic planning documents that are relevant to the proposal including;

- Central Coast Community Strategic Plan 2018- 2028
- Central Coast Affordable and Alternative Housing Strategy 2020
- Central Coast Council Draft Local Strategic Planning Statement

The proposal is generally consistent with these documents and the justification is outlined below.

### Central Coast Community Strategic Plan 2018 - 2028

The Central Coast Community Strategic Plan (CCCSP) now acknowledges the former Wyong and Gosford government areas as one region. The Plan provides a clear path of action for the communities' future and is characterised by five themes: *Belonging; Smart, Green, Responsible and Liveable*.

The CCCSP identifies a number of important projected population and housing statistics. Most relevant to this planning proposal for rezoning to R1 is the need for an additional 41,500 dwellings on the Central Coast by 2036 to accommodate population growth levels.

Table 3 below outlines the relevant objectives and the details of how this proposal for rezoning can assist in achieving them.

*Table 3: Assessment of objectives*

Relevant Objectives	Comment
A4 Enhance community safety within neighbourhoods, public spaces and places.	The proposed rezoning will facilitate the utilisation of land that has been vacant for some time and used as a space for anti-social behaviour and illegal dumping. The development of the land provides use of this space that will discourage these negative behaviours and improve the public safety.
B4 Activate spaces and places to complement activity around town centres, foreshores, lakes and green spaces for families, community and visitors	The indicative concept plan has been designed to achieve sustainable medium density housing opportunities in an established residential area, and within the Woy Woy local centre. The proposed rezoning will facilitate the development of the land for residential purposes, as well as retention of the existing environmental and recreation open space areas which will reinforce the sustainability of these spaces.
F1 Protect our rich environmental heritage by conserving beaches, waterways, bushland, wildlife corridors and inland areas and the diversity of local native species.	The planning proposal includes the retention of the land supporting a watercourse and bushland. The proposal includes the specific retention of this land for RE1 public recreation purposes and includes bushfire and bushland management strategies to preserve the environmental attributes of this land.
F2 Promote greening and ensure the wellbeing of communities through the protection of local bushland, urban trees, tree canopies and expansion of the Coastal Open Space System (COSS)	The proposed rezoning allows for the retention of the most valuable environmental attributes of the site by the part retained as RE1 zoned land. The proposal includes setbacks and tree retention to achieve this objective with the existing bushland on site.  The proposal for rezoning and future development of the site effectively utilises the site characteristics without compromising the natural and environmental heritage.
F3 Improve enforcement for all types of environmental non-compliance including littering and illegal dumping and encourage excellence in industry practices to protect and enhance environmental health.	While the planning proposal does not contribute to the enforcement process, the site has experienced illegal dumping during past years as a consequence of the fact that it is a vacant unmanaged parcel of land. The development of the site will discourage this and therefore contribute to lessening the burden of enforcement on Council.
I2 Ensure all new developments are well planned with good access to public transport, green	The site is well located to existing public transport links with a bus stop within 165m of the site in Nambucca Drive. This service provides links north to Woy Woy Train Station and Woy Woy local centre.



Relevant Objectives	Comment
<i>space and community facilities and support active transport</i>	The proposed rezoning includes the part retention of the zoning of the site as RE1 public recreation. This piece of the land supports the existing creek and will adjoin the public reserve located on Nambucca Drive.
<i>I3 Ensure land use planning and development is sustainable and environmentally sound and considers the importance of local habitat, green corridors, energy efficiency and stormwater management</i>	The proposed rezoning will facilitate important opportunities for sustainable development. The Biodiversity Review Report attached in Appendix B provides a preliminary review of existing flora and fauna characteristics which will likely be reinforced by a Biodiversity Development Assessment Report following gateway approval.
<i>I4 Provide a range of housing options to meet the diverse and changing needs of the community including adequate affordable housing</i>	<p>The proposed rezoning will provide opportunities for additional medium density housing to meet the needs of the Central Coast community. The proponent is a long established local community housing provider with vast experience established in the Central Coast region.</p> <p>The development of the site, as a result of the rezoning of this land, will include affordable housing options.</p>

This proposal will help to address a number of these objectives by providing:

- Housing choice and diversity;
- Reinforce existing open space and community infrastructure for the local community to access
- Retaining the environmentally sensitive attributes of the site; and
- Location of accessible future housing opportunities within walking distance of services

### Central Coast Affordable and Alternative Housing Strategy 2020

The Central Coast Affordable and Alternative Housing Strategy (CCAHS) was adopted in January 2020. The vision for the strategy is for a *fair and inclusive region, where everyone has access to affordable and sustainable housing* (CCAHS; 2020). This is underpinned by two key aims;

- To improve access to affordable housing for very low, low and moderate income households, and
- To reduce the number of cases of homelessness and reliance on social support systems.

Despite growth in low to very low income brackets, there has been no proportional growth in the private rental stock in the LGA since 2006 (PLH Annual Report 2019). PLH recorded a decline in the amount of community housing provided in the region. Rental stress on the Central Coast as measured by the ABS in 2016 affected 36% of households, compared with a NSW average of 26%.

The CCAHS identifies,

*The constrained supply of diverse housing options and of private rental and social housing is having a significant impact upon housing affordability in the context of a rapidly aging population, increasing demand from the Sydney market and an increase in long-term rental among families and older people who can no longer afford home purchase.*

*The rate of medium and higher density development in the LGA is much lower than the Greater Sydney average, and has experienced little or no proportional growth over the past decade. There has been no proportional growth in private rental stock in the LGA since 2006, and an actual decline in the amount of social housing since 2011. This is directly related to the lack of growth in medium and higher density housing. The loss of more affordable caravan parks and Manufactured Housing Estates, and relative undersupply of more affordable housing types like New Generation Boarding Houses, is also*



having a serious impact on very low income renters and those more vulnerable in the local housing market.

The relative scarcity of rental accommodation at the more affordable end of the market, and the extreme pressure on existing supply, is contributing to the increasing numbers in housing stress, homelessness and marginal housing, even among groups who would once have been in more secure accommodation.

The Central Coast Affordable and Alternative Housing Strategy (CCAAHS) identified a growing need for affordable housing. Table 4 below addresses the proposal against the strategic actions of the document.

Table 4: Assessment of strategic actions

Relevant Objectives / Action	Comment
Strategy 1 – Council adopts definitions and benchmarks for ‘affordable housing’	PLH is a known local community housing provider in this local government area and provides housing for vulnerable community members who meet this profile/benchmark.
Strategy 2 - Key indicators	The proposal will contribute to the available community housing stock. PLH operates in partnership with local government entities to provide community housing opportunities.
Strategy 3 – Targets	The proposal will contribute to the available community housing stock and will assist Central Coast Council in achieving these targets.
Strategy 4 – Council owned land partnerships	The subject land is privately owned.
Strategy 5 – Multi tenure development on Council owned land	While not specifically relevant to the project, Council will seek to develop site's within the LGA through a competitive tendering process or preferred partnering arrangement with a registered community housing provider that maximises affordable housing yield, indicative dwelling type and tenure mix, risk apportionment and long-term management and maintenance arrangements. PLH has a long established relationship with the Central Coast Council and has already been selected for the Communities Plus program and is a recognised Tier 1 community housing provider.
Strategy 6 – Future developments on Council land	Not applicable, the site is owned by PLH.
Strategy 7 – Temporary/Short term dwelling developments	Not applicable, the proponent seeks a permanent redevelopment of the site.
Strategy 8 – Ensure affordable housing stock is well maintained	PLH has a demonstrated record for maintaining their properties and Section 2.3 identifies the additional service support that is provided to residents.
Strategy 9 – Identify sites within the comprehensive LEP	The subject site does not strictly meet this criteria, however the Strategy promotes the rezoning of land within proximity to centres and transport nodes to R1 zoned land. The proposal seeks adoption of a R1 zone to allow medium density housing on a site within 2.8km from a railway station, and within 400m of a bus stop that services the Woy Woy local centre. The site is therefore considered to be an opportune location for a rezoning in line with the adopted strategy.

Relevant Objectives / Action	Comment
Strategy 10 – Zone precincts within greenfield urban expansion areas	The site is located within an established residential area and the proposed concept plan identifies future development that is consistent with the character and scale of surrounding development.
Strategy 11 – Multi dwelling housing in R2 zone	Not applicable, the site is zoned RE1 land and proposes to rezone land to R1 zone.
Strategy 12 – Parking rates for residential flat buildings	Not applicable, this is an internal strategy for Council to undertake. However this Planning Proposal proposes parking at a rate of 1 space per dwelling and will meet demand.
Strategy 13 – Social Impact Assessment Policy and Guidelines	Not applicable as this relates specifically to boarding house developments.
Strategy 14 – Developer contributions	There are no development contributions that apply to this site.
Strategy 15 – Apartment mix within Centres	Not applicable, the site is not located within a centre.
Strategy 16 – Subdivision standards in greenfield areas.	Not applicable, the site is not located in a greenfield area.
Strategy 17 – Consider the impacts of low cost housing in accordance with the SEPP Affordable Rental Housing 2009 and the comprehensive LEP.	Not applicable, this is an internal strategy for Council to undertake.
Strategy 18 – Council's approach to homelessness	Not applicable, however this Planning Proposal seeks to increase the availability of community housing options within the Central Coast region.
Strategy 19 – Advocacy to State and Federal Government regarding homelessness on the Central Coast	Not applicable, however this Planning Proposal seeks to increase the availability of community housing options within the Central Coast region.
Strategy 20 – Increase sustainable access to private rental market for homelessness	PLH provides sustainable opportunities for local community housing. Section 2.3 identifies the existing relationships established within the community, that offer homelessness support.
Strategy 21 - Advocacy to State and Federal Government on issues contributing to homelessness.	Not applicable, however this Planning Proposal seeks to increase the availability of community housing options within the Central Coast region. This housing is often provided as a resource for 'at risk' members of the community.
Strategy 22 – Increase access to housing for at risk/chronic homeless	PLH is a recognised local community housing provider that assists with the transition of tenants from housing to private accommodation. This includes utilisation of support services as referenced in Section 2.3.
Strategy 23 – Development of the Central Coast Pilot Transitional Housing Model	While not strictly applicable to the subject proposal, PLH include transition support services for tenants within their care.
Strategy 24 - Advocacy to State and Federal Government on homelessness subsidy programs and support services.	Not applicable, however this Planning Proposal seeks to increase the availability of community housing options within the Central Coast region. PLH is a key contributor to community housing in this region and would commend this initiative.

Relevant Objectives / Action	Comment
Strategy 25 - Advocacy for early intervention subsidy programs and prevention of homelessness.	Not applicable, however this Planning Proposal seeks to increase the availability of community housing options within the Central Coast region. This housing is often provided as a resource for 'at risk' members of the community.
Strategy 26 – Increased resourcing and services for chronic homelessness	Not applicable, however this Planning Proposal seeks to increase the availability of community housing options within the Central Coast region.
Strategy 27 – Monitoring and reporting	Not applicable, however this Planning Proposal is an example of the fulfilment of the objectives of this Strategy.

Woy Woy is a suitable precinct for future growth in affordable housing, given its location and proximity to essential services, as well as the convenience to larger service centres from this location.

This site has the potential to be a key strategic outcome for the delivery of affordable housing on the Central Coast. The CCAHS identified that facilitative intervention to remove impediments in local planning schemes was a strategy for achieving the objective to increase the provision of affordable housing. The CCAHS provides as follows;

*Council will investigate further opportunities for rezoning to R1 or R3 under the comprehensive LEP within 400 metres of the town centres and railway stations and transport nodes.*

The proponent is a recognised and established housing provider on the Central Coast and offers support services within the housing packages that they provide. This holistic approach by PLH ensures that the housing solutions are innovative, focused and financially responsible, and promote independence for tenants that are able to return to private housing. This is consistent with the model provided in the CCAHS. The concept plan included in Appendix A provides housing consistent with those identified at Strategy 15 as it provides a mix of one and two bedroom units.

It is therefore considered appropriate to rezone the parcel of land to enable the provision of medium density housing to respond to the need for these types of developments in a location that has the capacity within the existing infrastructure and is well supported by local services.

### Central Coast Council Draft Local Strategic Planning Statement

The draft Central Coast Local Strategic Planning Statement (LSPS) was placed on exhibition on the 8<sup>th</sup> May 2020 for public comment. The LSPS provides a vision, planning priorities, actions and implementation methods for achieving the 20 year planning vision for the Central Coast. The document identifies key priorities and actions to achieve these priorities.

Action 8 identifies the priority for *providing for the housing needs of our growing region* and includes the implementation of the CCAHS as discussed above. It also identified the need for the preparation of the Central Coast Housing Strategy.

The proposed rezoning is considered to be consistent with the priorities identified in the LSPS, and moreover, will contribute to achieving the outcomes of the CCAHS as discussed above. The rezoning of this land promotes a consistency with the surrounding housing stock that supports medium density developments.


With the rezoning of a portion of the land for R1 general residential, this allows for the specific retention of the RE1 zoned land that contains more valuable environmental attributes than the western portion of the site. The particular retention of the RE1 zoned land, achieves priority 24 that seeks to *map, protect, and cherish natural areas and ecosystems*.

### 6.2.3 Is the Planning Proposal consistent with applicable State Environmental Planning Policies (SEPPs)?

Table 5 below details implications and relevance of SEPP's applicable to the proposal.

Table 5: Applicable State Environmental Planning Policies

SEPP	Relevance / Implication
State Environmental Planning Policy No. 19 – Bushland in Urban Areas Draft Environment SEPP	<p>SEPP No 19 is proposed to be consolidated into the SEPP Environment that was exhibited as a draft document in 2018. Notwithstanding, this SEPP has not been adopted at the time of writing.</p> <p>The land is proposed to be rezoned from RE1 Public Recreation and therefore the provisions of SEPP 19 apply. The land is not held in public ownership, however adjoins land that is a public reserve held in ownership by Central Coast Council.</p> <p>The proposed part rezoning of the land will allow for the development of the site for residential purposes without significant disturbance of the adjoining public open space area. The part zoning of the environmentally sensitive areas of the site as RE1 Public Recreation allows for a transition between this site and the land held in Council ownership, as well as allowing for the protection of the environmental attributes of the site. This option promotes the retention and on-going protection of the open space areas, particularly those areas of the subject site with key environmental attributes.</p> <p>The ultimate development of the site will be managed through the development application process that will ensure the protection and management of impacts on this adjoining parcel of land in relation to soils, tree removal, bushfire management, protection of the watercourse and on-going bushland management.</p>
State Environmental Planning Policy (Koala Habitat Protection) 2019	The SEPP does not apply to the subject site as it does not support an area of more than 1 ha.
State Environmental Planning Policy No 55 - Remediation of Land	<p>A Phase 1 Contaminated Site Investigation has been prepared by Douglas Partners and attached in Appendix D.</p> <p>The report identified potential minor sources of contamination and provided recommendations to be undertaken following the gateway determination for the remediation of the site. These remediations works included the removal of garbage waste found on site. The report concluded that the site is compatible with the proposed sensitive residential land use.</p>
State Environmental Planning Policy No 64 - Advertising and Signage	This SEPP relates to signage and is not applicable to the rezoning.
State Environmental Planning Policy (Coastal Management) 2018	The mapping extract below identifies that the land is affected by the SEPP.

SEPP	Relevance / Implication
	 <p><i>Figure 15: Extract from SEPP Coastal Management Mapping (Source: NSW Dept Planning)</i></p> <p>The land is affected by both the Coastal Use (shown in Figure 15) and Coastal Environment Area in its entirety. The subject site is located within an established residential area, some 250m from the coastline of Horsefield Bay. The rezoning of the land will not compromise the protection afforded to this land identified by the SEPP. The proposed development of the land is unlikely to impact on any critical coastal zones or coastal environmental assets. The rezoning seeks to amend an irregularity in the zoning for this site that is held in private ownership but zoned for public recreation purposes. While the rezoning will allow for a development to occur on site that is currently prohibited, this development will be consistent with the surrounding residential lands in a location that is highly disturbed. Public access to this land has been removed when the land was acquired by the proponent, despite the zoning. The rezoning does allow for the protection of the land that supports environmental attributes in the eastern portion of the site, and adjacent to the watercourse.</p> <p>Notwithstanding the above, the future development application for the residential development will need to address the provisions of Clauses 13 and 14 further at the time of lodgement.</p>
State Environmental Planning Policy (Building Sustainability index: BASIX) 2004	This SEPP relates to buildings and is not applicable in relation to this rezoning. Future residential development will be required to comply with relevant BASIX provisions and will be certified appropriately at development application stage.
State Environmental Planning Policy (Infrastructure) 2007	It is unlikely that the provisions of this SEPP would apply to any future development application.
State Environmental Planning Policy (Affordable Rental Housing) 2009	This SEPP applies to residential development in the state of NSW. Rezoning of this land will allow the introduction of medium density housing in this location. The in-fill development provisions of the SEPP do not apply to the site as it is not located in an accessible area and is at a distance greater than 400m to



SEPP	Relevance / Implication
	<p>land zoned B2 Local Centre or B4 Mixed Use (or equivalent). Development can be undertaken pursuant to the GLEP 2014 in accordance with the zoning. The subject site does not achieve the location requirements to qualify for the FSR incentives made available by the SEPP.</p> <p>The housing proposed in the concept plan can be utilised as affordable housing and is well located to meet the needs of affordable housing for this location.</p> <p>Where the land is rezoned, development for the purposes of a boarding house, secondary dwelling, supportive accommodation, or group home would be permissible pursuant to the SEPP for this site.</p>

#### 6.2.4 Is the Planning Proposal consistent with applicable Ministerial Directions (S.117 Directions)?

An assessment of the Planning Proposal and its consistency against the applicable Ministerial Directions is provided in Table 6 below.

Table 6: Assessment of the Planning Proposal against Relevant Ministerial Directions

Ministerial Direction	Objective/s	Consistency / Comment
1.1 Business and Industrial Zones	(a) Encourage employment growth in suitable locations, (b) Protect employment land in business and industrial zones, and (c) Support the viability of identified strategic centres.	Consistent. The infill R1 zoning will not adversely impact on existing business or industrial zones. To the contrary, the rezoning will increase patronage of local services in the Woy Woy local centre.
1.2 Rural Zones	Protect the agricultural production value of rural land.	Not applicable. The area to be rezoned is not used for agricultural production nor does it adjoin rural land.
1.3 Mining, Petroleum Production and Extractive Industries	Ensure that the future extraction of State or regionally significant reserves of coal, other minerals, petroleum and extractive materials are not compromised by inappropriate development.	Not applicable. The area to be rezoned adjoins public recreation and residential land and is not suitable for extraction of resources.
1.4 Oyster Aquaculture	Ensure priority oyster aquaculture areas are adequately considered and protected from any adverse impacts on water quality.	Not applicable. This proposed rezoning will not have any impact on priority oyster aquaculture areas.
1.5 Rural Lands	Protect agricultural production value of land and facilitate orderly and economic development of rural lands for rural and related purposes.	Not applicable. This proposed rezoning will not have any impact on rural lands.
2.1 Environment Protection Zones	Protect and conserve environmentally sensitive areas.	Consistent. The site supports a significant cleared portion and this land to be rezoned to accommodate the natural attributes of



Ministerial Direction	Objective/s	Consistency / Comment
		<p>the site. Future development of the site can be undertaken without significant impact on the natural environment however a Biodiversity Development Assessment Report would confirm this following gateway approval. Further to the above, the site can also be developed in a manner that will not impact on the existing watercourse located on site. The portions of land that support the key environmental attributes of the site are proposed to be retained as RE1.</p> <p>The retention of part of the site for RE1 Public Recreation allows the retention of significant vegetation adjacent to the existing watercourse on site.</p>
2.2 Coastal Management	Protect and manage coastal areas of NSW.	Not applicable.
2.3 Heritage Conservation	Conserve items, areas, objects and places of environmental heritage significance and indigenous heritage significance.	<p>Consistent.</p> <p>The planning proposal does not impact on any known heritage items or conservation areas, nor on any known Aboriginal area or item of significance. An AHIMS was completed for the site and no items of significance were identified (refer Appendix F).</p>
2.4 Recreation Vehicle Areas	Protect sensitive land or land with significant conservation values from adverse impacts from recreation vehicles.	<p>Not applicable.</p> <p>Recreation vehicle areas are not proposed.</p>
2.5 Application of E2 and E3 Zones and Environmental Overlays in Far North Coast LEP's	Ensure that a balanced and consistent approach is taken when applying environmental protection zones and overlays to land on the NSW Far North Coast.	Not applicable.
3.1 Residential Zones	<p>(a) Encourage a variety and choice of housing types to provide for existing and future housing needs,</p> <p>(b) Make efficient use of existing infrastructure and services and ensure that new housing has appropriate access to infrastructure and services, and</p> <p>(c) Minimise the impact of residential development on the environment and resource lands.</p>	<p>Consistent.</p> <p>The proposed rezoning will enable a variety of residential development permissible under the R1 zoning. This will provide for future housing needs of the community via opportunities for medium density residential development. This would characterise an important opportunity to maximise the capacity of a currently underutilised site, consistent with the Central Coast Regional Plan.</p> <p>Infrastructure is currently available for the site including electricity, water, sewer, communications and the site is well</p>

Ministerial Direction	Objective/s	Consistency / Comment
		located for public transport and existing transit linkages to Sydney and Newcastle.
3.2 Caravan Parks and Manufactured Home Estates	(a) Provide for a variety of housing types, and (b) Provide opportunities for caravan parks and manufactured home estates.	Not applicable.
3.3 Home Occupations	Encourage the carrying out of low-impact small businesses in dwelling houses.	Consistent. Home occupation and home child care are permissible uses within the proposed R1 zone. This will encourage employment opportunities within Woy Woy suburb, thus retaining important services in the precinct and reducing levels of out commuting.
3.4 Integrating Land Use and Transport	Ensure that urban structures, building forms, land use locations, development designs, subdivision and street layouts achieve the following planning objectives: (a) improving access to housing, jobs and services by walking, cycling and public transport, and (b) increasing the choice of available transport and reducing dependence on cars, and (c) reducing travel demand including the number of trips generated by development and the distances travelled, especially by car, and (d) supporting the efficient and viable operation of public transport services, and (e) providing for the efficient movement of freight.	Consistent. The site is located immediately adjacent to a local bus stop in Nambucca Drive and approximately 2.8km from the Woy Woy railway station. The proposal is consistent with local and regional strategies, in that it is providing opportunities for infill housing in close proximity to important services and facilities. The availability of public transport links immediately adjacent to the site supports the desired reduction in private vehicle use identified in the ministerial directions and the Central Coast Regional Plan.
3.5 Development Near Regulated Airports and Defence Airfields	(a) Ensure the effective and safe operation of regulated airports and defence airfields, and (b) Ensure that their operation is not compromised by development that constitutes an obstruction, hazard or potential hazard to aircraft flying in the vicinity, and (c) to ensure development, if situated on noise sensitive land, incorporates appropriate mitigation measures so that the	Not applicable. No airports are located within close proximity of the proposal.

Ministerial Direction	Objective/s	Consistency / Comment
	development is not adversely affected by aircraft noise	
3.6 Shooting Ranges	<p>(a) Maintain appropriate levels of public safety and amenity when rezoning land adjacent to an existing shooting range,</p> <p>(b) Reduce land use conflict arising between existing shooting ranges and rezoning of adjacent land,</p> <p>(c) Identify issues that must be addressed when giving consideration to rezoning land adjacent to an existing shooting range.</p>	<p>Not applicable.</p> <p>No shooting ranges are located within close proximity of the proposal.</p>
4.1 Acid Sulfate Soils	Avoid significant adverse environmental impacts from the use of land that has a probability of containing acid sulfate soils.	<p>Consistent.</p> <p>Most of the subject site is located within part Class 3 and 4 Acid Sulfate Soils in Gosford LEP 2013 mapping. An Acid Sulfate Soils Management Plan may be required (after gateway determination) due to the portion of potential class 3 soils in the northern section of the lot.</p> <p>Further discussion is provided in the Phase 1 Contaminated Site Investigation attached in Appendix D. This report provides the following comments in relation to the site,</p> <p><i>Based on the conditions encountered in the boreholes, the results of the screening and laboratory tests indicate that the dark brown sand below 2.5 m depth in Bore 1 is considered to be an acid sulfate soil. The brown and grey sands above approximately 1 m depth were confirmed to be not acid sulfate soils. In the event that excavation into the dark brown and brown sand soils (below approximately 1 m depth), then excavation should be carried out in accordance with an acid sulfate soil management plan (beyond the scope of the current assessment). Furthermore, given the variable results for the dark brown and brown sands, further testing is recommended to help delineate the acid sulfate soils from the non-acid sulfate soils.</i></p>
4.2 Mine Subsidence and Unstable Land	Prevent damage to life, property and the environment on land identified as unstable or	<p>Not applicable.</p> <p>The site nor surrounding lands are identified as being affected by mine subsidence.</p>

Ministerial Direction	Objective/s	Consistency / Comment
	potentially subject to mine subsidence.	
4.3 Flood Prone Land	(a) Ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005, and (b) Ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard and includes consideration of the potential flood impacts both on and off the subject land.	Consistent. The site is partly identified on Central Coast Council's flood prone land map. The flood affected land is contained within the part of the site proposed to be zoned RE1. The indicative plan provides development outside this potential flood impacted land, and at a minimum floor level which ensures that risk to life or property is not increased.
4.4 Planning for Bushfire Protection	(a) Protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and (b) Encourage sound management of bush fire prone areas.	Consistent. The site is categorised as Vegetation Category 1 and 2 with the majority of the land being Vegetation Buffer. The portion of land to be rezoned for residential purposes is designated as Vegetation Buffer bushfire prone land. A Bushfire Assessment Report was prepared by Conacher Consulting and attached in Appendix B. The report provides recommendations for the establishment of the APZ and minimum construction standard BAL. It is considered that the proposal will be able to satisfy the requirements of the RFS Planning for Bush Fire Protection 2019.
5.1 Implementation of Regional Strategies	Give legal effect to the vision, land use strategy, policies, outcomes and actions contained in regional strategies.	Not applicable. Does not apply to Central Coast LGA.
5.2 Sydney Drinking Water Catchment	Protect water quality in the Sydney drinking water catchment.	Not applicable. Does not apply to Central Coast LGA.
5.3 Farmland of State and Regional Significance on the NSW Far North Coast	Ensure protection of farmland for future generations and reduction of conflicts in agricultural areas.	Not applicable. Does not apply to Central Coast LGA.
5.4 Commercial and Retail Development along the Pacific Highway, North Coast	Managing commercial and retail development along the Pacific Highway on the North Coast.	Not applicable. Does not apply to Central Coast LGA.
5.8 Second Sydney Airport: Badgerys Creek	Avoid incompatible development in the vicinity of any future Sydney Airport at Badgerys Creek.	Not applicable. Does not apply to Central Coast LGA.

Ministerial Direction	Objective/s	Consistency / Comment
5.9 North West Rail Link Corridor Strategy	Promote, manage growth and consistent development in accordance with strategy within North West Rail Link corridor.	Not applicable. Does not apply to Central Coast LGA.
5.10 Implementation of Regional Plans	To give legal effect to the vision, land use strategy, goals, directions and actions contained in Regional Plans.	Consistent. Refer to the section above that considers the Central Coast Regional Strategy and other relevant regional documents.
6.1 Approval and Referral Requirements	Ensure that LEP provisions encourage the efficient and appropriate assessment of development.	Consistent. No new approvals or referral requirements are proposed.
6.2 Reserving Land for Public Purposes	(a) Facilitate the provision of public services and facilities by reserving land for public purposes, and (b) Facilitate the removal of reservations of land for public purposes where the land is no longer required for acquisition.	Consistent. The rezoning includes the partial retention of land zoned RE1 for public purposes. This is in keeping with the environmental attributes of the site and the adjoining existing public reserve. The partial zoning of existing RE1 land to R1 zoned land will allow for the efficient use of this portion of the land that has been vacant and under utilised. The overall plan will see land utilised for public reserve that is fitting with the existing circumstances on site, and the efficient utilisation of the remaining land.
6.3 Site Specific Provisions	Discourage unnecessarily restrictive site-specific planning controls.	Consistent. This proposal is for rezoning of the subject lands only. The proposed changes will be consistent with the standard instrument zoning and will not create any unnecessarily restrictive provisions.
7.1 Implementation of A Plan for Growing Sydney	Give effect to the vision, transport and land use strategy, policies, outcomes and actions contained in the Metropolitan Plan for Sydney.	Not applicable. Does not apply to Central Coast LGA.
7.2 Implementation of Greater Macarthur Land Release Investigation	Ensure development within the Greater Macarthur Land Release Investigation Area is consistent with the Greater Macarthur Land Release Preliminary Strategy and Action Plan	Not applicable. Does not apply to Central Coast LGA.
7.3 Parramatta Road Corridor Urban Transformation Strategy	Facilitate development in the Parramatta Road Corridor	Not applicable. Does not apply to Central Coast LGA
7.4 - 7.10	Not applicable. Does not apply to Central Coast LGA.	

### 6.3 Section C - Environmental, social and economic impact

#### 6.3.1 Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

A Biodiversity Review Report was prepared by Conacher Consulting and is attached in Appendix C. The report concludes as follows;

- i. No threatened flora species listed within the BC Act or the EPBC Act were observed within the subject site.
- ii. The following threatened fauna species were observed within the subject site during surveys:
  - Grey-headed Flying-fox (*Pteropus poliocephalus*)
  - Little Bent-winged Bat (*Miniopterus australis*);
  - Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- iii. The endangered ecological communities, Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion and Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, as listed within the BC Act (2016), was observed within the subject site.
- iv. No migratory species listed within the EPBC Act (1999), were observed within the subject site.
- v. The proposed rezoning and future development of the site is not likely to significantly affect threatened species, in accordance with Section 7.2 of the Biodiversity Conservation Act (2016);
- vi. The rezoning and future development of the site is not likely to trigger the Biodiversity Offset Threshold identified in Part 7 of the Biodiversity Conservation Regulation (2017); and
- vii. A Biodiversity Development Assessment Report is not likely to be required for a future development application following rezoning;
- viii. The rezoning and future development of the site is not likely to require a referral under the Environment Protection and Biodiversity Conservation Act (1999).

It is therefore unlikely that the planning proposal will have any adverse impact on the environmental attributes of the site or surrounds.

#### 6.3.2 Are there other likely environmental effects as a result of the Planning Proposal and how are they proposed to be managed?

A number of environmental issues have been considered in this planning proposal. Further discussion is provided below in conjunction with specialist consultants reports attached as Appendices to this planning proposal.

There is potential for some minor environmental effects relating to the following issues:

##### Contamination & Soils

Acid Sulfate Soils will need to be addressed throughout future DA stages and mitigation of any risk will be addressed in an Acid Sulfate Soils Management Plan.

A Phase 1 Preliminary Site Investigation report is included at Appendix D. This report concluded,

*In summary, the PSI indicates that the site is compatible (from a site contamination perspective) with the proposed sensitive (residential land uses), subject to the following condition:*

- *Appropriate clean-up and landfill disposal of the fly-tipped materials observed at the ground surface and scattered across the site. An assessment (inspection and possible confirmation testing) of the clean-up areas should be completed by a qualified consultant; and*
- *An Unexpected Finds Protocol to manage any asbestos, or other unexpected contamination, encountered at the ground surface or within soils during any future development works at the site.*



*Given the presence of isolated anthropogenic materials the possibility of encountering areas of contamination during any future development cannot be ruled out.*

*Groundwater testing was not completed, however, given that no significant soil contamination was found, groundwater is unlikely to be contaminated as a result of the known status of site soils. If extraction of groundwater is planned, then, further investigation will be necessary to determine its suitability for use.*

The site is therefore considered to be appropriate for the proposed rezoning and no further investigations are required.

## Bushfire

The site is bushfire prone as identified in Figure 16 below. The subject land is however separated from the larger portion of Category 1 land by the watercourse that dissects the site. The Preliminary Bushfire Assessment (included as Appendix B) included the recommendation for the establishment of an Asset Protection Zone of 14m width and this is indicated on the concept plans for consideration in Appendix A. Future dwellings are likely to be assessed as requiring a BAL29 construction standard where a setback of 14m can be achieved by future development. Access to the site, and within the local road network, is suitable and can be consistent with the requirements of *Planning for Bushfire Protection 2019*.

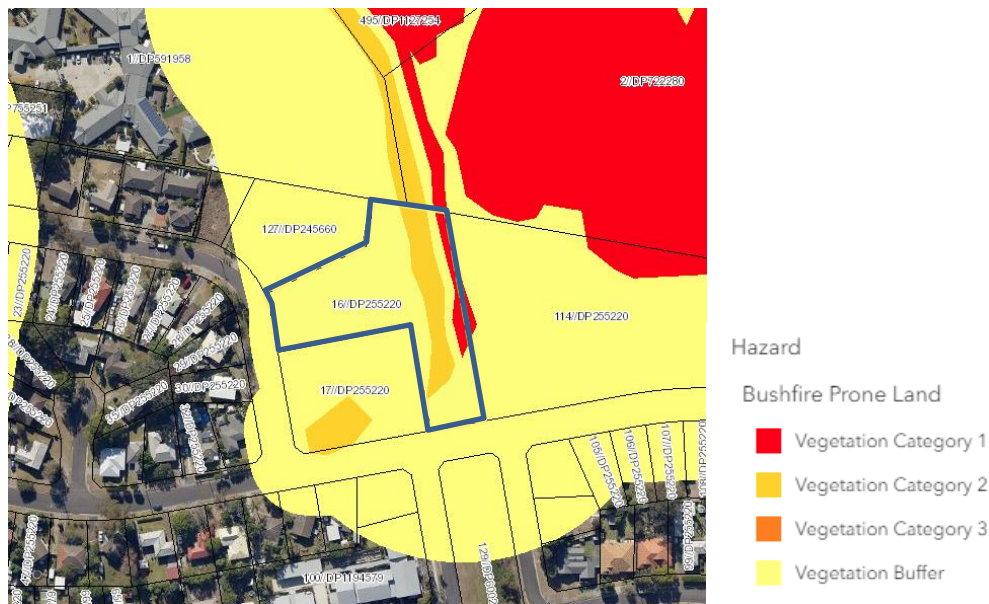


Figure 16: Extract from Bushfire Prone Land Map (NSW Planning Portal online)

The combined implementation of the measures provided in the Bushfire Hazard Assessment will ensure that future development can achieve the requirements of PBP 2019.

## Sediment and waste

Sediment and waste management controls will be appropriately applied by the applicant and Council in preparation and consideration of future development applications for the site.

## Acoustic

The unique location of the site allows future development to provide generous separation to adjoining residential development, and the existing public open space to the east, therefore limiting the acoustic impact on residential development in this locality. As the proposal is for residential development only, the ultimate use of the site will be consistent with surrounding land uses.

It is not anticipated that the issues outlined above would be detrimental to the proposal and will be able to be managed appropriately, mainly at development application stage.

### **Visual Impact**

The proposed development may result in a visual impact during construction, however as surrounding sites exhibit medium density residential development, the proposal is expected to visually integrate into the existing landscape.

It is not anticipated that these issues will be detrimental to the proposal and are able to be managed appropriately, mainly at development application stage. Some will need further assessment following the Gateway determination as discussed.

### **6.3.3 How has the Planning Proposal adequately addressed any social and economic effects?**

The following social and economic issues have been considered:

#### **European heritage**

No known European heritage items have been identified on or near the site and it is not anticipated that there will be any heritage concerns;

#### **Aboriginal heritage**

No known Aboriginal sites have been identified near the site and due to the disturbed state of the subject lands, it is not anticipated that there will be any impacts. An AHIMS search was conducted on 4/12/2019 and confirmed that no Aboriginal sites or places are recorded within a 200m vicinity of the subject lands (refer Appendix J). Notwithstanding the above, the proponent intend to seek advice regarding the preparation of an Aboriginal Heritage Report for the subject land prior to the gateway determination.

#### **Amenity & Context of Surrounding Land Use**

The subject site is located within the context of an established residential area. Properties on the immediately adjacent property to the north and south of the site are used for medium density residential accommodation. Land opposite the site in Macleay Avenue is used for low density residential development. Issues of amenity as they relate to privacy, noise, solar access and shadow are regulated at the development application stage, notwithstanding this the orientation of the lot, the size of the lot and separation, and the consistency with the surrounding land uses will minimise the impact on the amenity of this locality.

#### **Scenic Quality**

The retained open space corridor will provide an attractive landscaped backdrop to future residential development and this integrates well with the existing adjoining RE1 Public recreation zoned land. The outlook would be retained and incorporated into the future development to provide an aesthetically appealing development when viewed from the park and surrounding streets.

#### **Population & Settlement Patterns**

Woy Woy is a local centre and a key area within the Peninsula region of the Central Coast. Population information available for Woy Woy is shown in Figure 17 below. This figure identifies Woy Woy as having approximately 60% of its population aged 55 years and over.

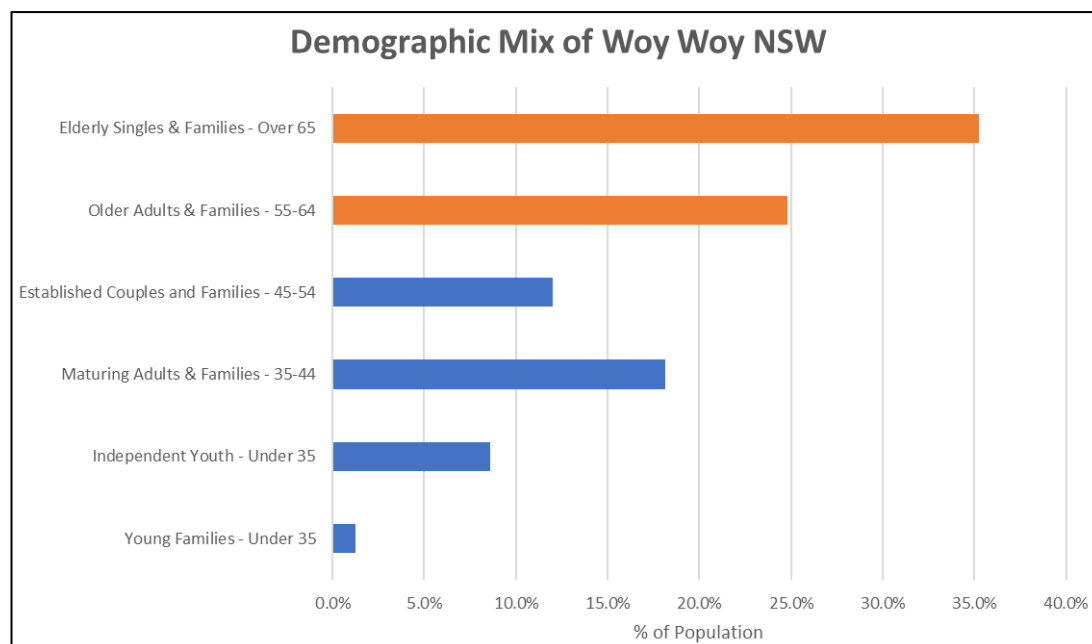


Figure 17: Demographic mix of Woy Woy (Source: Pacific Link Housing)

Figure 18 provides a breakdown for the demand for dwellings by Unit type, indicating a preference for smaller land holdings and a preference for studio/1 bedroom, 2 bedroom and 3 bedroom apartments.

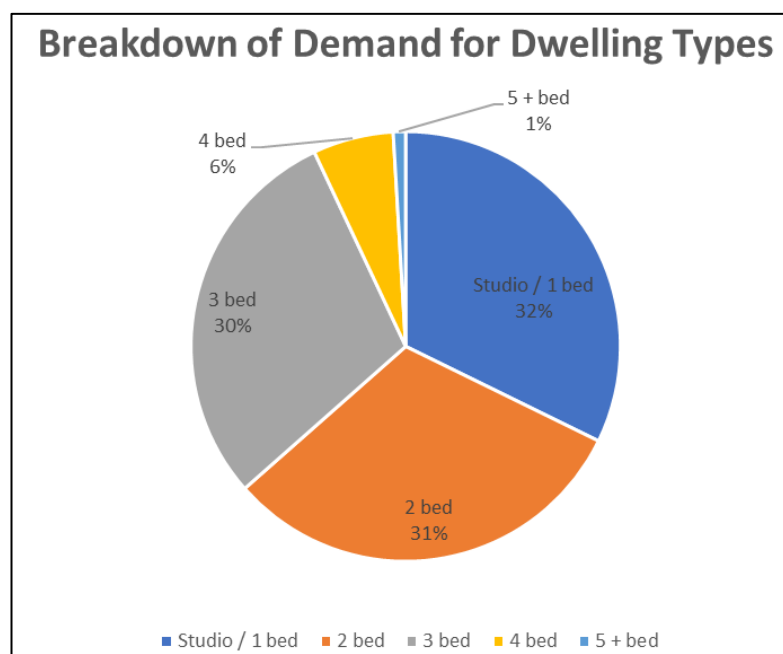


Figure 18: Breakdown of demand for Dwelling Types (Source: Pacific Link Housing)

Considering figures 17 and 18 above, these current trends and the demand for housing as extrapolated from the housing waiting lists that Pacific Link Housing administer, suggest that key population groups seeking accommodation in this location fit in the following tenancy constructs;

- Mature aged single adults;
- Mature aged couples/families; and
- Younger single parent families

The proposal will seek the use of land that is currently vacant to be utilised for the purposes of medium density development. Unit accommodation is proposed in the concept design at Appendix A and this will allow the site to be used for purposes consistent with the demand in this location.

Woy Woy is a location that is well serviced by public transport and provides convenient and accessible links to commercial, retail and medical services in the town centre. The Woy Woy Railway station is conveniently located within the town centre and provides access to services required at a regional level to either Gosford / Newcastle in the north, or Sydney to the south via the railway line.

Where this development allows for accommodation of these vulnerable population groups, they will be provided with convenient and accessible proximity to local everyday services.

### Affordable Housing & Socio-Economic Factors

In response to the contributing factors of the population mix and settlement patterns identified above, it is now relevant to consider the provision of affordable housing and socio-economic factors that contribute to the demand for affordable housing.

Woy Woy was identified in SIEFA Index of Relative Socio-Economic Disadvantage (IRSD) as being in one of the most disadvantaged areas see Figure 19 below.

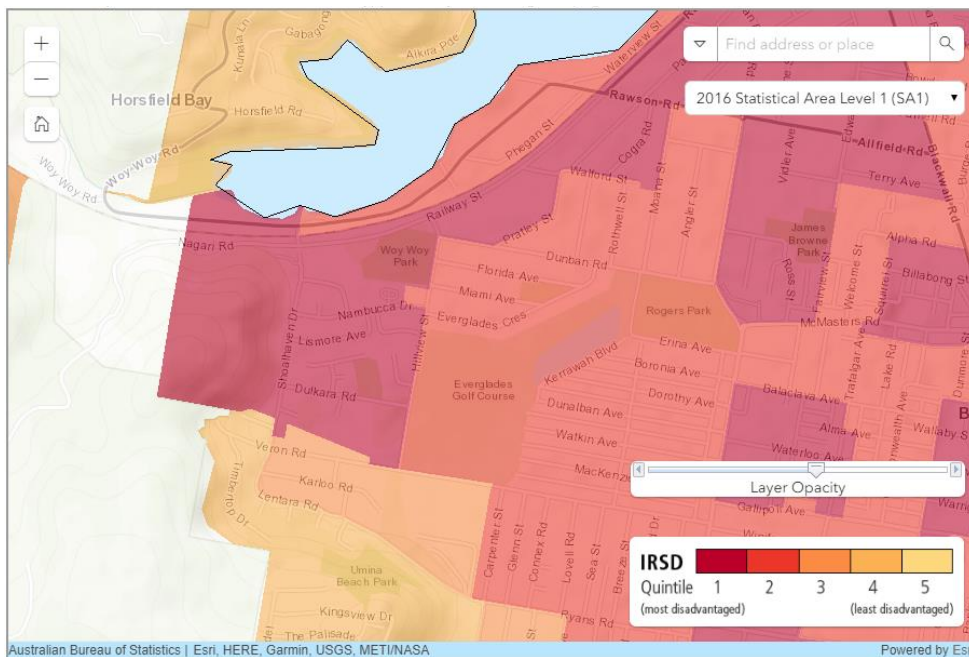


Figure 19: SIEFA Index of Relative Socio-Economic Disadvantage (IRSD) (Source ABS 2016)

In review of the above, and in combination with the population and housing demands for Woy Woy, the planning proposal is considered to be responsive to the need for affordable housing and the demand for this type of housing in this location.

At the Council Meeting of the 13 May 2019 a draft report entitled the *Central Coast Council Affordable Housing Strategy Background Paper*, authored by Judith Stubbs & Associates (April 2018) was considered and determined to be used in part as a foundation for the development of a Central Coast Affordable Housing Strategy. This policy has now been adopted, as discussed earlier.

The following information was provided in this report, relevant to the subject location;

Between 2016 and 2036, population projections indicate that an additional 36,400 dwellings will be required, of which 25,800 will need to be for smaller couple and sole person households, and the balance of 10,600 for larger households.

There has been a general lack of growth in the diversity of dwelling types in the LGA over the past decade. This lack of diversity, combined with the rapid aging of the LGA's population in the context of its relatively dispersed urban settlement pattern and disadvantaged demographic profile presents particular challenges for the supply of appropriately located affordable housing. The relatively low and declining rate of social rental housing is also noted, as well as the relatively low growth of private rental.

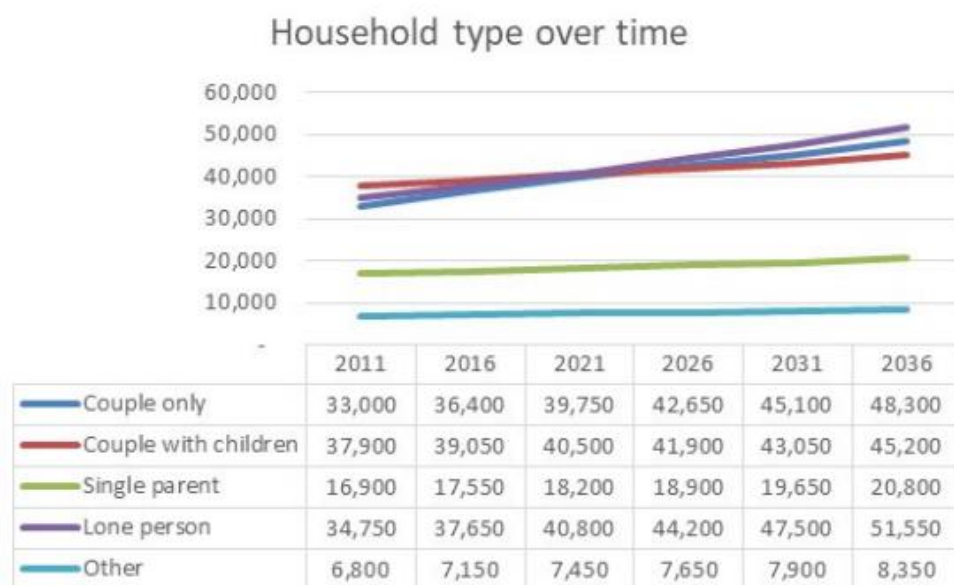


Figure 20: Central Coast LGA projected household type over time (Numbers) (Source NSW Dept PIE)

This indicates the need for strong planning intervention in the future, in particular to create well located and affordable strata dwellings close to major urban centres.

...the location of affordably priced housing is a key issue in terms of social equity and sustainability. Providing for a mix of affordably priced housing for different target groups in well located areas provides for social mix and reduces the potential stigma that can be associated with such accommodation. Locating such housing close to transport and services also provides for the needs of key groups including those with a disability and the frail aged, reduces car dependency and the cost of transport, which can be a significant impost on very low, low and moderate income households<sup>38</sup> and on the environment.

This site has the potential to be a key strategic outcome for the delivery of affordable housing on the Central Coast. It is therefore considered appropriate to rezone the parcel of land to enable the provision of medium density housing to respond to the need for these types of developments in a location that has the capacity within the existing infrastructure and is well supported by local services.

### Traffic & Parking

The planning proposal concept plan proposes a maximum of 21 units comprising 1 and 2 bedroom apartments. The overall development of the site will generate no more than 11 vehicle trips during peak periods, based on the recommended RMS trip rate of 0.5 trips per dwelling for medium density residential developments. The traffic generated by the development will be distributed to the surrounding local road network along Shoalhaven Drive, Nambucca Drive and Hillview Street. As these streets are currently operating well within their capacities, the additional 11 peak hour trips will have no impact on the performance of the local road network.



Adequate on-site parking is proposed in the concept design so as not to rely on street parking. Parking is provided at the rate of 1 space per unit with 3 on site visitor parking spaces. While this is less than the typical parking rate required for medium density housing, it is acknowledged that affordable housing is often influenced negatively by the provision of on-site parking in two ways, firstly, driving the pricing of housing up and secondly reducing the feasibility of a development project (Draft CCAHS; 2018). The subject site is well located in relation to the bus service that provides access to the Woy Woy local centre, and therefore reduces the demand for on-site parking. ABS data for car ownership per dwelling indicates the rate of 1 space per dwelling for the Central Coast to be accurate for 1 – 2 bedroom units.

The proposed concept design allows for at grade parking with suitable turning and maneuverability to allow forward egress from the site. The width of the site allows for a combined entry and exit point onto Macleay Avenue, with a traffic calming single one way driveway throughout the site.

### **Public Open Space**

The planning proposal includes the partial zoning of land adjacent to the existing public reserve, within the eastern portion of the land to RE1 Public Recreation. The land is held in private ownership by PLH, however could be acquired by Council as part of the rezoning process in order to utilise this land for public recreation. This land supports environmental characteristics, including a watercourse, that is to be preserved under this scheme. By retaining the zoning of this land for public recreation will preserve the high amenity of the setting of this site and contribute to the promotion of public open space areas in the LGA.

This is an improvement on the current circumstances whereby the land is zoned for public recreation purposes but held in private ownership.

### **Economic impacts**

The rezoning has the capacity to increase patronage at a number of Woy Woy's commercial enterprises including the Woy Woy retail/commercial precinct and Shopping Centre. It is anticipated that the proposal will have a positive benefit on the local community.

The planning proposal has the potential to provide a positive impact on the local economy during the construction phase of the development of the site. The construction industry is a significant component of the economy accounting for 6.8% of Gross Domestic Product (GDP) and employing 9.1% of the Australian workforce, making it Australia's fourth largest industry. The industry has strong linkages with other sectors, so its impacts on the economy go further than the direct contribution of construction. (ABS, 2016)

The proposal will increase economic growth in the wider region by utilising goods and services during the construction process. The total expenditure will be filtered through the local businesses to create far more wealth than was initially injected. It can therefore be predicted that the future cost of construction would significantly increase the size of the local economy.

## **6.4 Section D - State and Commonwealth interests**

### **6.4.1 Is there adequate public infrastructure for the Planning Proposal?**

Woy Woy locality is a local centre as part of the Central Coast region and enjoys the benefits of local level everyday services associated with retail, medical, education and commercial facilities. The Woy Woy railway station is located approximately 2.6km.

The site is serviced by public transport bus links with a public bus stop located in Nambucca Drive that provides access to the Woy Woy town centre and railway station.

The site is well located and can be serviced by water, electricity and communications.



#### 6.4.2 What are the views of State and Commonwealth public authorities consulted in accordance with the gateway determination?

This planning proposal has yet to achieve Gateway determination therefore public consultation and government agency referrals have not yet been undertaken.

Consultation with State and Commonwealth public authorities, if required, should be identified as part of the Gateway determination.

## 7 Part 4 - Mapping

### 7.1 Proposed Land Zoning Map

Figure 21 below is an extract from the proposed land zoning map incorporating site rezoning from RE1 Public Recreation to part R1 General Residential and part RE1 Public Recreation.

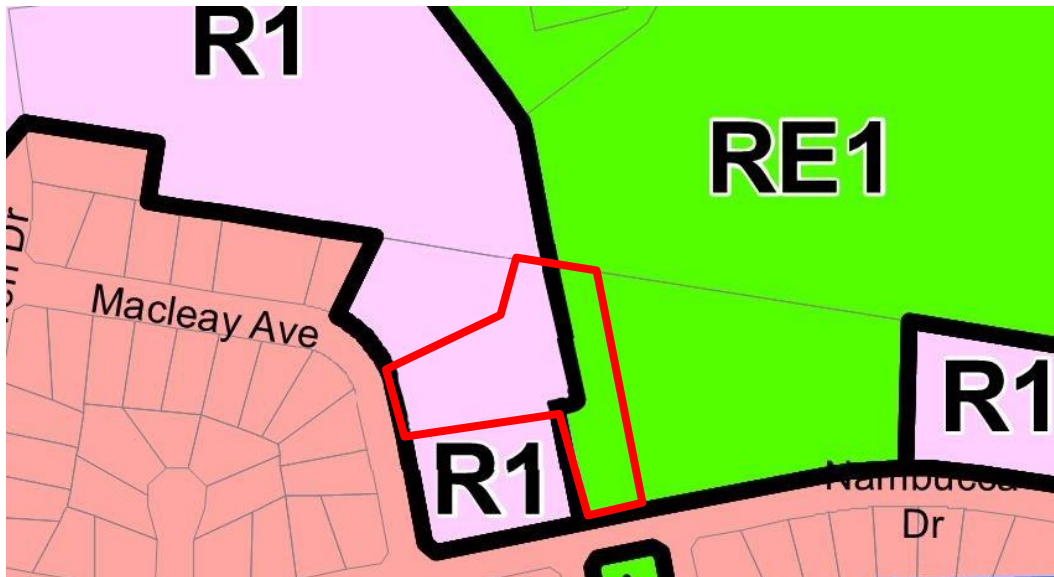


Figure 21: Proposed Land Zoning Map

### 7.2 Proposed Minimum Lot Size Map

Figure 22 below is an extract from the proposed minimum lot size map incorporating site rezoning from RE1 Public Recreation to part R1 General Residential and part RE1 Public Recreation. This map indicates that land zoned R1 General Residential will adopt a minimum lot size of 550m<sup>2</sup>.

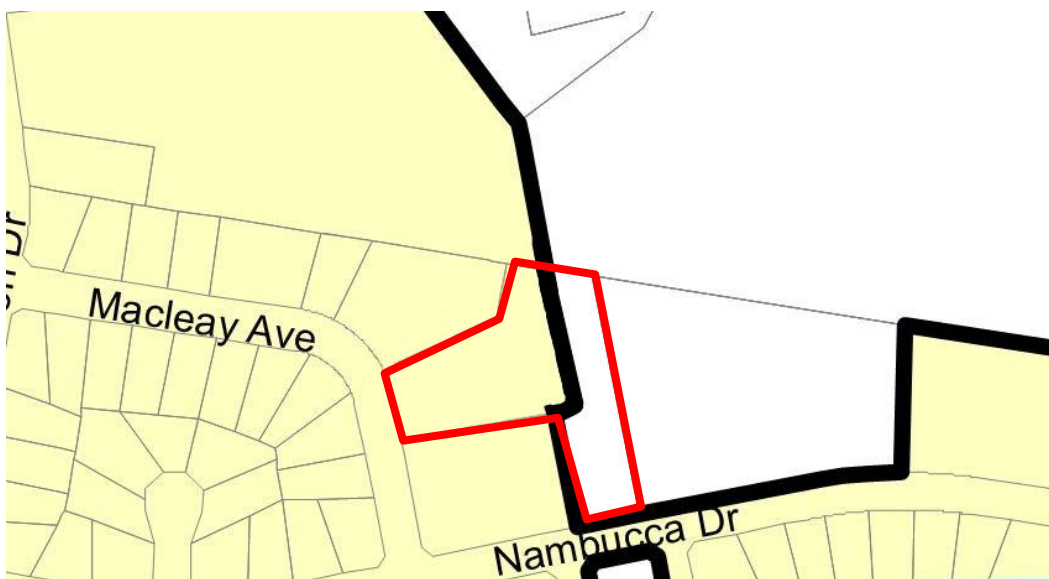


Figure 22: Proposed Minimum Lot Size Map

### 7.3 Proposed Maximum Height of Building Map

Figure 23 below is an extract from the proposed maximum height of building map incorporating site rezoning from RE1 Public Recreation to part R1 General Residential and part RE1 Public Recreation. This map indicates that land zoned R1 General Residential will adopt a maximum height of building of 8.5m.

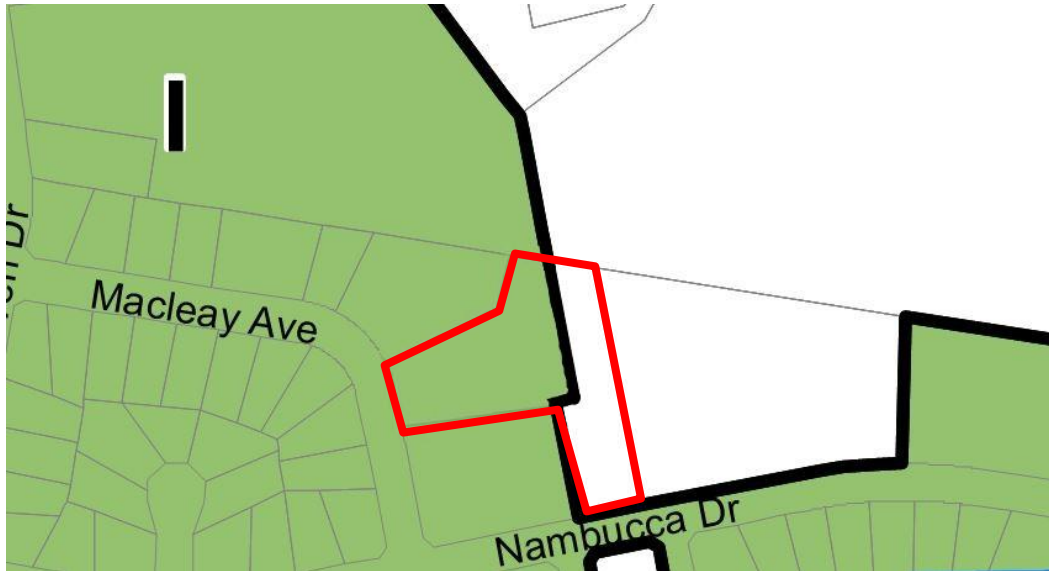


Figure 23: Proposed Maximum Height of Building Map

### 7.4 Proposed FSR Map

Figure 24 below is an extract from the proposed FSR map incorporating site rezoning from RE1 Public Recreation to part R1 General Residential and part RE1 Public Recreation. This map indicates that land zoned R1 General Residential will adopt a maximum FSR of 0.7:1 consistent with surrounding lands and subject to the provisions of Clause 4.4.



Figure 24: Proposed FSR Map

## 8 Part 5 - Community Consultation

No community consultation has been undertaken on the proposal to date.

It is recommended that Council exhibit the proposal for a period of 28 days and should include:

- Notification in a local newspaper by Central Coast Council;
- Notification on the website of Central Coast Council; and
- Notification in writing to the adjoining and other affected land owners.

The exhibition will need to include:

- The planning proposal and accompanying studies and reports;
- The Gateway determination; and
- Any information or technical reports relied upon for the preparation of the planning proposal.

## 9 Part 6 - Project Timeline

Action	Timeframe
Anticipated commencement date (date of Gateway determination)	
Anticipated timeframe for completion of required technical information	
Timeframe for government agency consultation (pre-exhibition)	
Public exhibition (commencement and completion dates)	
Date of Public hearing (if required)	
Consideration of submissions	
Timeframe for government agency consultation (post exhibition if required)	
Post exhibition planning proposal consideration / preparation	
Submission to Department to finalise LEP	
Date RPA will make Plan (if delegated)	
Date RPA will forward to the Department for notification (if not delegated)	

## Appendix A – Concept Plan by ADG Architects

Appendix provided under separate cover.

## Appendix B – Preliminary Bushfire Hazard Assessment Report by Conacher Consulting

Appendix provided under separate cover.



## Appendix C – Biodiversity Review Report by Conacher Consulting

Appendix provided under separate cover.

## Appendix D – Phase 1 Contaminated Site Investigation by Douglas Partners

Appendix provided under separate cover.

## Appendix E – Preliminary Geotechnical Assessment by Douglas Partners

Appendix provided under separate cover.

## Appendix F – AHIMS Search

Appendix provided under separate cover.

## Appendix G – Site Survey by Barker Ryan Stewart

Appendix provided under separate cover.

## Appendix H – Civil Engineering Advice

Appendix provided under separate cover.