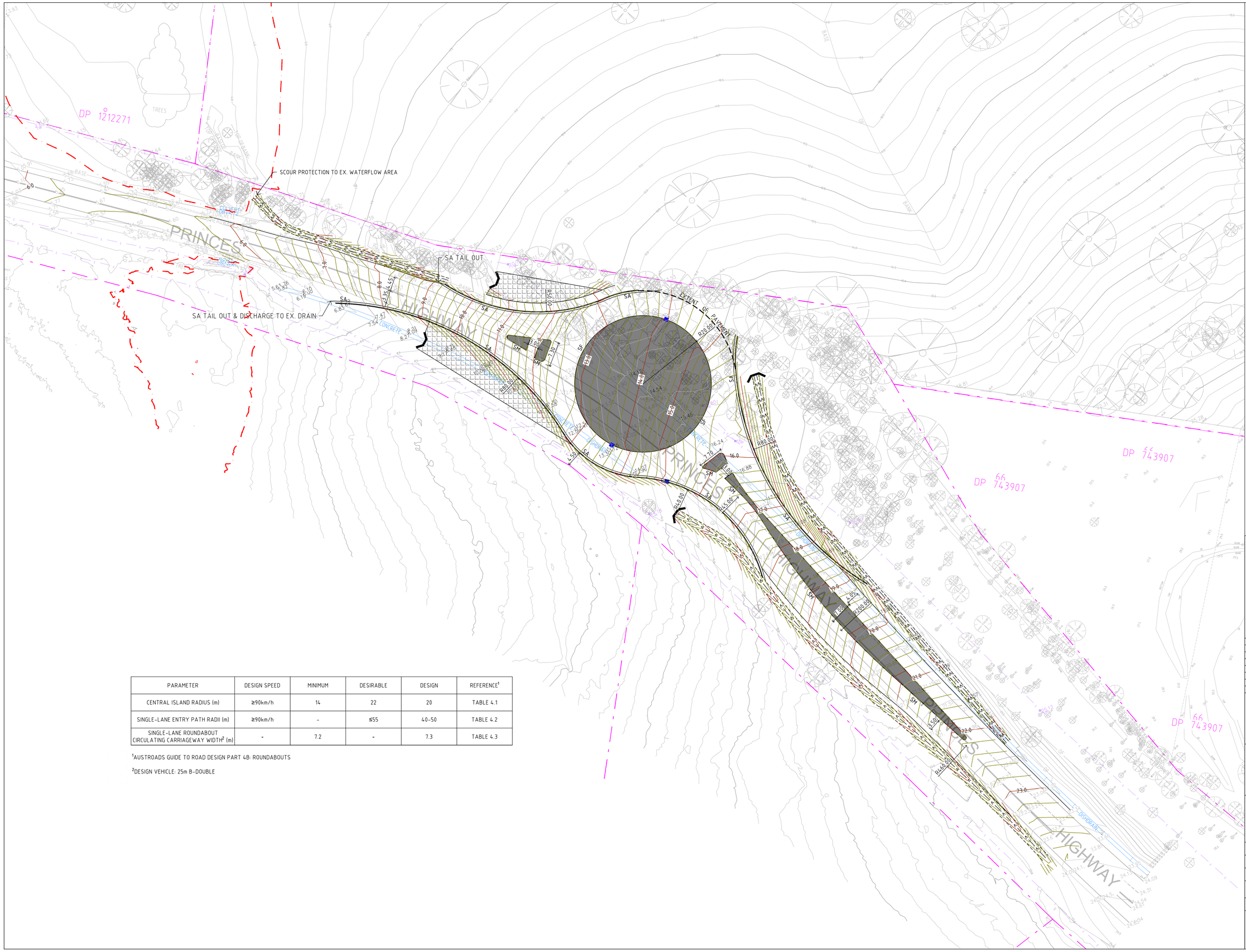


PARAMETER	DESIGN SPEED	MINIMUM	DESIRABLE	DESIGN	REFERENCE[1]
CENTRAL ISLAND RADIUS (m)	≥90km/h	14	22	20	TABLE 4.1
SINGLE-LANE ENTRY PATH RADII (m)	≥90km/h	-	≤55	40-50	TABLE 4.2
SINGLE-LANE ROUNDABOUT CIRCULATING CARRIAGEWAY WIDTH[2] (m)	-	7.2	-	7.3	TABLE 4.3

[1] AUSTROADS GUIDE TO ROAD DESIGN PART 4B: ROUNDABOUTS

[2] DESIGN VEHICLE: 25m B-DOUBLE

EXISTING SURVEY LEGEND:

- SITE BOUNDARY
- SURFACE SPOT LEVEL
- SURFACE CONTOUR
- 1% AEP FLOOD EXTENT
- TREE
- TELECOMMUNICATIONS LINE
- PILLAR (TELSTRA)
- COMMS SPOT LEVEL
- DISH DRAIN
- DISH DRAIN SPOT LEVEL

DESIGN WORKS LEGEND:

- MAJOR DESIGN CONTOUR
- MINOR DESIGN CONTOUR
- SA KERB (KERB & GUTTER)
- SF KERB (RAISED KERB)
- SM KERB (BARRIER KERB)
- HEADWALL
- SWALE
- CONCRETE LINED DRAIN
- INDICATIVE FILL AREA (HEADWALL)

NOTES:

1. ROUNDABOUT HAS BEEN DESIGNED FOR VEHICLES UP TO A 26m LONG B-DOUBLE
2. 20m ROUNDABOUT CENTRAL ISLAND RADIUS PER TABLE 4.1 OF AUSTROADS GUIDE TO ROAD DESIGN PART 4B FOR ≥90km/h DESIRED DRIVER SPEED ON THE FASTEST LEG PRIOR TO ROUNDABOUT.
3. ENTRY PATH APPROACH CURVE RADIUS NO GREATER THAN 55m PER TABLE 4.2 OF AUSTROADS GUIDE TO ROAD DESIGN PART 4B FOR ≥90km/h DESIRED DRIVER SPEED ON THE ON THE LEG PRIOR TO THE ROUNDABOUT.

DRAWING KEY

REV	DATE	DESCRIPTION	DRAWN	REVIEWED
P1	19/04/22	FOR APPROVAL	SC	SN

PROJECT

PRINCES HIGHWAY ROUNDABOUT WORKS, MORUYA

DRAWING TITLE

CIVIL WORKS PLAN

ptc.
Suite 502, 1 James Place
North Sydney NSW 2060
t +61 2 8920 0800
ptcconsultants.co

CLIENT	HEALTH INFRASTRUCTURE
DRAWING #	SK-0301
PROJECT #	21-3123
SCALE	1 : 500 @ A1 1 : 1000 @ A3

FOR APPROVAL

REV P1

SCOPE OF WORKS

1. A NEW ROUNDABOUT IS BEING CONSTRUCTED. THIS DRAWING DETAILS THE ASSOCIATED SCOPE OF WORKS REQUIRED TO ENABLE THE WORKS TO BE COMPLETED.
2. TELSTRA DIVERSION
   OBTAIN THE DETAILED SCOPE OF WORKS FROM TELSTRA. THE WORKS INCLUDES DIVERSION OF EXISTING CABLING WITH ADDITIONAL PITS. ALL WORKS TO COMPLY WITH TELSTRA STANDARDS AND WIRING RULES.
3. STREET LIGHTING
   OBTAIN THE LIGHTING CATEGORY FROM THE RMS, OBTAIN AND THE DESIGN BRIEF FROM ESSENTIAL ENERGY AND PROVIDE LIGHTING TO AS/NZS 1158.
4. SITE POWER
   WHERE THE CONTRACTOR REQUIRES AC POWER FOR SITE FACILITIES IT SHALL BE OBTAINED FROM THE LOCAL SUPPLY AUTHORITY.
5. ALL PITS, CONDUITS, CABLES AND LIGHTING POLES ARE TO BE POSITIONED ON THE COORDINATED CIVIL DRAWINGS INDICATING EXACT LOCATION LEVELS AND CLEARANCES.
6. ALL WORKS MUST BE COORDINATED WITH ASP L3 DESIGN.
7. ASP WORKS MUST INCLUDE FOR THE UNDER BORING AND STEEL SLEEVE INSTALLATION TO ADDRESS THE WATER CREEK LANDSCAPE.
8. ENSURE THAT THE EXISTING COMMUNICATIONS ON THE SOUTHERN SIDE OF PRINCESS HIGHWAY ARE RETAINED AND AVOIDED DURING THE WORKS. PROVIDE ALL NECESSARY PROTECTION AND PROVISIONS DURING THE CONSTRUCTION OF THE NEW ROUND ABOUT AND STREET LIGHTING TO MAINTAIN AND PROTECT THE COMMUNICATIONS CABLING.
9. REFER TO THE CIVIL DRAWINGS FOR THE EXACT LOCATION AND SETOUT OF SERVICES AND POSITION ON NEW ROUNDABOUT.

PROJECT NOTES:

ENVIRONMENTAL & SAFETY REPORTS
BEFORE CONSTRUCTION COMMENCES REFER TO THE REVIEW OF ENVIRONMENTAL FACTORS WORKSHEET AND THE DESIGNER'S SAFETY REPORT FOR THIS PROJECT

AIR
L1SP TO LIMIT VEHICLE USE TO MINIMIZE FUME GENERATION.
L1SP TO USE BEST PRACTICE TO MINIMIZE DUST DURING THE WORKS
EXAMPLES TO MINIMIZE DUST. DAMPER SOIL WITH WATER
BACKFILL TRENCH AS QUICKLY AS POSSIBLE
MINIMIZE VEHICLE MOVEMENTS OVER EXCAVATED AREA

EROSION AND SEDIMENTATION CONTROL
EROSION AND SEDIMENTATION CONTROL MEASURES ARE REQUIRED TO BE INSTALLED AND OPERATIONAL AS REQUIRED

WATER
L1SP TO INSTALL EROSION AND SEDIMENTATION CONTROL MEASURES AND KEEP OPERATIONAL AS REQUIRED

NOISE
L1SP TO MINIMIZE NOISE GENERATION
MAKE SURE ALL CONSTRUCTION VEHICLES' NOISE LEVELS ARE WITHIN AUSTRALIAN STANDARDS.
ONLY WORK WITHIN THE STANDARD WORKING HOURS (E.G. WEEKDAYS, 7AM TO 4PM. SATURDAYS 8AM TO 1PM)

CONTAMINATION AND WASTE
CONSTRUCTION WASTE TO BE CATEGORIZED AND DISPOSED OF CORRECTLY OR RECYCLED
LEVEL 1 SERVICE PROVIDER IS TO FOLLOW ESSENTIAL ENERGY'S CEOM1000.90 HEALTH, SAFETY AND ENVIRONMENT HANDBOOK AND ALL STATE AND FEDERAL LAWS
CARE IS TO BE TAKEN DURING TRANSFORMER TRANSPORTATION SO THE TRANSFORMER IS NOT DAMAGED IN A WAY THAT COULD CAUSE AN OIL LEAK.

LAND USE AND TRANSPORT
L1SP IS TO APPLY FOR THE APPROPRIATE LICENCES FOR THE WORKS AND TRANSPORT OF MATERIALS AS REQUIRED

COUNCIL - ROAD OPENING ACTIVITY PERMIT
L1SP IS TO APPLY FOR A ROAD OPENING ACTIVITY PERMIT FROM THE LOCAL COUNCIL BEFORE COMMENCEMENT OF WORK
OBTAIN LOCAL COUNCIL APPROVAL FOR TRAFFIC CONTROL PLAN.

SITE TRAFFIC AND PEDESTRIAN CONTROL
L1SP IS TO IDENTIFY AND DOCUMENT TRAFFIC AND PEDESTRIAN CONTROL PLANS AS NECESSARY TO CONTROL VEHICLE AND HUMAN TRAFFIC AROUND THE SITE.
INSTALL TRAFFIC AND PERSONNEL CONTROL BARRIERS AS REQUIRED BY LAW

FLORA AND FUANA
L1SP TO BE AWARE OF ENDANGERED NATIVE FAUNA AND TAKE CARE NOT TO DAMAGE OR INJURE IN ANY WAY
IF ANY ENDANGERED FAUNA ENTERS THE WORK AREA ALL WORK IS TO STOP UNTIL THE ENDANGERED FAUNA HAS MOVED ON AND IS CLEAR OF THE WORK AREA
ALL ENDANGERED OR PROTECTED FLORA WITHIN THE WORK AREA IS TO BE FENCED OFF
REFER TO CECM1000.77 FOR FURTHER DETAILS

VISUAL AND HERITAGE
IF ANY ABORIGINAL OBJECTS ARE FOUND DURING CONSTRUCTION, WORK IS TO STOP AND THE DEPT OF ENVIRONMENT AND ENERGY NOTIFIED

IDENTIFICATION LABELS
L1SP TO INSTALL ASSET IDENTIFICATION AND OPERATIONAL LABELS TO EACH ASSET

CABLE DESTINATION TAGS
L1SP TO ATTACH CABLE DESTINATION TAGS ON EACH CABLE AS PER CEOP8042

DIAL BEFORE YOU DIG: JOB
DIAL BEFORE YOU DIG SEARCHES WERE CARRIED OUT ON 06/03/2022 AND HAVE FOUND UNDERGROUND SERVICES FOR NBN, TELSTRA AND ESSENTIAL ENERGY IN WORK AREA
THERE MAYBE OTHER COMPANYS WITH UNDERGROUND SERVICES IN THE AREA. IT IS THE LEVEL 1 SERVICE PROVIDER'S RESPONIBILITY TO CHECK AND VERIFY ALL UNDERGROUND SERVICES IN THE VICINITY OF THE WORKS

SAFETY WARNING
POTENTIALLY HAZARDOUS POLE TOP LOAD CHANGES MAY OCCUR DURING THE CONSTRUCTION OF THIS PROJECT. CONSIDERATION MUST BE GIVEN TO THE SUPPORTING OF POLES PRIOR TO WORK COMMENCING ON POLES

CIVIL WORKS:
TRENCHING AND BACK FILL TO BE CARRIED OUT BY L1SP
CIVIL WORKS TO BE TO THE LOCAL COUNCIL REQUIREMENTS

CABLE ALIGNMENT
ALL CABLES, CONDUITS ETC TO BE INSTALLED TO ESSENTIAL ENERGY DRG CEOM7201.11

MAJOR OPTICAL FIBRE
MAJOR OPTICAL FIBRE - UNDERGROUND CABLE ACROSS WORK AREA. L1SP TO ARRANGE FOR LOCATING AND MARKING BEFORE WORK COMMENCES

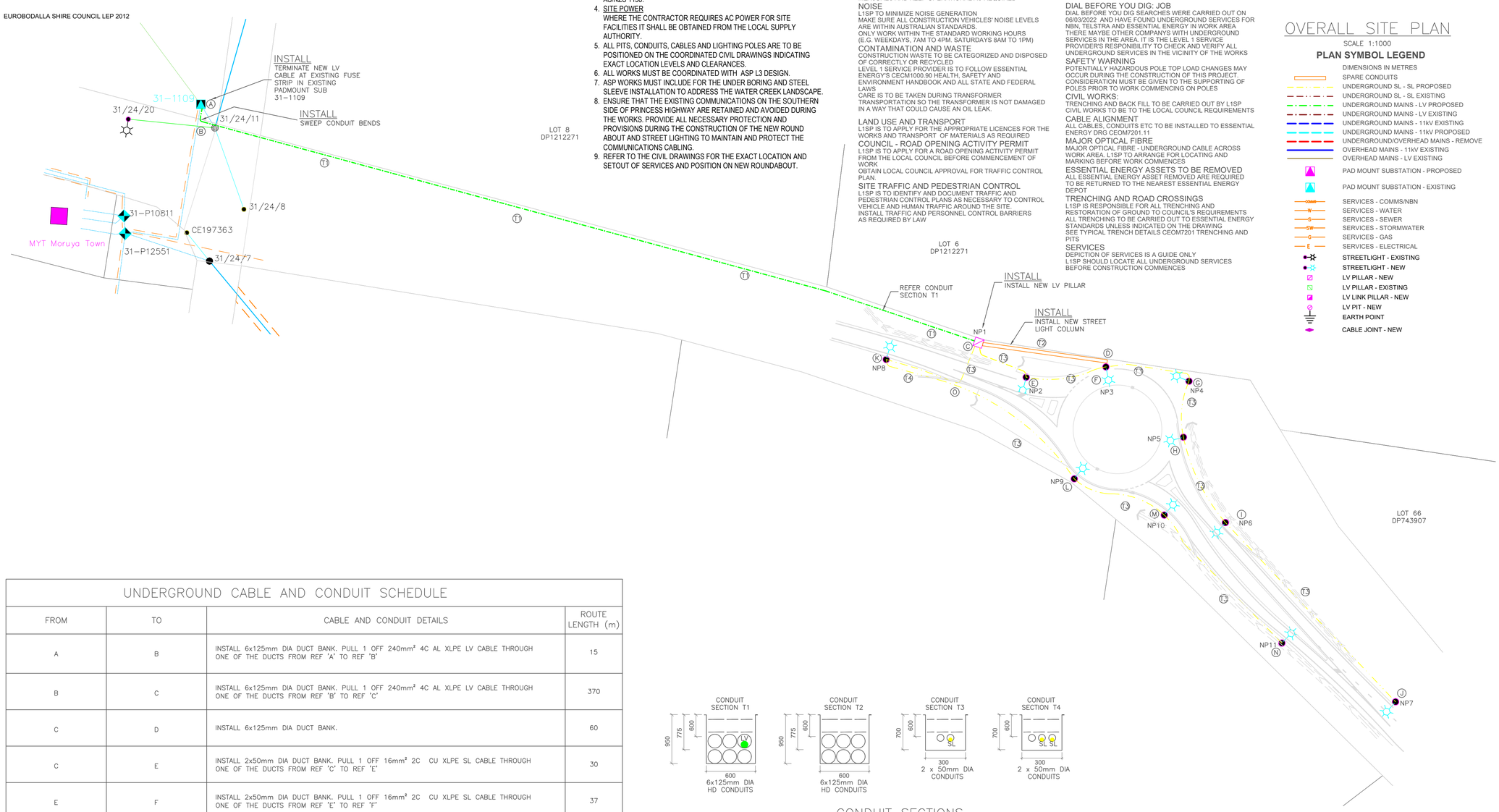
ESSENTIAL ENERGY ASSETS TO BE REMOVED
ALL ESSENTIAL ENERGY ASSET REMOVED ARE REQUIRED TO BE RETURNED TO THE NEAREST ESSENTIAL ENERGY DEPOT

TRENCHING AND ROAD CROSSINGS
L1SP IS RESPONSIBLE FOR ALL TRENCHING AND RESTORATION OF GROUND TO COUNCIL'S REQUIREMENTS
ALL TRENCHING TO BE CARRIED OUT TO ESSENTIAL ENERGY STANDARDS UNLESS INDICATED ON THE DRAWING
SEE TYPICAL TRENCH DETAILS CEOM7201 TRENCHING AND PITS

SERVICES
DEPICTION OF SERVICES IS A GUIDE ONLY
L1SP SHOULD LOCATE ALL UNDERGROUND SERVICES BEFORE CONSTRUCTION COMMENCES

OVERALL SITE PLAN

SCALE 1:1000



PLAN SYMBOL LEGEND

- DIMENSIONS IN METRES
- SPARE CONDUITS
- UNDERGROUND SL - SL PROPOSED
- UNDERGROUND SL - SL EXISTING
- UNDERGROUND MAINS - LV PROPOSED
- UNDERGROUND MAINS - LV EXISTING
- UNDERGROUND MAINS - 11kV EXISTING
- UNDERGROUND MAINS - 11kV PROPOSED
- UNDERGROUND/OVERHEAD MAINS - REMOVE
- OVERHEAD MAINS - 11kV EXISTING
- OVERHEAD MAINS - LV EXISTING
- PAD MOUNT SUBSTATION - PROPOSED
- PAD MOUNT SUBSTATION - EXISTING
- SERVICES - COMMS/NBN
- SERVICES - WATER
- SERVICES - SEWER
- SERVICES - STORMWATER
- SERVICES - GAS
- SERVICES - ELECTRICAL
- STREETLIGHT - EXISTING
- STREETLIGHT - NEW
- LV PILLAR - NEW
- LV PILLAR - EXISTING
- LV LINK PILLAR - NEW
- LV PIT - NEW
- EARTH POINT
- CABLE JOINT - NEW

CONDUIT SECTIONS
N.T.S.

UNDERGROUND CABLE AND CONDUIT SCHEDULE

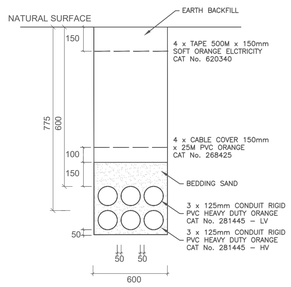
FROM	TO	CABLE AND CONDUIT DETAILS	ROUTE LENGTH (m)
A	B	INSTALL 6x125mm DIA DUCT BANK. PULL 1 OFF 240mm² 4C AL XLPE LV CABLE THROUGH ONE OF THE DUCTS FROM REF 'A' TO REF 'B'	15
B	C	INSTALL 6x125mm DIA DUCT BANK. PULL 1 OFF 240mm² 4C AL XLPE LV CABLE THROUGH ONE OF THE DUCTS FROM REF 'B' TO REF 'C'	370
C	D	INSTALL 6x125mm DIA DUCT BANK.	60
C	E	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'C' TO REF 'E'	30
E	F	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'E' TO REF 'F'	37
F	G	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'F' TO REF 'G'	40
G	H	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'G' TO REF 'H'	26
H	I	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'H' TO REF 'I'	45
I	J	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'I' TO REF 'J'	113
C	O	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'C' TO REF 'E'	23
O	K	INSTALL 3x50mm DIA DUCT BANK. PULL 2 OFF 16mm² 2C CU XLPE SL CABLES THROUGH TWO OF THE DUCTS FROM REF 'O' TO REF 'K'	35
O	L	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'C' TO REF 'E'	70
L	M	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'C' TO REF 'E'	47
M	N	INSTALL 2x50mm DIA DUCT BANK. PULL 1 OFF 16mm² 2C CU XLPE SL CABLE THROUGH ONE OF THE DUCTS FROM REF 'C' TO REF 'E'	80

UNDERGROUND CONSTRUCTION SCHEDULE

LOCATION LABEL	ASSET LABEL	STANDARD DRAWING No.	ASSEMBLY NUMBER	CONSTRUCTION NOTES
A	SUB 31–1109			* TERMINATE NEW 240mm² 4C AL XLPE LV CABLE AT EXISTING FUSE STRIP IN EXISTING PADMOUNT SUBSTATION 31–1109
B				* INSTALL SWEEP BENDS
C	NP1	CEOM7202.05	TYPE 3	* INSTALL LV URD PILLAR – TYPE 3

STREETLIGHT CONSTRUCTION SCHEDULE

LOCATION LABEL	ASSET LABEL	STANDARD DRAWING No.	ASSEMBLY NUMBER	CONSTRUCTION NOTES
E	NP2	CEOM7206.05	26	* LANTERN ROADLED MIDI 150W WITH PE CELL
F	NP3	CEOM7206.10	33	* COLUMN – 10.5m X 4.5m SINGLE ARM IMPACT ABSORBING GALVANISED
G	NP4			* LANTERN MOUNTING HEIGHT 10.5m
H	NP5			* COLUMN LOCATION 2.0m FROM BACK OF KERB
I	NP6	CEOM7206.04		* RAGBOLT SL01 FOUNDATION – WIND REGION 'A'
J	NP7			
K	NP8			
L	NP9			
M	NP10			
N	NP11			



TYPICAL TRENCH DETAIL

DESIGNED UNDER QUALITY SYSTEM CERTIFIED AS COMPLYING WITH ISO 9001 BY AN ACCREDITED CERTIFICATION BODY

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NOTES:

STANDARDS
THE WORKS MUST BE COMPLETED IN ACCORDANCE WITH THE FOLLOWING:

AS/NZS 3000 WIRING RULES;
NSW SERVICE AND INSTALLATION RULES;
ESSENTIAL ENERGY NETWORK STANDARDS;
ELECTRICITY DISTRIBUTOR SERVICE AND INSTALLATION RULES;
AS/NZS 1158 EXTERNAL LIGHTING – ROADS AND PUBLIC SPACES;
AS/NZS 4282-2019 CONTROL OF OBTRUSIVE LIGHTING EFFECTS;
AS/CA S009: INSTALLATION REQUIREMENTS FOR CUSTOMER CABLING (WIRING RULES)
AS/CA S008: TELECOMMUNICATIONS TECHNICAL STANDARD – REQUIREMENTS FOR CUSTOMER CABLING PRODUCTS 2015;
TLN: TELECOMMUNICATIONS (LABELLING NOTICE FOR CUSTOMER EQUIPMENT AND CUSTOMER CABLING) INSTRUMENT 2015;
TELECOMMUNICATIONS (TYPES OF CABLING WORK) DECLARATION 2013;

NOTES:
1 ALL EXISTING SUPPLY AUTHORITY ASSETS ARE DEEMED TO BE IN GOOD CONDITION. IF FOUND TO BE OTHERWISE CONTACT THE SUPPLY AUTHORITY INSPECTOR.
2 THE CONTRACTOR IS TO CHECK AND CERTIFY ALL MEASUREMENTS ON SITE AND NOTIFY THE DESIGNER OF ANY DESCREPENCIES BEFORE COMMENCING WORK.
3 CARRYOUT ALL WORK TO SUPPLY AUTHORITY STANDARDS OR AS SPECIFIED ON THIS DRAWING.
4 THE CONTRACTOR MUST VERIFY THE LOCATION OF ALL UNDERGROUND ASSETS ON SITE WITH "DIAL BEFORE YOU DIG" AND MUST HAVE A COPY OF "DIAL BEFORE YOU DIG" PLANS, NO MORE THAN 30 DAYS OLD, ON SITE FOR REFERENCE. HENDERSON CONSULTING P/L TAKES NO RESPONSIBILITY FOR ANY DAMAGE TO ASSETS CAUSED BY THE CONTRACTOR DURING THE COURSE OF THE WORKS

Status
DESIGN DEVELOPMENT

Revision

REV	DESCRIPTION	DATE	INT.
A	75% DESIGN DEVELOPMENT ISSUE	12.04.2022	MH
B	REF ISSUE	22.04.2022	MH
C	REF ISSUE	28.04.2022	MH

Key Plan

ELECTRICAL & LIGHTING
STEENSEN VARMING
Copenhagen
London
Sydney
Canberra
Hong Kong
New York
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Sydney, NSW, 2000, Australia
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t : +61 / 02 9967 2200
e : info@steensenvarming.com

Client
NSW GOVERNMENT Health Infrastructure

Architect
Conrad Gargett
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Queensland Australia 4001
Tel: +61 7 3229 3555
Web: www.conradgargett.com.au

Project
PRINCESS HIGHWAY MORUYA NEW ROUNDABOUT

Drawing
ELECTRICAL SERVICES
ELECTRICAL RETICULATION LAYOUT

A1 Scale
Project 207183
Issue C
Number SV-EL-DWG-SD-15PW12

DRAWN	DESIGNED	CHECKED	APPROVED
IR	AK	MH	MH

10 0 10 20 30 40 50 60 70
SCALE 1:1 mm

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SCOPE OF WORKS

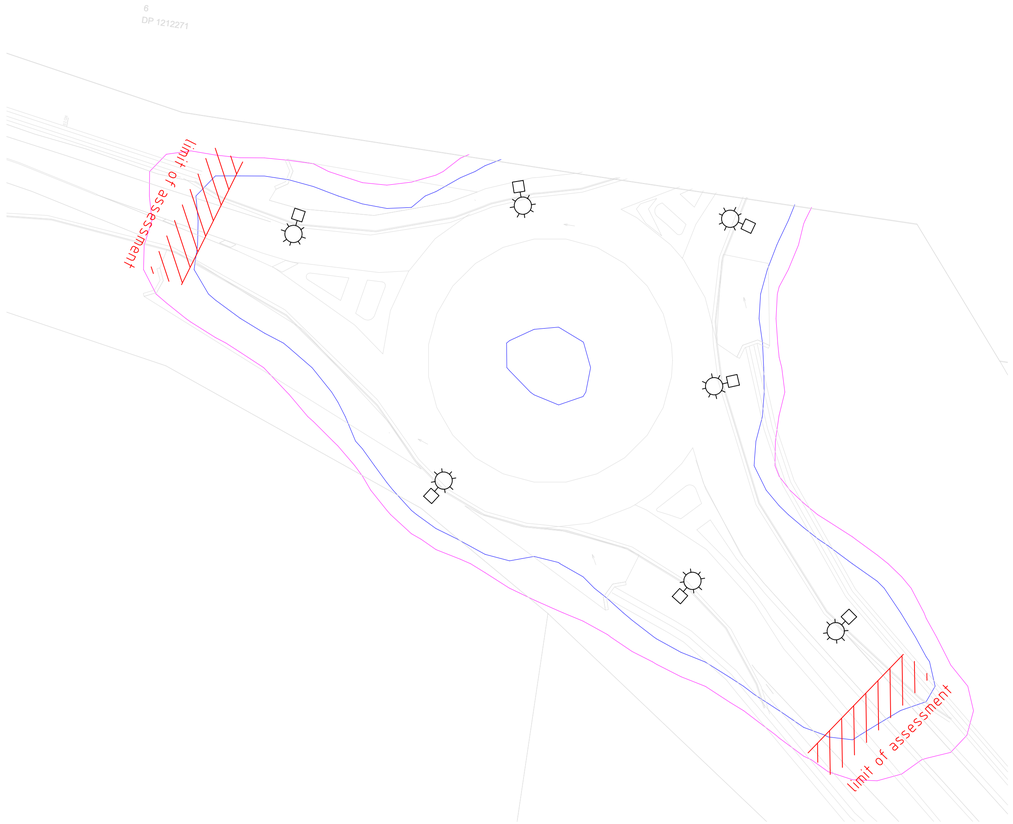
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6. ALL WORKS MUST BE COORDINATED WITH ASP L3 DESIGN.
7. ASP WORKS MUST INCLUDE FOR THE UNDER BORING AND STEEL SLEEVE INSTALLATION TO ADDRESS THE WATER CREEK LANDSCAPE.
8. ENSURE THAT THE EXISTING COMMUNICATIONS ON THE SOUTHERN SIDE OF PRINCESS HIGHWAY ARE RETAINED AND AVOIDED DURING THE WORKS. PROVIDE ALL NECESSARY PROTECTION AND PROVISIONS DURING THE CONSTRUCTION OF THE NEW ROUND ABOUT AND STREET LIGHTING TO MAINTAIN AND PROTECT THE COMMUNICATIONS CABLING.
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TELECOMMUNICATIONS (TYPES OF CABLING WORK) DECLARATION 2013;

LIGHTING EQUIPMENT AND BILLING SCHEDULE

SYMBOL	STATE	LUMINAIRE		COLUMN/POLE		BRACKET/OUTREACH	UPCAST	CATEGORY	LUMINAIRE MOUNTING HEIGHT (m)
		DESCRIPTION	PART NO	DESCRIPTION	FOOTING (BOLT/FOUNDATION)	DESCRIPTION			
	New	NEW 150w ROADLED MIDI	290340	10.5m IMPACT ABSORBING COLUMN		4.5m Single Outreach	5°	V3	10.5



Road Lighting Certification

This design has been produced by bransonjames and is certified to comply with the design brief and relevant current sections of AS/NZS 1158, except at locations noted on the design.

bransonjames disclaims any responsibility or liability in connection with the following;

1. The design has been based on information received by bransonjames from third parties. Such information has not be verified by bransonjames for completeness or correctness.
2. In producing this design, no account has been taken by bransonjames for sloping terrain/carriageways, crests, vehicular barriers, trees and vegetation, or any other object that may interfere with the lighting design.
3. The design must be installed as specified on this drawing, and no variations allowed without written consent from bransonjmaes.
4. bransonjames cannot be responsible for environmental conditions, which may compromise the compliance of the design.
5. Calculated results, shown herein are subject to practical tolerances such as photometric measurement, manufacturing variation, lamp and control gear characteristics, supply voltage and frequency variation.
6. The compliance of this design is dependent upon the luminaire manufacturer supplying luminaires that are representative of the data contained with the appropriate registered laboratory photometric test report.
7. The design is predicated upon the adoption of a maintenance regime that will maintain the performance of the luminaire to a level equal to or above the Maintenance factors used in the design.

Company Representative: Brendon Hince MIES IES373

Signed .....

Date .....3/11/18.....

THE LIGHTING HAS BEEN DESIGNED TO ACHIEVE COMPLIANCE WITH CATEGORY V3 IN ACCORDANCE WITH AS1158.1.1

DESIGNED UNDER QUALITY SYSTEM CERTIFIED AS COMPLYING WITH ISO 9001 BY AN ACCREDITED CERTIFICATION BODY

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Key Plan

ELECTRICAL & LIGHTING
STEENSEN VARMING
Copenhagen
London
Sydney
Canberra
Hong Kong
New York
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Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t : +61 / 02 9967 2200
e : info@steensenvarming.com

Client
NSW GOVERNMENT Health Infrastructure

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Queensland Australia 4001
Tel: +61 7 3229 3555
Web: www.conradgargett.com.au

Project
PRINCESS HIGHWAY MORUYA
NEW ROUNDABOUT

Drawing
ELECTRICAL SERVICES
STREET LIGHTING

A1 Scale
Project 207183
Issue C
Number
SV-EL-DWG-SD-15PW13

DRAWN	DESIGNED	CHECKED	APPROVED
IR	AK	MH	MH

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SCALE 1: 1 mm

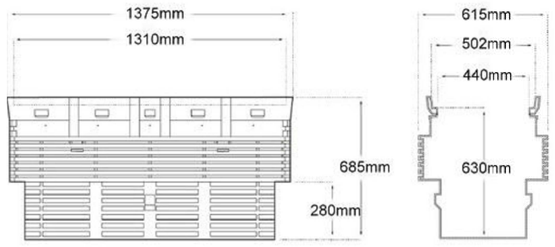
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SCOPE OF WORKS

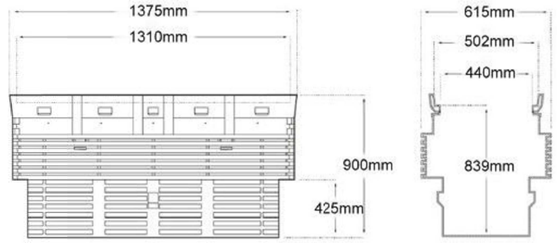
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   OBTAIN THE LIGHTING CATEGORY FROM THE RMS, OBTAIN AND THE DESIGN BRIEF FROM ESSENTIAL ENERGY AND PROVIDE LIGHTING TO AS/NZS 1158.
4. SITE POWER
   WHERE THE CONTRACTOR REQUIRES AC POWER FOR SITE FACILITIES IT SHALL BE OBTAINED FROM THE LOCAL SUPPLY AUTHORITY.
5. ALL PITS, CONDUITS, CABLES AND LIGHTING POLES ARE TO BE POSITIONED ON THE COORDINATED CIVIL DRAWINGS INDICATING EXACT LOCATION LEVELS AND CLEARANCES.
6. ALL WORKS MUST BE COORDINATED WITH ASP L3 DESIGN.
7. ASP WORKS MUST INCLUDE FOR THE UNDER BORING AND STEEL SLEEVE INSTALLATION TO ADDRESS THE WATER CREEK LANDSCAPE.
8. ENSURE THAT THE EXISTING COMMUNICATIONS ON THE SOUTHERN SIDE OF PRINCESS HIGHWAY ARE RETAINED AND AVOIDED DURING THE WORKS. PROVIDE ALL NECESSARY PROTECTION AND PROVISIONS DURING THE CONSTRUCTION OF THE NEW ROUND ABOUT AND STREET LIGHTING TO MAINTAIN AND PROTECT THE COMMUNICATIONS CABLING.
9. REFER TO THE CIVIL DRAWINGS FOR THE EXACT LOCATION AND SETOUT OF SERVICES AND POSITION ON NEW ROUNDABOUT.

STANDARDS
THE WORKS MUST BE COMPLETED IN ACCORDANCE WITH THE FOLLOWING:

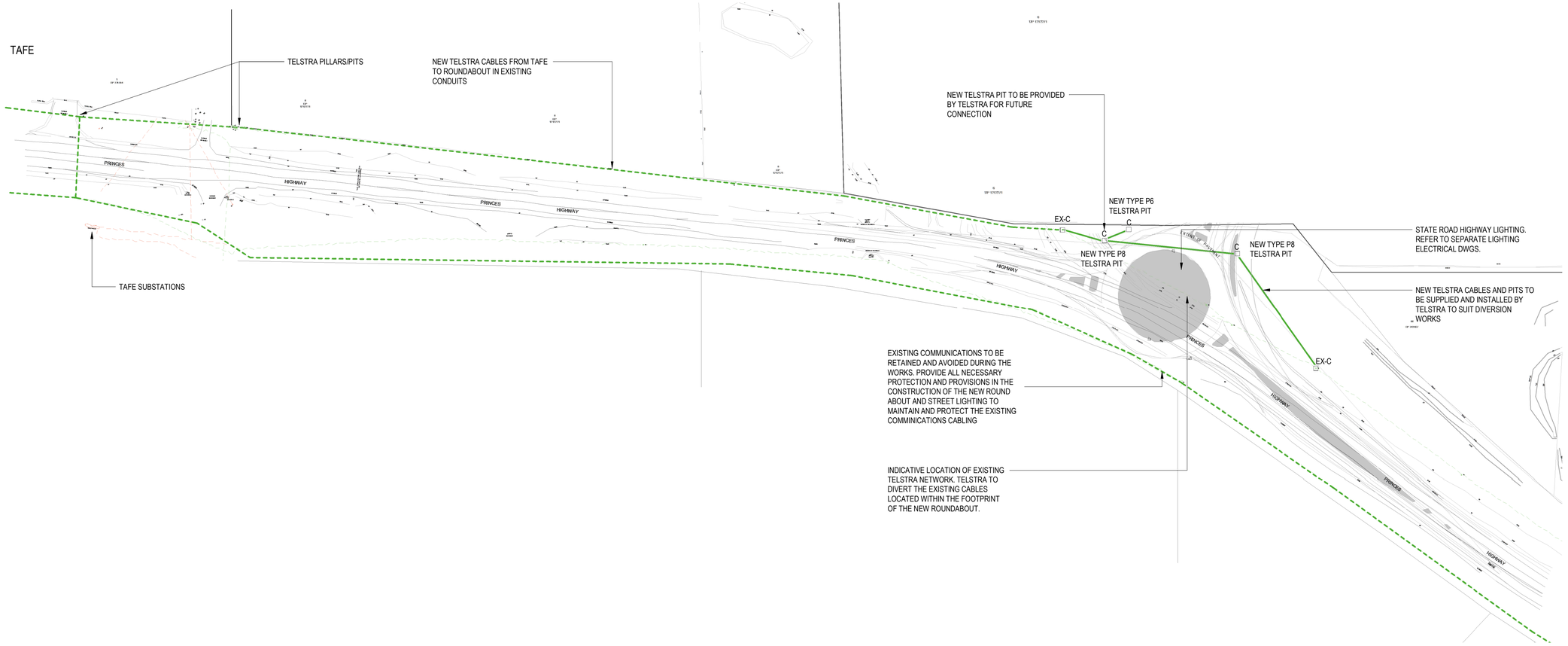
AS/NZS 3000 WIRING RULES;
NSW SERVICE AND INSTALLATION RULES;
ESSENTIAL ENERGY NETWORK STANDARDS;
ELECTRICITY DISTRIBUTOR SERVICE AND INSTALLATION RULES;
AS/NZS 1158 EXTERNAL LIGHTING – ROADS AND PUBLIC SPACES;
AS/NZS 4282-2019 CONTROL OF OBTRUSIVE LIGHTING EFFECTS;
AS/CA S009: INSTALLATION REQUIREMENTS FOR CUSTOMER CABLING (WIRING RULES)
AS/CA S008: TELECOMMUNICATIONS TECHNICAL STANDARD – REQUIREMENTS FOR CUSTOMER CABLING PRODUCTS 2015;
TLN: TELECOMMUNICATIONS (LABELLING NOTICE FOR CUSTOMER EQUIPMENT AND CUSTOMER CABLING) INSTRUMENT 2015;
TELECOMMUNICATIONS (TYPES OF CABLING WORK) DECLARATION 2013;



NEW TYPE P6 TELSTRA PIT DETAIL



NEW TYPE P8 TELSTRA PIT DETAIL



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NOTES:

Status
DESIGN DEVELOPMENT

Revision

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Key Plan

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Project
PRINCESS HIGHWAY MORUYA
NEW ROUNDABOUT

Drawing
ELECTRICAL SERVICES
TELSTRA DIVERSION SCOPE OF WORKS

A1 Scale As indicated
Project 207183
Issue C
Number SV-EL-DWG-SD-15PW11

DRAWN	DESIGNED	CHECKED	APPROVED
IR	AK	MH	MH

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Your reference:

5 May 2022

Attention: **Ash McGowan Root Partnerships**

Sent via AConex

Dear Ash,

RE: ROUNDABOUT WORKS TRAFFIC ADVICE AND CTPMP

This letter summarises key traffic considersations to supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

1.0 SITE DESCRIPTION

The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot 2, DP 1281576, a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north is a small residential subdivision called Mynora Estate.

The approximate location of the roundabout is shown in Figure 1.1 below.

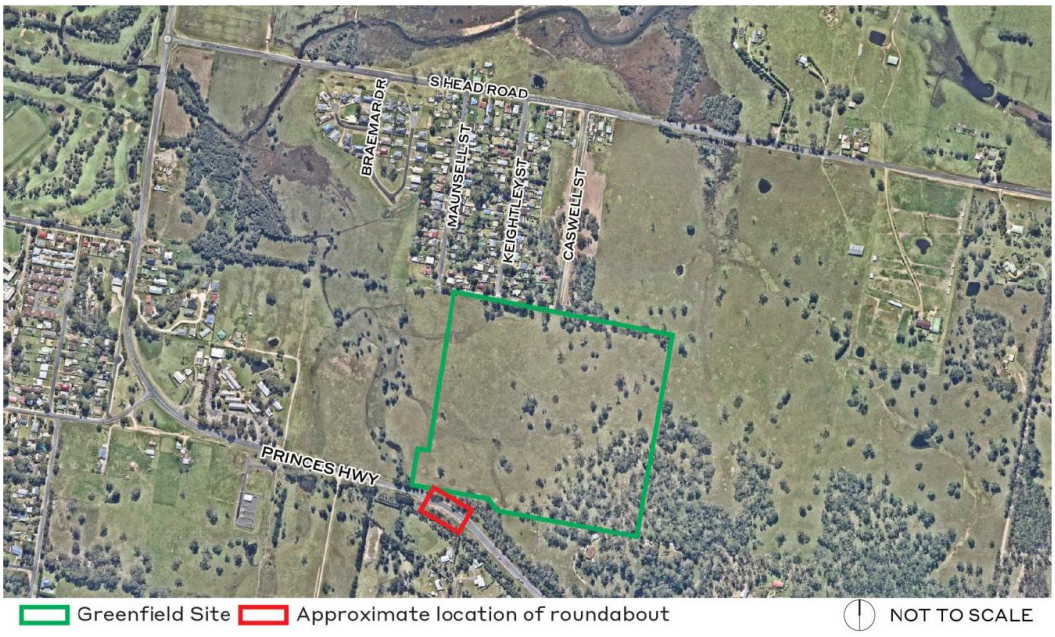


Figure 1.1: Location of proposed works

2.0 Proposed Works and Traffic Considerations

The works proposed under this REF include the following:

- Construction of a new roundabout located on Princes Highway.
- Ancillary road and public domain works
- Ancillary electrical reticulation and street lighting

A further detailed description of the proposed works is contained in the Review of Environmental Factors report prepared by Ethos Urban.

The works will be completed in two stages with works indicatively commencing in September 2022 and having a completion in April 2023.

Attached to this letter is a preliminary Construction Traffic and Pedestrian Management Plan (CTPMP) to support the REF and the CTPMP will be refined in consultation with the project's Contractor, Transport for NSW (TfNSW) and Eurobodalla Shire Council (ESC), and further detailed assessment would be expected as part of a detailed CTPMP which would form part of the recommended mitigation measures.

The worst-case for vehicle movements are expected to be in the order of 200 to 240 movements per day based on the estimated haulage needs and number of workers. The overall level of movements are able to accommodate on Princes Highway and its associated intersections.

Traffic impacts of construction works will be managed by scheduling deliveries and staff shift changes outside of peak traffic periods and not warrant the need for any additional infrastructure or temporary overlay requirements to mitigate construction works operations.

In terms of general principles for the works the following are noted:

- right turn movements out of the site/construction area will be priority controlled, with the exception of articulated vehicles and b-double movements which are to be manage under 'stop/go' traffic control
- in regard to peak seasonal periods:
  - all through movements will be maintained and at a 60km/h speed through the works zone
  - Considering the network pinch points to the north within the Moruya town centre any reduction in speed and traffic flow associated with the work zone is unlikely exacerbate the peak seasonal flows or generate significant additional delays along the Princes Highway

Yours faithfully,





Andrew Eke

Manager Major Projects

Bitzios Consulting

Jason Brook

Senior Transport Planner

Bitzios Consulting

Attachment A

Preliminary CTPMP

Princes Highway Roundabout Moruya

Preliminary Construction Traffic and Pedestrian Management Plan

Health Infrastructure NSW

5 May 2022

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Document Issue History

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P5059.001R Princes Highway Roundabout Preliminary CTPMP *(Draft)*	B. Campbell / J. Brook	A. Eke	J. Brook	08/04/2022	Ash McGowan, Root Partnerships, Via Aconex
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P5059.003R Princes Highway Roundabout Preliminary CTPMP	B. Campbell / J. Brook	J. Brook	J. Brook	05/05/2022	Ash McGowan, Root Partnerships, Via Aconex

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1. INTRODUCTION

1.1 Background

Bitzios Consulting has been engaged by Health Infrastructure NSW to prepare a preliminary Construction Traffic and Pedestrian Management Plan (CTPMP) to support a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

The location of the subject site is shown in Figure 1.1.



Figure 1.1: Subject Site Location

1.2 Purpose

The purpose of this CTPMP is to assess the impacts associated with construction activities and maintain an accessible and efficient road network for all users. This document has been prepared to assist the Health Instructure NSW (and their contractors) to implement vehicle and pedestrian management measures when carrying out the works phase of the development.

The purpose of this report is to also inform the review of environmental factors (REF) assessment.

The CTPMP will be refined in consultation with the project's Contractor and Eurobodalla Shire Council (ESC), and further detailed assessment would be expected as part of a detailed CTPMP which would form part of conditions of approval.

2. EXISTING CONDITIONS

2.1 Road Network

2.1.1 Princes Highway

The Princes Highway is a Transport for New South Wales (TfNSW) controlled highway connecting Sydney and Melbourne. In the vicinity of the project site, the Princes Highway is a two-lane undivided road with a posted speed limit of 100km/hr. To the west of the project site, the posted speed is reduced to 80km/hr and further to 50km/hr before entering Moruya.

2.1.2 Albert Street

Albert Street is a local road that runs along the northern boundary of the project site. It is a two-lane undivided road with a speed limit of 50km/h and runs parallel to the northern site frontage.

2.1.1 Maunsell Street / Keightley Street / Caswell

Maunsell, Keightley, and Caswell Street are local roads that give access to Albert Street. Both streets are two lane, undivided with a 50km/h posted speed and are lined with residential properties. A secondary access proposed via Albert Street / Caswell Street is to be an emergency vehicle access only in general or in the event there is any temporary restrictions to Princes Highway (i.e. in the event on an accident, floods etc).

2.1.2 South Head Road

South Head Road is an undivided two-lane rural arterial road connecting Moruya Heads to the east with Moruya to the west. In the vicinity of the subject site, the posted speed limit is 70km/h. South Head Road is separated from the site by a small residential catchment on the northern side of the subject site. South Head Road is a local road under the jurisdiction of Eurobodalla Shire Council.

2.2 Parking

The road network immediately surrounding the subject site consists predominantly of rural arterial or local access and collector streets. There are no formalised on-street parking facilities in the area.

2.3 Public Transport

The site currently exists as a greenfield site and as such, does not have any existing public transport facilities. Abutting the site to the west is the TAFE NSW campus, which is serviced by Route 860, travelling along the coast from Moruya to Batemans Bay.

2.4 Active Transport

There are no active transport facilities fronting the project site. To the north, there is a footpath network that services some of the local streets with a pedestrian spine on South Head Road that connects to the Moruya town centre. To the east, the TAFE NSW campus is serviced by 3.0m shared path which connects to the Moruya town centre active transport facilities.

3. CONSTRUCTION ACTIVITIES

3.1 Description of Construction Activities

This CTPMP covers works which includes:

- Construction of a roundabout on Princes Highway to provide site access
- Clearing on existing trees
- Adjustment to existing telecom services and installation of new inground services

Table 3.1: Description and Staging of Works

Stage	Description of Construction Works	Indicative Commencement Date*	Indicative Completion
Stage 1 – Site Establishment, half roundabout construction	▪ Establishment of traffic management ▪ Lowering of existing Telstra service ▪ Clear and Grub ▪ Site set-out ▪ Bulk earthworks ▪ Installation of inground services ▪ Build subgrade/subbase ▪ Construct / FRP roundabout and ▪ Signage and lighting ▪ Lay base course/wearing course ▪ Installation of line marking and road furniture ▪ Open half of roundabout and access to Main site access	September 2022	December 2022
Stage 2 – Full roundabout construction*	▪ Traffic Management switch ▪ Clear and Grub ▪ Set out ▪ Bulk earthworks ▪ Installation of inground services ▪ Build subgrade/subbase ▪ Construct / FRP roundabout and ▪ Signage and lighting ▪ Lay base course/wearing course ▪ Installation of line marking and road furniture ▪ Commission of Roundabout and Street lighting ▪ Full roundabout opening	December 2022	April 2023

Main site works for the building works will be subject to a separate CTPMP and TCPs.

3.2 Construction Hours

Construction works, including the delivery of machinery and materials to and from the site, will occur between the approved hours of:

- 7:00am and 6:00pm Monday to Friday
- 8:00am and 1:00pm Saturday.

Where possible, access and activities requiring external heavy vehicle movements should be scheduled to occur outside network peak periods which occur between 8:00am and 9:00am in the morning and 2:45pm and 4:15pm in the afternoon to avoid school start and finish times.

No work shall be carried out on Sundays or public holidays. Activities may be undertaken outside of the approved working hours for construction if required:

- By the police or a public authority for the delivery of vehicles, plant or materials
- In an emergency to avoid the loss of life, damage to property or to prevent environmental harm
- Where the works are inaudible at the nearest sensitive receivers
- Where a variation is approved in advance in writing by the Planning Secretary or his nominee if appropriate justification is provided for the works
- For the delivery, set up and removal of construction cranes, where notice of the crane related works is provided to the Planning Secretary and affected residents at least seven days prior to the works
- Or if permitted under COVID-19 provisions.

Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

Deliveries of heavy machinery may be required out of the construction hours of operation to conform to the overriding requirements of Transport for NSW.

3.3 Construction Worker Induction

All workers and subcontractors engaged onsite will be required to undergo a site induction. The induction should include permitted access routes to and from the construction site for all vehicles, as well as standard environmental, Work Health and Safety, Driver Code of Conduct and emergency procedures.

3.3.1 SafeWork Requirements

To protect the safety of workers and the public, the worksite should be adequately secured (i.e. security fence) to prevent access by unauthorised personnel. Additionally, all works must be conducted in accordance with the relevant SafeWork requirements at all times.

3.3.2 Safe Work Method Statements

A Safe Work Method Statement should be prepared whenever any person is undertaking works on or adjacent to the public domain.

3.3.3 Truck Driver Code of Conduct

All drivers associated with the project are to abide by a Code of Conduct in order to:

- Minimise impacts of construction on the local road network
- Minimise conflicts with other road users
- Minimise road traffic noise
- Ensure truck drivers use specified routes.

A Driver Code of Conduct has been included in **Appendix A**.

3.4 Construction Worker Parking

Parking for construction personnel will be provided on-site and is suitable for the expected staff numbers. No impact on surrounding public parking is expected as a result of the construction activity.

Public and active transport trips generated by construction activities are expected to be low. Carpooling should be encouraged where possible.

3.5 Construction Site Access

Construction traffic management for the site accesses therefore has two key elements:

1. Construction traffic management for the construction of the site accesses
2. Construction traffic management for the use of the constructed accesses as site accesses.

Construction vehicle access during the works will be via one gate on Princes Highway as shown indicatively in Figure 3.1 and detailed below. Gate 1 will be used as the primary access during construction prior to opening on the constructed site access (likely at the end of Stage 1). Access to the site as part of these works will be generally for storage and parking of construction vehicles.

All construction vehicles will enter and exit the site in a forward direction.



Adapted from NSW Spatial Map Viewer

Figure 3.1: Proposed Gate Locations

3.5.1 Gate 1 – Auxiliary Left Turn (Interim) / Roundabout

Gate 1 will tie-in to Princes Highway on the northern side. It will facilitate construction vehicle ingress in a minor function to avoid damage and be utilised as a permanent access for the adjacent site.

The entry gate will generally be kept closed at all times, except to allow construction vehicles to enter the site. When this gate is in use, a gateman will be required at the entry gate to the site compound during construction hours to open and close the gate as required and manage the ingress of vehicles.

Appropriate signage will be placed at the entry gate to notify vehicles.

3.6 Delivery, Loading and Unloading of Plant, Equipment and Materials

During all stages of the works, the loading and unloading and storage of all plant, equipment and/or materials will only occur within the site boundary. In the event that loading, unloading and/or storage of any plant, equipment and/or materials is required outside of the site area, an appropriate application for a Work Zone should be made to the relevant road authority (Eurobodalla Shire Council).

3.7 Dust Minimisation

The site access to have a shakedown device installed in accordance with Eurobodalla Shire Council requirements so that trucks do not track dirt onto the public road network. Additionally, all trucks entering or exiting the site are to have their loads sealed and covered. To further control dust onsite, exposed surfaces and stockpiles should be supressed by regular watering.

3.8 Road Occupancy Licence

Under Section 138 of the *Roads Act 1993*, Road Occupancy Licenses (ROL) are required where an activity requires an existing road to be used in such a way that affects traffic flow. This type of traffic control is required for proposed road works associated with the proposed works. Further details of the proposed traffic controls are provided in Section 6.

Applications for ROLs should be submitted to the relevant authority (Eurobodalla Shire Council) at least 10 working days prior to the planned commencement of the activity requiring the road occupancy. The activity must not commence until the ROL has been obtained.

3.9 Road Dilapidation Report

Before the commencement of construction, consultation with the relevant owner and provider of services that are likely to be affected by the development should be undertaken to make suitable arrangement for access to, diversion, protection, and support of the affected infrastructure.

A dilapidation report identifying the condition of all public infrastructure in the vicinity of the site (including roads, gutters, and footpaths) shall be carried out by a suitably qualified person prior to the commencement of and after the completion of the Stage 2 construction works.

A copy of the dilapidation report shall be provided to the Certifying Authority and Eurobodalla Shire Council prior to the commencement of the Stage 2 construction works for that activity and no later than one month upon completion of the Stage 2 construction works.

The cost of repairing any damage caused to Council or other Public Authority assets in the vicinity of the site as a result of the construction works associated with the approved development shall be met in full by the Contractor prior to the commencement of use of any stage of the development.

3.10 Road Safety Audits

Independent Road Safety Audits shall be conducted of the TCPs in accordance with the *Transport for NSW Guidelines for Road Safety Audit Practices (2011)*, *Austroads Guide to Road Safety Part 6: Road Safety Audit* and IPWEA guidelines.

4. CONSTRUCTION TRAFFIC

4.1 Types of Construction Traffic

A combination of truck and vehicle types will be used during each stage of the works as detailed in Table 4.1. Predominantly, the upper limit of heavy vehicles will be semi-trailers (articulated vehicles (AV)), however, in the event that a B-double is required, the site has capacity to facilitate these movements and all exit movements will be assisted by traffic control/gatemen and liaison with Eurobodalla Shire Council will occur.

Table 4.1: Types of Construction Traffic Per Stage

Stage	Vehicles
1	Frannas, Body Trucks, Aggregate Concrete Trucks, Mobile Pumps, B-doubles, Water Trucks and Low Loader
2	Frannas, Body Trucks, Aggregate Concrete Trucks, Mobile Pumps, B-doubles, Water Trucks and Low Loader

4.2 Vehicle Frequency

The expected daily two-way heavy vehicle movements during each stage of the works are detailed in Table 4.2. The worst-case for vehicle movements are expected to be in the order of 200-240 movements per day based on the estimated haulage needs and number of workers.

Table 4.2: Heavy Vehicle Frequency Per Stage

Indicative Month	Stage 1	Stage 2	Total
September 2022	70		**70**
October 2022	100		**100**
November 2022	150		**150**
December 2022	90	100	**190**
January 2023		150	**150**
February 2023		150	**150**
March 2023		150	**150**
April 2023		190	**150**

4.2.1 Impact on the Local Road Network

Construction accesses will be managed by gatemen to mitigate traffic impacts and control deliveries and at access locations. In the instance the B-doubles are required (noting the frequency is expected to be very low), traffic controllers will manage the access under a Traffic Control Plan. Traffic impacts of construction works will be managed by scheduling deliveries and staff shift changes outside of peak traffic periods. Construction works are expected to have relatively low impacts to the surrounding road network as traffic generation is generally low. However, impacts will be moderate to significant for around eight months based on the nature of road works. As such, truck movements should be spread throughout the day and staff will generally arrive before the morning peak hour (noting that construction hours start at 7:00am) and will leave after the afternoon/evening peak (noting that construction hours end at 6:00pm).

Traffic surveys undertaken by Bitzios Consulting identified the network peak periods as generally being between 8:00am-9:00am and 2:45pm-3:45pm. Any significant shift changes should be scheduled to occur outside these hours.

Due to the residential nature of some of the surrounding streets, queuing and idling of heavy vehicles on the external road network will not be permitted. This should be managed by engaging trusted suppliers and the spreading of heavy vehicle movements throughout the day. Vehicles may only wait inside the worksite. Truck drivers delivering prior to 7:00am will be instructed in advance to park at the at a to be determined suitable location to avoid parking around residential streets. Once it is 7:00am, truck drivers will use their radios to confirm that it is acceptable to come to the site. It shall be noted that this activity only occurs between 6:30am and 7:00am, and that during site opening hours, all trucks will park within the site upon arrival.

Some minor increase to intersection delays may occur due to additional vehicles on the network associated with construction. Overall, construction traffic impacts are expected to be low and the aforementioned mitigation measures will be implemented to further reduce impacts (such as scheduling of deliveries and staff shifts).

4.3 Construction Vehicle Routes

Construction vehicle movements will occur to and from the north on Princes Highway (and then to and from the wider road network). Construction vehicles will predominantly use the state-controlled network to access the site with routes.

4.4 Road Restrictions

Princes Highway is an approved 23m B-double route to and from the subject site. If larger vehicles are required during the main works phase of the project, approval must be sought from Transport for NSW and managed under that approval.

5. TRAFFIC IMPACTS

5.1 General Traffic

The project team will maximise the safety for road users and workers by isolating the active work areas from live traffic. This will be achieved by providing sufficient clearance between the work areas and adjacent travel lanes and using temporary safety barriers where required.

5.2 On-street Parking

There are no parking areas on Princes Highway in proximity to the subject site. Therefore, construction works will not impact on any on-street or off-street parking spaces.

5.3 Pedestrians and Cyclists

During the external works phase of the project, pedestrian and cyclist access to the surrounding road network will be maintained.

5.4 Bus Zones and Bus Services

There are no bus zones on Princes Highway in proximity to the subject site. Therefore, construction works will not impact on any bus zones. However, bus services operating on Princes Highway past the site must be maintained.

5.5 Adjacent Properties

Vehicular access to adjacent properties will be maintained at all times as per the existing conditions.

5.6 Emergency Services

The proposed construction activities are not expected to impact emergency services.

5.7 Agricultural Vehicles

The proposed construction activities are not expected to impact agricultural vehicles (tractors etc.). Vehicular access to adjacent properties will be maintained at all times as per the existing conditions (including to agricultural properties). All existing traffic lanes and widths are being maintained as part of works being undertaken as part of the CTPMP. Further, the volume of agricultural vehicles is expected to be low.

6. CONSTRUCTION TRAFFIC MANAGEMENT

6.1 Traffic Control Plans

Prior to implementation, construction traffic management measures will require the preparation of approved TCPs. TCPs indicate the road worksite arrangements to ensure the safety of all road users as well as workers at the site.

Preliminary TCPs will need to be developed in accordance with AS1742.3 and the Transport for NSW Traffic control at work sites Technical Manual (July 2018). These have been designed by a qualified person holding the current Transport for NSW 'Prepare Work Zone Traffic Management Plans' accreditation.

It should be noted that any road occupancy will require approval from Eurobodalla Shire Council with local residents/neighbours also being consulted prior to activities commencing.

6.2 Traffic Controllers

The services of a qualified Traffic Control subcontractor must be used to provide traffic control services for the construction phase of the project if need be. Traffic controllers will be trained, hold a current SafeWork NSW Traffic Control Work Training Card and comply with the requirements of the *Transport for NSW Traffic control at work sites Technical Manual (July 2018)*.

7. STAKEHOLDER CONSULTATION

7.1 Eurobodalla Shire Council and Transport for NSW

Consultation is to be undertaken with Eurobodalla Shire Council and Transport for NSW as part of the CTPMP for works. Further consultation with Council will be required with the development of further details CTPMPs once a construction contractor is appointed.

7.2 Community

Information is to be provided to nearby residents and other non-residential landowners adjacent to the site (i.e. on Princes Highway between South Head Road and Mountain View Road). This information should include:

- Proposed works on Princes Highway
- Impacts to amenity as a result of proposed works (i.e. traffic conditions, pedestrian diversions etc.)
- Information on the timing of the proposed works.

This information is to be provided via a flyer delivered to local letterboxes.

8. MONITORING AND EVALUATION

8.1 Ongoing Inspections

Formal and documented short-term and long-term inspections shall be undertaken at worksites by persons holding the Prepare Work Zone Traffic Management Plan qualification.

8.2 Reporting

It is also important for any near miss incidents to be recorded and documented then reviewed as part of any inspection.

In the case of incidents, either witnessed or reported, involving the public or from which legal proceedings might arise, the actual type, size and location of signs, and devices in use at the time of the incident should be recorded and the sign arrangement photographed for subsequent reporting. The actual travelled path width and condition and weather conditions should also be recorded, as well as personal injury, extent of vehicle damage and vehicle details, such as registration.

8.3 Responsibilities

8.3.1 Works Supervisor

For all long-term worksites, the works supervisor who is appropriately qualified shall:

- Inspect the traffic control layout on the day before the work begins and at least once per week during the duration of the work
- Inspect the traffic control layout between shifts at least once during the first week and at least once every two months for the duration of work
- Review the reported near miss incidents
- Provide after-hours contact to local police for the duration of the work
- Inspect the site on the final day to ensure that unnecessary signs and devices are removed
- Record results of these inspections noting date, time, deficiencies and any corrective action taken or specified
- Ensure that any specified corrective action is taken.

8.3.2 Team Leader

For all works, the team leader (or site supervisor) shall:

- Keep a record of the TCPs that were used
- Have a copy of the TCPs used onsite
- Record start and finish times and location of the works
- Record near misses
- Carry out inspections before work starts, during the works and pre-closedown of the site using the nominated checklist, noting:
  - Date and time of inspection
  - Deficiencies identified and corrective action taken
  - Changes or modifications made to the site.
- Periodically check that all signs and devices are satisfactory and in their correct position
- Make these records available to authorised staff.

8.3.3 Project Manager

The project manager shall:

- Record near misses
- Carry out inspections before work starts, during the works and pre-closedown of the site using the nominated checklist, noting:
- Liaise with school management on a daily basis (minimum) regarding any changes to scheduled works, traffic control and construction vehicle movements
- Ensure that a traffic control safety inspection is carried out at least once per month by a person qualified in 'Prepare Work Zone Traffic Management Plans' and that the date, time and deficiencies are recorded
- Ensure that a traffic control safety inspection or Road Safety Audit is carried out prior to the implementation of any changes in traffic control or a TCP
- Ensure that a traffic control safety inspection or Road Safety Audit is carried out prior to the implementation of any lateral shift tapers to ensure that geometric requirements and delineation methods are in accordance with the approved TCP
- Ensure that near miss incidents are being reported and recorded then reviewed
- Ensure that any corrective action specified is taken and recorded.

This information may be critical, should legal proceedings follow an incident.

The Department of Planning, Industry and Environment must be notified in writing to compliance@planning.nsw.gov.au immediately after the applicant becomes aware of an incident. The notification must identify the development (including the development application number and the name of the development if it has one) and set out the location and nature of the incident. **Appendix E** contains the Written Incident Notification and Reporting Requirements (Appendix 2 of the development consent).

8.3.4 Drivers

Drivers are to:

- Obey road rules at all times
- Follow the haulage routes defined in this CTPMSP or the site-specific CTPMSP
- Notify the site contact/escort of arrival
- Follow instructions from traffic controllers to access the site or perform manoeuvres specified in a TCP
- Follow instructions from the site contact/escort, including directions to nominated laydown or holding areas
- After arriving at the nominated laydown area, exit the vehicle and remain in a predefined safe area while loading or unloading of plant, equipment and/or materials is undertaken
- Once unloading of the plant, equipment and/or materials has been completed, return to the vehicle and exit the site, following instructions from the site contact/escort and traffic controllers. The driver is then to follow the designated haulage routes
- Read, understand and follow this CTPMSP, site-specific TCPs and any other relevant project documentation regarding road safety and traffic management
- Abide by the Driver Code of Conduct.

Appendix A: Driver Code of Conduct

2022

TRUCK DRIVER CODE OF CONDUCT

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1. GENERAL RESPONSIBILITIES

As a professional driver working in the transport industry, I agree to and adopt this code of conduct. I accept that as a professional driver I have responsibilities under both chain of responsibility and OH&S Legislation to maintain my fitness for duty and not accept unsafe practices or breaches of the law. I share the road with other road users and aim to improve community safety.

1. I recognise and accept my obligations as a professional driver by:
   - setting a good example to others
   - supporting safety within the workplace
   - actively supporting this code and promoting it to other drivers
   - encouraging safety on the road.
2. I undertake to comply with all road laws, and be considerate of others by:
   - being professional at all times
   - being considerate of other road users
   - being fit for duty - alert, healthy and prepared for the driving task
   - observing speed limits & seat belt laws
   - observing fatigue regulations
   - observing drug & alcohol laws
   - leaving a safe distance between other vehicles
   - travelling in left lanes unless overtaking
   - avoiding the use of noisy engine brakes at inappropriate times
   - not being under the influence of drugs or alcohol
   - not tailgating other vehicles.
3. I agree to and adopt all the company's working policies and regulations.
4. I agree to obey all other related laws.
5. I support the introduction in companies of "Safe Systems" of work that include practices & procedures to reduce the risk of injuries or death.
6. I take pride in my vehicle and conduct regular checks to ensure my truck and the load is in a safe condition.
7. I understand that driver distraction is a risk and will reduce this risk through:
   - avoiding the use of mobile phones, two-way radios or other forms of communication whilst the vehicle is moving
   - fully preparing for any journey to avoid being distracted when driving.
8. I actively support this code of conduct for the purpose of promoting compliance with laws and promoting safe behaviour, within the workplace and on the road.
9. I undertake to actively participate through my OH&S representatives/delegates to commit to industry codes of conduct, codes of practice and safety guidelines.

2. LEGAL DRIVING HOURS AND REST PERIOD

Definition of ***"rest time"*** – The rest time is any continuous period of at least 15 minutes that is not driving time or work time. Breaks of less than 15 minutes are classed as work time.

Definition of ***"work time"*** - The work time of a driver includes driving time, and other time spent by the driver doing the following tasks:

a. loading or unloading

b. inspecting, servicing or repairing

c. cleaning or refuelling

d. performing marketing tasks

e. helping with or supervising an activity mentioned in paragraphs a to c

f. recording information, or completing a document in accordance with the regulations, or in relation to the operation of a truck.

The maximum a driver can drive without a break is five hours and 15 minutes and a driver must have a minimum of 15 minutes rest in every 5.5 hours.

A driver can take a rest period in the driver's seat with the engine turned off, in an approved sleeper berth, or away from the vehicle. However, rest periods of 7 continuous hours must be taken away from the vehicle.

A driver cannot work more than 12 hours in any 24 hour period. A rest period of 7 continuous hours must be taken during this 24 hour period. This applies for any 24 hour period, e.g. 6:00am to 6:00am or 5:30pm to 5:30pm.

The maximum number of hours a regulated truck driver can work in any 168 hour (7 day) period is 72 hours.

Table 2.1 summarises the standard allowable truck driver working hours. Standard hours apply to all drivers who do not have accreditation for fatigue management.

Table 2.1: Standard hours – work and rest hours requirement

In any period of…	A driver must not work for more than a maximum of…	And must have the rest of that period off work with at least a minimum rest break of…
5 ½ hours	5 ¼ hours work time	15 continuous minutes rest time
8 hours	7 ½ hours work time	30 minutes rest time in blocks of 15 continuous minutes
11 hours	10 hours work time	60 minutes rest time in blocks of 15 continuous minutes
24 hours	12 hours work time	7 continuous hours stationary rest time*
7 days	72 hours work time	24 continuous hours stationary rest time
14 days	144 hours work time	2 x night rest breaks# and 2 x night rest breaks taken on consecutive days

** Stationary rest time is the time a driver spends out of a heavy vehicle or in an approved sleeper berth of a stationary heavy vehicle.*

Night rest breaks are 7 continuous hours stationary rest time taken between the hours of 10pm on a day and 8am on the next day (using the time zone of the base of the driver) or a 24 continuous hours stationary rest break.

3. SAFETY

3.1 GENERAL

The driver must adhere to the following rules:

- comply with the instructions given for health and safety
- comply with all Australian Road Rules
- comply with all requirements of the National Heavy Vehicle Regulator (NHVR)
- comply with Lendlease's Code of Conduct
- comply with all safety instructions, including safe working practices and procedures set in place and use any equipment that is issued for personal protection and ensure that it is maintained in proper order
- never wilfully, recklessly or intentionally interfere with, remove, misuse or damage anything that is provided in the interests of safety, health or welfare nor wilfully place at risk the safety and health of any other person at their workplace
- work with due care and consideration to safeguard your own safety and health and the safety and health of others
- smoking is forbidden in all vehicles, mobile plant, buildings and enclosed structures
- protect the environment.

3.2 USE OF MOBILE PHONES

The driver must adhere to the following relating to use of mobile phones:

- it is strictly forbidden to drive a vehicle while using (includes talking, sending or receiving text messages, playing games or taking photos) when using a hand-held phone. It is also forbidden to perform these activities when the vehicle is stopped but not parked, for example when you are waiting at traffic lights
- a hands-free device can reduce the physical effort to make and receive calls but doesn't necessarily make it safe to use a phone while driving. It is forbidden to use a hands-free phone while driving if it causes you to lose proper control of your vehicle. The penalty includes significant fines and loss of demerit points
- if using a hands-free phone while driving is required:
  - make sure it is a hands-free phone that is set up and working before you start driving
  - keep the conversation short. Don't engage in complex or emotional conversations
  - tell the person on the other end that you are driving and may have to end the call
  - never text message (SMS) while driving
  - end the call if it is distracting you from driving.

3.3 SITE SAFETY

The driver must follow the following rules relating to site safety:

- site speed limit
- maintain a clean and orderly site
- comply with safety directions
- assess hazards in a task before commencing
- immediately report all potential hazards seen on site

- immediately report all injuries
- immediately report any environmental damage – oil spills, noise, soil contamination etc.
- drivers are not allowed to enter confined spaces. Entry to confined spaces is subject to a permit, which is issued to appropriately trained authorised persons only.

4. WORK ETHICS

4.1 ALCOHOL AND DRUGS

It is Lendlease's policy to maintain a drug and alcohol-free work environment. The use, sale, transfer or possession of illegal drugs or other illegal substances, is strictly prohibited at the work site. This also includes illegal or improper use of controlled substances.

Reporting to work under the influence of any such substance is also strictly prohibited. Doing so will result in the application of the relevant disciplinary procedures.

In addition, compliance with any laws, policies or regulations regarding the use or possession of alcohol, illegal drugs, or controlled substances by persons who operate motor vehicles is mandatory.

The following Blood Alcohol Content (BAC) levels apply for entry to the Tweed Valley Hospital site:

- BAC level of 0.0% applies to heavy vehicle drivers
- the consumption of alcohol and other drugs, except prescribed and over the counter medicines during work hours is prohibited
- bringing alcohol and other drugs on site is prohibited
- if planning to consume alcohol locally after work ensure your vehicle is parked outside the Tweed Valley Hospital project site.

4.2 STANDARDS OF BEHAVIOUR

The following behaviour is unacceptable in the workplace:

- instigating a fight and/or workplace bullying
- assaulting or threatening other employees or persons
- theft
- harassment and discrimination of any kind
- initiation or participation in unauthorised activities that may cause personal injury, property damage or physical stress or anxiety to other employees or members of the public
- abuse, damage or destruction of property
- interfering with or removing without permission, the property of the company or any other person
- failing to adhere to safe operating procedures
- horseplay, practical jokes and skylarking
- the taking of unauthorised photographs and removal of company assets is strictly forbidden.

Employees under the influence of alcohol and/or drugs will not be permitted on any worksite. Employees affected by alcohol and/or drugs must not drive vehicles or operate any plant, equipment or machinery.

5. PRE-DEPARTURE CHECK

A pre-departure check is a procedure to be completed daily. Each driver is to carry out a visual inspection of the items listed. This is to be done by the driver prior to the commencement of each shift/or when changing into another vehicle mid-shift.

A pre-trip check involves the inspection of critical equipment. Each driver has to visually inspect as a minimum the items listed below:

- Wheels and Tyres:
  - tyres are adequately inflated
  - tyre tread, depth and integrity
  - wheels are secure.
- Lights and reflectors:
  - all lights, including clearance lights, are working
  - reversing alarm (where applicable)
  - all reflectors and lenses are intact and clean.
- Windscreens, mirrors and wipers:
  - windows, mirrors for security, damage and grime
  - wipers and windscreen washers ensuring clear forward vision.
- Structure, Bodywork and Fluid Systems:
  - all panels and readily visible structural members are secure; and
  - leaks of any fluid (oil, water, refrigerant/coolant, hydraulic fluid, brake fluid or other).
- Brakes:
  - brake failure indicators
  - pressure/vacuum gauges; and
  - drain air tanks daily.
- all roadworthiness faults found during the daily vehicle inspection shall be documented in the driver maintenance report book and reported immediately to the appropriate personnel to ascertain the urgency of the fault, in accordance with procedures.
- responsibility for communicating faults:
  - any major faults are to be reported by the driver directly to their manager or their delegate as well as being recorded/ reported in the vehicle logbook.

6. HOURS OF OPERATION

Drivers are likely to be driving across different periods of the day and are to be aware of the requirement to drive to the prevailing conditions.

As a driver you need to be aware that your driving behaviour and level of attention will need to vary across different times of the day, for instance:

Day-Time Periods

- you will need to pay additional attention to congestion and possible queuing
- you will need to be patient and drive according to the road conditions at the time
- you will need to reduce the number of times you change lanes to minimise the potential of a crash
- you will need to be more cognisant of cyclists and pedestrians along the roadside and crossing the road.

Night-Time Periods

- you will need to pay additional attention to adhering to speed limits
- you will need to take greater caution of other speeding or non-complying motorists
- you will need to take greater caution of animals possibly crossing the road or feeding on the road's edge
- you will need to be mindful of coming across early morning or late evening pedestrians/cyclists that may or may not be under the effects of alcohol.

7. TRUCK ROUTES

7.1 TRUCK ROUTES

You are to remain on designated truck routes. The primary designated truck routes are as follows:

Pacific Highway to Site

The designated route is via:

- Pacific Motorway
- Tweed Coast Road (accessed via the Tweed Coast Road interchange)
- Cudgen Road.

Site to Pacific Highway

The designated route is via:

- Cudgen Road
- Tweed Coast Road
- Pacific Motorway (accessed via the Tweed Coast Road interchange).

Any required deviations to the designated truck route are to be authorised by the Construction Manager.

8. INFORMATION SOURCES

- Driving Hours and Rest Periods

  https://www.nhvr.gov.au/safety-accreditation-compliance/fatigue-management/work-and-rest-requirements/standard-hours

- NSW Government, RMS, Heavy Vehicle Driver Handbook

  http://www.rms.nsw.gov.au/documents/roads/licence/heavy-vehicle-driver-handbook.pdf

- Truck Drivers Manual

  http://www.infrastructure.gov.au/roads/safety/publications/1990/pdf/Edu_book_Truck.pdf

Appendix B: Written Incident Notification and Reporting Requirements

APPENDIX 2 WRITTEN INCIDENT NOTIFICATION AND REPORTING REQUIREMENTS

Written Incident Notification Requirements

1. A written incident notification addressing the requirements set out below must be emailed to the Planning Secretary at the following address: compliance@planning.nsw.gov.au within seven days after the Applicant becomes aware of an incident. Notification is required to be given under this condition even if the Applicant fails to give the notification required under condition A27 or, having given such notification, subsequently forms the view that an incident has not occurred.
2. Written notification of an incident must:
    a. identify the development and application number;
    b. provide details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident);
    c. identify how the incident was detected;
    d. identify when the applicant became aware of the incident;
    e. identify any actual or potential non-compliance with conditions of consent;
    f. describe what immediate steps were taken in relation to the incident;
    g. identify further action(s) that will be taken in relation to the incident; and
    h. identify a project contact for further communication regarding the incident.
3. Within 30 days of the date on which the incident occurred or as otherwise agreed to by the Planning Secretary, the Applicant must provide the Planning Secretary and any relevant public authorities (as determined by the Planning Secretary) with a detailed report on the incident addressing all requirements below, and such further reports as may be requested.
4. The Incident Report must include:
    a. a summary of the incident;
    b. outcomes of an incident investigation, including identification of the cause of the incident;
    c. details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence; and
    d. details of any communication with other stakeholders regarding the incident.

REPORT TO

HEALTH INFRASTRUCTURE

ON

PRELIMINARY (DESKTOP) SITE INVESTIGATION

FOR

PROPOSED ROUNDABOUT DEVELOPMENT

AT

PRINCES HIGHWAY, MORUYA, NSW

Date: 11 May 2022
Ref: E34938PLrpt

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For and on behalf of
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DOCUMENT REVISION RECORD

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E34938PLrpt	Final Report	11 May 2022

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This Report (which includes all attachments and annexures) has been prepared by JKE for the Client, and is intended for the use only by that Client.

This Report has been prepared pursuant to a contract between JKE and the Client and is therefore subject to:

a) JKE's proposal in respect of the work covered by the Report;
b) The limitations defined in the client's brief to JKE; and
c) The terms of contract between JKE and the Client, including terms limiting the liability of JKE.

If the Client, or any person, provides a copy of this Report to any third party, such third party must not rely on this Report, except with the express written consent of JKE which, if given, will be deemed to be upon the same terms, conditions, restrictions and limitations as apply by virtue of (a), (b), and (c) above.

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Executive Summary

Health Infrastructure ('the client') commissioned JK Environments (JKE) to undertake a Preliminary (Stage 1) Site Investigation (PSI) for the proposed roundabout and associated roadworks development on the Princes Highway, Moruya, NSW. The purpose of the PSI is to make a preliminary assessment of site contamination. The site location is shown on Figure 1 and the investigation was confined to the site boundaries as shown on Figure 2 attached in the appendices.

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

The primary aims of the PSI were to: identify past or present potentially contaminating activities at the site; identify the potential for site contamination; and assess the need for further investigation. The objectives were to:

- Provide an appraisal of the past site use(s) based on a review of historical records;
- Assess the current site conditions and land use by completing a site walkover inspection;
- Identify potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Prepare a conceptual site model (CSM); and
- Assess whether an intrusive investigation is required.

The scope of work included the following:

- Review of site information, including background and site history information from various sources outlined in the report;
- A walkover site inspection; and
- Preparation of a PSI report presenting the results of the assessment, including a CSM.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013), guidelines made under or with regards to the Contaminated Land Management Act (1997) and State Environmental Planning Policy (Resilience and Hazards) 2021 (formerly known as SEPP55). A list of reference documents/guidelines is included in the appendices.

Based on the scope of work undertaken for this PSI, JKE identified fill material as the primary potential contamination sources at the site. Considering this, and based on a qualitative assessment of various lines of evidence as discussed throughout this report, JKE is of the opinion that there is a relatively low potential for site contamination that could impact the receptors. Based on the potential contamination sources/AEC identified, and the potential for contamination, further investigation of the contamination conditions is considered to be required.

JKE is of the opinion that the historical land uses and potential source of contamination identified would not preclude the proposed development. The following is recommended:

- Preliminary soil sampling and analysis should be undertaken to make an assessment of the soil contamination conditions prior to commencement of any soil disturbance on site as part of the proposed development works;
- An unexpected finds protocol (UFP) should be prepared and implemented during the proposed development works; and
- A waste classification should be undertaken prior to off-site disposal of any waste.

JKE also note that the western portion of the site is located within an acid sulfate soil (ASS) risk area. Once the final development plans and extent of soil disturbance is known, a suitable investigation should occur to assess ASS risks in the context of the proposed development works, and assess the need to develop and implement an ASS management plan.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of this report.

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Abbreviations

Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
Conceptual Site Model	**CSM**
Detailed Site Investigation	**DSI**
Environment Protection Authority	**EPA**
Environmental Site Assessment	**ESA**
JK Environments	**JKE**
Map Grid of Australia	**MGA**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Polychlorinated Biphenyls	**PCBs**
Per-and Polyfluoroalkyl Substances	**PFAS**
Protection of the Environment Operations	**POEO**
Review of Environmental Factors	**REF**
Sampling, Analysis and Quality Plan	**SAQP**
State Environmental Planning Policy	**SEPP**
Source, Pathway, Receptor	**SPR**
Total Recoverable Hydrocarbons	**TRH**
Transport for NSW	**TfNSW**
United States Environmental Protection Agency	**USEPA**
Volatile Organic Compounds	**VOC**
World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Metres BGL	**mBGL**
Metres	**m**

1 INTRODUCTION

Health Infrastructure ('the client') commissioned JK Environments (JKE) to undertake a Preliminary (Stage 1) Site Investigation (PSI) for the proposed roundabout and associated roadworks development on the Princes Highway, Moruya, NSW. The purpose of the PSI is to make a preliminary assessment of site contamination. The site location is shown on Figure 1 and the investigation was confined to the site boundaries as shown on Figure 2 attached in the appendices.

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

JKE completed a Preliminary Site Investigation of the greenfield property immediately to the north of the site in 2021. The site information and site history provided in the Lotsearch report (refer to Appendix B) obtained for the investigation of the greenfield property to the north of the site was utilised in preparation of this PSI.

1.1 Proposed Development Details

The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot 2 in DP 1281576, which is a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north of the greenfield site is a small residential subdivision called Mynora Estate.

Based on the details provided, JKE understand that the proposed development includes:

- Construction of a new roundabout located on Princes Highway;
- Ancillary road and public domain works; and
- Ancillary electricity reticulation and street lighting.

1.2 Aim and Objectives

The primary aims of the PSI were to: identify past or present potentially contaminating activities at the site; identify the potential for site contamination; and assess the need for further investigation. The objectives were to:

- Provide an appraisal of the past site use(s) based on a review of historical records;
- Assess the current site conditions and land use by completing a site walkover inspection;
- Identify potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Prepare a conceptual site model (CSM); and
- Assess whether an intrusive investigation is required.

1.3 Scope of Work

The investigation was undertaken generally in accordance with a JKE proposal (Ref: EP55793PLRev1) of 22 February 2022 and written acceptance from the client via email from the project manager, Root Partnerships, of 11 March 2022. The scope of work included the following:

- Review of site information, including background and site history information from various sources outlined in the report;
- A walkover site inspection; and
- Preparation of a PSI report presenting the results of the assessment, including a CSM.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[1], guidelines made under or with regards to the Contaminated Land Management Act (1997)[2] and State Environmental Planning Policy (Resilience and Hazards) 2021[3] (formerly known as SEPP55). A list of reference documents/guidelines is included in the appendices.

[1] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

[2] Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

[3] *State Environmental Planning Policy (Resilience and Hazards) 2021* (NSW) (referred to as SEPP Resilience and Hazards 2021)

2 SITE INFORMATION

2.1 Site Identification

Table 2-1: Site Identification

Site Address:	Undefined. The site is located on Princes Highway, Moruya, NSW
Lot & Deposited Plan:	Undefined
Current Land Use:	Highway / Public Road
Proposed Land Use:	Roundabout
Local Government Authority (LGA):	Eurobodalla Shire Council JKE note that the public roadway is under the jurisdiction of Transport for NSW (TfNSW)
Current Zoning:	SP2 – Classified Road
Site Area (m^2) (approx.):	20,000m^2 based on approximate site area shown on Figures 1 and 2
RL (AHD in m) (approx.):	7-20
Geographical Location (decimal degrees) (approx. centre of site):	Latitude: -35.924179 Longitude: 150.091806

2.2 Site Location and Regional Setting

The site is located in a predominantly rural and residential area of Moruya and consists of a portion of the Princes Highway and associated land/road reserve to the north and south of the road. Racecourse Creek is located approximately 1km to the north-west of the site.

2.3 Topography

The site is located within an area of undulating regional topography. The site itself is located at the foot of a north-west facing hillside that slopes down towards the north, west and south at gradients of between approximately 3° to 7°. The western part of the site appeared to be intersected by a tributary leading into Racecourse Creek. The tributary was channelled beneath the roadway, generally in a south to north direction.

2.4 Site Inspection

A walkover inspection of the site was undertaken by JKE on 25 March 2022. The inspection was limited to accessible areas of the site and immediate surrounds. Selected site photographs obtained during the inspection are attached in the appendices.

A summary of the inspection findings is outlined in the following subsections:

2.4.1 Current Site Use and/or Indicators of Former Site Use

At the time of the inspection, the majority of site was occupied by land intersected by the Princes Highway running east to west. No indicators of former land use were identified.

2.4.2 Buildings, Structures and Roads

No buildings or structures were present on-site at the time of the site inspection. The site was intersected by Princes Highway, which was covered by paved asphalt and appeared to be in good condition. A gravelled access road was present in the eastern portion of the site, leading towards the adjacent property to the north. A paved drainage channel was observed on the southern portion of the site running east to west.

2.4.3 Boundary Conditions, Soil Stability and Erosion

A fence was observed along the site's northern boundary and appeared to enclose the adjacent northern property. The remainder of the site was unfenced. Surface scouring observed in the southern portion of the site indicated soil erosion via surface water and wash away of surface soils.

2.4.4 Presence of Drums/Chemical Storage and Waste

No drums, chemical storage or waste was observed on the site during the inspection.

2.4.5 Evidence of Cut and Fill

Fill material (igneous gravels, sand, etc.) observed at the site surface along the shoulders of the Princes Highway indicated that some filling/earthworks have occurred onsite.

2.4.6 Visible or Olfactory Indicators of Contamination (odours, spills etc)

No visible (e.g., spills, staining) or olfactory (i.e., odours) indicators of contamination were observed during the site inspection.

2.4.7 Drainage and Services

Surface water flows would be expected to flow to the north-west in keeping with the local topography. Drainage is expected to be captured by the drainage ditch and associated drainage feature and by the unpaved surfaces. Fibre optic cable posts were found along the northern portion of the site, indicating the presence of fibre optic cables beneath the ground.

2.4.8 Sensitive Environments

The tributary appeared to drain into Racecourse Creek, located approximately 1km north-west of the site.

2.4.9 Landscaped Areas and Visible Signs of Plant Stress

Outside of paved or gravel covered areas, the site was generally grass covered, with a number of medium to large trees along the edge of the site boundaries. No obvious signs of plant stress or dieback were observed at the time of the inspection.

2.5 Surrounding Land Use

During the site inspection, JKE observed the following land uses in the immediate surrounds:

- North – Cattle pasture followed by residential;
- South – Residential and agricultural;
- East – Residential and agricultural; and,
- West – Residential and agricultural followed by TAFE campus.

JKE did not observe any land uses in the immediate surrounds that were identified as potential contamination sources for the site.

2.6 Underground Services

The 'Dial Before You Dig' (DBYD) plans were reviewed for the PSI in order to establish whether any major underground services exist at the site or in the immediate vicinity that could act as a preferential pathway for contamination migration. Several services were identified on site; however, no underground services were identified that would be expected to act as preferential pathways for contamination migration.

3 GEOLOGY AND HYDROGEOLOGY

3.1 Regional Geology

Regional geological information was reviewed for the investigation. The information was sourced from the Lotsearch report attached in the appendices. The report indicates that the site is underlain by Moruya Tonalite of the Moruya Suite, which typically consists of tonalite, granodiorite, biotite, granite, adamellite, diorite and gabbro.

The Moruya 1:25,000 Quaternary Geology Sheet indicates that most of the site is underlain by bedrock of the Moruya Supersuite. However, along to the tributaries, Quaternary aged alluvial and colluvial fan soils are mapped. These soils comprise *"fluvial sand, silt, gravel, clay"*.

3.2 Acid Sulfate Soil (ASS) Risk and Planning

A review of the acid sulfate soil (ASS) risk map prepared by Department of Land and Water Conservation (1997)[4] indicated that the site is partially located in an area classed as having 'low probability' of occurrence of ASS materials within 1 metre of the ground surface. This occurs at the western-most end of the site.

ASS information presented in the Lotsearch report indicated that the western portion of the site is located within a Class 2 ASS risk area. Works in a Class 2 risk area that could pose an environmental risk in terms of ASS include all works below existing ground level and works by which the water table is likely to be lowered.

3.3 Hydrogeology

Hydrogeological information was reviewed for the investigation. The information was sources from the Lotsearch report attached in the appendices. The report indicates that the regional aquifer on-site and, in the areas, immediately surrounding the site includes fractured or fissured, extensive aquifers of low to moderate productivity. There was a total of 44 registered bores within the report buffer of 2,000m. In summary:

- The nearest registered bore was located approximately 430m from the site. This was utilised for domestic/stock purposes;
- The bores were generally registered for a mixture of monitoring, domestic and domestic stock purposes;
- The drillers log information from the closest registered bores typically identified clay or sandy soil to depths of 0.9-8.0m, underlain by granite bedrock. Standing water levels (SWLs) in the bores ranged from 2.0m below ground level (BGL) to 25.0mBGL.

The information reviewed for the investigation indicated that the subsurface conditions across the majority of the site (particularly in the development footprint) are likely to consist of relatively low permeability (residual) soils overlying shallow bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low. Use of groundwater is not proposed as part of

[4] Department of Land and Water Conservation, (1997). *1:25,000 Acid Sulfate Soil Risk Map (Series 8926S3,Moruya, Ed 2)*

the development. The majority of the registered bores are located in the low-lying land to the west of the site.

Considering the local topography and surrounding land features, JKE anticipate the overall groundwater flow direction to be towards the west.

3.4 Water Bodies

Permanent surface water bodies were not identified in the immediate vicinity of the site. The tributary that extended through (i.e. beneath the road) the western part of the site did not appear to be a permanent water body and was considered likely to be an ephemeral surface water flow path during rain events. The closest surface water body is Racecourse Creek located approximately 1km to the north-west of the site.

4 SITE HISTORY INFORMATION

4.1 Review of Historical Aerial Photographs and Historical Maps

Historical aerial photographs were reviewed for the PSI. The information was sourced for the Lotsearch report. A summary of the relevant information is presented in the following table:

Table 4-1: Summary of Historical Aerial Photographs

Year	Details
1961	**On-site:** The northern and southern portions of the site appeared to be vacant and grassed with some vegetation and tree coverage, with the Princes Highway intersecting the site running from east to west. **Off-site:** The surrounds appeared vacant and grassed and were most likely used for grazing and/or agricultural purposes.
1966-1979	The site and surrounding features appeared generally similar to the previous photograph.
1981	**On-site:** The site appeared similar to the previous photographs. **Off-site:** The area some distance to the north of the site appeared to be developed for residential purposes, with additional roads and sub-divisions for housing evident.
1989	**On-site:** The Princes Highway appeared to have been widened. Some cut and/or fill works may have taken place at this time. **Off-site:** The immediate surrounds appeared generally similar to the previous photographs.
1999	**On-site:** The site and the Princes Highway appeared generally similar to the present day. **Off-site:** The immediate surrounds appeared generally similar to the previous photographs. There was some evidence of residential development to the south of the site.
2006 2012 2015 2020	The site and surrounding features appeared generally similar to the previous photograph. Additional residential development had occurred to the south of the site.

In addition to the aerial photographs, the Lotsearch report presented a series of historical maps. The historical maps indicated that the Princes Highway was a mapped roadway from at least 1943.

4.2 NSW EPA and Department of Defence Records

A review of the NSW EPA and Department of Defence databases was undertaken for the assessment. Information from the following databases were sourced from the Lotsearch report:

- Records maintained in relation to contaminated land under Section 58 of the CLM Act 1997;
- Records of sites notified in accordance with the Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997 (2015)[5];

[5] NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997.* (referred to as Duty to Report Contamination)

- Licensed activities under the Protection of the Environment Operations Act (1997)[6];
- Sites being investigated under the NSW EPA per-and polyfluoroalkyl substances (PFAS) investigation program;
- Sites being investigated by the Department of Defence for PFAS contamination; and
- Sites being managed by the Department of Defence for PFAS contamination.

The search included the site and surrounding areas in the report buffer. The results included the following:

- A Caltex service station was listed within the report buffer under Section 58 of the CLM Act 1997. However, this property is located approximately 1,500m north-west of the site (down gradient) and is not considered to represent an off-site source of contamination; and
- The Moruya Sewage Treatment Plant was licensed under the POEO Act 1997. This property is located approximately 1,200m north of the site (down gradient) and therefore is not considered to represent an off-site source of contamination.

4.3 Historical Business Directory and Additional Lotsearch Information

Historical business records and other relevant information were reviewed for the PSI. The information was sourced from the Lotsearch report and summarised in the following table:

Table 4-2: Historical Business Directory and other Records

Records	On-site	Off-site
Historical dry cleaners, motor garages and service stations	None	There were several service stations and dry cleaners listed in the report buffer between 1961-1991. These properties were a listed as 'road match' in the database rather than a "premise match", therefore the exact location cannot be predicted with confidence. The aerial photographs during this period did not indicate that there was any development in the immediate vicinity. Therefore, these properties/activities are not considered to represent an off-site source of contamination.
Other historical businesses that could represent potential sources of contamination	None	None
National waste management site database	None	None
National liquid fuel facilities	None	There were three listed liquid fuel facilities within the report buffer. These were petrol stations located over 500m from the site. Due to the distance of these properties from the site, they are not considered to represent an off-site source of contamination.
Mapped heritage items	None	Various heritage items were mapped in the report buffer. These are not considered to have any relevance in the context of the investigation objectives.

[6] Protection of the Environment Operations Act 1997 (NSW) (referred to as POEO Act 1997)

Records	On-site	Off-site
Mapped ecological constraints	None	Various ecological items were mapped in the report buffer. These are not considered to have any relevance in the context of the investigation objectives.
Mapped naturally occurring asbestos	None	None

4.4 Summary of Site History Information

Based on the information reviewed and a weight of evidence assessment of the site history documentation, and site observations made by JKE, we consider that the site has been historically used as a road corridor since at least 1943 and it is presumed to have been of similar use or vacant land before this time. Potential cut and/or fill works may have taken place at the site during the Princes Highway paving and widening works between 1981 and 1988.

The immediate surrounds appeared to have been used for similar purposes, with the exception of the low-density residential properties to the south of the site and the grazing activities on the land to the north of the site.

4.5 Integrity of Site History Information

The majority of the site history information was obtained from government organisations as outlined in the relevant sections of this report. The veracity of the information from these sources is considered to be relatively high. A certain degree of information loss can be expected given the lack of specific land use details over time. JKE have relied upon the Lotsearch report and have not independently verified any information contained within. However, it is noted that the Lotsearch report is generated based on databases maintained by various government agencies and is expected to be reliable.

5 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) and the review of site history information. Reference should also be made to the figures attached in the appendices.

5.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are presented in the following table:

Table 5-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material – Based on the site walkover inspection and the aerial photographs, it is possible that portions of the have been historically filled to achieve the existing levels for the Princes Highway. Fill in the form of engineered basecourse and sub-base may have also been imported.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.

5.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The mechanisms for contamination, affected media, receptors and exposure pathways relevant to the potential contamination sources/AEC are outlined in the following CSM table:

Table 5-2: Conceptual Site Model

Potential mechanism for contamination	The potential mechanisms for contamination are most likely to include 'top-down' impacts and spills. There is a potential for sub-surface releases to have occurred if deep fill is present, although this is considered to be the least likely mechanism for contamination.
Affected media	Soil has been identified as the potentially affected medium. The potential for groundwater impacts is considered to be relatively low. However, groundwater would need to be considered in the event significant contamination was identified in soil.
Receptor identification	Human receptors include construction workers and intrusive maintenance workers. Sediment wash during construction or rain events could have the potential to impact ecological receptors including terrestrial organisms and plants within unpaved areas.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works. Potential exposure pathways for ecological receptors include primary contact and ingestion.

	Exposure during future site use could occur via direct contact with soil in unpaved areas, exposure to vapours in trenches, or inhalation of airborne asbestos fibres during soil disturbance.
Potential exposure mechanisms	The primary potential exposure mechanism for site contamination would be through direct contact and inhalation (i.e. dermal, ingestion or inhalation) with exposed soils, vapours or airborne asbestos fibres during construction or excavation works.

5.3 Assessment of Data Gaps

JKE has undertaken a preliminary data gap analysis based on the findings of the PSI. The data gaps and comments are outlined in the following table:

Table 5-3: Data Gap Assessment

Data Gap	JKE Comments
Historical land titles search was limited to one lot	A land titles search was outside the scope of the desktop assessment. Considering the land use appears unchanged as a roadway or vacant land since at least 1943, JKE is of the opinion that the land titles records is unlikely to provide any information that would alter the CSM
Council Records	The review of council records was limited to planning-related information within the Local Environmental Plan (as outlined in the Lotsearch report). JKE is of the opinion that further review of council records such as building approval and development application records is unlikely to identify any information that would alter the outcome of the assessment at this stage.
SafeWork NSW	SafeWork NSW records were not obtained for this assessment. As the predominant site use appears to be residential, JKE is of the opinion that licensed dangerous goods records are unlikely to exist for the site.
Sampling/analysis of media	Sampling and analysis of media identified in the CSM was not undertaken for the PSI. Recommendations to address this data gap have been included in this report.

6 CONCLUSIONS

6.1 Contamination Sources/AEC and Potential for Site Contamination

Based on the scope of work undertaken for this PSI, JKE identified fill material as the primary potential contamination sources at the site. Considering the above, and based on a qualitative assessment of various lines of evidence as discussed throughout this report, JKE is of the opinion that there is a relatively low potential for site contamination that could impact the receptors.

6.2 Need for Further Investigation

Based on the potential contamination sources/AEC identified, and the potential for contamination, further investigation of the contamination conditions is considered to be required.

6.3 Conclusions and Recommendations

JKE is of the opinion that the historical land uses and potential source of contamination identified would not preclude the proposed development. The following is recommended:

- Preliminary soil sampling and analysis should be undertaken to make an assessment of the soil contamination conditions prior to commencement of any soil disturbance on site as part of the proposed development works;
- An unexpected finds protocol (UFP) should be prepared and implemented during the proposed development works; and
- A waste classification should be undertaken prior to off-site disposal of any waste.

JKE also note that the western portion of the site is located within an ASS risk area. Once the final development plans and extent of soil disturbance is known, a suitable investigation should occur to assess ASS risks in the context of the proposed development works, and assess the need to develop and implement an ASS management plan.

JKE consider that the PSI objectives outlined in Section 1.2 have been addressed.

7 LIMITATIONS

The following limitation apply to this investigation:

- JKE accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the JKE proposal; and terms of contract between JKE and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- This report has been prepared in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, JKE has not undertaken any verification process, except where specifically stated in the report;
- JKE has not investigated off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- JKE accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- JKE have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. JKE should be contacted immediately in such circumstances; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Important Information About This Report

These notes have been prepared by JKE to assist with the interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors:
This report has been prepared in response to specific project requirements as stated in the JKE proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

JKE will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by JKE to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions:
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data:
Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Investigation Limitations:
Although information provided by an investigation can reduce exposure to the risk of the presence of contamination, no investigation can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

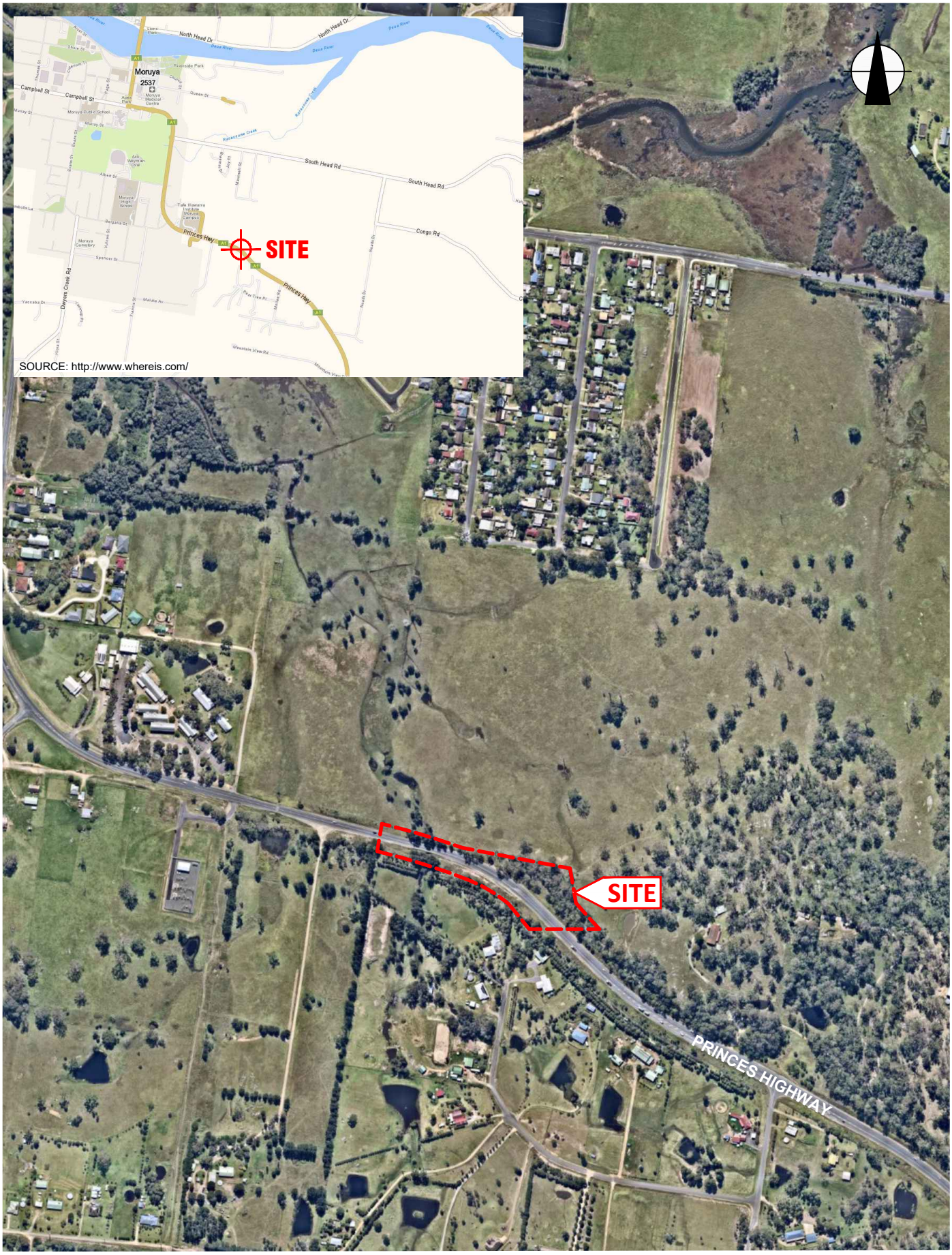
Misinterpretation of Reports by Design Professionals:
Costly problems can occur when design professionals develop plans based on misinterpretation of the report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Report:
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete report should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely:
As the investigation is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the report, and you are encouraged to read them closely.

Appendix A: Report Figures



AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

This plan should be read in conjunction with the Environmental report.

Title: **SITE LOCATION PLAN**

Location: PRINCES HIGHWAY, MORUYA, NSW

Project No: E34938PL

Figure No: 1

JKEnvironments

PLOT DATE: 5/05/2022 11:00:23 AM DWG FILE: S:\5 EIS\5C EIS JOBS\34000\SE34938PL MORUYA\CAD\E34938PL.DWG

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LEGEND

APPROXIMATE SITE BOUNDARY

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 10 20 30 40 50

SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **SAMPLE LOCATION PLAN**

Location: PRINCES HIGHWAY, MORUYA, NSW

Project No: E34938PL

Figure No: 2

JKEnvironments

PLOT DATE: 5/05/2022 11:00:31 AM DWG FILE: S:\S EIS\SC EIS JOBS\34000'S\E34938PL MORUYA\CAD\E34938PL.DWG

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Appendix B: Site Information

Selected Site Photos

Project Ref: E34938PL
Site Address: Princes Highway, Moruya NSW
Selected Site Photos Dated: 25 March 2022

	**Photograph 1:** Taken from the northern portion of the site, facing west. Note paved Princes Highway and fill material at the surface along the road shoulder.
	**Photograph 2:** Taken from the northern portion of the site, facing east. Note paved Princes Highway and fill material at the surface along the road shoulder.
	**Photograph 3:** Taken from the southern portion of the site, facing east. Note the sandy gravelly fill material at the surface.

	**Photograph 4:** Taken showing the southern portion of the site, facing west.
	**Photograph 5:** Taken showing an example of the fill material encountered at the surface of the site in unpaved areas.
	**Photograph 6:** Taken showing the western creekline, facing south.

Lotsearch Environmental Risk and Planning Report

LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Date: 30 Mar 2021 09:50:59

Reference: LS019166 EP

Address: Lot 6 Princes Highway, Moruya, NSW 2537

Disclaimer:
The purpose of this report is to provide an overview of some of the site history, environmental risk and planning information available, affecting an individual address or geographical area in which the property is located. It is not a substitute for an on-site inspection or review of other available reports and records. It is not intended to be, and should not be taken to be, a rating or assessment of the desirability or market value of the property or its features.
You should obtain independent advice before you make any decision based on the information within the report.
The detailed terms applicable to use of this report are set out at the end of this report.

Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	NSW Department of Finance, Services & Innovation	19/02/2021	19/02/2021	Quarterly	-	-	-	-
Topographic Data	NSW Department of Finance, Services & Innovation	25/06/2019	25/06/2019	As required	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	11/03/2021	08/03/2021	Monthly	1000	0	0	1
Contaminated Land Records of Notice	Environment Protection Authority	04/03/2021	04/03/2021	Monthly	1000	0	0	0
Former Gasworks	Environment Protection Authority	09/03/2021	11/10/2017	Monthly	1000	0	0	0
National Waste Management Facilities Database	Geoscience Australia	11/02/2021	07/03/2017	Quarterly	1000	0	0	0
National Liquid Fuel Facilities	Geoscience Australia	15/02/2021	13/07/2012	Annually	1000	0	0	3
EPA PFAS Investigation Program	Environment Protection Authority	12/03/2021	23/11/2020	Monthly	2000	0	0	0
Defence PFAS Investigation & Management Program - Investigation Sites	Department of Defence	30/03/2021	30/03/2021	Monthly	2000	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	30/03/2021	30/03/2021	Monthly	2000	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	29/03/2021	29/03/2021	Monthly	2000	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	12/03/2021	12/03/2021	Monthly	2000	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	02/02/2021	13/12/2018	Annually	1000	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	08/03/2021	08/03/2021	Monthly	1000	0	0	1
Delicensed POEO Activities still regulated by the EPA	Environment Protection Authority	08/03/2021	08/03/2021	Monthly	1000	0	0	0
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	08/03/2021	08/03/2021	Monthly	1000	3	3	4
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	1	1
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	150	-	23	23
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500	-	8	8
Points of Interest	NSW Department of Finance, Services & Innovation	18/02/2021	18/02/2021	Quarterly	1000	0	0	15
Tanks (Areas)	NSW Department of Customer Service - Spatial Services	16/02/2021	16/02/2021	Quarterly	1000	0	0	0
Tanks (Points)	NSW Department of Customer Service - Spatial Services	16/02/2021	16/02/2021	Quarterly	1000	0	0	7
Major Easements	NSW Department of Finance, Services & Innovation	17/02/2021	17/02/2021	Quarterly	1000	1	3	8
State Forest	Forestry Corporation of NSW	25/02/2021	14/02/2021	Annually	1000	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	22/01/2021	11/12/2020	Annually	1000	0	0	0
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	08/10/2014	17/03/2000	As required	1000	1	1	1
Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018	NSW Department of Planning, Industry and Environment	26/10/2020	21/02/2018	Annually	1000	0	0	0

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Groundwater Boreholes	NSW Dept. of Primary Industries - Water NSW; Commonwealth of Australia (Bureau of Meteorology)	24/07/2018	23/07/2018	Annually	2000	0	0	44
Geological Units 1:250,000	NSW Department of Planning, Industry and Environment	20/08/2014		Annually	1000	1	-	3
Geological Structures 1:250,000	NSW Department of Planning, Industry and Environment	20/08/2014		Annually	1000	0	-	0
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Unknown	1000	0	0	0
Atlas of Australian Soils	Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES)	19/05/2017	17/02/2011	As required	1000	2	2	2
Environmental Planning Instrument Acid Sulfate Soils	NSW Department of Planning, Industry and Environment	18/03/2021	26/02/2021	Monthly	500	1	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000	1	1	2
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	None planned	1000	0	0	0
Dryland Salinity Potential of Western Sydney	NSW Department of Planning, Industry and Environment	12/05/2017	01/01/2002	None planned	1000	-	-	-
Mining Subsidence Districts	NSW Department of Customer Service - Subsidence Advisory NSW	16/02/2021	16/02/2021	Quarterly	1000	0	0	0
Current Mining Titles	NSW Department of Industry	04/03/2021	04/03/2021	Monthly	1000	0	0	0
Mining Title Applications	NSW Department of Industry	04/03/2021	04/03/2021	Monthly	1000	0	0	0
Historic Mining Titles	NSW Department of Industry	04/03/2021	04/03/2021	Monthly	1000	3	3	3
Environmental Planning Instrument SEPP State Significant Precincts	NSW Department of Planning, Industry and Environment	18/03/2021	07/12/2018	Monthly	1000	0	0	0
Environmental Planning Instrument Land Zoning	NSW Department of Planning, Industry and Environment	18/03/2021	12/03/2021	Monthly	1000	2	5	31
Commonwealth Heritage List	Australian Government Department of the Agriculture, Water and the Environment	23/02/2021	20/11/2019	Quarterly	1000	0	0	0
National Heritage List	Australian Government Department of the Agriculture, Water and the Environment	23/02/2021	20/11/2019	Quarterly	1000	0	0	0
State Heritage Register - Curtilages	NSW Department of Planning, Industry and Environment	15/02/2021	30/11/2020	Quarterly	1000	0	0	0
Environmental Planning Instrument Local Heritage	NSW Department of Planning, Industry and Environment	18/03/2021	12/03/2021	Monthly	1000	0	0	3
Bush Fire Prone Land	NSW Rural Fire Service	26/03/2021	11/02/2021	Weekly	1000	0	0	2
Vegetation of Southern Forests	NSW Office of Environment & Heritage	09/12/2014	10/10/2011	Unknown	1000	0	0	2
Ramsar Wetlands of Australia	Australian Government Department of Agriculture, Water and the Environment	24/02/2021	19/03/2020	Annually	1000	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	14/08/2017	15/05/2017	Annually	1000	2	2	5
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000	4	4	11
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	29/03/2021	29/03/2021	Weekly	10000	-	-	-

Site Diagram

Lot 6 Princes Highway, Moruya, NSW 2537



Legend

- Site Boundary
- Internal Parcel Boundaries

Total Area: 262256m^2

Total Perimeter: 2555m

Scale: 0 25 50 100 150 200 Meters

Data Sources: Aerial Imagery © NSW Department of Finance, Services & Innovation

Disclaimers:

Measurements are approximate only and may have been simplified or smaller lengths removed for readability.

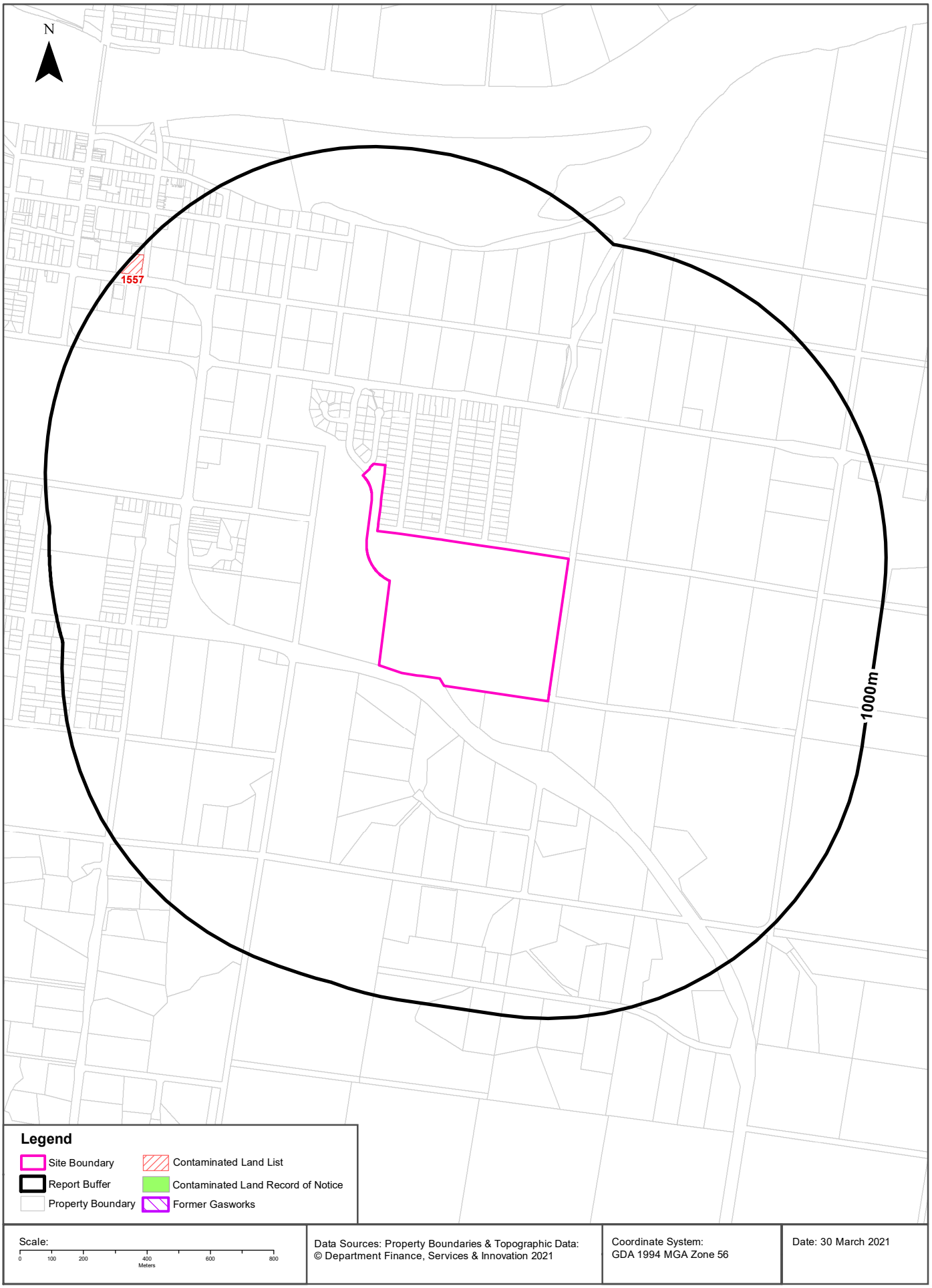
Parcels that make up a small percentage of the total site area have not been labelled for increased legibility.

Coordinate System: GDA 1994 MGA Zone 56

Date: 30 March 2021

Contaminated Land

Lot 6 Princes Highway, Moruya, NSW 2537



Contaminated Land

Lot 6 Princes Highway, Moruya, NSW 2537

List of NSW contaminated sites notified to EPA

Records from the NSW EPA Contaminated Land list within the dataset buffer:

Map Id	Site	Address	Suburb	Activity	Management Class	Status	Location Confidence	Dist (m)	Direction
1557	Caltex Service Station Moruya	80-84 Campbell Street	Moruya	Service Station	Regulation under CLM Act not required	Current EPA List	Premise Match	943m	North West

The values within the EPA site management class in the table above, are given more detailed explanations in the table below:

EPA site management class	Explanation
Contamination being managed via the planning process (EP&A Act)	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. The contamination of this site is managed by the consent authority under the Environmental Planning and Assessment Act 1979 (EP&A Act) planning approval process, with EPA involvement as necessary to ensure significant contamination is adequately addressed. The consent authority is typically a local council or the Department of Planning and Environment.
Contamination currently regulated under CLM Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). Management of the contamination is regulated by the EPA under the CLM Act. Regulatory notices are available on the EPA's Contaminated Land Public Record of Notices.
Contamination currently regulated under POEO Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. Management of the contamination is regulated under the Protection of the Environment Operations Act 1997 (POEO Act). The EPA's regulatory actions under the POEO Act are available on the POEO public register.
Contamination formerly regulated under the CLM Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). The contamination was addressed under the CLM Act.
Contamination formerly regulated under the POEO Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed under the Protection of the Environment Operations Act 1997 (POEO Act).
Contamination was addressed via the planning process (EP&A Act)	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed by the appropriate consent authority via the planning process under the Environmental Planning and Assessment Act 1979 (EP&A Act).
Ongoing maintenance required to manage residual contamination (CLM Act)	The EPA has determined that ongoing maintenance, under the Contaminated Land Management Act 1997 (CLM Act), is required to manage the residual contamination. Regulatory notices under the CLM Act are available on the EPA's Contaminated Land Public Record of Notices.
Regulation being finalised	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997. A regulatory approach is being finalised.
Regulation under the CLM Act not required	The EPA has completed an assessment of the contamination and decided that regulation under the Contaminated Land Management Act 1997 is not required.
Under assessment	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment. For example, the completion of management actions regulated under the planning process or Protection of the Environment Operations Act 1997. Alternatively, the EPA may require information via a notice issued under s77 of the Contaminated Land Management Act 1997 or issue a Preliminary Investigation Order.

NSW EPA Contaminated Land List Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Contaminated Land

Lot 6 Princes Highway, Moruya, NSW 2537

Contaminated Land: Records of Notice

Record of Notices within the dataset buffer:

Map Id	Name	Address	Suburb	Notices	Area No	Location Confidence	Distance	Direction
N/A	No records in buffer							

Contaminated Land Records of Notice Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority
Terms of use and disclaimer for Contaminated Land: Record of Notices, please visit
http://www.epa.nsw.gov.au/clm/clmdisclaimer.htm

Former Gasworks

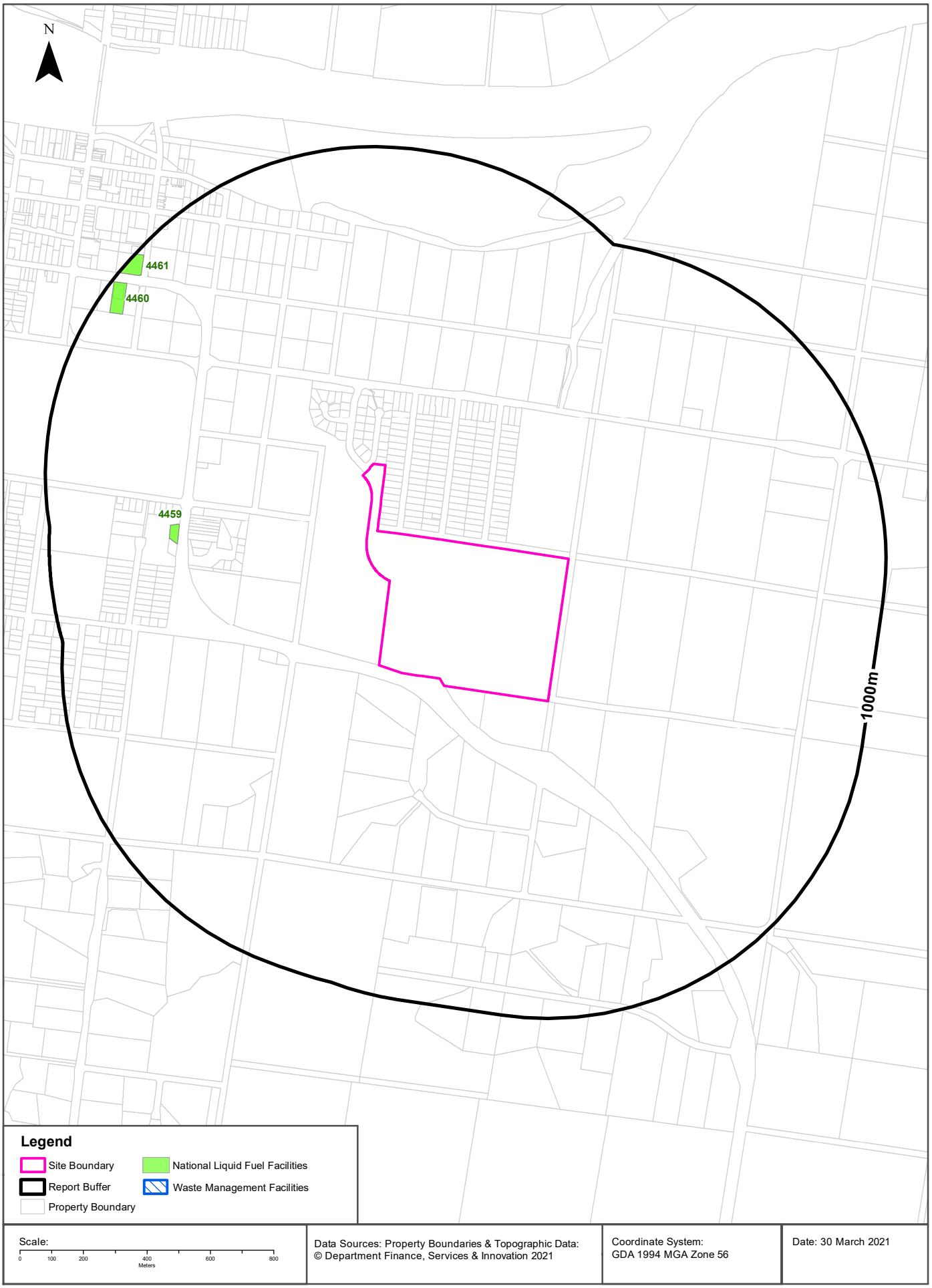
Former Gasworks within the dataset buffer:

Map Id	Location	Council	Further Info	Location Confidence	Distance	Direction
N/A	No records in buffer					

Former Gasworks Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Waste Management & Liquid Fuel Facilities

Lot 6 Princes Highway, Moruya, NSW 2537



Waste Management & Liquid Fuel Facilities

Lot 6 Princes Highway, Moruya, NSW 2537

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Landfill	Reprocess	Transfer	Comments	Loc Conf	Dist (m)	Direction
N/A	No records in buffer											

Waste Management Facilities Data Source: Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

National Liquid Fuel Facilities

National Liquid Fuel Facilties within the dataset buffer:

Map Id	Owner	Name	Address	Suburb	Class	Operational Status	Operator	Revision Date	Loc Conf	Dist (m)	Direction
4459	Caltex	Woolworths Caltex Moruya	2808 Princes Highway	Moruya	Petrol Station	Operational		25/07/2011	Premise Match	593m	West
4460	Caltex	Caltex Moruya	95A Princes Highway	Moruya	Petrol Station	Operational		25/07/2011	Premise Match	913m	North West
4461	7-Eleven Pty Ltd	Caltex Moruya	80-82 Campbell Street	Moruya	Petrol Station	Operational		13/07/2012	Premise Match	943m	North West

National Liquid Fuel Facilities Data Source: Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

PFAS Investigation & Management Programs

Lot 6 Princes Highway, Moruya, NSW 2537

EPA PFAS Investigation Program

Sites that are part of the EPA PFAS investigation program, within the dataset buffer:

Id	Site	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

EPA PFAS Investigation Program: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Defence PFAS Investigation Program

Sites being investigated by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Investigation Program Data Custodian: Department of Defence, Australian Government

Defence PFAS Management Program

Sites being managed by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Management Program Data Custodian: Department of Defence, Australian Government

Airservices Australia National PFAS Management Program

Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

Map ID	Site Name	Impacts	Loc Conf	Dist	Dir
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

Defence Sites

Lot 6 Princes Highway, Moruya, NSW 2537

Defence 3 Year Regional Contamination Investigation Program

Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

Property ID	Base Name	Address	Known Contamination	Loc Conf	Dist	Dir
N/A	No records in buffer					

Defence 3 Year Regional Contamination Investigation Program, Data Custodian: Department of Defence, Australian Government

EPA Other Sites with Contamination Issues

Lot 6 Princes Highway, Moruya, NSW 2537

EPA Other Sites with Contamination Issues

This dataset contains other sites identified on the EPA website as having contamination issues. This dataset currently includes:

- James Hardie asbestos manufacturing and waste disposal sites
- Radiological investigation sites in Hunter's Hill
- Pasminco Lead Abatement Strategy Area

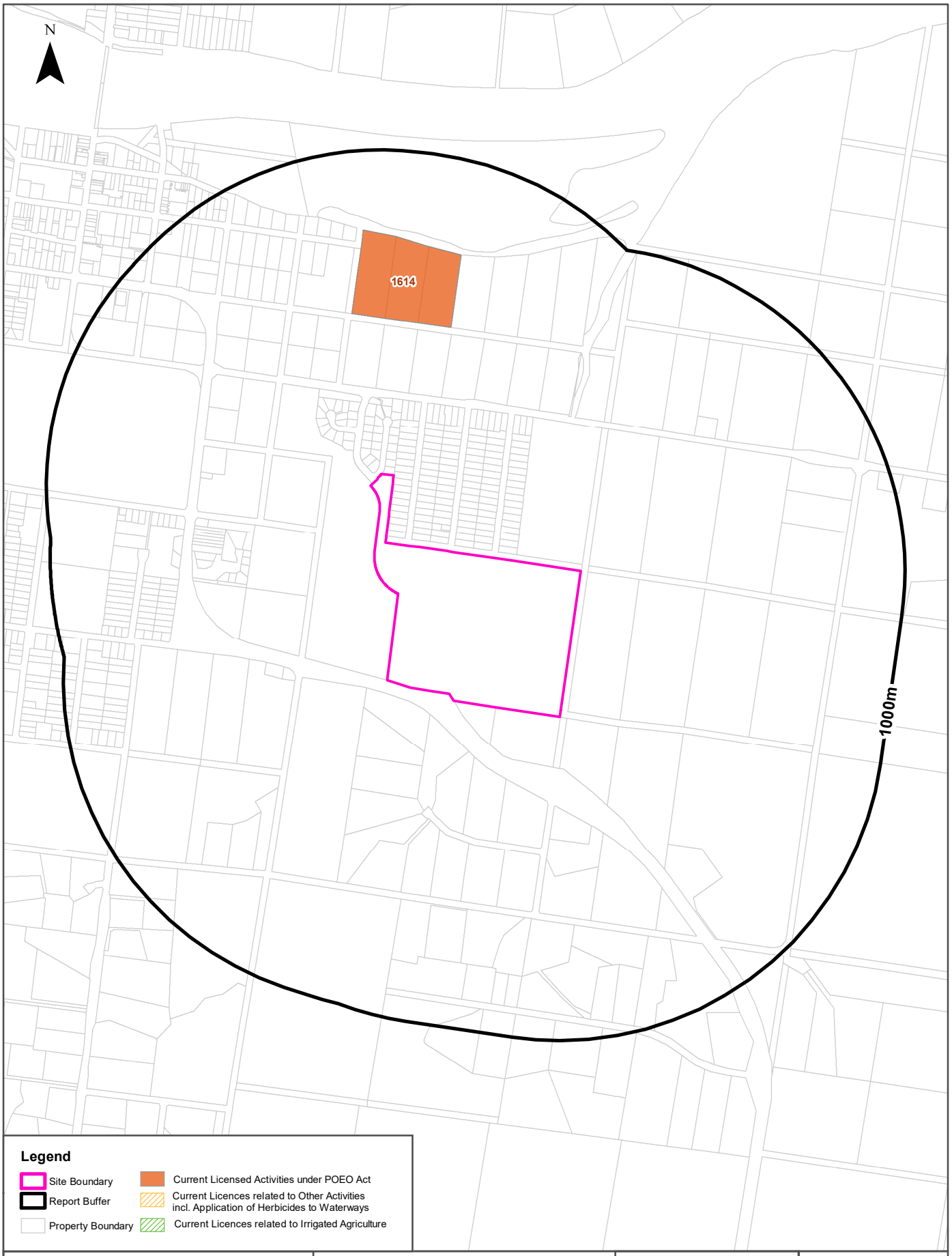
Sites within the dataset buffer:

Site Id	Site Name	Site Address	Dataset	Comments	Location Confidence	Distance	Direction
N/A	No records in buffer						

EPA Other Sites with Contamination Issues: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Current EPA Licensed Activities

Lot 6 Princes Highway, Moruya, NSW 2537



EPA Activities

Lot 6 Princes Highway, Moruya, NSW 2537

Licensed Activities under the POEO Act 1997

Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

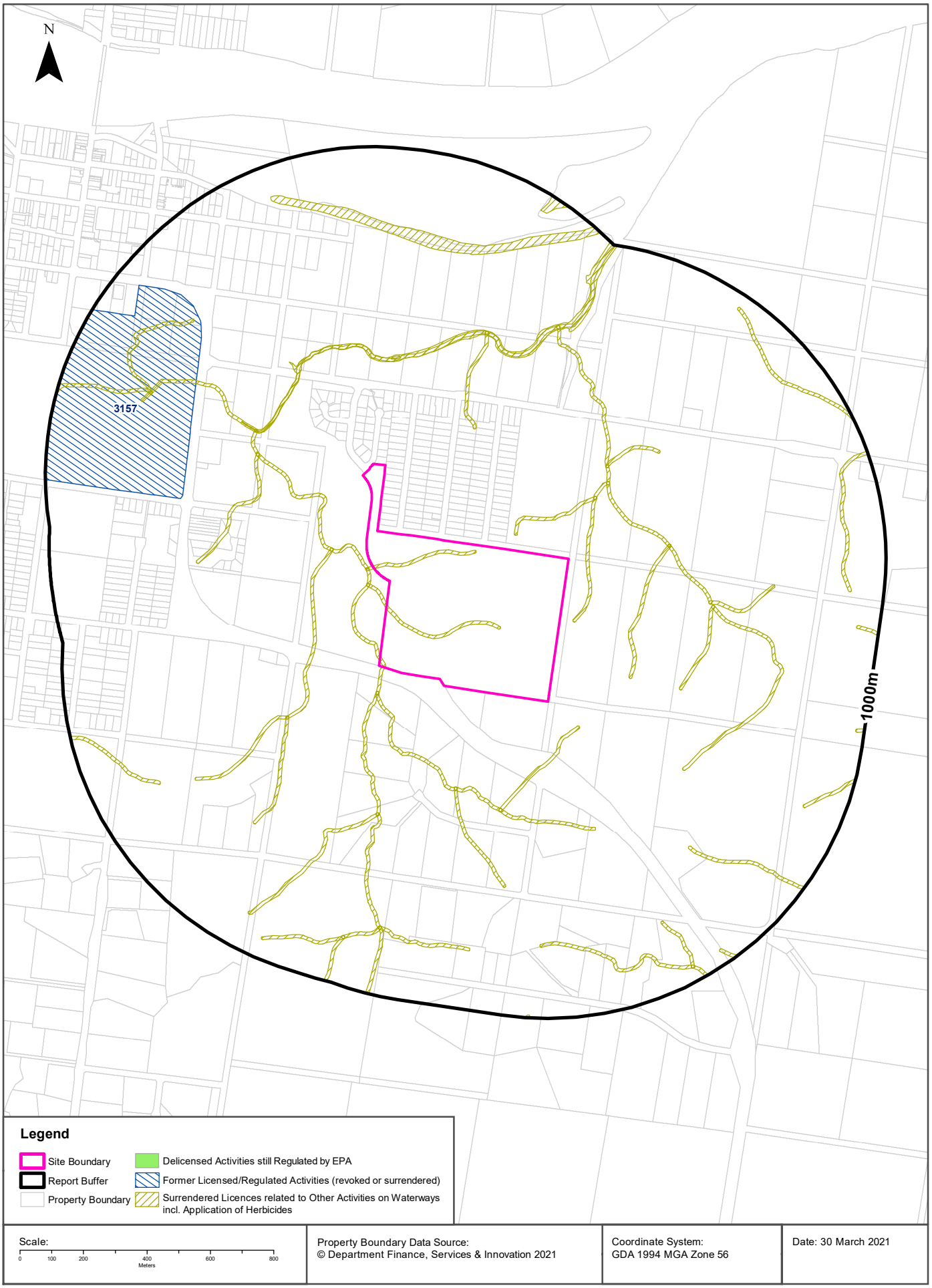
EPL	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
1614	EUROBODALLA SHIRE COUNCIL	MORUYA SEWAGE TREATMENT PLANT	QUEEN ST	MORUYA	Sewage treatment processing by small plants	Premise Match	478m	North

POEO Licence Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Delicensed & Former Licensed EPA Activities

Lot 6 Princes Highway, Moruya, NSW 2537



EPA Activities

Lot 6 Princes Highway, Moruya, NSW 2537

Delicensed Activities still regulated by the EPA

Delicensed activities still regulated by the EPA, within the dataset buffer:

Licence No	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
N/A	No records in buffer							

Delicensed Activities Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Former Licensed Activities under the POEO Act 1997, now revoked or surrendered

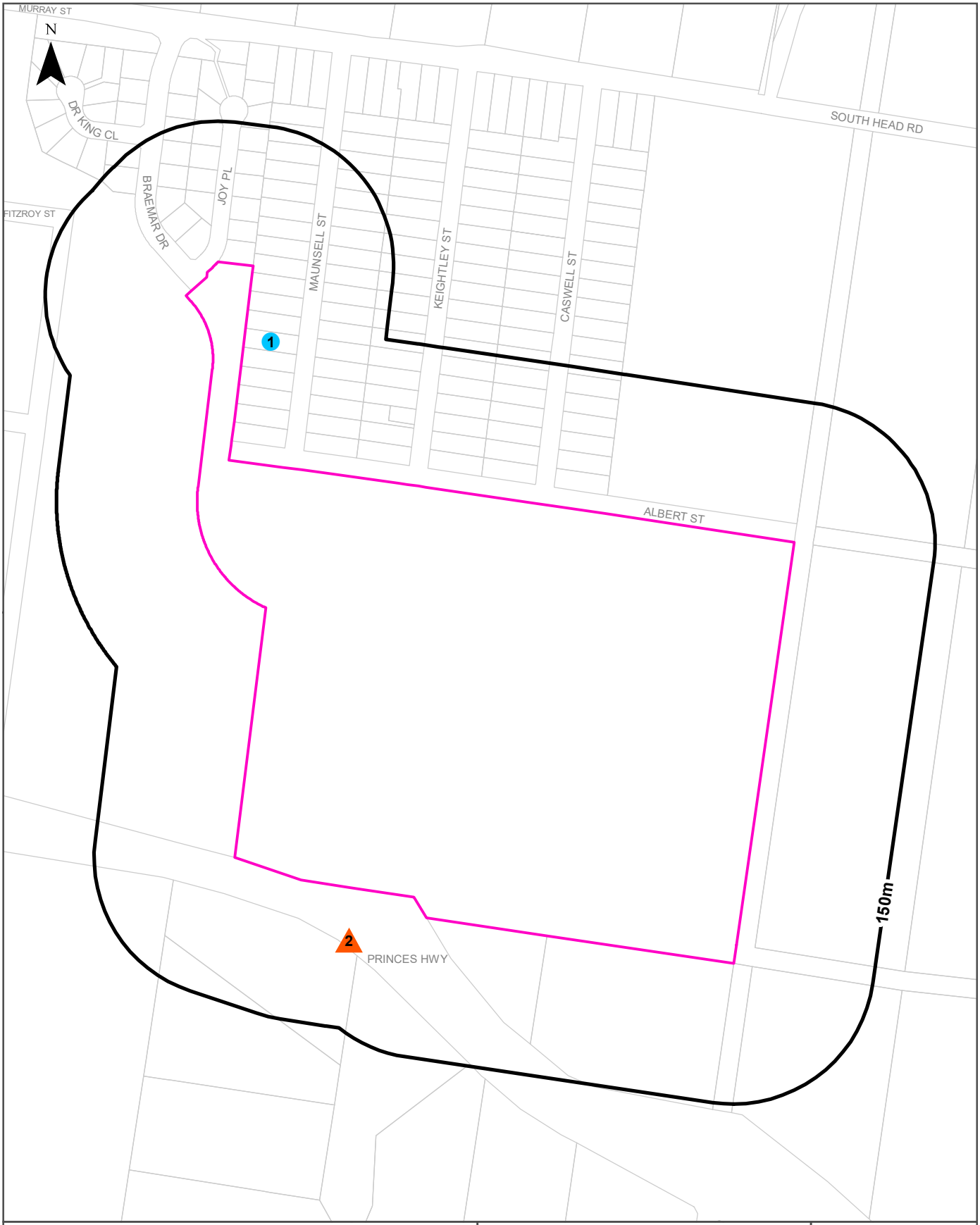
Former Licensed activities under the Protection of the Environment Operations Act 1997, now revoked or surrendered, within the dataset buffer:

Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW	Surrendered	06/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	Onsite
4838	Robert Orchard	Various Waterways throughout New South Wales - SYDNEY NSW 2000	Surrendered	07/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	Onsite
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW - PROSPECT, NSW, 2148	Surrendered	09/11/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	Onsite
3157	MORUYA GOLF CLUB LTD f	EVANS ST, MORUYA, NSW 2537	Surrendered	27/06/2000	Other activities, Sewage treatment processing by small plants	Premise Match	556m	North West

Former Licensed Activities Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Historical Business Directories

Lot 6 Princes Highway, Moruya, NSW 2537



Legend

- Site Boundary
- Buffer 150m
- Property Boundary
- Business directory records mapped to a specific premise
- Business directory records mapped to a road intersection
- Business directory records mapped to a road corridor
- Business directory records mapped to a general area

Scale: 0 75 150 225 300 Meters

Coordinate System: GDA 1994 MGA Zone 56

Date: 30 March 2021

Data Sources: Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

Lot 6 Princes Highway, Moruya, NSW 2537

Business Directory Records 1950-1991
Premise or Road Intersection Matches

Universal Business Directory records from years 1991, 1982, 1970, 1961 & 1950, mapped to a premise or road intersection within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
1	NOT LISTED	Brotherton N.L.& D.L Carrier., 25 Maunsell St, Moruya	148349	1991	Premise Match	0m	North West

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Business Directory Records 1950-1991
Road or Area Matches

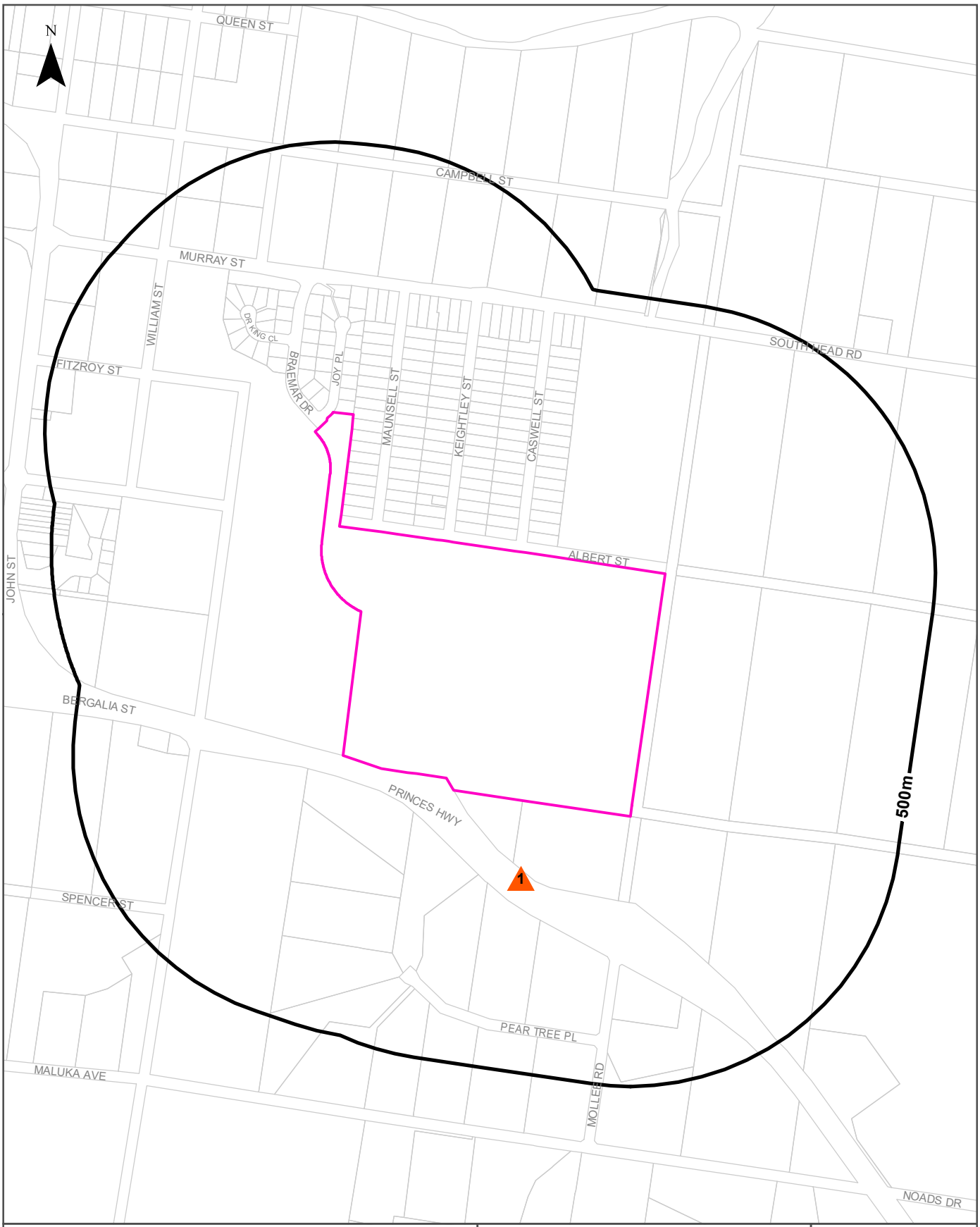
Universal Business Directory records from years 1991, 1982, 1970, 1961 & 1950, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
2	NOT LISTED	B & T Auto Electrics., Princes Hway, Moruya	148343	1991	Road Match	0m
	NOT LISTED	Caltex Oil Aust. Pty. Ltd., Princes Hway, Moruya	148350	1991	Road Match	0m
	NOT LISTED	Gogas Shell B.H.P. Autogas Pty. Ltd., Princes Hway, Moruya	148369	1991	Road Match	0m
	NOT LISTED	Golden Fleece Service Station., Princes Hway, Moruya	148370	1991	Road Match	0m
	NOT LISTED	Mobil Servicentre., Princes Hway, Moruya	148378	1991	Road Match	0m
	NOT LISTED	Moruya Produce & Machinery Pty. Ltd., Princes Hway, Moruya	148396	1991	Road Match	0m
	NOT LISTED	Motel Luhana., Princes Hway, Moruya	148403	1991	Road Match	0m
	NOT LISTED	Motel Moruya., Princes Hway, Moruya	148404	1991	Road Match	0m
	WINDSCREEN REPLACEMENTS &/OR REPAIRS.	Novus Windscreen Repairs., Unit 5 Highway Centre Princes Hway Moruya	148335	1991	Road Match	0m
	NOT LISTED	Pearly Shells Hotel-Motel., Princes Hway, Moruya	148407	1991	Road Match	0m
	NOT LISTED	River Breeze Caravan Park., Princes Hway, Moruya	148412	1991	Road Match	0m
	NOT LISTED	Shell Co. Of Australia., Princes Hway, Moruya	148413	1991	Road Match	0m
	NOT LISTED	Shellgas., Princes Hway, Moruya	148414	1991	Road Match	0m
	NOT LISTED	Specified Concrete Pty. Ltd., Princes Hway, Moruya	148417	1991	Road Match	0m
	NOT LISTED	Stejjbm Pty Ltd. Wndw. Fnme Mir., 21 Princes Hway, Moruya	148418	1991	Road Match	0m
	MOTOR GARAGES & ENGINEERS	BP Moruya Service Station, Princes Hghwy. Moruya	571976	1970	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Esso Servicenter, Princes Hghwy. Moruya	571977	1970	Road Match	0m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Golden Fleece Service Station (The), Princes Hghwy. Moruya	571988	1970	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Mobil Service Centre, Princes Hghwy. Moruya	571978	1970	Road Match	0m
	DRY CLEANERS, PRESSERS & DYERS	Moruya Dry Cleaners, Princes Hghwy. Moruya	571915	1970	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Vidgen Motors, Princes Hghwy. Moruya	571980	1970	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Bridge Motors, Princes Highway., Moruya	215231	1961	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Excelsior Garage and Service Station Pty. Ltd., Princes Highway., Moruya	215232	1961	Road Match	0m

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Dry Cleaners, Motor Garages & Service Stations

Lot 6 Princes Highway, Moruya, NSW 2537



Legend

- Site Boundary
- Buffer 500m
- Property Boundary
- Business directory records mapped to a specific premise
- Business directory records mapped to a road intersection
- Business directory records mapped to a road corridor
- Business directory records mapped to a general area

Scale: 0 130 260 390 520 Meters

Coordinate System: GDA 1994 MGA Zone 56

Date: 30 March 2021

Data Sources: Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

Lot 6 Princes Highway, Moruya, NSW 2537

Dry Cleaners, Motor Garages & Service Stations Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a premise or road intersection, within the dataset buffer.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
	No records in buffer						

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Dry Cleaners, Motor Garages & Service Stations Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
1	MOTOR GARAGES & ENGINEERS	BP Moruya Service Station, Princes Hghwy. Moruya	571976	1970	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Esso Servicenter, Princes Hghwy. Moruya	571977	1970	Road Match	0m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Golden Fleece Service Station (The), Princes Hghwy. Moruya	571988	1970	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Mobil Service Centre, Princes Hghwy. Moruya	571978	1970	Road Match	0m
	DRY CLEANERS, PRESSERS & DYERS	Moruya Dry Cleaners, Princes Hghwy. Moruya	571915	1970	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Vidgen Motors, Princes Hghwy. Moruya	571980	1970	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Bridge Motors, Princes Highway., Moruya	215231	1961	Road Match	0m
	MOTOR GARAGES & ENGINEERS	Excelsior Garage and Service Station Pty. Ltd., Princes Highway., Moruya	215232	1961	Road Match	0m

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Aerial Imagery 2020

Lot 6 Princes Highway, Moruya, NSW 2537



Scale:
0 60 120 180 240
Meters

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Coordinate System:
GDA 1994 MGA Zone 56

Date: 30 March 2021

Aerial Imagery 2015

Lot 6 Princes Highway, Moruya, NSW 2537



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Coordinate System: GDA 1994 MGA Zone 56

Date: 30 March 2021

Aerial Imagery 2012

Lot 6 Princes Highway, Moruya, NSW 2537



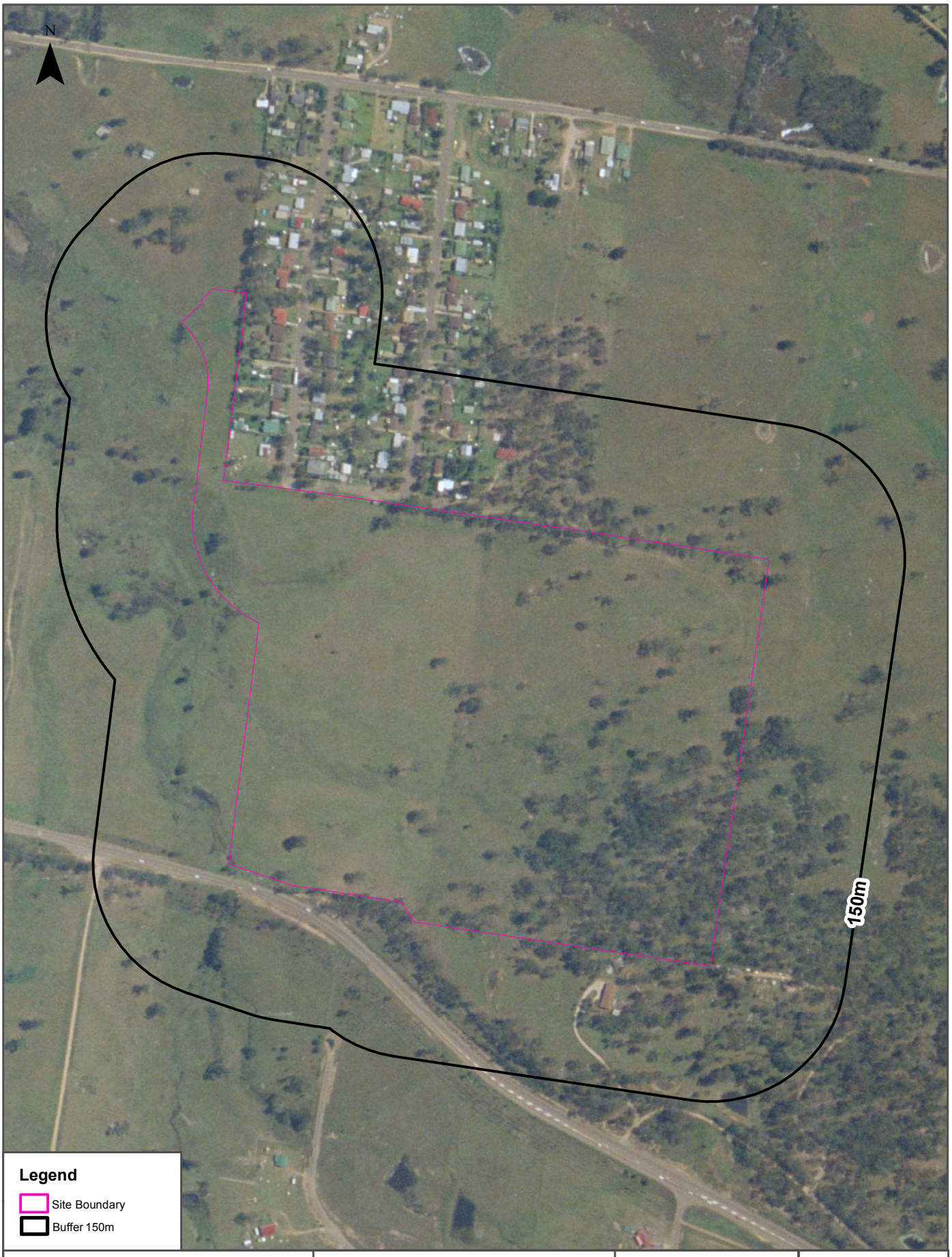
Aerial Imagery 2006

Lot 6 Princes Highway, Moruya, NSW 2537



Aerial Imagery 1999

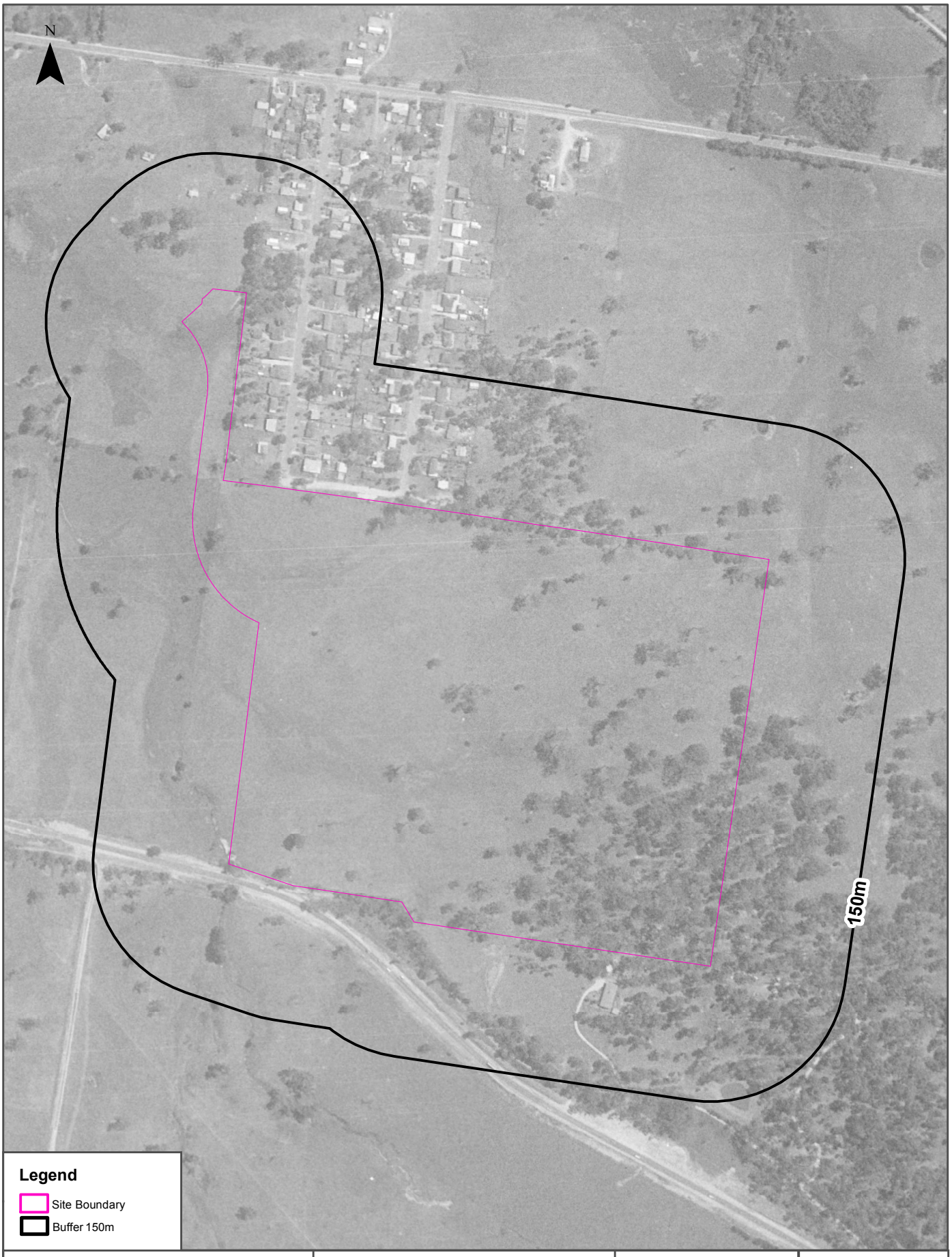
Lot 6 Princes Highway, Moruya, NSW 2537



Scale: 0 60 120 180 240 Meters	Data Source Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 30 March 2021

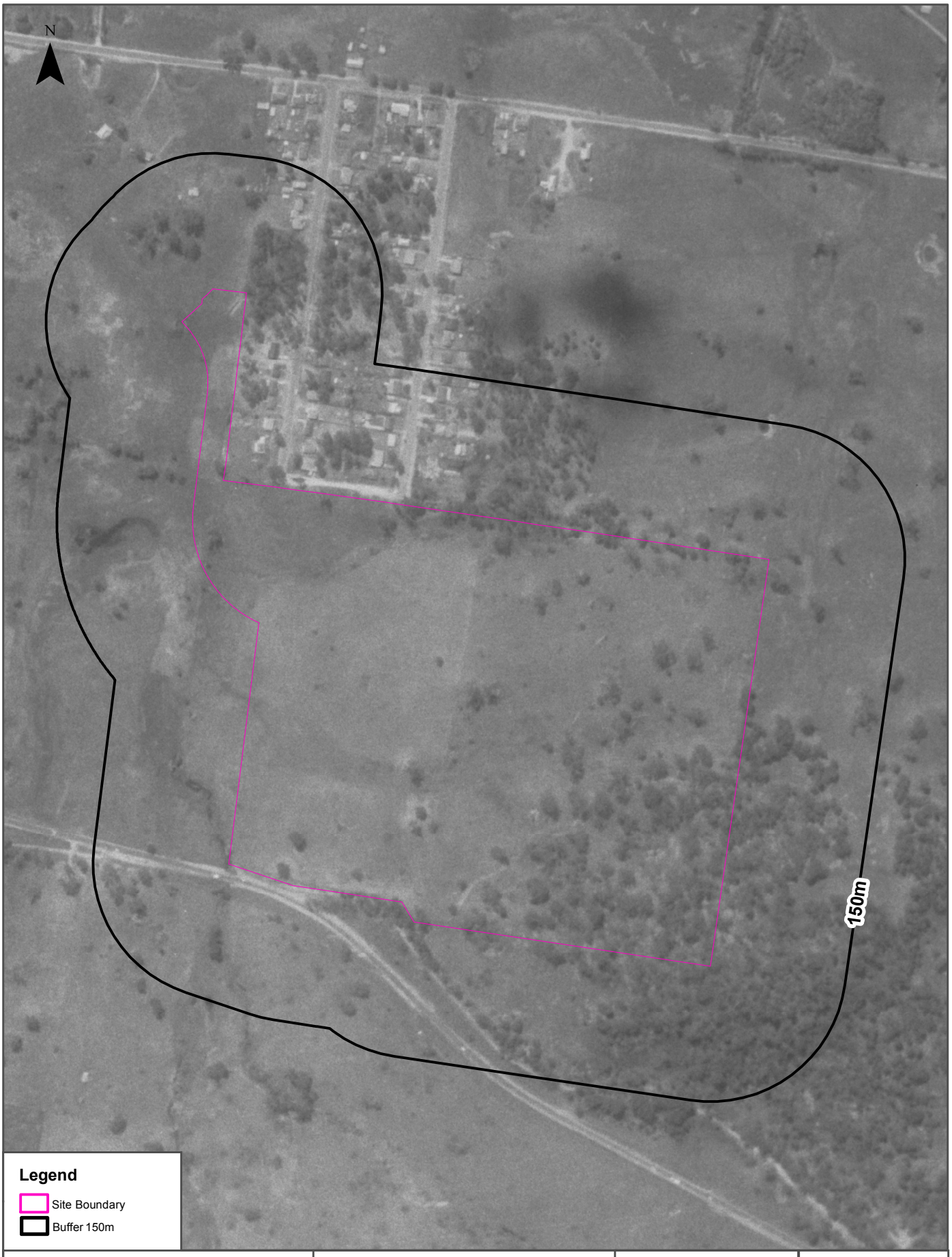
Aerial Imagery 1989

Lot 6 Princes Highway, Moruya, NSW 2537



Aerial Imagery 1981

Lot 6 Princes Highway, Moruya, NSW 2537



Aerial Imagery 1979

Lot 6 Princes Highway, Moruya, NSW 2537



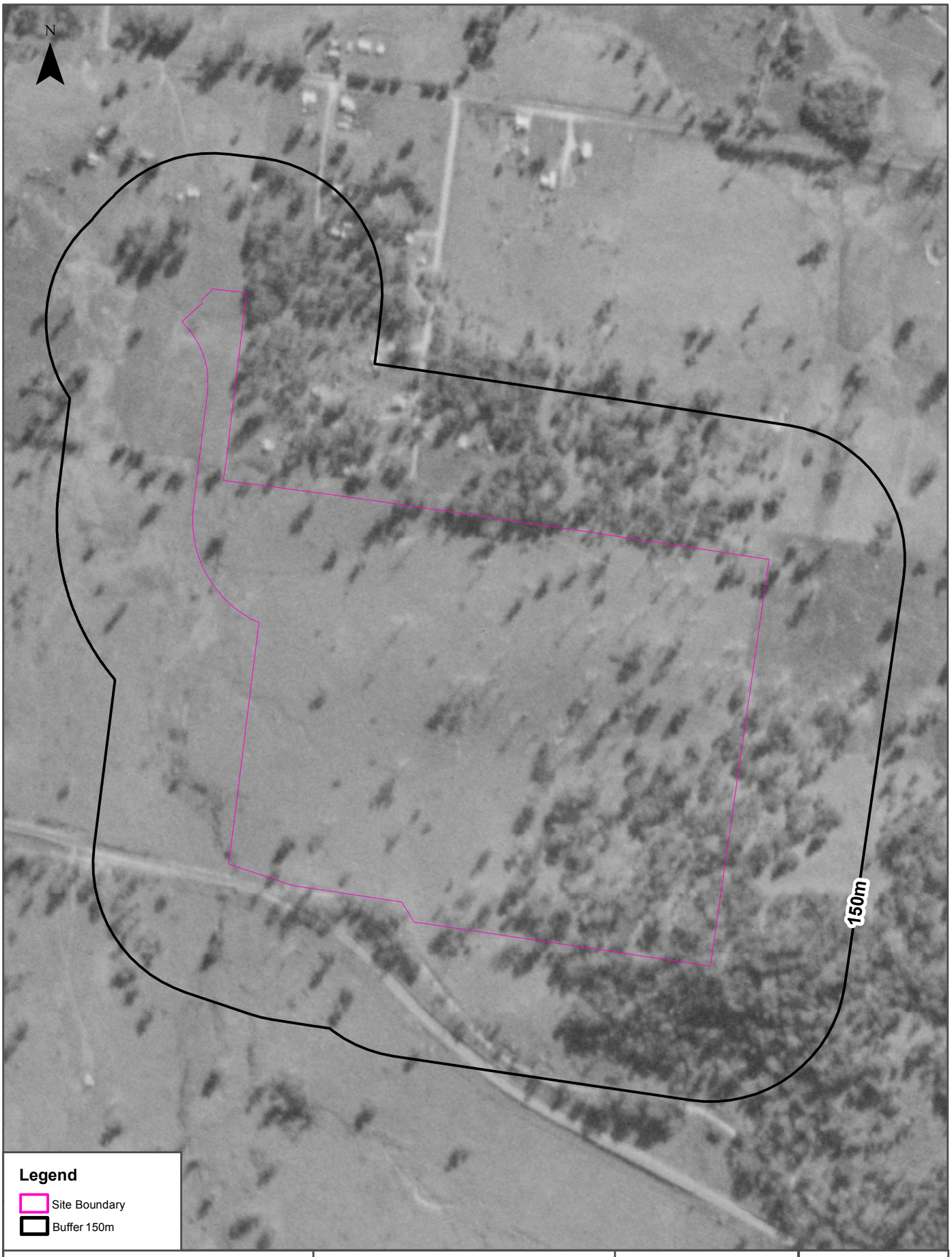
Aerial Imagery 1970

Lot 6 Princes Highway, Moruya, NSW 2537



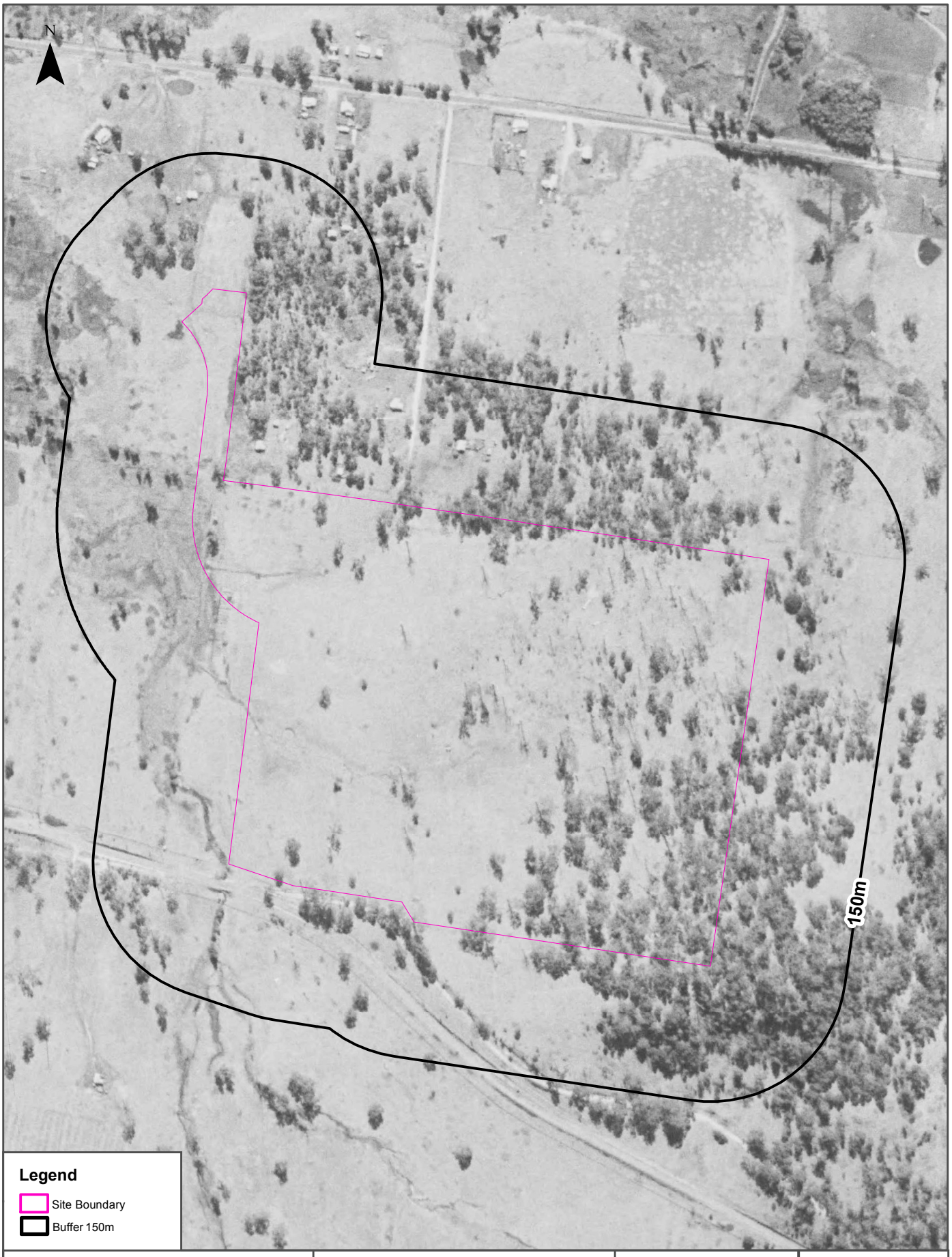
Aerial Imagery 1966

Lot 6 Princes Highway, Moruya, NSW 2537



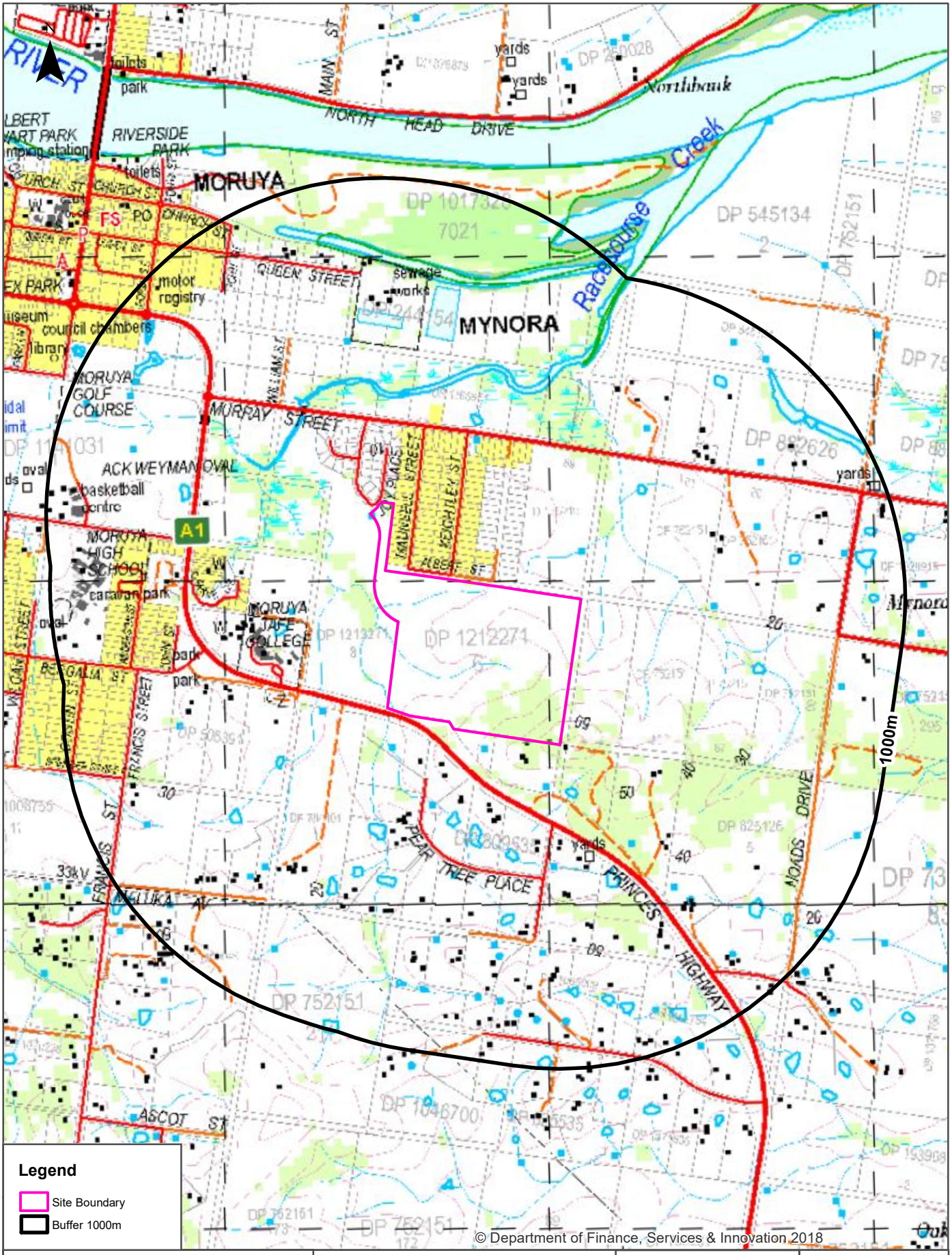
Aerial Imagery 1961

Lot 6 Princes Highway, Moruya, NSW 2537



Topographic Map 2015

Lot 6 Princes Highway, Moruya, NSW 2537



Legend

- Site Boundary
- Buffer 1000m

Scale: 0 100 200 400 600 800 Meters

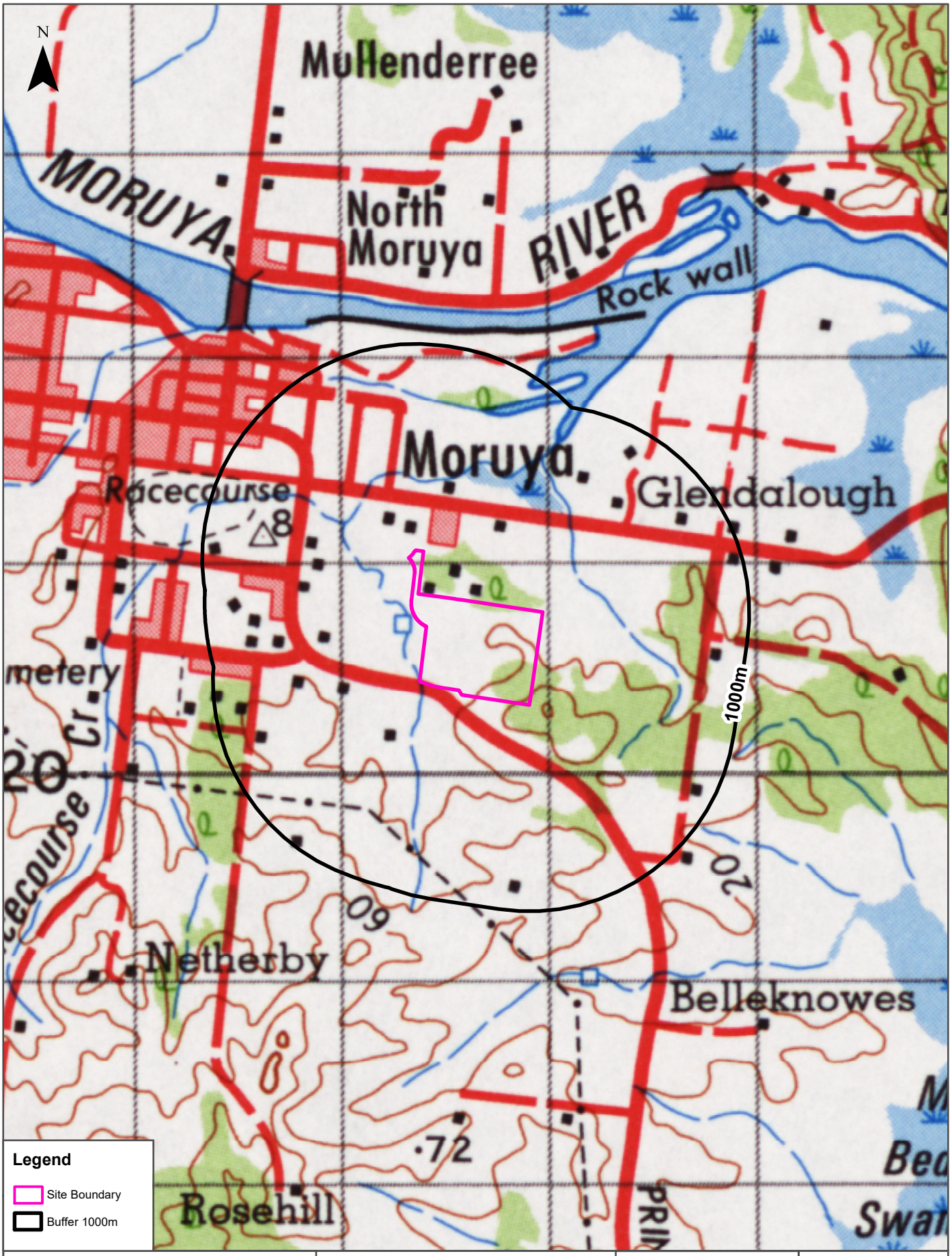
Data Sources: Topographic Map Data © NSW Land and Property Information

Coordinate System: GDA 1994 MGA Zone 56

Date: 30 March 2021

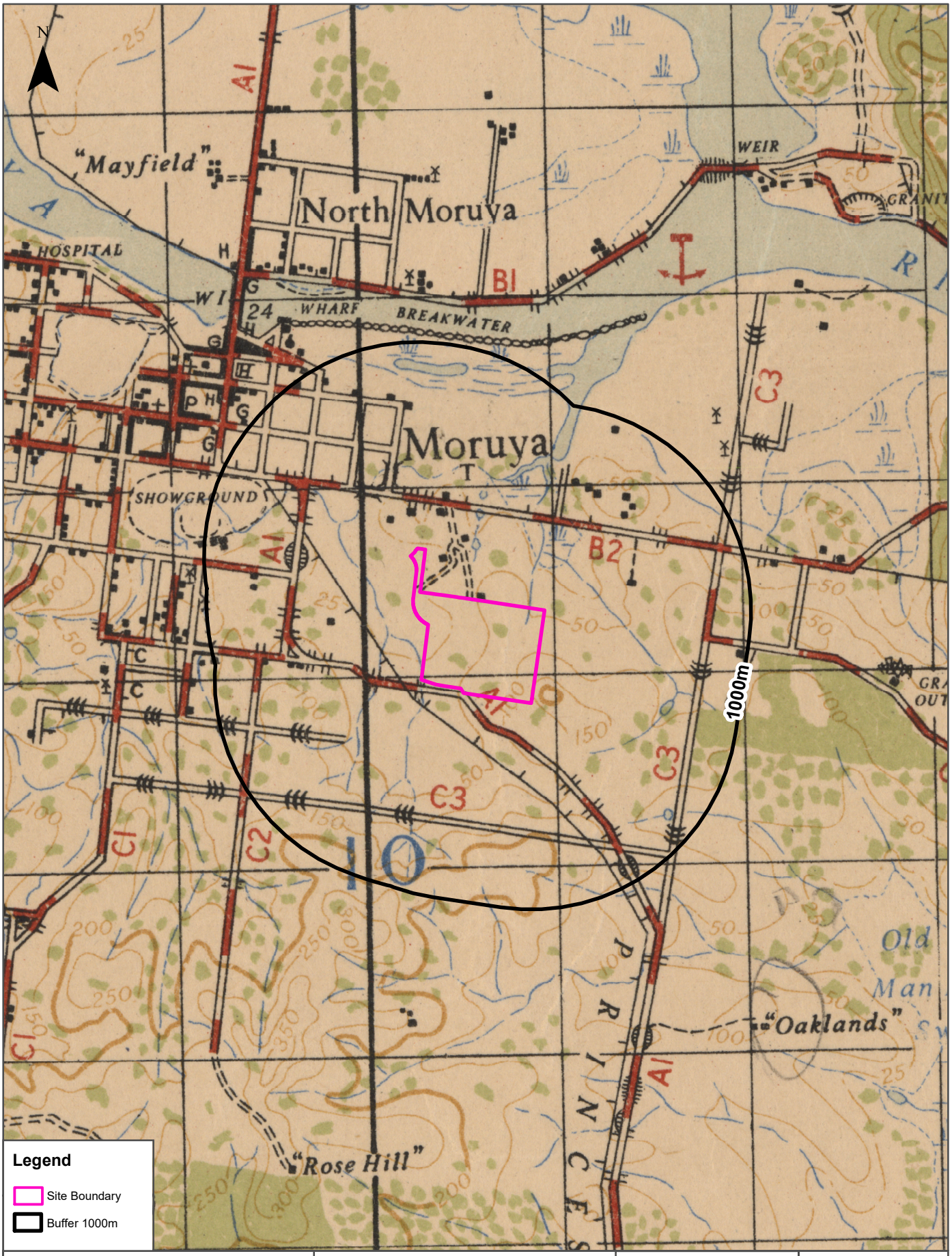
Historical Map 1971

Lot 6 Princes Highway, Moruya, NSW 2537



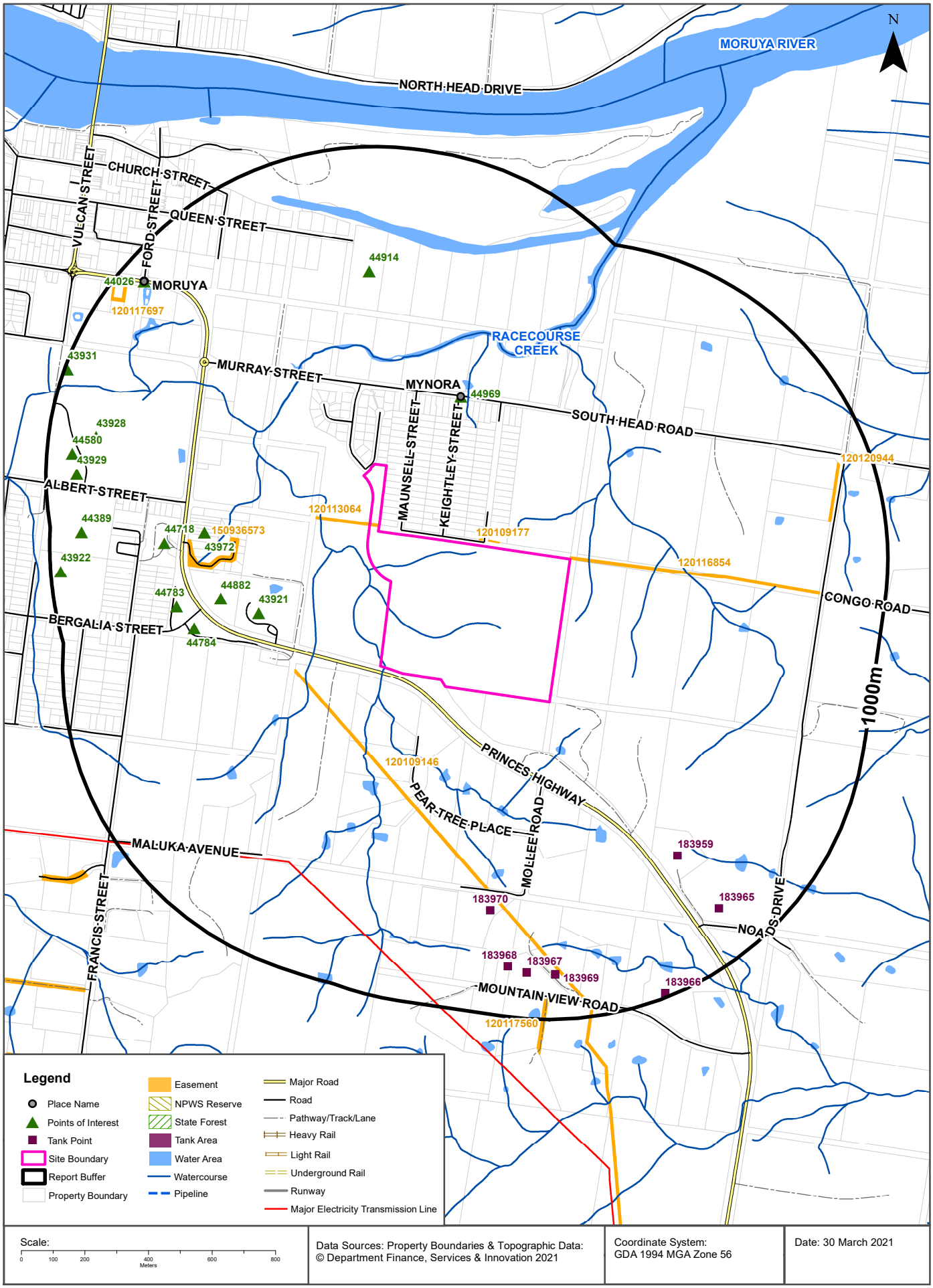
Historical Map c.1943

Lot 6 Princes Highway, Moruya, NSW 2537



Topographic Features

Lot 6 Princes Highway, Moruya, NSW 2537



Topographic Features

Lot 6 Princes Highway, Moruya, NSW 2537

Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
44969	Urban Place	MYNORA	319m	North
43921	TAFE College	MORUYA TAFE COLLEGE	388m	West
44882	Place Of Worship	Place Of Worship	485m	West
43972	Place Of Worship	BAPTIST CHURCH	514m	West
44784	Park	Park	594m	West
44914	Sewage Works	Sewage Works	608m	North
44783	Park	Park	625m	West
44718	Tourist Park / Home Village	BLUE GUMS CARAVAN PARK	638m	West
43928	Sports Field	ACK WEYMAN OVAL	850m	North West
44389	High School	MORUYA HIGH SCHOOL	900m	West
43929	Sports Centre	BASKETBALL CENTRE	902m	West
44580	Community Facility	MORUYA SHOWGROUND EXHIBITION PAVILION	919m	West
44026	Town	MORUYA	923m	North West
43922	Sports Field	OVAL	967m	West
43931	Golf Course	MORUYA GOLF COURSE	990m	North West

Topographic Data Source: © Land and Property Information (2015)
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Topographic Features

Lot 6 Princes Highway, Moruya, NSW 2537

Tanks (Areas)

What are the Tank Areas located within the dataset buffer?
Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
	No records in buffer					

Tanks (Points)

What are the Tank Points located within the dataset buffer?
Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
183959	Water	Operational		01/11/2014	629m	South East
183970	Water	Operational		01/11/2014	676m	South
183965	Water	Operational		01/11/2014	840m	South East
183968	Water	Operational		01/11/2014	843m	South
183967	Water	Operational		01/11/2014	855m	South
183969	Water	Operational		01/11/2014	858m	South
183966	Water	Operational		01/11/2014	987m	South East

Tanks Data Source: © Land and Property Information (2015)
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Major Easements

What Major Easements exist within the dataset buffer?
Note. Easements provided by LPI are not at the detail of local governments. They are limited to major easements such as Right of Carriageway, Electrical Lines (66kVa etc.), Easement to drain water & Significant subterranean pipelines (gas, water etc.).

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
120113064	Primary	Undefined		0m	Onsite
120116854	Primary	Undefined		2m	East
120109177	Primary	Undefined		20m	North
120109146	Primary	Undefined		207m	South
150936573	Primary	Right of way	15 and variable	405m	West
120120944	Primary	Undefined		822m	East
120117697	Primary	Undefined		931m	North West

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
120117560	Primary	Undefined		937m	South

Easements Data Source: © Land and Property Information (2015)
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Topographic Features

Lot 6 Princes Highway, Moruya, NSW 2537

State Forest

What State Forest exist within the dataset buffer?

State Forest Number	State Forest Name	Distance	Direction
N/A	No records in buffer		

State Forest Data Source: © NSW Department of Finance, Services & Innovation (2018)
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National Parks and Wildlife Service Reserves

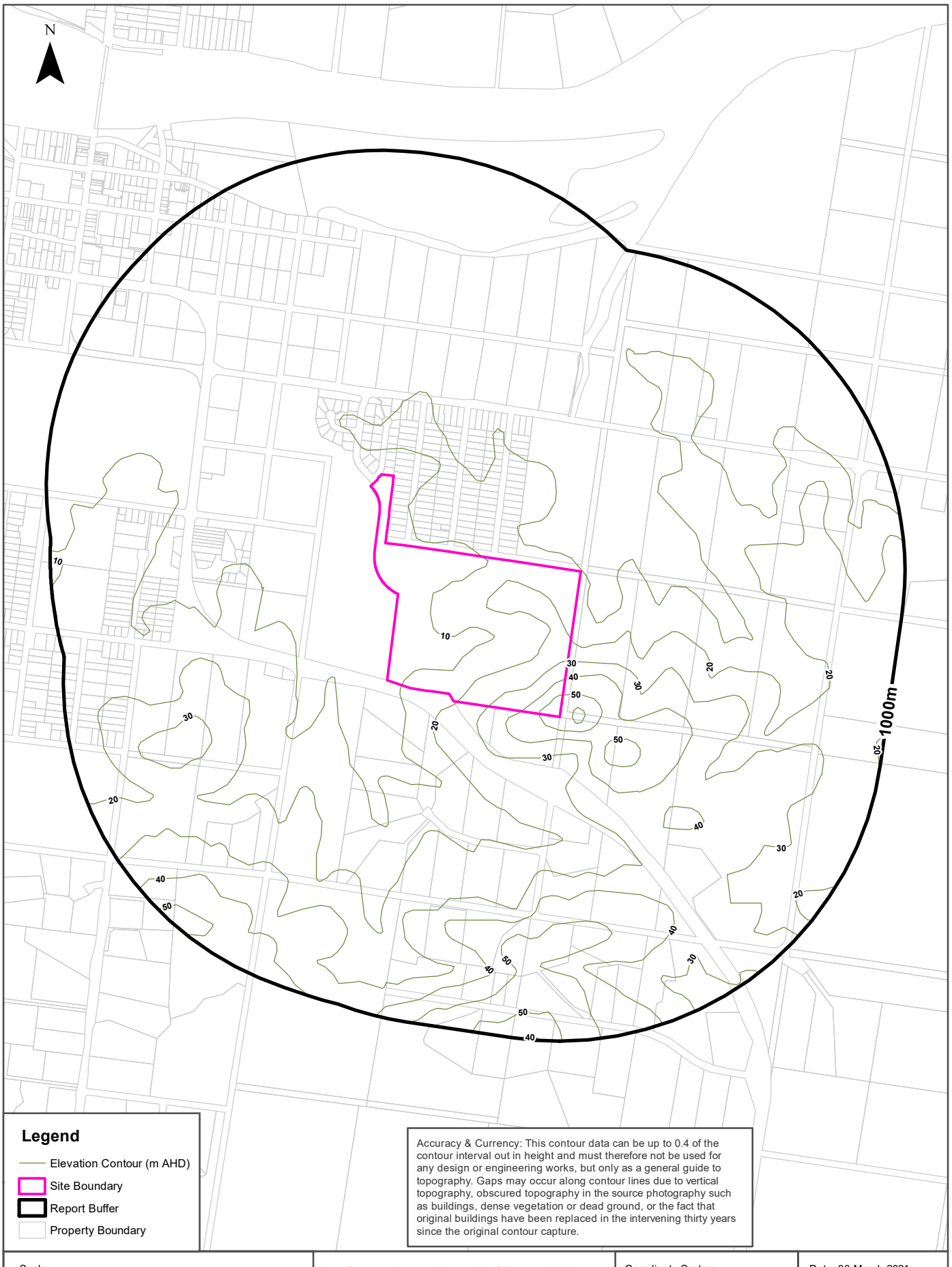
What NPWS Reserves exist within the dataset buffer?

Reserve Number	Reserve Type	Reserve Name	Gazetted Date	Distance	Direction
N/A	No records in buffer				

NPWS Data Source: © NSW Department of Finance, Services & Innovation (2018)
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Elevation Contours (m AHD)

Lot 6 Princes Highway, Moruya, NSW 2537



Hydrogeology & Groundwater

Lot 6 Princes Highway, Moruya, NSW 2537

Hydrogeology

Description of aquifers on-site:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity

Description of aquifers within the dataset buffer:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)
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Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018

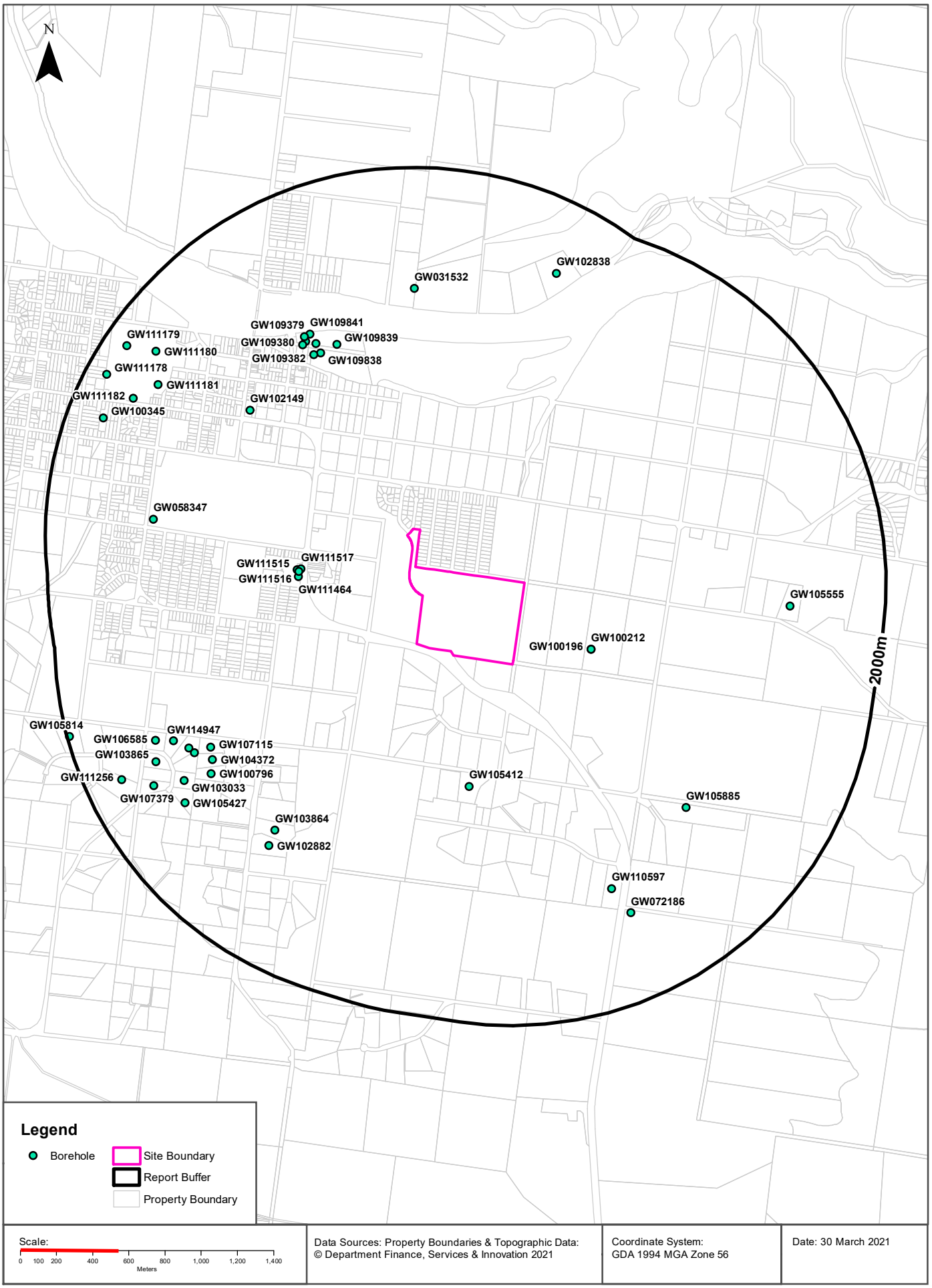
Temporary water restrictions relating to the Botany Sands aquifer within the dataset buffer:

Prohibition Area No.	Prohibition	Distance	Direction
N/A	No records in buffer		

Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018 Data Source : NSW Department of Primary Industries

Groundwater Boreholes

Lot 6 Princes Highway, Moruya, NSW 2537



Hydrogeology & Groundwater

Lot 6 Princes Highway, Moruya, NSW 2537

Groundwater Boreholes

Boreholes within the dataset buffer:

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m bgl)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW100212	10BL152225	Bore	Private	Domestic, Stock	Domestic, Stock		12/05/1993	12.00	12.00	Good	2.00	0.600		418m	East
GW100196	10BL145757	Bore		Domestic	Domestic		01/01/1992	24.00			4.00			418m	East
GW111517	10BL603275	Bore	Private	Monitoring Bore	Monitoring Bore		13/12/2010	8.80	8.80					598m	West
GW111516	10BL603275	Bore	Private	Monitoring Bore	Monitoring Bore		13/12/2010	8.70	8.70					609m	West
GW111464	10BL604658	Bore	Private	Monitoring Bore	Monitoring Bore		16/05/2011	7.50	7.50					613m	West
GW111515	10BL603275	Bore	Private	Monitoring Bore	Monitoring Bore		13/12/2010	8.80	8.80					620m	West
GW105412	10BL160723	Bore		Domestic, Stock	Domestic		03/01/2003	86.50	86.50		15.80	0.013		705m	South
GW109838	10BL601366	Bore	Local Govt	Monitoring Bore	Monitoring Bore		18/12/2006	3.20	3.20					1099m	North West
GW109839	10BL601366	Bore	Local Govt	Monitoring Bore	Monitoring Bore		18/12/2006	3.20	3.20					1103m	North West
GW109382	10BL601776	Bore	Local Govt	Test Bore	Test Bore		18/12/2006	3.20	3.20					1108m	North West
GW102149	10BL158263	Piezo meter	Private	Monitoring Bore	Monitoring Bore			5.00	5.00		2.25			1109m	North West
GW109381	10BL601776	Bore	Local Govt	Test Bore	Test Bore		18/12/2006	3.20	3.20					1157m	North West
GW109380	10BL601776	Bore	Local Govt	Test Bore	Test Bore		02/10/2008	3.20	3.20					1187m	North West
GW109840	10BL601366	Bore	Local Govt	Monitoring Bore	Monitoring Bore		18/12/2006	3.20	3.20		2.53			1194m	North West
GW109841	10BL601366	Bore	Local Govt	Monitoring Bore	Monitoring Bore		18/12/2006	3.20	3.20		2.17			1219m	North West
GW109379	10BL601776	Bore	Local Govt	Test Bore	Test Bore		02/10/2008	3.20	3.20					1221m	North West
GW105885	10BL160882	Bore		Domestic, Stock			09/05/2005							1245m	South East
GW107115	10BL162509	Bore	Private	Domestic, Stock	Domestic, Stock		04/02/2004	25.60	25.60	Good	1.90	2.000		1272m	South West
GW103864	10BL159407	Bore		Domestic, Stock	Domestic		15/06/2000	36.00	36.00	100	1.50	1.200		1295m	South West
GW104372	10BL159308	Bore	Private	Domestic	Domestic		01/01/1997	40.00	40.00		6.00			1297m	South West
GW031532	10BL023653	Well	Private	Domestic, Stock	Not Known			2.70	2.80	Fair				1330m	North
GW100796	10BL150734	Bore		Domestic, Farming, Stock	Stock		01/01/1993	33.00	33.00		31.00	0.500		1343m	South West
GW110597	10BL165948	Bore	Private	Domestic, Stock	Domestic, Stock		01/01/2006	30.00			24.00	0.080		1359m	South East
GW107975	10BL164970	Bore	Private	Domestic	Domestic		15/04/2005	31.40	31.40		5.00	2.000		1368m	South West
GW102882	10BL158030	Bore		Domestic, Stock	Domestic, Stock		01/01/1997	50.00	50.00		25.00	1.000		1384m	South West
GW105601	10BL160843	Bore	Private	Domestic	Domestic		18/10/2002	31.70	31.70	Good	4.50	0.750		1385m	South West

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m bgl)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW058347	10BL127781	Bore	Private	Domestic	Recreation (groundwater)		01/12/1982	83.80	83.80					1404m	West
GW114947	10WA119059	Bore	Private	Domestic, Stock	Domestic, Stock		03/12/2014	25.00	25.00		6.00	0.760		1447m	South West
GW105555	10BL161035, 10BL601999, 10WA118715	Bore	Private	Domestic, Irrigation, Stock	Irrigation		31/07/2003	31.70	31.70	Good	6.10	0.750		1475m	East
GW103033	10BL157964	Bore		Domestic, Stock	Domestic, Stock		01/01/1997	25.00	25.00					1491m	South West
GW072186		Bore open thru rock	Private		Domestic, Stock		01/02/1994	24.00	24.00	Good				1524m	South East
GW106585	10BL163749	Bore	Private	Domestic, Stock	Domestic, Stock		01/09/2004	31.00	31.00	400	3.60	0.375		1538m	West
GW105427	10BL160186	Bore		Domestic, Stock	Domestic, Stock		03/02/2002	31.70	31.70		7.10	1.000		1553m	South West
GW103865	10BL159417	Bore		Domestic, Stock	Domestic		22/12/1999	43.00	43.00	100	3.50	1.500		1581m	South West
GW102838	10BL138501	Bore		Domestic	Domestic		01/01/1988	50.00	50.00					1606m	North
GW111181	10BL604231	Bore	Local Govt	Monitoring Bore	Monitoring Bore		16/08/2010	3.60	3.60					1609m	North West
GW107379	10BL162536	Bore	Private	Domestic	Domestic		30/01/2004	31.00	31.00	Good	5.40	0.680		1651m	South West
GW111182	10BL604231	Bore	Local Govt	Monitoring Bore	Monitoring Bore		16/08/2010	3.60	3.60					1692m	North West
GW111180	10BL604231	Bore	Local Govt	Monitoring Bore	Monitoring Bore		16/08/2010	3.60	3.60					1721m	North West
GW111256	10BL601361	Bore	Private	Domestic, Stock	Domestic, Stock		28/03/2007	37.50	37.50	good	8.20	0.300		1795m	South West
GW100345	10BL143325	Bore	Private	Domestic, Stock	Domestic, Stock		01/05/1991	15.00	15.00	800	1.00	0.700		1799m	North West
GW111179	10BL604231	Bore	Local Govt	Monitoring Bore	Monitoring Bore		16/08/2010	3.60	3.60					1870m	North West
GW111178	10BL604231	Bore	Local Govt	Monitoring Bore	Monitoring Bore		16/08/2010	3.60	3.60					1883m	North West
GW105814	10BL161392	Bore	Private	Domestic	Domestic		18/03/2003	43.90	43.90		5.10	0.390		1986m	West

Borehole Data Source : NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corporation for all bores prefixed with GW. All other bores © Commonwealth of Australia (Bureau of Meteorology) 2015. Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

Hydrogeology & Groundwater

Lot 6 Princes Highway, Moruya, NSW 2537

Driller's Logs

Drill log data relevant to the boreholes within the dataset buffer:

Groundwater No	Drillers Log	Distance	Direction
GW100212	0.00m-1.00m BLACK SOILS 1.00m-6.00m DECOMPOSED GRANITE 6.00m-8.00m SAND 8.00m-12.00m GRANITE	418m	East
GW111517	0.00m-0.20m CONCRETE 0.20m-0.30m GRAVEL, MEDIUM GRAINED 0.30m-3.00m CLAY GRAVELLY SANDY,FINE GRAINED 3.00m-8.80m GRAVELLY SANDY CLAY,FINE GRAINED GRAVEL AND SAND	598m	West
GW111516	0.00m-0.20m CONCRETE 0.20m-0.40m GRAVELLY SANDY CLAY,FINE GRAINED,DRY 0.40m-2.00m CLAY GRAVELLY SANDY,FINE GRAINED SAND AND GRAVEL 2.00m-3.00m GRAVELLY SANDY CLAY ,BROWN 3.00m-5.40m GRAVELLY SANDY CLAY ,MOIST DARK BROWN 5.40m-8.70m GRAVELLY SANDY CLAY,VERY MOIST TO WET	609m	West
GW111464	0.00m-0.20m CONCRETE 0.20m-6.00m GRAVEL SANDY WITH MINOR CLAY 6.00m-7.50m CLAY SANDY WITH MINOR GRAVEL,LOOSE SAND	613m	West
GW111515	0.00m-0.20m CONCRETE 0.20m-0.60m SILTY CLAY,FIRM,DRY,LOW PLASTICITY,YELLOW,BROWN,GREY 0.60m-5.70m GRAVELLY SANDY CLAY,FINE GRAINED SAND AND GRAVEL 5.70m-8.80m CLAY,GRAVELLY,SANDY,DARK BROWN	620m	West
GW105412	0.00m-0.90m TOPSOIL / SAND/CLAY 0.90m-25.90m BLUE GRANITEBANDS OF DECOMP.ROCKS 25.90m-51.00m BLUE GRANITE 51.00m-58.00m GRANITE 58.00m-86.50m HARD BLUE GRANITE	705m	South
GW109838	0.00m-0.30m SILTY SAND,MEDIUM BROWN,LOOSE,SLIGHT MOISTURE 0.30m-3.20m SILTY SAND,LIGHT BROWN,GRAINED,MOSTLY COURSE SAND,SEA SHELLS	1099m	North West
GW109839	0.00m-0.60m SILTY SAND,MEDIUM BROWN,LOOSE,SLIGHT MOISTURE,SOME GRAVEL 0.60m-3.20m SILTY SAND,L/BROWN,GRAINED MOSTLY COURSE SAND,SOME SEA SHELLS	1103m	North West
GW109382	0.00m-0.30m SILTY SAND,MED.BROWN 0.30m-3.20m SILTY SAND,L/BROWN,SOME SEA SHELLS	1108m	North West
GW102149	0.00m-1.30m Clay/Gravel Fill 1.30m-2.50m Sandy Clay 2.50m-3.25m Clay and Sand 3.25m-5.00m Sandy Clay	1109m	North West
GW109381	0.00m-0.60m SILTY SAND,MED BROWN,SOME FINE GRAVEL 0.60m-3.20m SILTY SAND,L/BROWN,LOOSE SOME SEA SHELLS	1157m	North West
GW109380	0.00m-1.00m SILTY SAND,MED.BROWN,SLIGHT MOISTURE 1.00m-3.20m SILTY SAND,L/BROWN, HOMOGENOUS,LOOSE	1187m	North West
GW109840	0.00m-1.00m SILTY SAND,MEDIUM BROWN,LOOSE,SLIGHT MOISTURE 1.00m-3.20m SILTY SAND,L/BROWN,GRAINED,MOSTLY COURSE SAND ,SILT,LOOSE	1194m	North West
GW109841	0.00m-2.00m SILTY SAND,MEDIUM BROWN,LOOSE,SLIGHT MOISTURE,SEA SHELLS 2.00m-3.20m SILTY SAND,L/BROWN,MOSTLY COURSE SAND,SEA SHELLS	1219m	North West
GW109379	0.00m-2.00m SILTY SAND,MEDIUM BROWN,SEA SHELLS 2.00m-3.20m SILTYSAND,L/BROWN,LOOSE TRACE OF SEA SHELLS	1221m	North West
GW107115	0.00m-1.20m Topsoil, dark 1.20m-3.90m Clay, red 3.90m-5.40m Sandy Clay 5.40m-10.60m Granite, decomposed 10.60m-14.30m Granite, hard, decomposed 14.30m-19.20m Granite, blue, some bands of decomposed 19.20m-25.60m Granite, blue	1272m	South West
GW103864	0.00m-1.00m TOPSOIL AND CLAY (GREY) 1.00m-6.00m WEATHERED GRANITE 6.00m-9.00m HARD GRANITE 9.00m-36.00m HARD TO WEATHERED GRANITE	1295m	South West

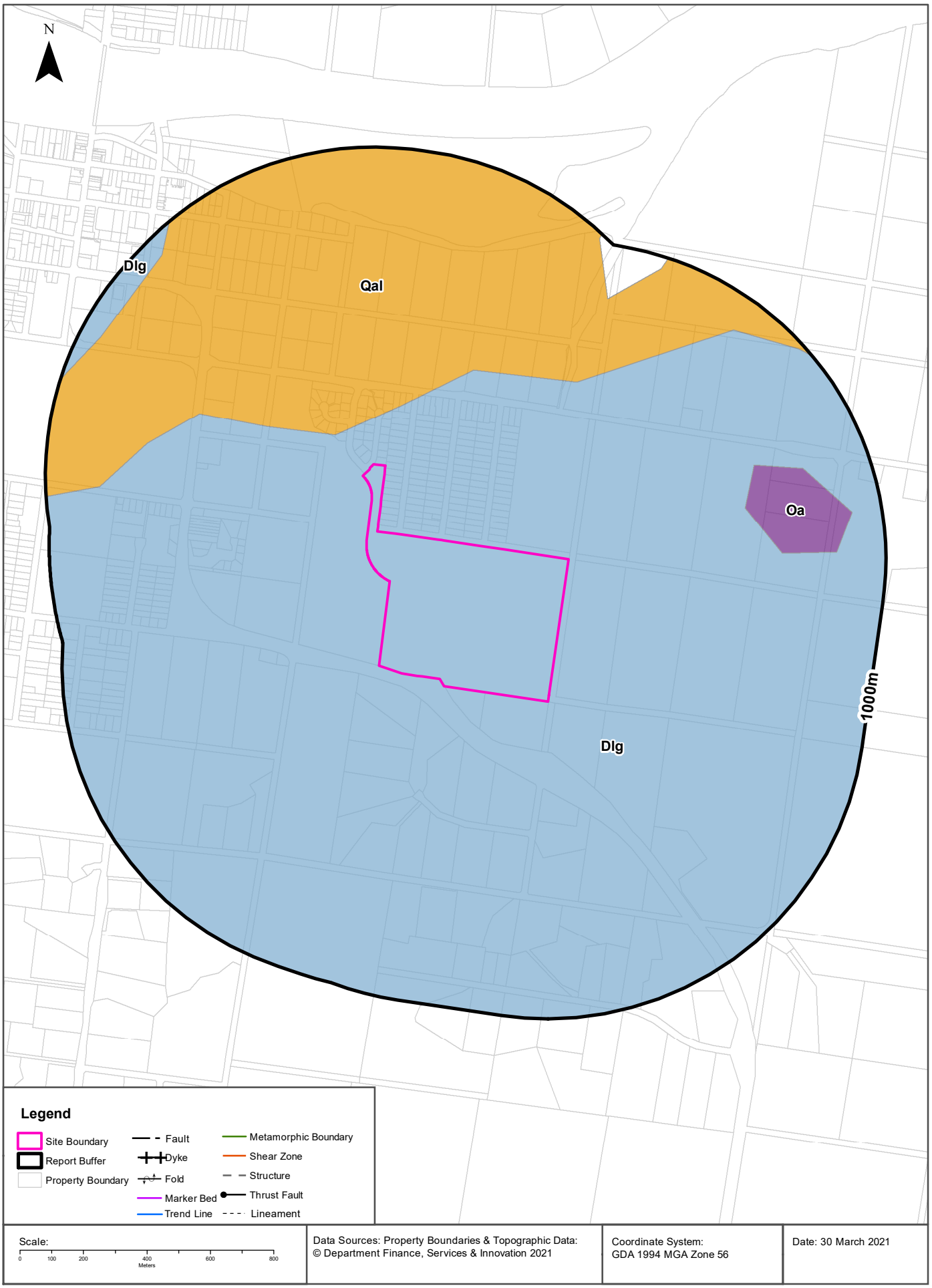
Groundwater No	Drillers Log	Distance	Direction
GW031532	0.00m-2.44m Loam Sandy 2.44m-2.76m Sand Water Supply	1330m	North
GW107975	0.00m-0.90m topsoil' 0.90m-7.60m granite, soft decompsoed 7.60m-12.10m granite, decomposed 12.10m-31.40m granite, blue some bands of weathered granite	1368m	South West
GW105601	0.00m-0.90m topsoil 0.90m-10.60m granite 10.60m-31.40m granite, blue	1385m	South West
GW058347	0.00m-0.30m Topsoil 0.30m-7.60m Clay Water Supply 7.60m-83.80m Granite	1404m	West
GW114947	0.00m-1.00m TOPSOIL 1.00m-4.00m CLAY 4.00m-11.00m GRANITE DECOMPOSED 11.00m-13.00m GRANITE DECOMPOSED WATER SUPPLY 13.00m-21.00m GRANITE 21.00m-22.00m GRANITE WATER SUPPLY 22.00m-25.00m GRANITE	1447m	South West
GW105555	0.00m-0.90m SANDY TOPSOIL 0.90m-8.50m DECOMPOSED GRANITE 8.50m-27.40m WHITE GRANITE 27.40m-31.70m BLUE GRANITE	1475m	East
GW072186	0.00m-5.00m Decomposed Granite	1524m	South East
GW106585	0.00m-0.90m clay, red 0.90m-4.50m granite, red decomposed 4.50m-31.00m granite, blue with bonds of decomposed	1538m	West
GW105427	0.00m-0.90m DARK BROWN TOPSOIL 0.90m-10.60m DECOMPOSED GRANITE 10.60m-31.70m HARD BLUE GRANITE	1553m	South West
GW103865	0.00m-0.50m TOPSOIL AND CLAY 0.50m-6.00m DECOMPOSED GRANITE 6.00m-10.00m HARD GRANITE 10.00m-43.00m HARD AND FRACTURED GRANITE	1581m	South West
GW111181	0.00m-0.80m FILL,CLAY LOAM,M/BROWN,FIRM,MOIST,FINE GRAVEL AND SAND 0.80m-1.50m CLAY SILT,M/BROWN,GREY,FIRM,MOIST,PLASTIC 1.50m-3.30m SILT,LIGHT/MEDIUM GREY,MUDDY TEXTURE,LOOSE 3.30m-3.60m SILTY CLAY,M/GREY/RED/BROWEN,HARD LAYER	1609m	North West
GW107379	0.00m-0.60m topsoil 0.60m-2.40m clay, light brown 2.40m-4.20m clay, sandy 4.20m-12.80m granite, decomposed 12.80m-23.70m granite, hard with bands of decomposed 23.70m-31.00m granite, blue	1651m	South West
GW111182	0.00m-0.70m FILL,CLAY LOAM,M/BROWN,FIRM,PLASTIC 0.70m-1.00m CLAYEY SANDY SILT,FINE GRAINED 1.00m-1.70m SILT,LIGHT,M/GREY,MUDDY TEXTURE 1.70m-2.00m CLAY,SANDY SILT,L/GREY,FIRM,PLASTIC 2.00m-3.60m SANDY CLAY SILT,L/MED/ GREY,SOFT,FIRM MOIST	1692m	North West
GW111180	0.00m-0.60m FILL,CLAY LOAM,M/BROWN,MOIST 0.60m-1.00m SANDY SILT,FINE GRAINED,L/GREY,FIRM 1.00m-3.60m SANDY SILT,CLAY SILT L/GREY/BROWN	1721m	North West
GW111256	0.00m-3.00m SILTY CLAY 3.00m-6.50m GRANITE DECOMPOSED 6.50m-27.00m GRANITE WEATHERED 27.00m-32.00m GRANITE BLUE,SOME WEATHERED ZONES 32.00m-37.50m GRANITE BLUE	1795m	South West
GW100345	0.00m-0.50m TOPSOIL BLACK-SANDY CLAY 0.50m-5.50m WEARHERED GRANITE & CLAY 5.50m-15.00m HARD GRANITE CAPPING GOING TO FISSURED AND WELL WEATHERED GRANITE	1799m	North West
GW111179	0.00m-0.50m FILL, GRAVELLY CLAY LOAM M/BROWN 0.50m-0.70m CLAY LOAM, GREY/BROWN ,SOME GRAVEL 0.70m-1.20m SANDY CLAY,M/BROWN,SATURATED 1.20m-3.40m SILTY SAND,L/GREY,MUDDY,FINE GRAINED SAND 3.40m-3.60m CLAY,L/GREY / GREEN,DENSE,STIFF,MOIST	1870m	North West

Groundwater No	Drillers Log	Distance	Direction
GW111178	0.00m-0.70m FILL,CLAY LOAM,M/BROWN,FIRM,MOIST 0.70m-1.20m GRAVEL SANDY,L/BROWN,FIRM,COARSE QUARTZ SAND 1.20m-1.50m SANDY CLAY,VERY FIRM,MOIST,PLASTIC 1.50m-2.40m SILTY CLAY,SAND BROWN,SEMI PLASTIC,QUARTZ 2.40m-3.60m SANDY CLAY,COARSE,M/BROWN,VERY HARD,MOIST	1883m	North West
GW105814	0.00m-0.90m clay,black 0.90m-5.10m granite, decomposed 5.10m-12.10m granite, blue with bonds of decomposed 12.10m-28.60m granite, blue 28.60m-40.20m granite, blue some faulted bonds 40.20m-43.90m granite, blue	1986m	West

Drill Log Data Source: NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corp
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Geology 1:250,000

Lot 6 Princes Highway, Moruya, NSW 2537



Geology

Lot 6 Princes Highway, Moruya, NSW 2537

Geological Units

What are the Geological Units onsite?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dom Lith	Map Sheet	Dataset
Dlg	Tonalite, granodiorite, biotite granite, adamellite, diorite, gabbro	Moruya Tonalite	Moruya Suite		Palaeozoic			1:250,000

What are the Geological Units within the dataset buffer?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dom Lith	Map Sheet	Dataset
Dlg	Tonalite, granodiorite, biotite granite, adamellite, diorite, gabbro	Moruya Tonalite	Moruya Suite		Palaeozoic			1:250,000
Oa	Turbiditic sequence; sandstone, mudstone, shale; quartzite, quartz phyllite, phyllite, slate	Adaminaby Group	Adaminaby Group		Palaeozoic			1:250,000
Qal	Alluvium, gravel, swamp deposits and sand dunes	undifferentiated			Cainozoic			1:250,000

Geological Structures

What are the Geological Structures onsite?

Feature	Name	Description	Map Sheet	Dataset
No features				1:250,000

What are the Geological Structures within the dataset buffer?

Feature	Name	Description	Map Sheet	Dataset
No features				1:250,000

Geological Data Source : NSW Department of Industry, Resources & Energy

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Naturally Occurring Asbestos Potential

Lot 6 Princes Highway, Moruya, NSW 2537

Naturally Occurring Asbestos Potential

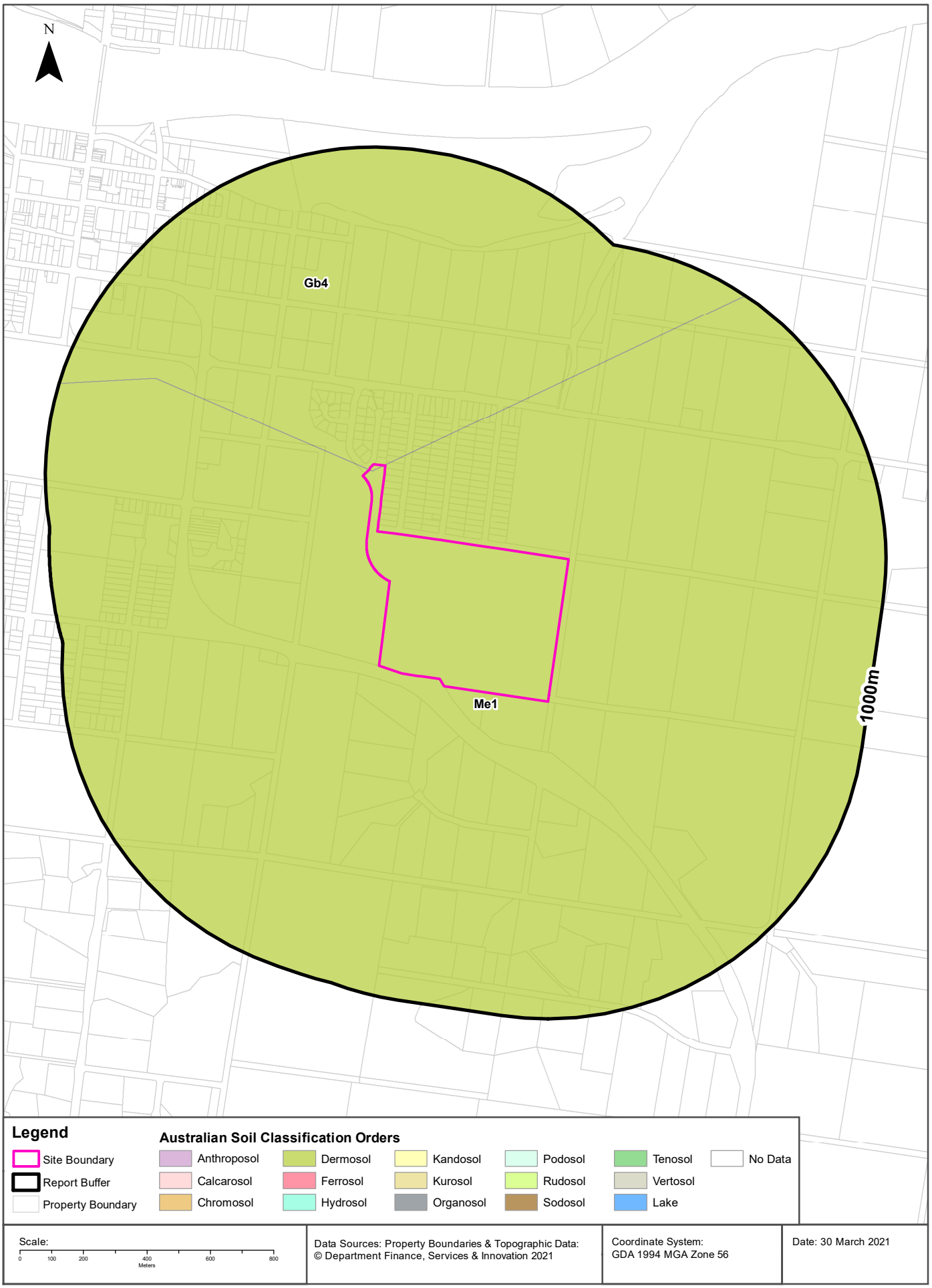
Naturally Occurring Asbestos Potential within the dataset buffer:

Potential	Sym	Strat Name	Group	Formation	Scale	Min Age	Max Age	Rock Type	Dom Lith	Description	Dist	Dir
No records in buffer												

Naturally Occurring Asbestos Potential Data Source: © State of New South Wales through NSW Department of Industry, Resources & Energy

Atlas of Australian Soils

Lot 6 Princes Highway, Moruya, NSW 2537



Soils

Lot 6 Princes Highway, Moruya, NSW 2537

Atlas of Australian Soils

Soil mapping units and Australian Soil Classification orders within the dataset buffer:

Map Unit Code	Soil Order	Map Unit Description	Distance
Gb4	Dermosol	River terraces: (1) lower of dark, porous, loamy soils (Um6.11), (2) middle of (Gn2.2 and Gn2.4),(3) upper of (Dy2.41 or Dy3.41 or Dy5.41), and (4) present floodplains of various (Uc1 and Um1) soils..	0m
Me1	Dermosol	Hilly with some steep slopes and small graded valleys: moderately steep rounded hills of brown and red friable earths (Gn3.21 and Gn3.22 and Gn3.11 and Gn3.12) in association with less rounded hill slopes of hard acidic yellow mottled soils (Dy3.41), hard acidic red soils (Dr2.21), and yellow leached earths (Gn3.54), and also other hill slopes of loamy soils having an A2 horizon (Um4.2) with yellow-brown earths (Gn2.44); stream valleys of various soils including (Dy4.41), (Dy5.41), and (Um6.11).	0m

Atlas of Australian Soils Data Source: CSIRO
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Acid Sulfate Soils

Lot 6 Princes Highway, Moruya, NSW 2537



Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2021

Coordinate System: GDA 1994 MGA Zone 56

Date: 30 March 2021

Acid Sulfate Soils

Lot 6 Princes Highway, Moruya, NSW 2537

Environmental Planning Instrument - Acid Sulfate Soils

What is the on-site Acid Sulfate Soil Plan Class that presents the largest environmental risk?

Soil Class	Description	EPI Name
2	Works below natural ground surface present an environmental risk; Works by which the watertable is likely to be lowered present an environmental risk	Eurobodalla Local Environmental Plan 2012

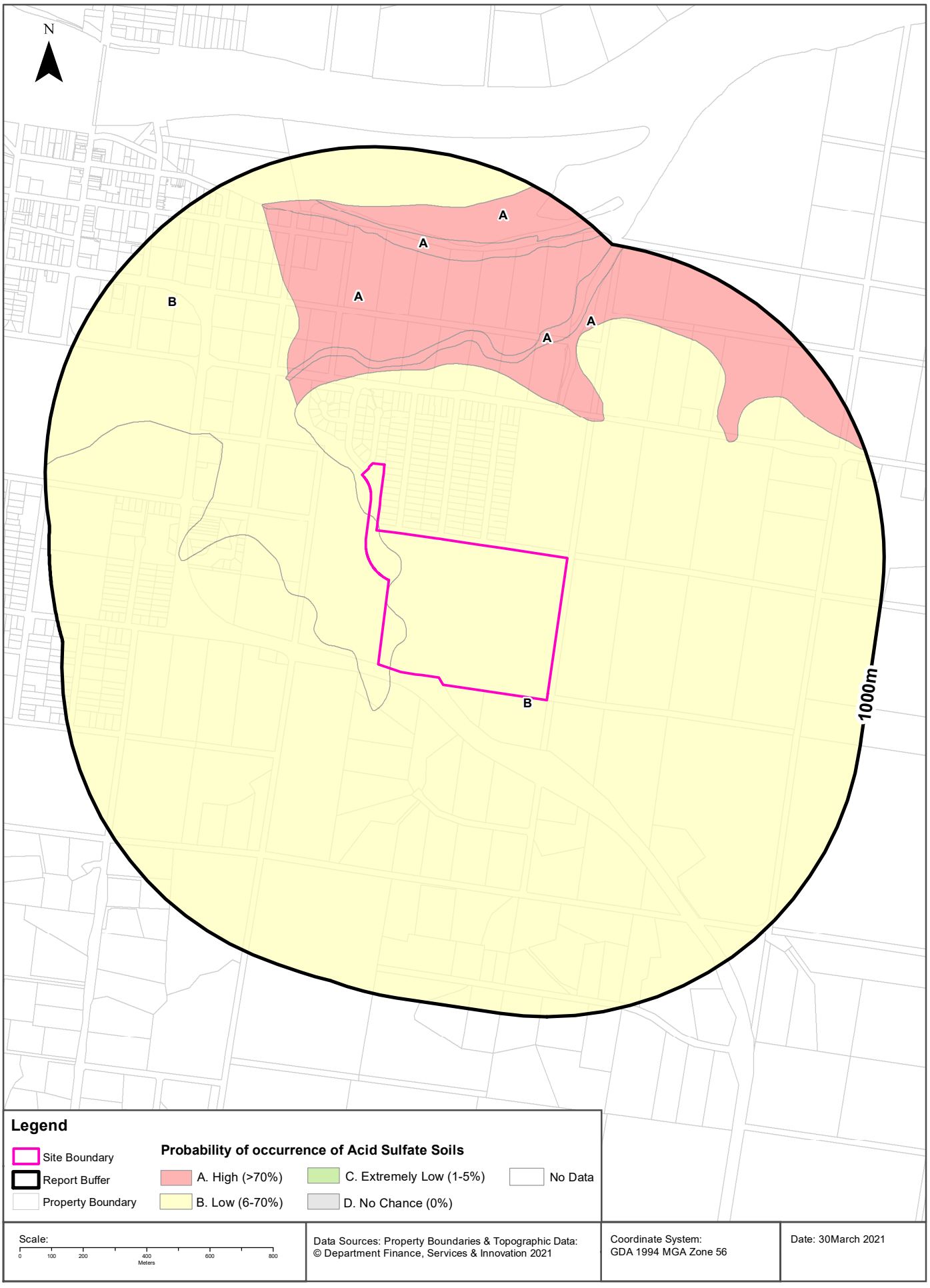
If the on-site Soil Class is 5, what other soil classes exist within 500m?

Soil Class	Description	EPI Name	Distance	Direction
N/A				

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Atlas of Australian Acid Sulfate Soils

Lot 6 Princes Highway, Moruya, NSW 2537



Acid Sulfate Soils

Lot 6 Princes Highway, Moruya, NSW 2537

Atlas of Australian Acid Sulfate Soils

Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance
B	Low Probability of occurrence. 6-70% chance of occurrence.	0m
A	High Probability of occurrence. >70% chance of occurrence.	283m

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO
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Dryland Salinity

Lot 6 Princes Highway, Moruya, NSW 2537

Dryland Salinity - National Assessment

Is there Dryland Salinity - National Assessment data onsite?

No

Is there Dryland Salinity - National Assessment data within the dataset buffer?

No

What Dryland Salinity assessments are given?

Assessment 2000	Assessment 2020	Assessment 2050	Distance	Direction
N/A	N/A	N/A	N/A	N/A

Dryland Salinity Data Source : National Land and Water Resources Audit
The Commonwealth and all suppliers of source data used to derive the maps of "Australia, Forecast Areas Containing Land of High Hazard or Risk of Dryland Salinity from 2000 to 2050" do not warrant the accuracy or completeness of information in this product. Any person using or relying upon such information does so on the basis that the Commonwealth and data suppliers shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information. Any persons using this information do so at their own risk.
In many cases where a high risk is indicated, less than 100% of the area will have a high hazard or risk.

Dryland Salinity Potential of Western Sydney

Dryland Salinity Potential of Western Sydney within the dataset buffer?

Feature Id	Classification	Description	Distance	Direction
N/A	Outside Data Coverage			

Dryland Salinity Potential of Western Sydney Data Source : NSW Office of Environment and Heritage
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Mining

Lot 6 Princes Highway, Moruya, NSW 2537

Mining Subsidence Districts

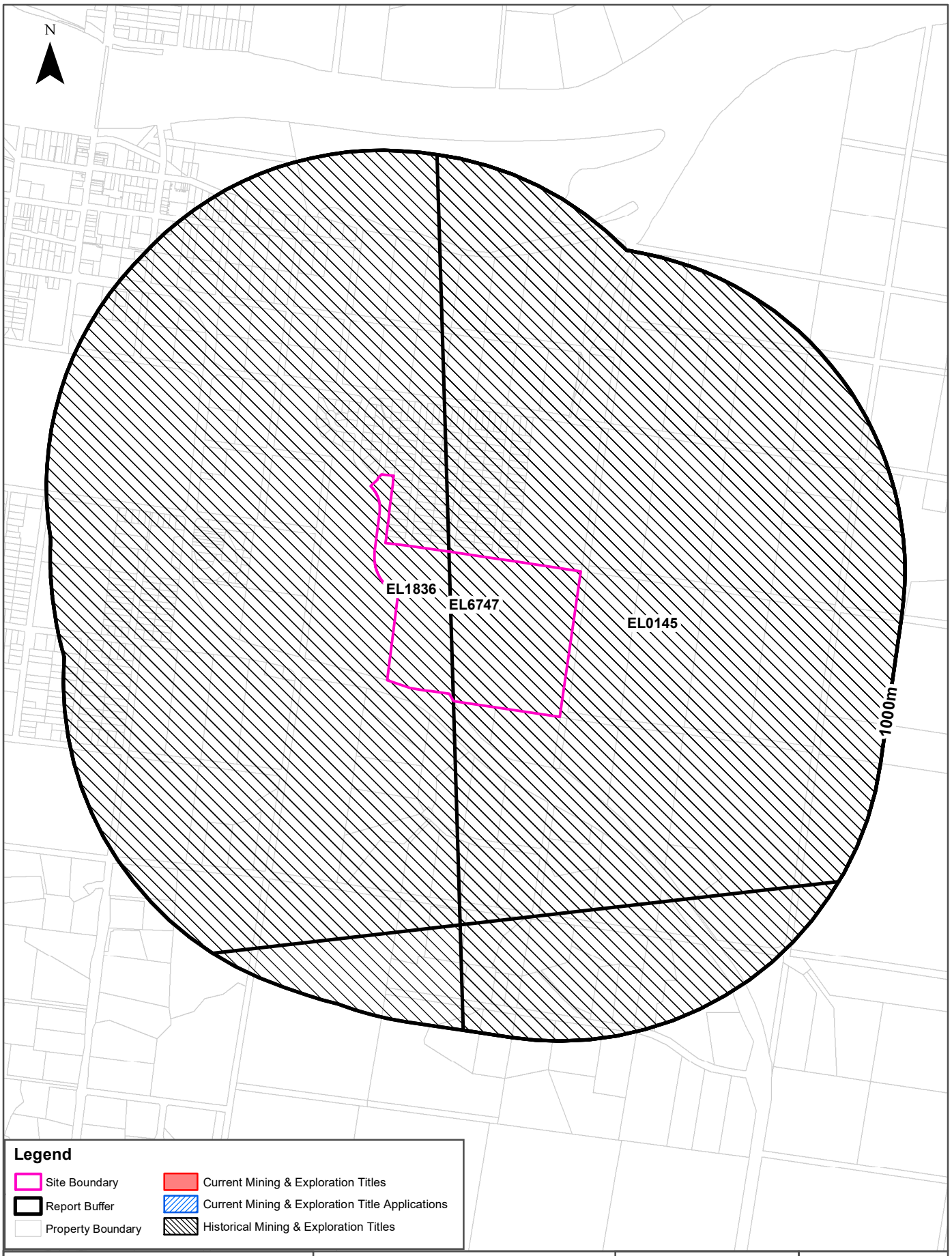
Mining Subsidence Districts within the dataset buffer:

District	Distance	Direction
There are no Mining Subsidence Districts within the report buffer		

Mining Subsidence District Data Source: © Land and Property Information (2016)
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Mining & Exploration Titles

Lot 6 Princes Highway, Moruya, NSW 2537



Mining

Lot 6 Princes Highway, Moruya, NSW 2537

Current Mining & Exploration Titles

Current Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Grant Date	Expiry Date	Last Renewed	Operation	Resource	Minerals	Dist (m)	Dir'
N/A	No Records in Buffer								

Current Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

Current Mining & Exploration Title Applications

Current Mining & Exploration Title Applications within the dataset buffer:

Application Ref	Applicant	Application Date	Operation	Resource	Minerals	Dist (m)	Dir'
N/A	No Records in Buffer						

Current Mining & Exploration Title Applications Data Source: © State of New South Wales through NSW Department of Industry

Mining

Lot 6 Princes Highway, Moruya, NSW 2537

Historical Mining & Exploration Titles

Historical Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Start Date	End Date	Resource	Minerals	Dist (m)	Dir'
EL1836	SELTRUST MINING CORPORATION PTY LIMITED	01 Feb 1982	01 Feb 1983	MINERALS	Au	0m	Onsite
EL6747	OROYA MINING LIMITED	5 Apr 2007	8 Oct 2012	MINERALS	Au	0m	Onsite
EL0145	PLANET GOLD	01 Jul 1969	01 Jul 1970	MINERALS	Au Cu Ni Co	0m	Onsite

Historical Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

State Environmental Planning Policy

Lot 6 Princes Highway, Moruya, NSW 2537

State Significant Precincts

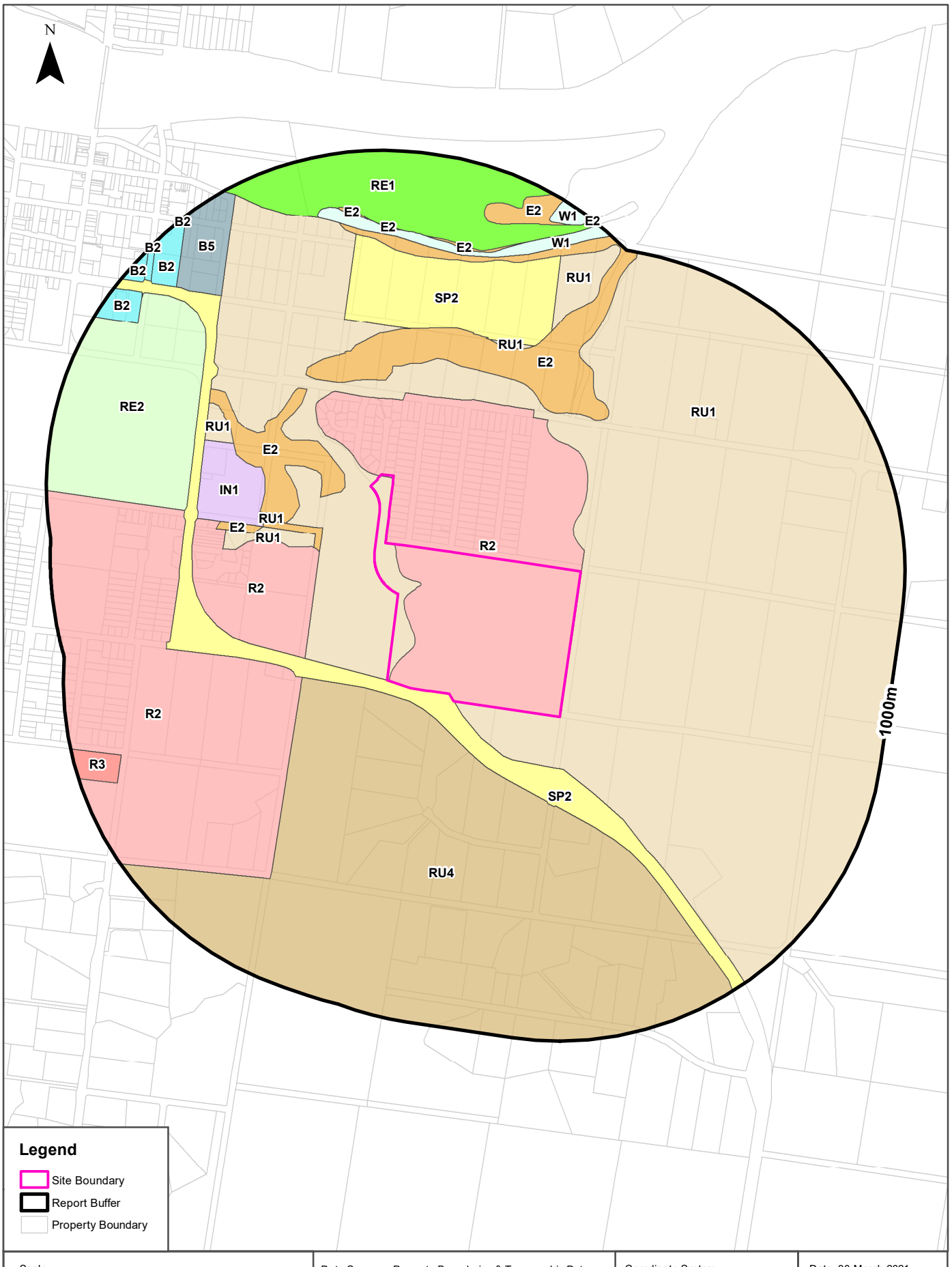
What SEPP State Significant Precincts exist within the dataset buffer?

Map Id	Precinct	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
N/A	No Records in Buffer							

State Environment Planning Policy Data Source: NSW Crown Copyright - Planning & Environment
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EPI Planning Zones

Lot 6 Princes Highway, Moruya, NSW 2537



Environmental Planning Instrument

Lot 6 Princes Highway, Moruya, NSW 2537

Land Zoning

What EPI Land Zones exist within the dataset buffer?

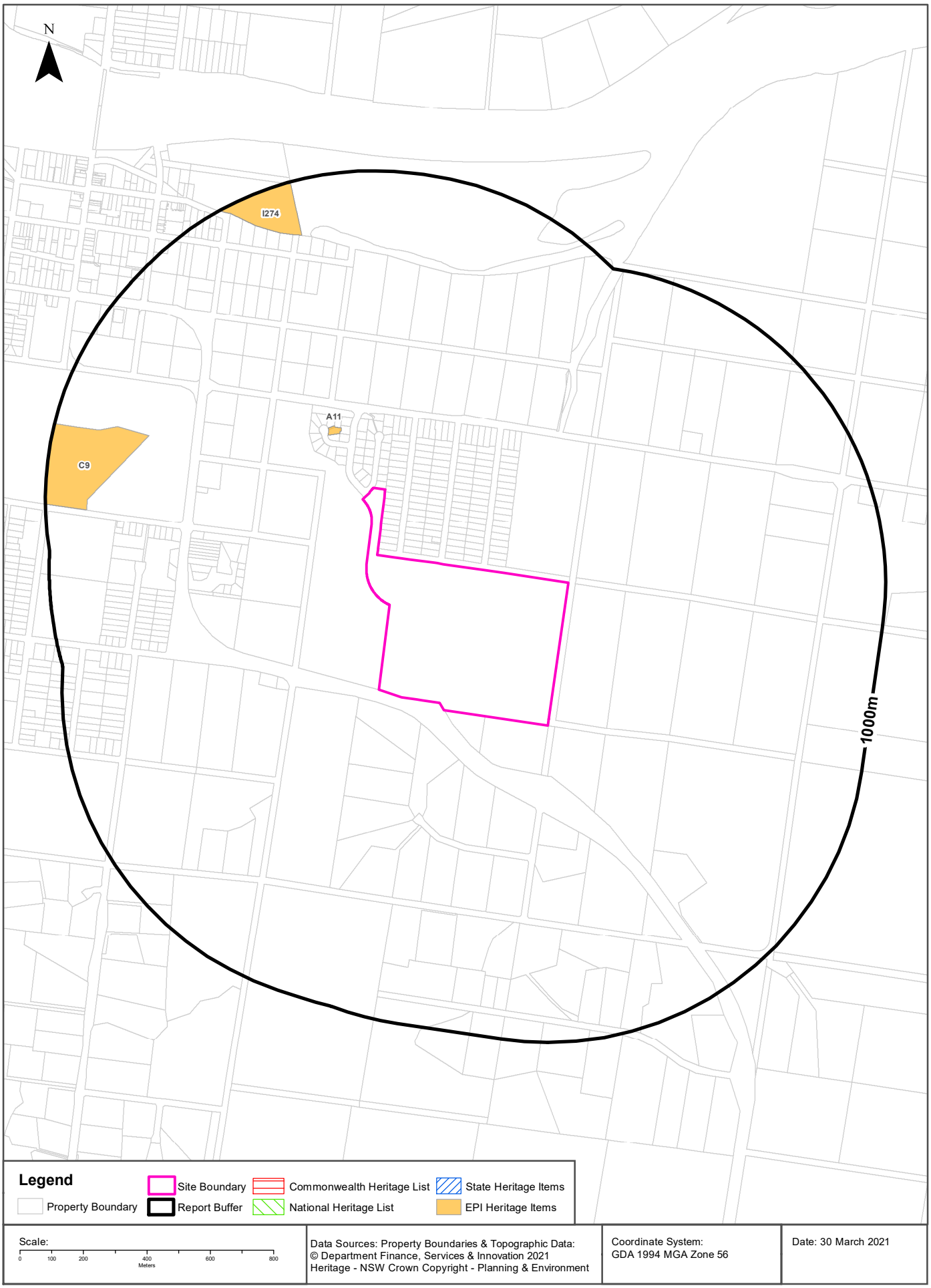
Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
R2	Low Density Residential		Eurobodalla Local Environmental Plan 2012	27/11/2015	27/11/2015	18/09/2020	Amendment No 7	0m	Onsite
RU1	Primary Production		Eurobodalla Local Environmental Plan 2012	11/10/2019	11/10/2019	18/09/2020	Amendment No 11	0m	Onsite
SP2	Infrastructure	Classified Road	Eurobodalla Local Environmental Plan 2012	11/10/2019	11/10/2019	18/09/2020	Amendment No 11	0m	North East
RU4	Primary Production Small Lots		Eurobodalla Local Environmental Plan 2012	11/10/2019	11/10/2019	18/09/2020	Amendment No 11	40m	South West
E2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	18/09/2020	18/09/2020	18/09/2020	Amendment No 14	79m	North West
R2	Low Density Residential		Eurobodalla Local Environmental Plan 2012	27/11/2015	27/11/2015	18/09/2020	Amendment No 7	171m	West
RU1	Primary Production		Eurobodalla Local Environmental Plan 2012	18/09/2020	18/09/2020	18/09/2020	Amendment No 14	189m	West
R2	Low Density Residential		Eurobodalla Local Environmental Plan 2012	18/09/2020	18/09/2020	18/09/2020	Amendment No 14	264m	West
RU1	Primary Production		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		286m	North West
E2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		291m	North
IN1	General Industrial		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		326m	North West
E2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	18/09/2020	18/09/2020	18/09/2020	Amendment No 14	353m	West
RU1	Primary Production		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		444m	North West
SP2	Infrastructure	Sewerage System	Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		457m	North
RU1	Primary Production		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		513m	North
RE2	Private Recreation		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		556m	North West
RU1	Primary Production		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		659m	North
W1	Natural Waterways		Eurobodalla Local Environmental Plan 2012	11/10/2019	11/10/2019	18/09/2020	Amendment No 11	712m	North East
E2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		732m	North
B5	Business Development		Eurobodalla Local Environmental Plan 2012	18/01/2013	18/01/2013	18/09/2020	Amendment No 2	742m	North West
RE1	Public Recreation		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		742m	North
E2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		754m	North
E2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		783m	North
E2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		838m	North
R3	Medium Density Residential		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		853m	West
B2	Local Centre		Eurobodalla Local Environmental Plan 2012	11/10/2019	11/10/2019	18/09/2020	Amendment No 11	857m	North West
B2	Local Centre		Eurobodalla Local Environmental Plan 2012	11/10/2019	11/10/2019	18/09/2020	Amendment No 11	876m	North West
B2	Local Centre		Eurobodalla Local Environmental Plan 2012	11/10/2019	11/10/2019	18/09/2020	Amendment No 11	928m	North West

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
B2	Local Centre		Eurobodalla Local Environmental Plan 2012	11/10/2019	11/10/2019	18/09/2020	Amendment No 11	944m	North West
E2	Environmental Conservation		Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	18/09/2020		989m	North
B2	Local Centre		Eurobodalla Local Environmental Plan 2012	11/10/2019	11/10/2019	18/09/2020	Amendment No 11	999m	North West

Environmental Planning Instrument Data Source: NSW Crown Copyright - Planning & Environment
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Heritage Items

Lot 6 Princes Highway, Moruya, NSW 2537



Heritage

Lot 6 Princes Highway, Moruya, NSW 2537

Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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National Heritage List

What are the National Heritage List Items located within the dataset buffer?
Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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State Heritage Register - Curtilages

What are the State Heritage Register Items located within the dataset buffer?

Map Id	Name	Address	LGA	Listing Date	Listing No	Plan No	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: NSW Crown Copyright - Office of Environment & Heritage
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Environmental Planning Instrument - Heritage

What are the EPI Heritage Items located within the dataset buffer?

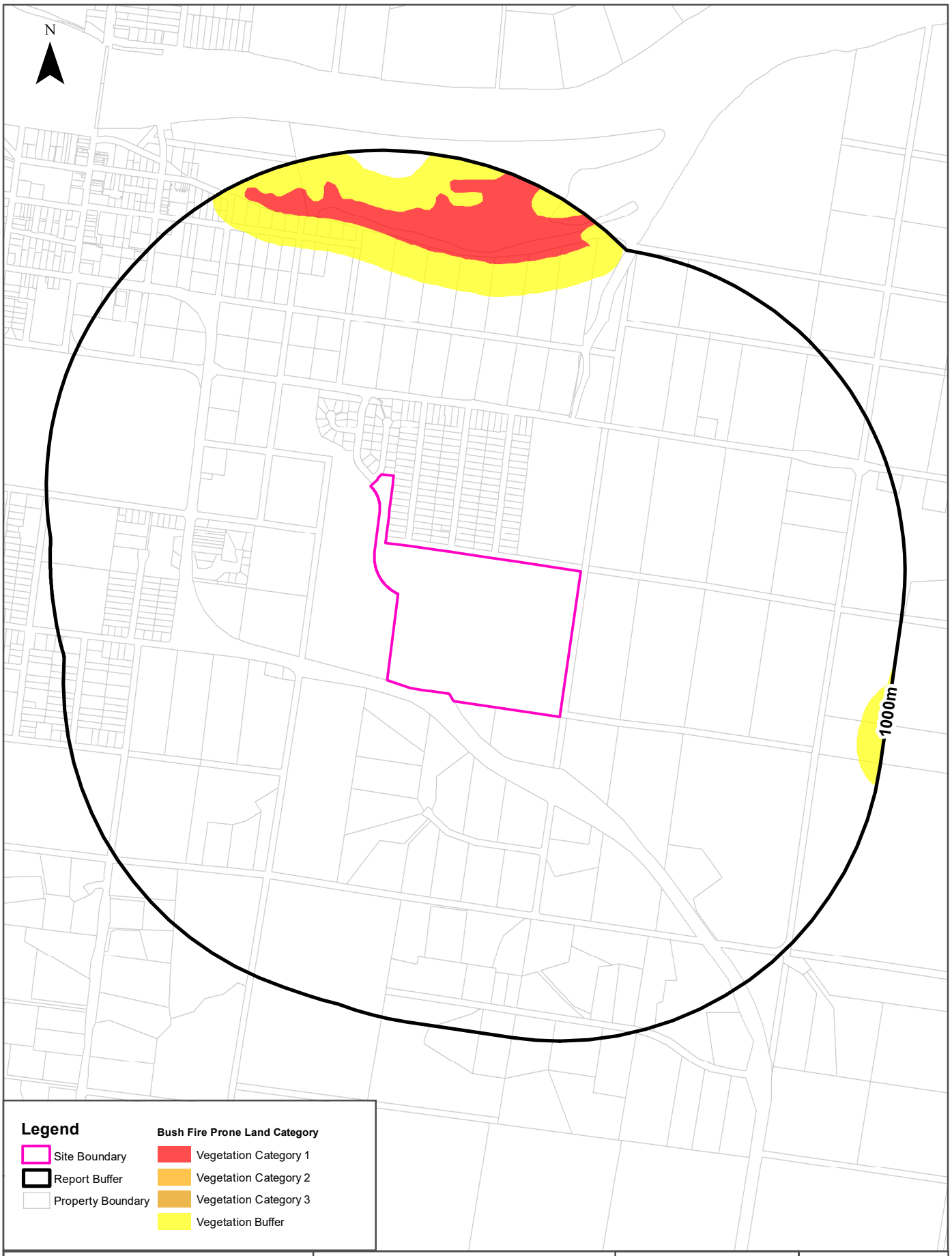
Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
A11	Site of Braemar Farm, formerly comprising farmhouse and outbuildings, and Bunya Pine	Item - Archaeological	Local	Eurobodalla Local Environmental Plan 2012	11/05/2018	11/05/2018	11/10/2019	202m	North West

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
C9	Moruya Showground, comprising Grandstand and Exhibits Pavilion	Conservation Area - General	Local	Eurobodalla Local Environmental Plan 2012	20/07/2012	20/07/2012	11/10/2019	703m	North West
I274	Old Tidal Swimming Pool	Item - General	Local	Eurobodalla Local Environmental Plan 2012	07/11/2014	07/11/2014	11/10/2019	827m	North West

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Natural Hazards - Bush Fire Prone Land

Lot 6 Princes Highway, Moruya, NSW 2537



Scale: 0 100 200 400 600 800 Meters

Data Sources: Bush Fire Prone Land: © NSW Rural Fire Service 2021. Property Boundaries: © Department Finance, Services & Innovation 2021

Coordinate System: GDA 1994 MGA Zone 56

Date: 30 March 2021

Natural Hazards

Lot 6 Princes Highway, Moruya, NSW 2537

Bush Fire Prone Land

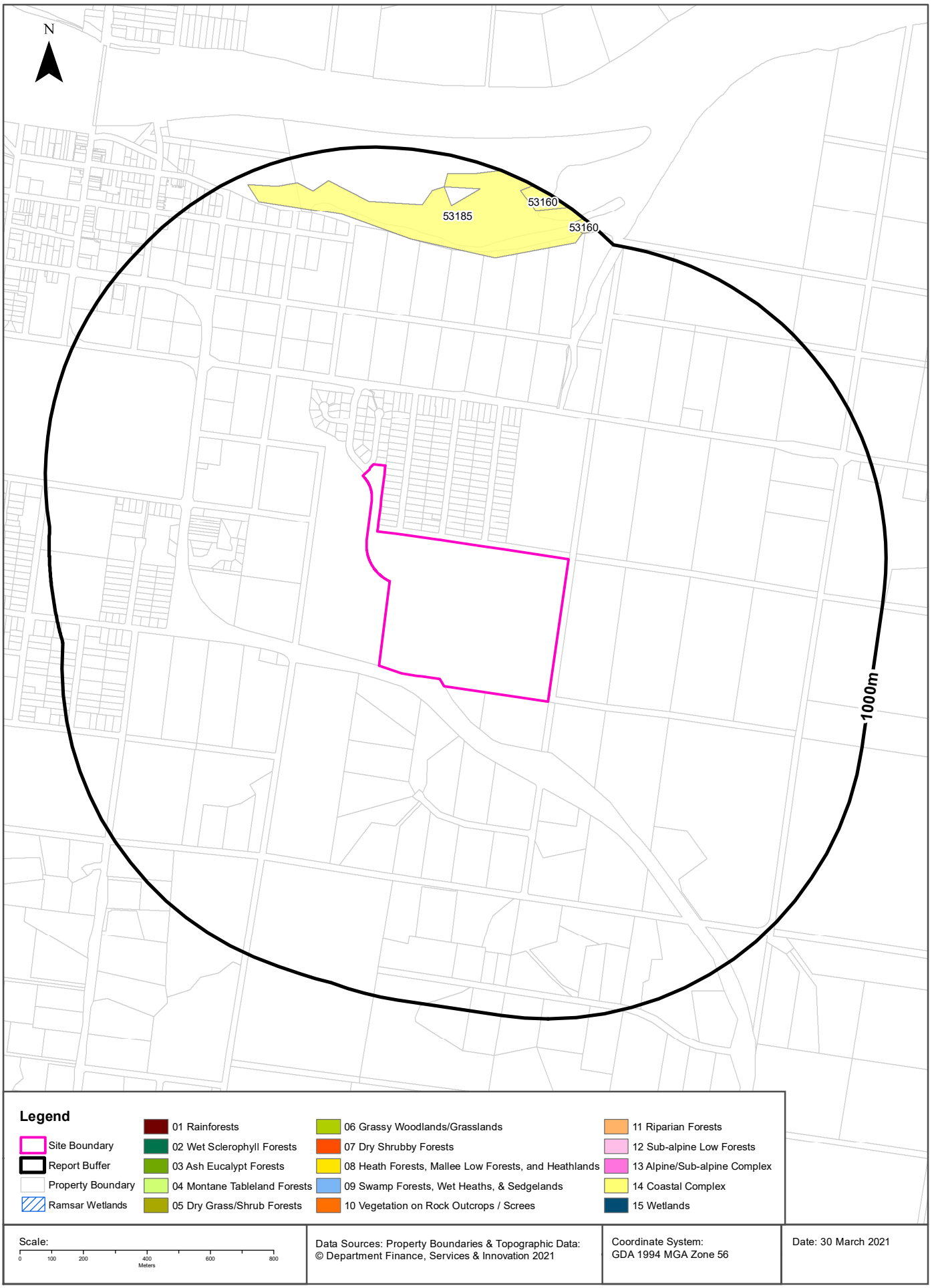
What are the nearest Bush Fire Prone Land Categories that exist within the dataset buffer?

Bush Fire Prone Land Category	Distance	Direction
Vegetation Buffer	601m	North
Vegetation Category 1	701m	North

NSW Bush Fire Prone Land - © NSW Rural Fire Service under Creative Commons 4.0 International Licence

Ecological Constraints - Vegetation of the Southern Forests

Lot 6 Princes Highway, Moruya, NSW 2537



Ecological Constraints

Lot 6 Princes Highway, Moruya, NSW 2537

Vegetation of the Southern Forests

What vegetation of the Southern Forests exists within the dataset buffer?

Map Id	Veg Code	Formation	Class	Group	Distance	Direction
53185	25	14 Coastal Complex	14b Coastal Swamp Heath/Forest Complex	South Coast Swamp Forest Complex	714m	North
53160	185	14 Coastal Complex	14c Coastal Estuarine Complex	Mangrove Estuarine Low Forest	932m	North

Vegetation of the Southern Forests: NSW Office of Environment and Heritage
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Ramsar Wetlands

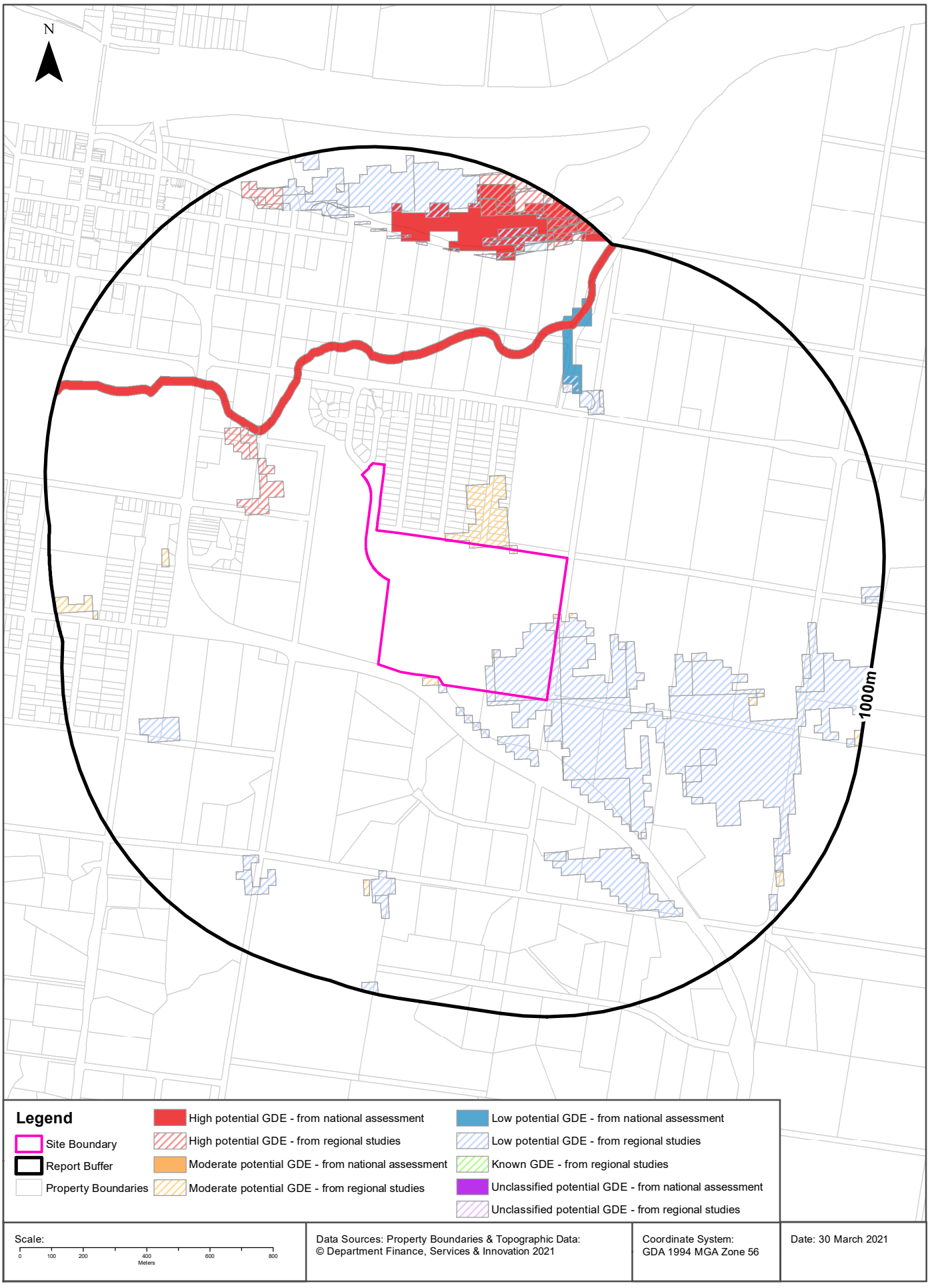
What Ramsar Wetland areas exist within the dataset buffer?

Map Id	Ramsar Name	Wetland Name	Designation Date	Source	Distance	Direction
N/A	No records in buffer					

Ramsar Wetlands Data Source: © Commonwealth of Australia - Department of Environment

Ecological Constraints - Groundwater Dependent Ecosystems Atlas

Lot 6 Princes Highway, Moruya, NSW 2537



Ecological Constraints

Lot 6 Princes Highway, Moruya, NSW 2537

Groundwater Dependent Ecosystems Atlas

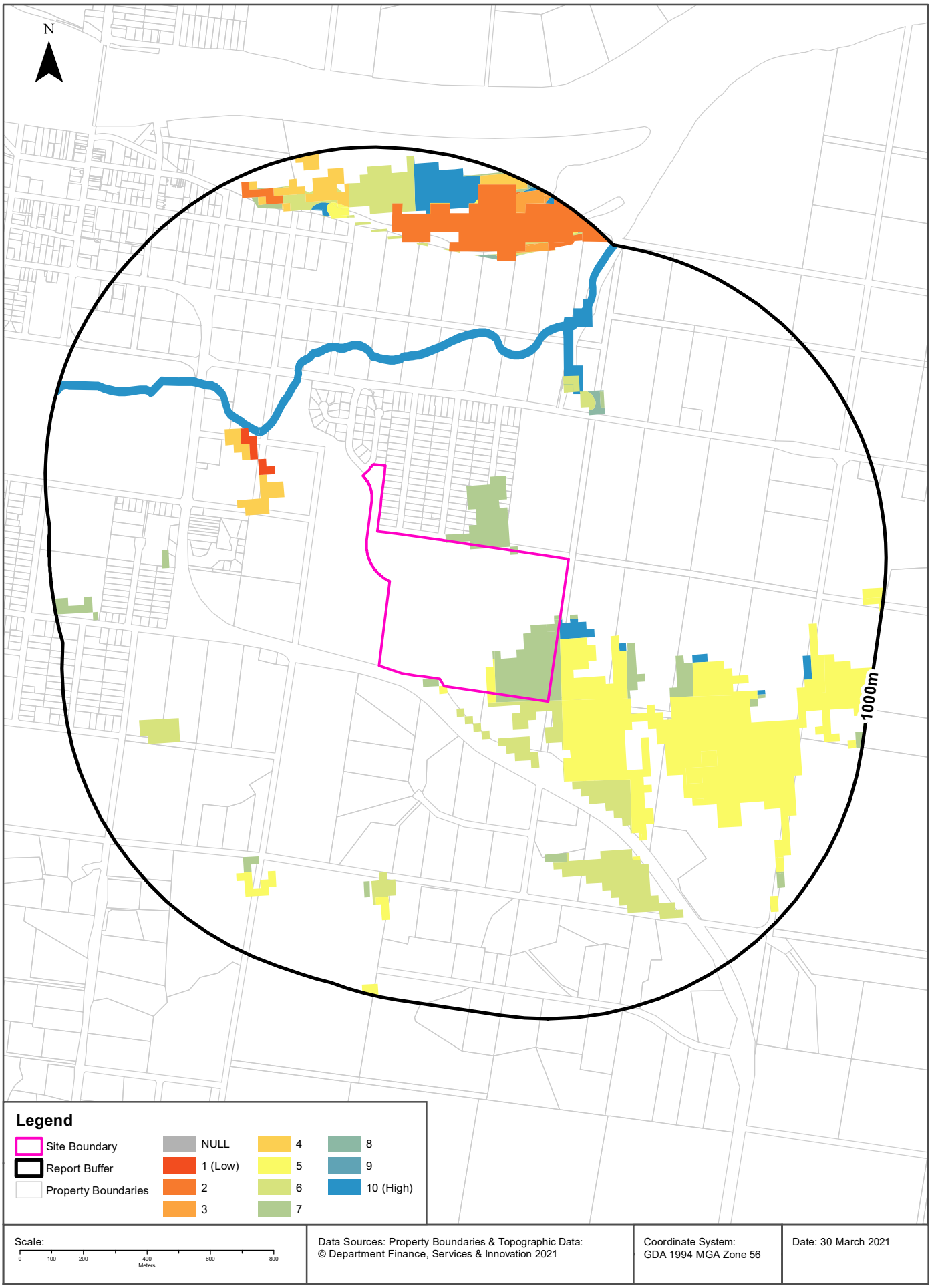
Type	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
Terrestrial	Low potential GDE - from regional studies	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m
Terrestrial	Moderate potential GDE - from regional studies	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m
Terrestrial	High potential GDE - from regional studies	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		250m
Aquatic	High potential GDE - from national assessment	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	River		317m
Aquatic	Low potential GDE - from national assessment	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Wetland	Unconsolidated sedimentary	515m

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology

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Ecological Constraints - Inflow Dependent Ecosystems Likelihood

Lot 6 Princes Highway, Moruya, NSW 2537



Ecological Constraints

Lot 6 Princes Highway, Moruya, NSW 2537

Inflow Dependent Ecosystems Likelihood

Type	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
Terrestrial	5	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m
Terrestrial	6	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m
Terrestrial	7	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m
Terrestrial	10	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m
Terrestrial	4	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		250m
Terrestrial	1	Deeply dissected sandstone plateaus.	Vegetation		276m
Aquatic	10	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	River		317m
Terrestrial	8	Deeply dissected sandstone plateaus.	Vegetation		458m
Aquatic	2	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Wetland	Unconsolidated sedimentary	704m
Terrestrial	3	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		707m
Terrestrial	2	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		850m

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology
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Ecological Constraints

Lot 6 Princes Highway, Moruya, NSW 2537

NSW BioNet Atlas

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km of the site?

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Actitis hypoleucos	Common Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Not Sensitive	Critically Endangered	
Animalia	Aves	Ardenna tenuirostris	Short-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Arenaria interpres	Ruddy Turnstone	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Botaurus poiciloptilus	Australasian Bittern	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Calamanthus fuliginosus	Striated Fieldwren	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Calidris alba	Sanderling	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris canutus	Red Knot	Not Listed	Not Sensitive	Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris ruficollis	Red-necked Stint	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris tenuirostris	Great Knot	Vulnerable	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Charadrius mongolus	Lesser Sand-plover	Vulnerable	Not Sensitive	Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Diomedea exulans	Wandering Albatross	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Epthianura albifrons	White-fronted Chat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Gallinago hardwickii	Latham's Snipe	Not Listed	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Glossopsitta pusilla	Little Lorikeet	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haematopus fuliginosus	Sooty Oystercatcher	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haematopus longirostris	Pied Oystercatcher	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hirundapus caudacutus	White-throated Needletail	Not Listed	Not Sensitive	Vulnerable	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ixobrychus flavicollis	Black Bittern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Lathamus discolor	Swift Parrot	Endangered	Category 3	Critically Endangered	
Animalia	Aves	Limosa lapponica	Bar-tailed Godwit	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Limosa limosa	Black-tailed Godwit	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Lophoictinia isura	Square-tailed Kite	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Macronectes halli	Northern Giant-Petrel	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Ninox strenua	Powerful Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Numenius madagascariensis	Eastern Curlew	Not Listed	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Numenius phaeopus	Whimbrel	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Pachycephala olivacea	Olive Whistler	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pandion cristatus	Eastern Osprey	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Petroica boodang	Scarlet Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Petroica phoenicea	Flame Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Phoebetria fusca	Sooty Albatross	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Pluvialis fulva	Pacific Golden Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Pluvialis squatarola	Grey Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Ptilinopus superbus	Superb Fruit-Dove	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Puffinus assimilis	Little Shearwater	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Stagonopleura guttata	Diamond Firetail	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Sternula albifrons	Little Tern	Endangered	Not Sensitive	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Stictonetta naevosa	Freckled Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Thalassarche cauta	Shy Albatross	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Thalassarche melanophris	Black-browed Albatross	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Thalasseus bergii	Crested Tern	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Thinornis cucullatus cucullatus	Eastern Hooded Dotterel	Critically Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Tringa brevipes	Grey-tailed Tattler	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Tringa glareola	Wood Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Tringa incana	Wandering Tattler	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Tringa nebularia	Common Greenshank	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Tringa stagnatilis	Marsh Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA;JAMBA
Animalia	Aves	Tyto novaehollandiae	Masked Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Tyto tenebricosa	Sooty Owl	Vulnerable	Category 3	Not Listed	
Animalia	Mammalia	Arctocephalus pusillus doriferus	Australian Fur-seal	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Not Sensitive	Endangered	
Animalia	Mammalia	Eubalaena australis	Southern Right Whale	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Kerivoula papuensis	Golden-tipped Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Megaptera novaeangliae	Humpback Whale	Vulnerable	Not Sensitive	Vulnerable	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Mammalia	Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Myotis macropus	Southern Myotis	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Petauroides volans	Greater Glider	Endangered Population	Not Sensitive	Vulnerable	
Animalia	Mammalia	Petauroides volans	Greater Glider	Not Listed	Not Sensitive	Vulnerable	
Animalia	Mammalia	Petaurus australis	Yellow-bellied Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Petaurus norfolcensis	Squirrel Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Phascogale tapoatafa	Brush-tailed Phascogale	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Phascolarctos cinereus	Koala	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Potorous tridactylus	Long-nosed Potoroo	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Scoteanax rueppellii	Greater Broad-nosed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Sminthopsis leucopus	White-footed Dunnart	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	Chelonia mydas	Green Turtle	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Aldrovanda vesiculosa	Waterwheel Plant	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Eucalyptus leucoxylon subsp. pruinosa	Yellow Gum	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Genoplesium vernale	East Lynne Midge Orchid	Vulnerable	Category 2	Vulnerable	
Plantae	Flora	Persicaria elatior	Tall Knotweed	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Pomaderris bodalla	Bodalla Pomaderris	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Thesium australe	Austral Toadflax	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Wilsonia rotundifolia	Round-leafed Wilsonia	Endangered	Not Sensitive	Not Listed	

Data does not include NSW category 1 sensitive species.

NSW BioNet: © State of NSW and Office of Environment and Heritage

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Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a code is given under the field heading “LC” or “LocConf”. These codes lookup to the following location confidences:

LC Code	Location Confidence
Premise match	Georeferenced to the site location / premise or part of site
General area or suburb match	Georeferenced with the confidence of the general/approximate area
Road match	Georeferenced to the road or rail
Road intersection	Georeferenced to the road intersection
Feature is a buffered point	Feature is a buffered point
Land adjacent to geocoded site	Land adjacent to Georeferenced Site
Network of features	Georeferenced to a network of features

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Appendix C: Guidelines and Reference Documents

Contaminated Land Management Act 1997 (NSW)

Department of Land and Water Conservation, (1997). 1:25,000 Acid Sulfate Soil Risk Map Series

Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land (1998)

NSW EPA, (2015). Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997

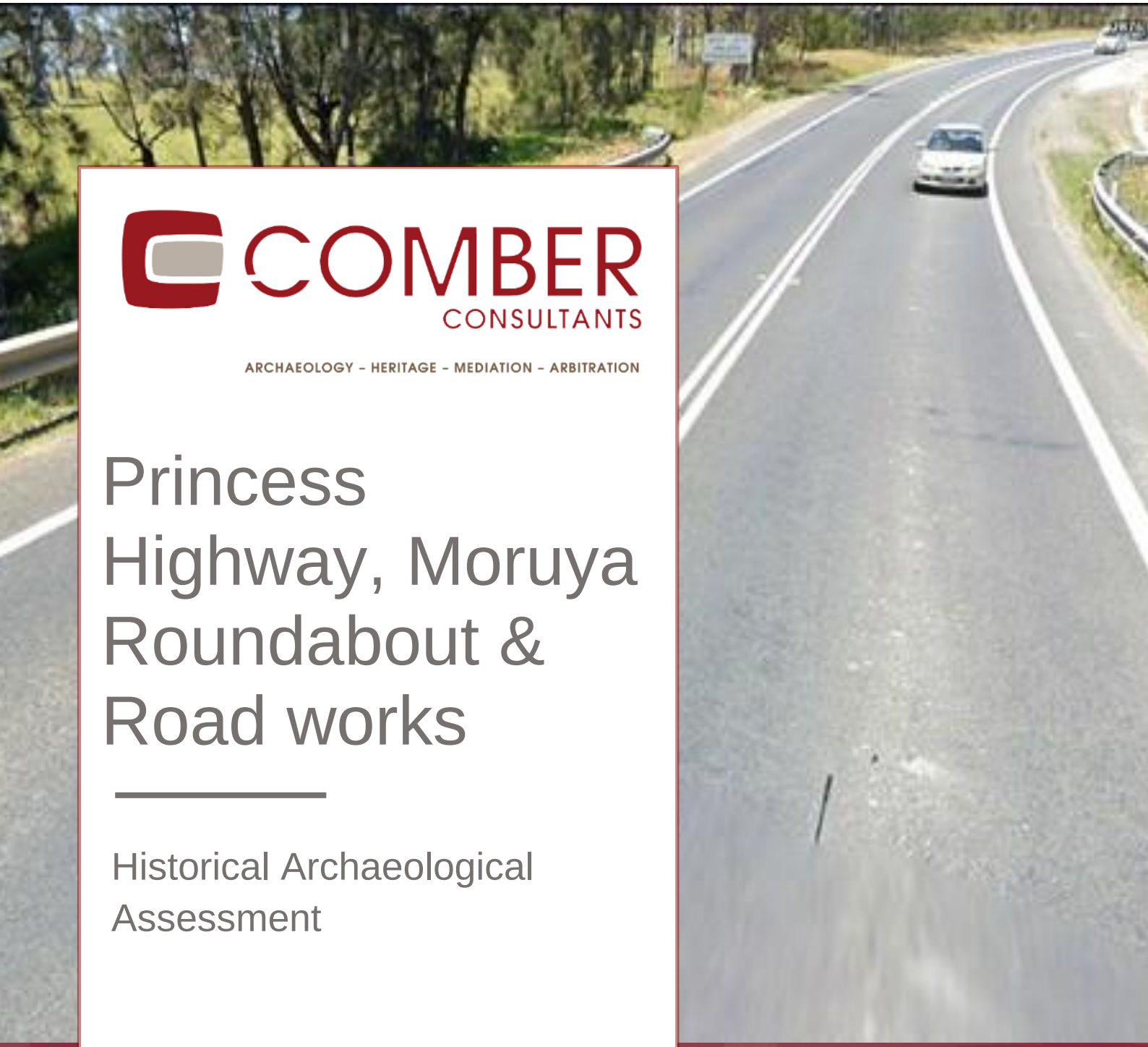
NSW EPA, (2017). Guidelines for the NSW Site Auditor Scheme, 3rd Edition

NSW EPA, (2020). Consultants Reporting on Contaminated Land, Contaminated Land Guidelines

National Environment Protection Council (NEPC), (2013) National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)

Protection of the Environment Operations Act 1997 (NSW)

State Environmental Planning Policy (Resilience and Hazards) 2021 (NSW)



COMBER CONSULTANTS

ARCHAEOLOGY – HERITAGE – MEDIATION – ARBITRATION

Princess Highway, Moruya Roundabout & Road works

Historical Archaeological Assessment

18th April 2022

Report to: **Root Partnership on behalf of Health Infrastructure NSW**

LGA: **Eurobodalla Shire**

Version: **B.2021**

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DOCUMENT CONTROL

PROJECT NO.: NH407 **STATUS**: FINAL

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B	12/05/2022	Dr Jillian Comber	David Nutley	Dr Jillian Comber

ACKNOWLEDGEMENTS

The historical research for this report (Section 4) has been prepared by Caroline Plim BA (History & Archaeology), Associate Diploma Local & Applied History, and Graduate Member PHA NSW & ACT.

INTEGRATED MANAGEMENT SYSTEM

Comber Consultants has a certified integrated management system to the requirements of ISO 9001 (quality), ISO 14001 (environmental), ISO 45001 (health and safety) and AS/NZS 4801 (health and safety). This is your assurance that Comber Consultants is committed to excellence, quality, and best practice and that we are regularly subjected to rigorous, independent assessments to ensure that we comply with stringent Management System Standards.

EXECUTIVE SUMMARY

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the construction of a new roundabout and associated roadworks on the Princes Highway, Moruya.

To ensure that the historical archaeological significance of the project area is not adversely impacted upon by this proposal and to meet planning requirements, Comber Consultants have been commissioned to undertake this historical archaeological assessment in accordance with the *NSW Heritage Manual, Assessing Heritage Significance* (Heritage Office 2001) and the Historical *Archaeology Code of Practice* (Heritage Office 2006).

The study area which is a highly disturbed road reserve does not contain historical archaeological potential and it is not expected that relics will be located within the property. Therefore, there are no constraints on the proposed development in respect of historical archaeology. However, please refer to the following recommendations:

Recommendation 1: Induction
A heritage induction should be provided to all employees, contractors and subcontractors engaged in the road construction on the significance of historical archaeology, that it an offence to harm relics and be advised of their responsibilities under the *Heritage Act 1977*.

Recommendation 2: Unexpected Finds and Human Remains Procedure
If any relics are unexpectedly uncovered during the redevelopment of the site, all work must cease in the vicinity of the object and an area of at least one metre around the relic secured and cordoned off using fencing and/or appropriate barriers. The archaeological consultant must be immediately contacted for further advice. The consultant will assess the object and provide further advice. No-one should enter the secured area and work can only recommence when advised by the consultant.

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1.0 INTRODUCTION

1.01 Background

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the construction of a new roundabout and associated roadworks on the Princes Highway, Moruya.

To ensure that the historical archaeological significance of the project area is not adversely impacted upon by this proposal and to meet planning requirements, Comber Consultants have been commissioned to undertake this historical archaeological assessment in accordance with the NSW Heritage Manual, *Assessing Heritage Significance* (Heritage Office 2001) and the *Historical Archaeology Code of Practice* (Heritage Office 2006).

1.02 Site location and description

The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot 2, DP 1281576, a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north is a small residential subdivision called Mynora Estate.

The location of Moruya is shown in Figure 1 and the approximate location of the roundabout is shown in Figure 2 below.



Figure 1: Location of Moruya

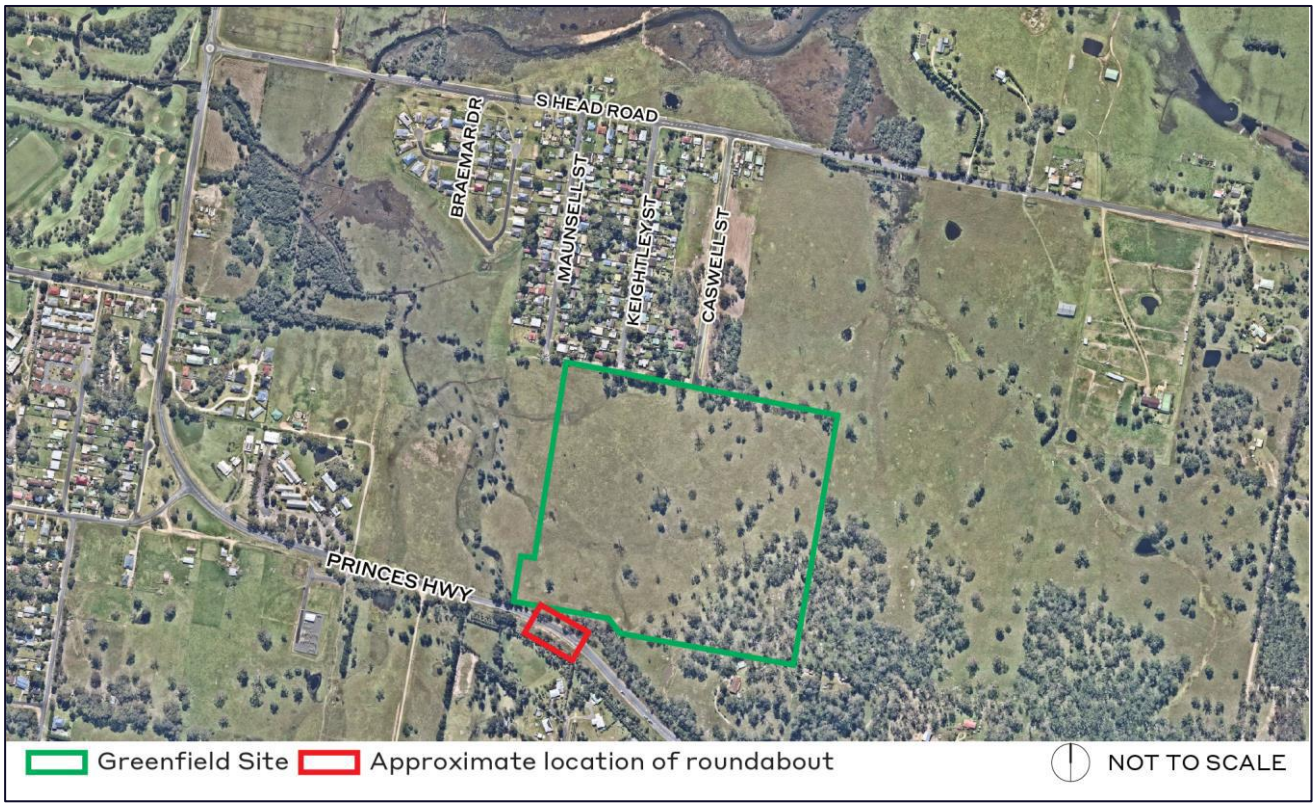


Figure 2: Approximate location of proposed works

1.03 Proposed Works

The works proposed under the REF include the following:

- Construction of a new roundabout located on the Princes Highway.
- Ancillary road and public domain works.
- Ancillary electricity reticulation and street lighting.

A further detailed description of the proposed works is contained in the Review of Environmental Factors report prepared by Ethos.

2.0 LEGISLATION

Heritage Act 1977 (as amended)

State Heritage Register

s31 of the NSW *Heritage Act 1977* provides for the establishment and maintenance of the State Heritage Register by the Heritage Council. s32 allows the Minister to direct the listing of an item which is of State heritage significance and sets out the procedure for listing an item.

Under s57 of the Heritage Act a person must not "demolish, despoil, excavate, alter, move, damage or destroy" an item listed on the State Heritage Register without a permit under s60 of the Act.

Protection of relics

As defined in the NSW Heritage Act 1977 a "relic"*:*

> *means any deposit, artefact, object or material evidence that:*
> *(a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
> *(b) is of State or local significance"*

Under section 139 of the *Heritage Act 1977:*

> *A person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit.*

The study area is not listed on the State Heritage Register and this assessment has identified that it is highly unlikely that relics will exist within the study area. Therefore a s160 or s140 permit will not be required.

3.0 HERITAGE LISTINGS

Searches of the following statutory registers indicates that the study area is not listed on any of the following statutory registers:

- National List
- State Heritage Register
- Local Environmental Plan

4.0 HISTORY

4.01 Town of Moruya

The site for the town of Moruya was chosen at a point in the river west of the study area that was "convient for navigation". It was gazetted on 8th August 1851, although squatters had taken up land in the area prior to gazettal of the village of Moruya. Initially, it was suggested that the village be called Gundary which was the name of a nearby cattle run but eventually the village was named Moruya, a Tharawal name for the home of the black swan (Comber 2021:5; Dixon 2002:xxiv-xxxv).

4.02 Princes Highway

The following history of the development of the Princes Highway is take from *OzRoads:The Australian Roads Website*: Ozroads: Princes Hwy (NSW)

In 1928 the Princes Highway was proclaimed State Highway No. 1, although it had existed as a major route for some time previously. It was named the Prince's Highway in honour of the visiting Prince of Wales on 19th October 1920. In 1941 the possessive form of the name was dropped and it became the Princes Highway.

Major reconstruction works for the Princes Highway began in a coordinated manner with the formation of the Main Roads Board in 1925. Previously, work had been of a local nature, serving local needs. Bridges were constructed by the Department of Public Works. The progressive reconstruction of the Highway was planned to be undertaken over a number of years working south from Broadway in Sydney to the Victorian Board. During the 1930s unemployment relief work undertook construction work as far south as Moruya. A 16km deviation across Cockwhy Range (north of Batemans Bay) was the major project during this time, taking eight years to complete and opening in December 1939. Further south a number of projects were completed during the depression including: construction of bridges over the Wagonga River at Narooma (1931); the Brogo River near Bega (1936) and a deviation at Palwambra Mountain between Mogo and Moruya (1932).

Reconstruction work ceased in 1941 due to the War in the Pacific with funds and workers transferred to working on major defence routes. After the end of the war, reconstruction recommenced and continued south from Batemans Bay. Construction of a steel truss bridge across the Clyde River was commenced 1946 but not completed until 1956 due to a post-war shortage of steel. Other construction works during this period included the Brogo Pass, north of Bega which eliminated one of the worst sections of the steep and winding road.

In 1876 the first bridge was constructed over the Moruya River to replace an existing ford (The Bega Standard and Candelo, Merimbula, Pambula, Eden, Wolumla and General Advertiser, Sat 5 Feb 1876, page 2).. This was a timber bridge which was replaced in 1899 by a steel bridge (Evening News (Sydney) 21 Nov 1899, page 3). The Australian Town and Country Journal (Sat Aug 1901, page 38) described this new bridge as the first of its kind in NSW. It was "built of iron cylinders sunk into the rock at the river bed". Unfortunately, this bridge was washed away in the 1945 floods (Goulburn Evening Post, Wed 11 April 1945, page 6) and a temporary timber bridge was constructed across the Moruya River. A permanent concrete bridge was constructed and opened in 1966. The bitumen seal finally reached Moruya in 1950 (OzRoads).

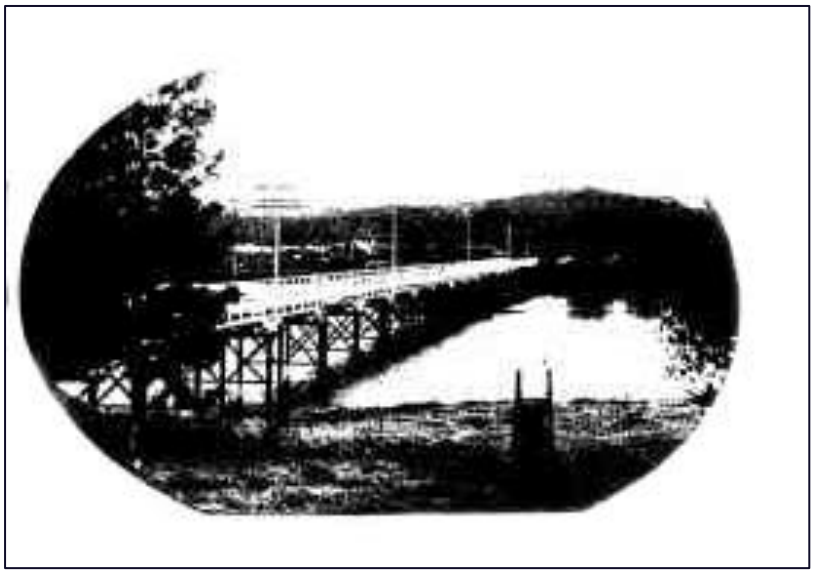


Figure 3: Image of the bridge over the Moruya River which was washed away during the 1945 floods (The Weekly Times (Melbourne), Sat 31 Oct 1936 page 38.

The road reconstruction and bitumen surface finally reached the Victorian border in 1965. The completion of the 40 year project was celebrated the opening a new bridge at Kiah across the Towamba River in 1965. Since then reconstruction, construction of deviations and new bridges has continued with the roundabout and roadworks currently planned for Moruya part of these ongoing works.

5.0 ARCHAEOLOGICAL ASSESSMENT

5.01 Archaeological potential

To undertake an archaeological assessment, it is necessary to assess whether an area contains archaeological potential. For the purposes of this report "archaeological potential" is the likelihood of a site to contain archaeological deposits that are protected by the relics provisions of the NSW *Heritage Act* 1977.

Such an assessment is guided by an understanding of the site as revealed through historical research and a site inspection. This report contains detailed historical research and the results of the site inspection.

It is useful to identify the level of archaeological potential as low, medium or high. This indicates the level of impact on the potential archaeological resource and hence the likelihood of intact archaeological deposits remaining. The degree of archaeological potential does not necessarily equate with the identified level of significance. An area may be mostly intact but it may be assessed as having minimal heritage significance.

The following definitions of high, medium and low archaeological potential will be used to assess the archaeological potential of individual items identified through the historical research.

- A **high** level of archaeological potential indicates that there is a high probability that the archaeological remains of a structure or structures are reasonably intact as there have been little or no impact following the demolition of the known structures.
- A **medium** level of archaeological potential indicates that there is a medium probability that the archaeological remains of a structure are partially or mostly intact but there has been some impact on its integrity through later development.
- A **low** level of archaeological potential indicates that there is a low probability that archaeological remains survive as there have been extensive impacts by known later development or works

5.02 Phases of occupation

To assist in determining the archaeological potential the site has been divided into 2 phases of occupation or use as detailed below. This provides a framework which assists in determining archaeological potential, as quite often each successive phase of use has impacted on the previous phase or phases:

Phase 1: Prior to 1950

Prior to gazettal of the Princes Highway the land would have been vacant until the town of Moruya was gazetted in 1851. As the town developed an unsealed track would have meandered through the town to outlying properties and towns further south. It would have been a well developed and well used unsealed road, as part of the Princes Highway.

As there were no structures constructed on the site, archaeological evidence is not predicted to located along the road. It is highly unlikely that any evidence such as personal items dropped by travellers would still remain on the site. The continual maintenance of the unsealed section of the Princes Highway would have removed any such evidence, if it existed.

Phase 2: Princes Highway: 1950 to present

The Princes Highway at Moruya was reconstructed and sealed with bitumen in 1950. Such construction would have continued the process of removing any relics that may have been dropped along the road.

5.03 Summary

As the study area has only been used as a transport route, first as an unsealed track, gradually becoming a more formal unsealed road and then bitumenised in the 1950s it is not expected that any relics will exist along the section of the road subject to the proposed upgrade. The study area does not contain archaeological potential.

6.0 PREVIOUS REPORTS

A review of historical archaeological assessments contained within the NSW Digital Heritage Library revealed no previous historical archaeological assessments undertaken in Moruya.

7.0 SITE INSPECTION

The site inspection was undertaken on 3-4 June 2021 by Dr Jillian Comber and David Nutley of Comber Consultants. The route for the Princes Highway upgrade and roundabout construction was driven along and the road reserve beside the road was walked along. As can be seen from the photograph below, the road is sealed with asphalt whilst the road reserve on either side contains pasture grass, weeds and regrowth.

No relics or evidence of previous structures was observed within the study area. However, it was noted that the road and road reserve were highly disturbed. Construction of the road would have removed any evidence of Aboriginal occupation that may once have existed along the study area. As a result, no specific mitigation measures are required.



Photograph 1: Location of the Princes Highway Upgrade and roundabout construction (Google maps)

8.0 SIGNIFICANCE ASSESSMENT

8.01 Preamble

Significance Assessment is the process whereby buildings, items or landscapes are assessed to determine their value or importance to the community.

The following criteria have been developed by Heritage NSW and embody the values contained in the Burra Charter. The Burra Charter provides principles and guidelines for the conservation and management of cultural heritage places within Australia.

8.02 Assessment

Historical
Criterion (a) – an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area)
The study area does not meet this criterion.

Association
Criterion (b) – an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area)
The study area does not meet this criterion.

Aesthetic/Technical
Criterion (c) – an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area)
The study area does not meet this criterion.

Social
Criterion (d) – an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons
The study area does not meet this criterion.

Research
Criterion (e) – an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area)
The study area does not meet this criterion.

Rarity
Criterion (f) – an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area)
The study area does not meet this criterion

Representative
Criterion (g) – an item is important in demonstrating the principal characteristics of a class of NSW's

- cultural or natural places; or
- cultural or natural environments.

or a class of the local area's

- cultural or natural places; or
- cultural or natural environments

The study area does not meet this criterion.

8.03 Statement of Significance

The site proposed for the roundabout and road upgrade does not contain any cultural significance. The study area is very small and is an existing road and road reserve constructed in 1950. It does not contain social, historic, scientific aesthetic, representative or rarity values.

10.0 SUMMARY AND RECOMMENDATIONS

10.01 Summary

The study area which is a highly disturbed road reserve does not contain historical archaeological potential and it is not expected that relics will be located within the property. Therefore, there are no constraints on the proposed development in respect of historical archaeology. However, please refer to the recommendations below.

10.02 Recommendations

Recommendation 1: Induction

A heritage induction should be provided to all employees, contractors and subcontractors engaged in the road construction on the significance of historical archaeology, that it an offence to harm relics and be advised of their responsibilities under the *Heritage Act 1977*.

Recommendation 2: Unexpected Finds and Human Remains Procedure

If any relics are unexpectedly uncovered during the redevelopment of the site, all work must cease in the vicinity of the object and an area of at least one metre around the relic secured and cordoned off using fencing and/or appropriate barriers. The archaeological consultant must be immediately contacted for further advice. The consultant will assess the object and provide further advice. No-one should enter the secured area and work can only recommence when advised by the consultant.

REFERENCES

Comber Consultants, 2022. Eurobodalla Health Service Redevelopment, Historical Archaeological Assessment. Unpublished report to Root Partnership on behalf of Health Infrastructure NSW

Dixon, R.M.W. 2002. *Australian Languages: Their Nature and Development*. Cambridge University Press.

17 May 2022

ptc.

Ash McGowan
Root Partnerships
Level 19, 9 Hunter Street
Sydney NSW 200

Dear Ash

1. Proposed Princes Highway Roundabout – Civil Statement

Introduction

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

Site Description

The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot 2, DP 1281576, a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north is a small residential subdivision called Mynora Estate. The approximate location of the roundabout is shown in Figure 1-1 below.
It is noted that ancillary inground works may extend beyond this location.



Figure 1-1 Approximate location of the proposed works.

Parking & Traffic Consultants Pty Ltd
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Suite 502, 1 James Place
North Sydney NSW 2060
info@ptcconsultants.co
t + 61 2 8920 0800
ptcconsultants.co

parking;
traffic;
civil design;
wayfinding;
ptc.

Proposed Works

The works proposed under this REF include the following:

- Construction of a new roundabout located on Princes Highway.
- Ancillary road and public domain works.
- Ancillary electricity reticulation and street lighting.

A further detailed description of the proposed works is contained in the Review of Environmental Factors report prepared by Ethos Urban.

Acid Sulfate Affectation

Investigation has been undertaken to determine whether the area of works is affected by acid sulfate soil. A section of the site is located in an area that has been mapped as Acid Sulfate Soil Area (Class 2)

Some of the ancillary works, including installation of conduits for electrical services, will be undertaken in the potential acid sulfate area. These works are limited to trenching and/or underboring for conduit installation. Should it be a requirement to not disturb the soil, horizontal directional drilling could be used to install the conduits through the potential acid sulfate area.

The proposed road works within this area is likely to be limited to mounding above existing surface to direct water flow to existing drainage channels.



Figure 1-2 Map Extract - Acid Sulfate Soils Area (Class 2)

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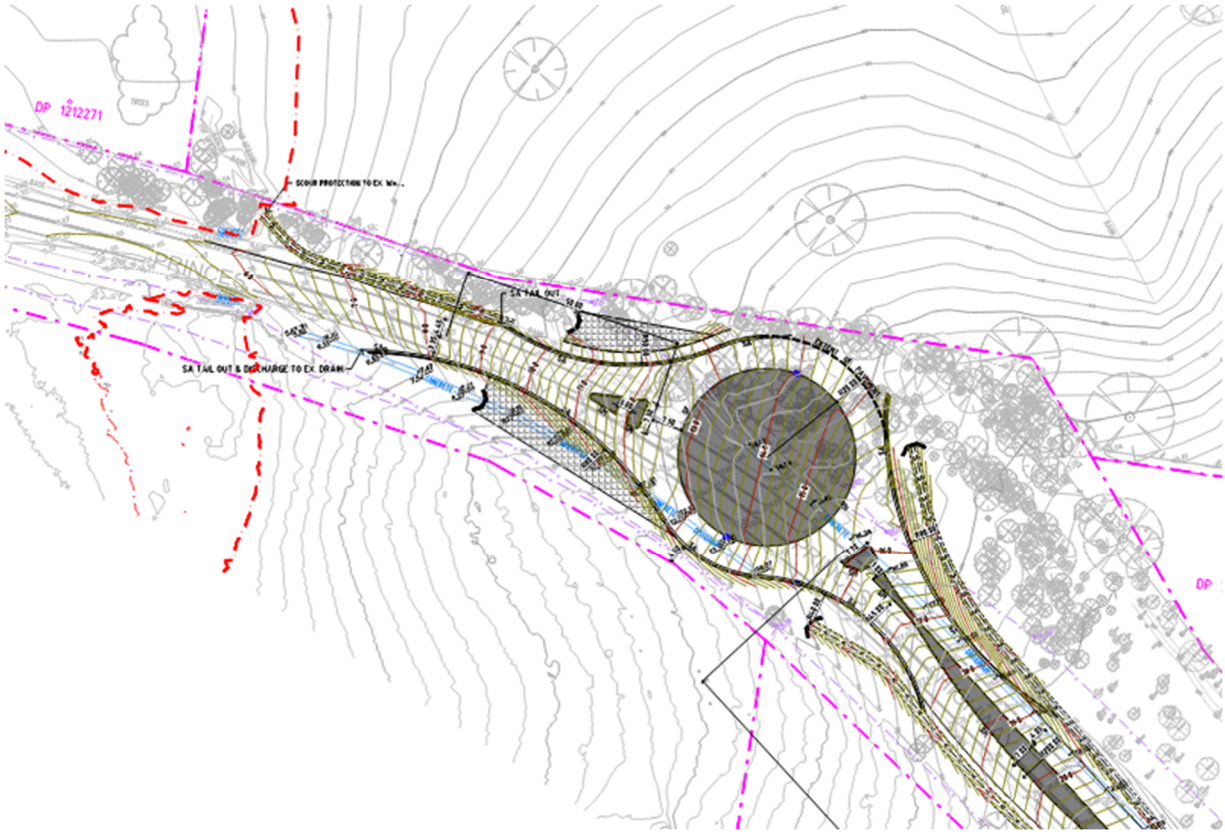


Figure 1-3 Approximate location of the proposed works.

1.1 Design Statement

The works within the potential acid sulfate soil zone could be undertaken in a manner that does not impact the water table or disturb a large volume of in-situ soil.

Yours faithfully

Stephen Naughton
Project Director
CPEng NER RPEQ

Document Control: Prepared by *SC* on *17 May 2022*. Reviewed by *SN* on *17 May 2022*.

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Abel Ecology

5 May 2022

2210065

Introduction

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

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The approximate location of the roundabout is shown in **Figure 1** below. It is noted that ancillary inground works may extend beyond this location.

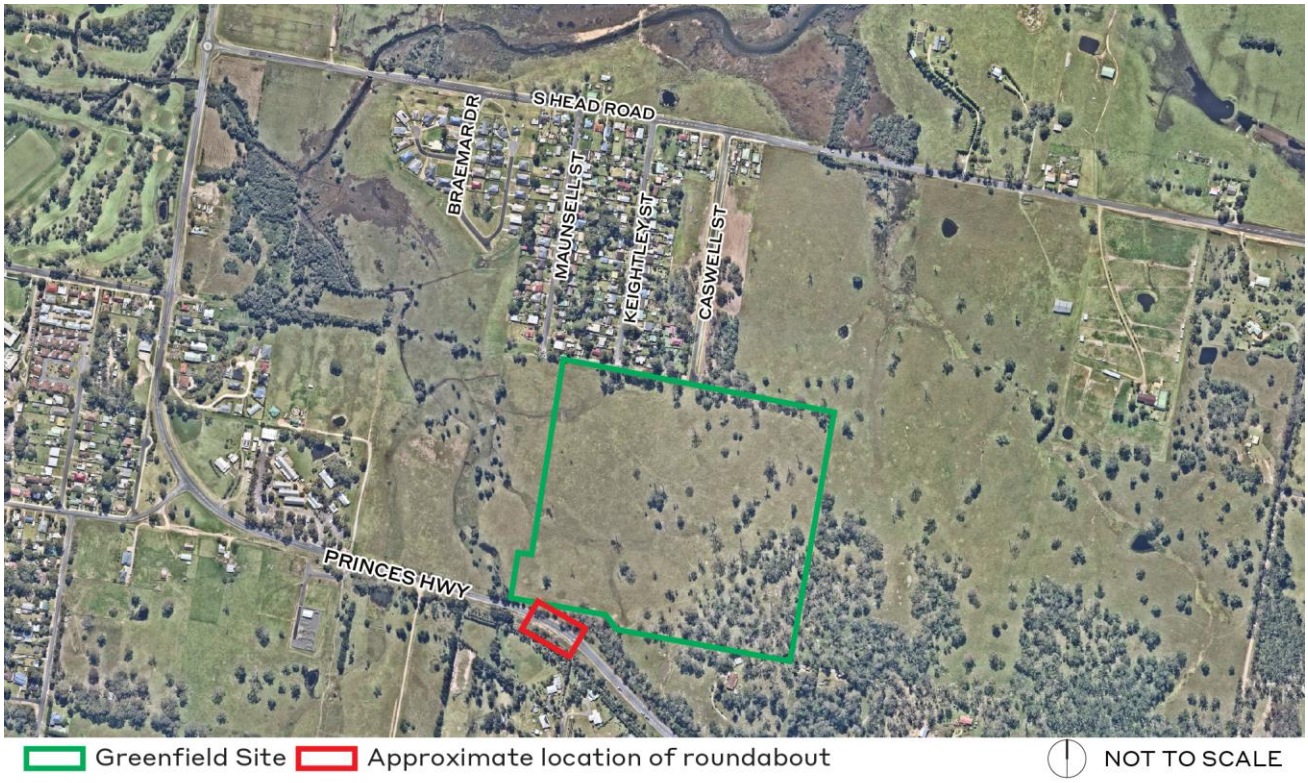
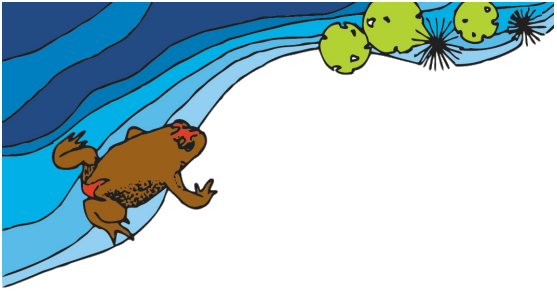


Figure 1 Approximate location of the proposed works. Proposed Works

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The works proposed under this REF include the following:

- Construction of a new roundabout located on Princes Highway.
- Ancillary road and public domain works.
- Ancillary electricity reticulation and street lighting.

A further detailed description of the proposed works is contained in the Review of Environmental Factors report prepared by Ethos Urban.

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Prescribed Ecological Actions Report (PEAR)

For

Princes Highway, Moruya NSW 2537

Adjacent

Lot 2
DP1281576

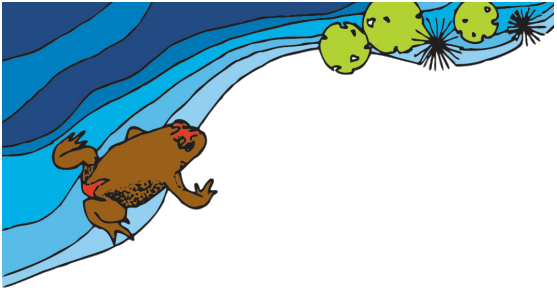
Proposed construction of a new roundabout and associated road works

Prepared for:	Health Infrastructure
Report No:	AE22-REP-2436-ISS-2
Prepared by:	Abel Ecology
Date:	17 May 2022

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The findings contained in this report are the result of discrete/specific methods used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points.

Any representation, statement, opinion or advice, expressed or implied in this publication is made in good faith but on the basis that Abel Ecology, its agents and employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever, which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement, or advice referred to above. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.

Furthermore, this report has been prepared solely for use by the Client. Abel Ecology accepts no responsibility for its use by other parties.

I confirm that I have read the NSW Land and Environment Court Practice Note commencing on 14 May 2007, Division 2, Part 31 of the Uniform Civil Procedure Rules 2005 and the Expert Witness Code of Conduct in Schedule 7 to the Uniform Civil Procedure Rules 2005. I have prepared this advice in accordance with the requirements of the Practice Note and Code of Conduct and believe this report is consistent with the requirements of the Practice Note and the Code of Conduct. I agree to be bound by the Practice Note and Code of Conduct.

Document History

Report	Version	Prepared by	Technical Review by	Proofread by	Submission	
					Method	Date
Report	Draft A	Mark Mackinnon	Dr Daniel McDonald	Dr Danny Wotherspoon and Jane Bonwick	Dropbox	12 April 2022
Report	Issue 1	Mark Mackinnon	Mark MacKinnon	Jane Bonwick	Dropbox	22 April 2022
Report	Issue 2	Mark Mackinnon	Mark MacKinnon	Jane Bonwick	Dropbox	17 May 2022

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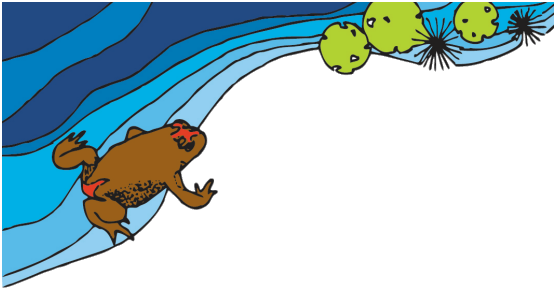


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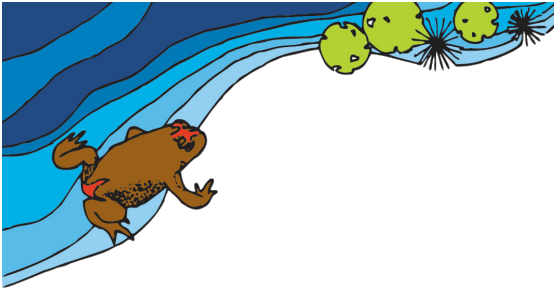


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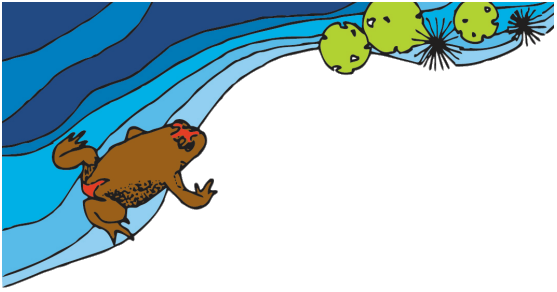


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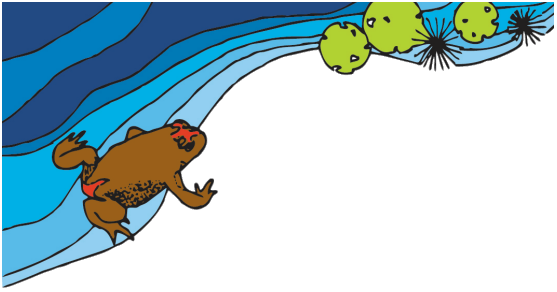
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List of Abbreviations

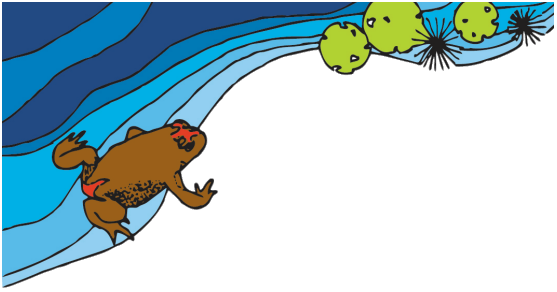
ALS	Actual Lot Size
BAM	Biodiversity Assessment Method
BC Act	Biodiversity Conservation Act 2016
BCR	Biodiversity Conservation Regulation 2017
BDAR	Biodiversity Development Assessment Report
d.b.h.	Diameter at breast height (~1.4 metres)
EEC	Endangered Ecological Community
ESD	Ecologically Sustainable Development
LEP	Local Environmental Plan
LGA	Local Government Area
MLS	Minimum Lot size

Note regarding maps in this report

The diagrams/site maps used in this report have been supplied by and are used with the permission of the client.

With regard to maps provided by the Land Information Centre, Topographic maps used with the permission of © Land and Property Information, NSW.

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Executive summary

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway to provide access to Lot 2, DP 1281576 in Moruya, NSW.

A biodiversity survey was carried out in the Princes Highway road corridor adjacent Lot 2, DP 1281576, Moruya NSW to assess the likely impacts of the proposal on species and ecological communities present on the site. The aim of the assessment is to determine whether the proposal requires a Biodiversity Development Assessment Report (BDAR) of a Species Impact Statement (SIS).

This report also describes whether there is likely to be any significant effect on any endangered ecological community, endangered population, threatened species or their habitats, as per the listings in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) (Commonwealth legislation).

The areas to be affected are roadside native vegetation adjacent Lot 2, DP 1281576, Moruya NSW within the Princes Highway road corridor.

The proposal (activity) is a part 5 assessment under the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). A part 5 activity will require further assessment if a test of significance produces a "significant impact" result.

The results from all of "tests of significance" examining the proposal indicate: **The proposal is not likely to significantly affect any threatened species or Endangered or Critically Endangered Species.**

There is no impediment to this proposal in the scope of this report. A BDAR prepared using the Biodiversity Assessment Method is not recommended. Similarly, a SIS is not required for the activity.

The provisions of the EPBC Act 1999 do not apply to this proposal and it does not require referral to the Commonwealth.

Recommendations:

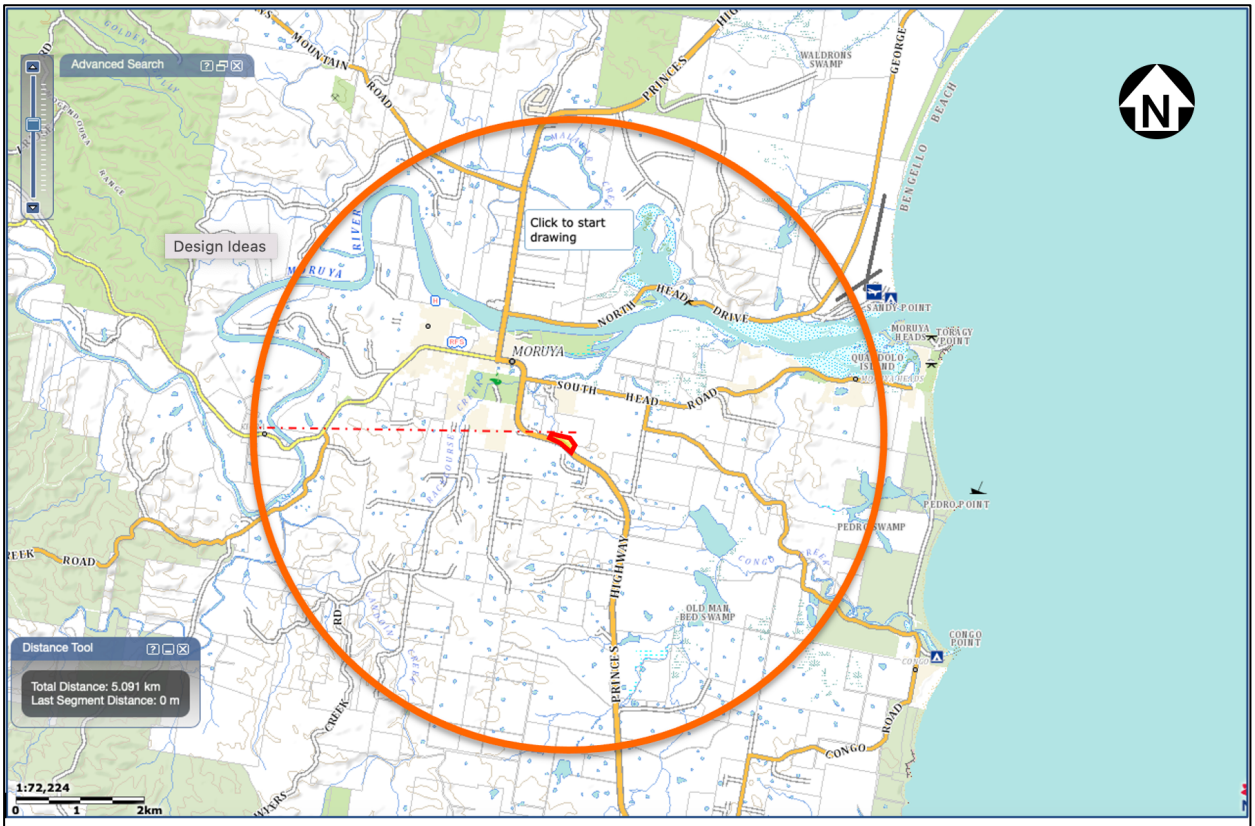
A Biodiversity Development Assessment Report (BDAR) is not required.

A Species Impact Assessment (SIS) is not required.

An approval may be issued with the following conditions:

A preclearance survey is to be conducted for hollow-bearing trees (Figure 12) to relocate resident fauna, and the hollows salvaged and relocated under the provisions of a Hollow Management Guideline document.

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Key

Site location

5 km radius around site location

5 km radius measured around site location on six maps.

Land and property Information NSW. Spatial Information eXchange (SIX) website 2022.

Figure 1. Site locality map.

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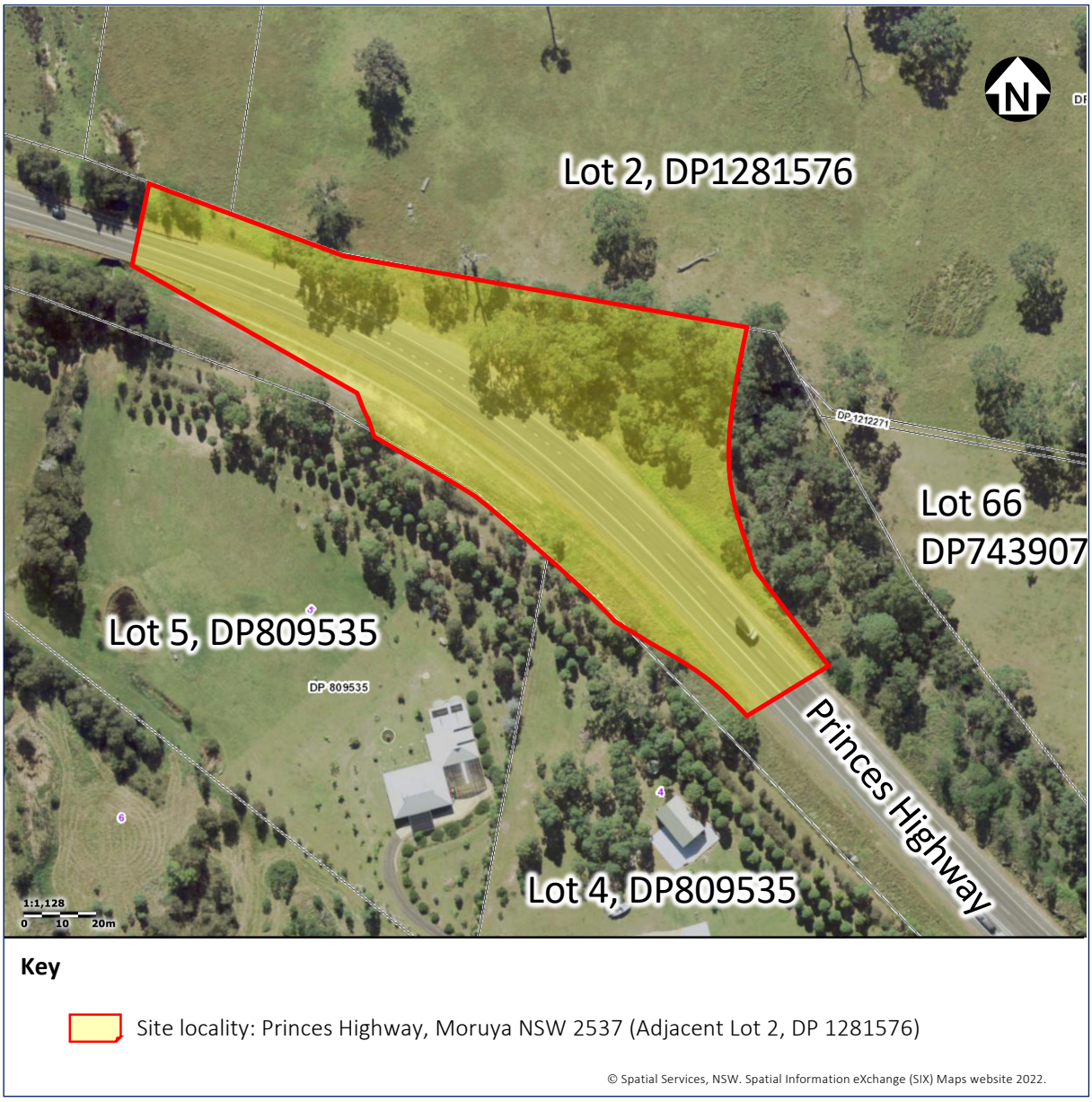


Figure 2. Locality map for proposed roundabout and road work affected area.

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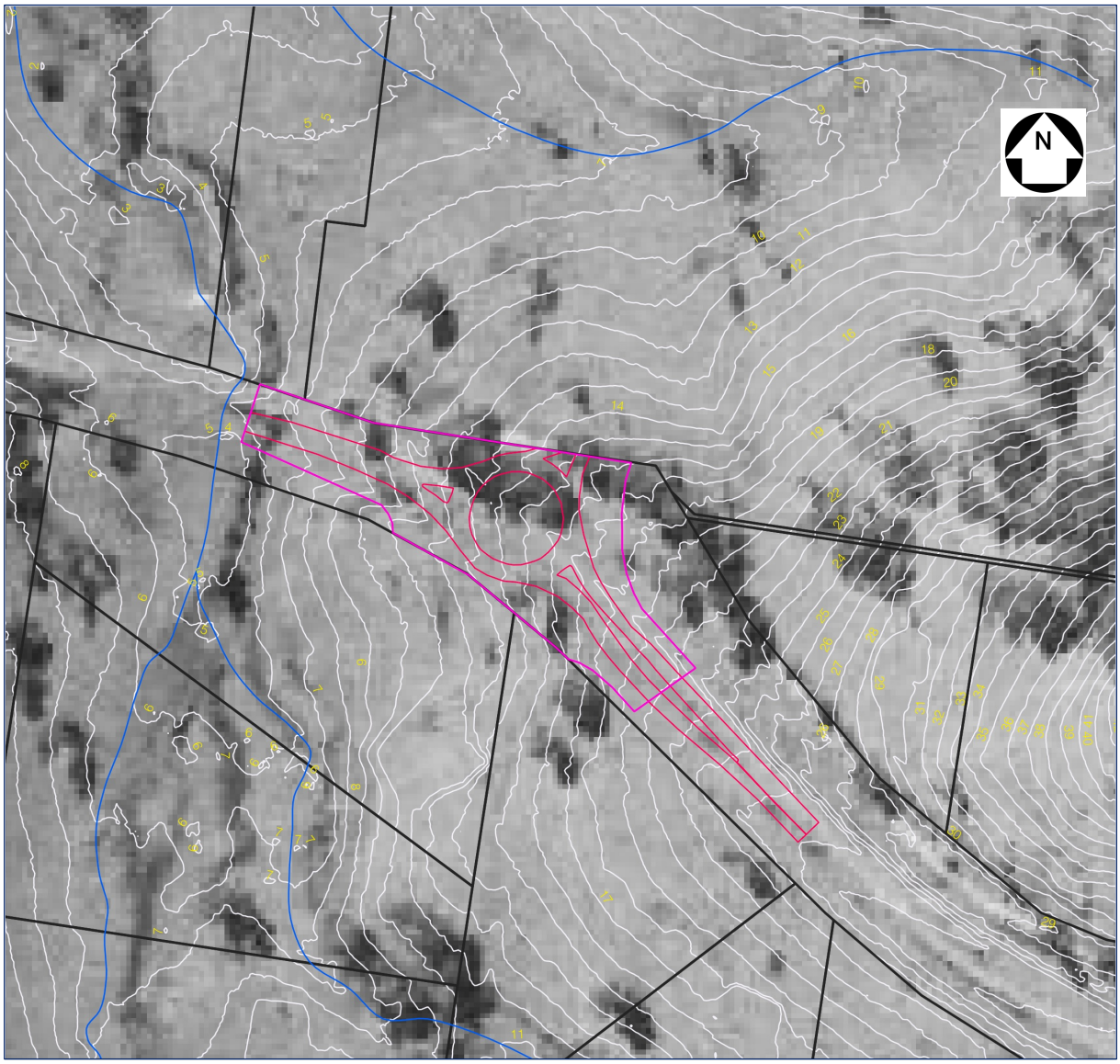


Figure 3. 1961 aerial photo of the site.

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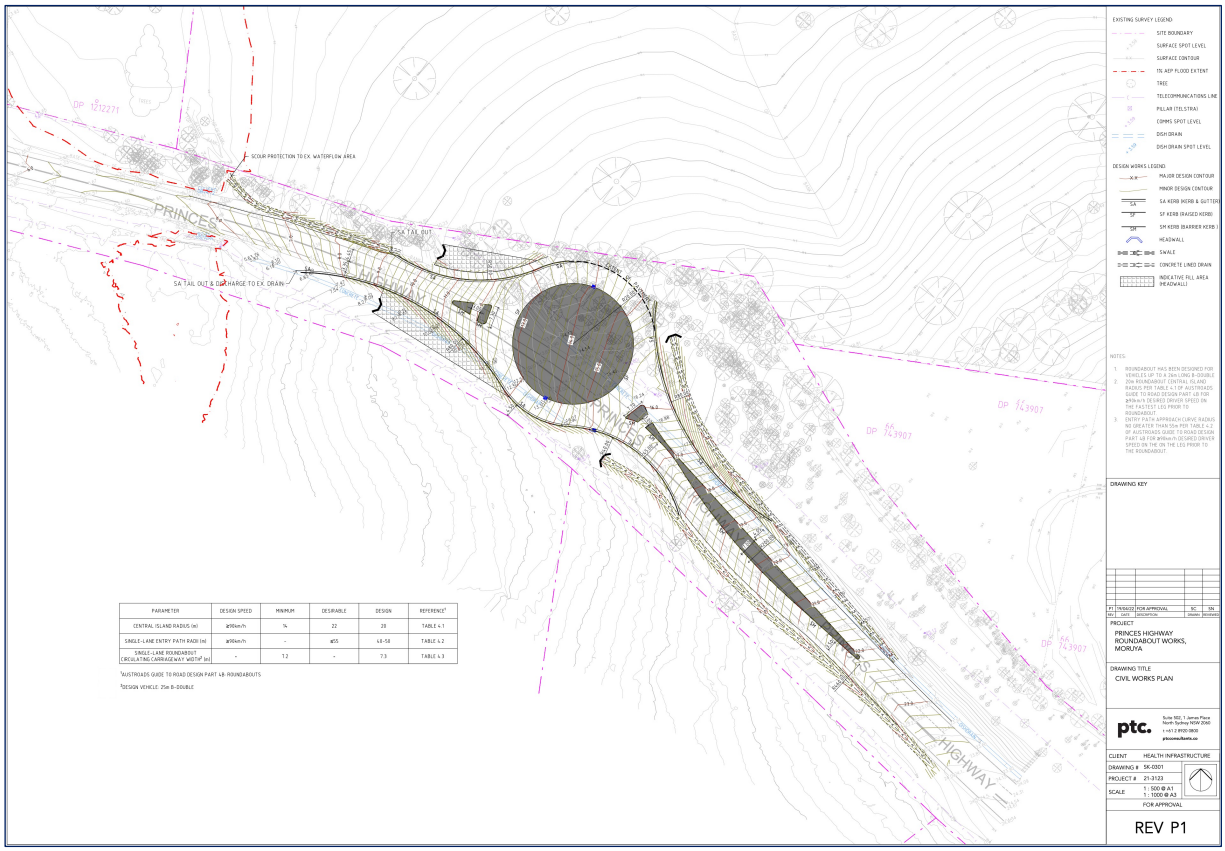


Figure 4. Proposal diagram for proposed roundabout and road work.

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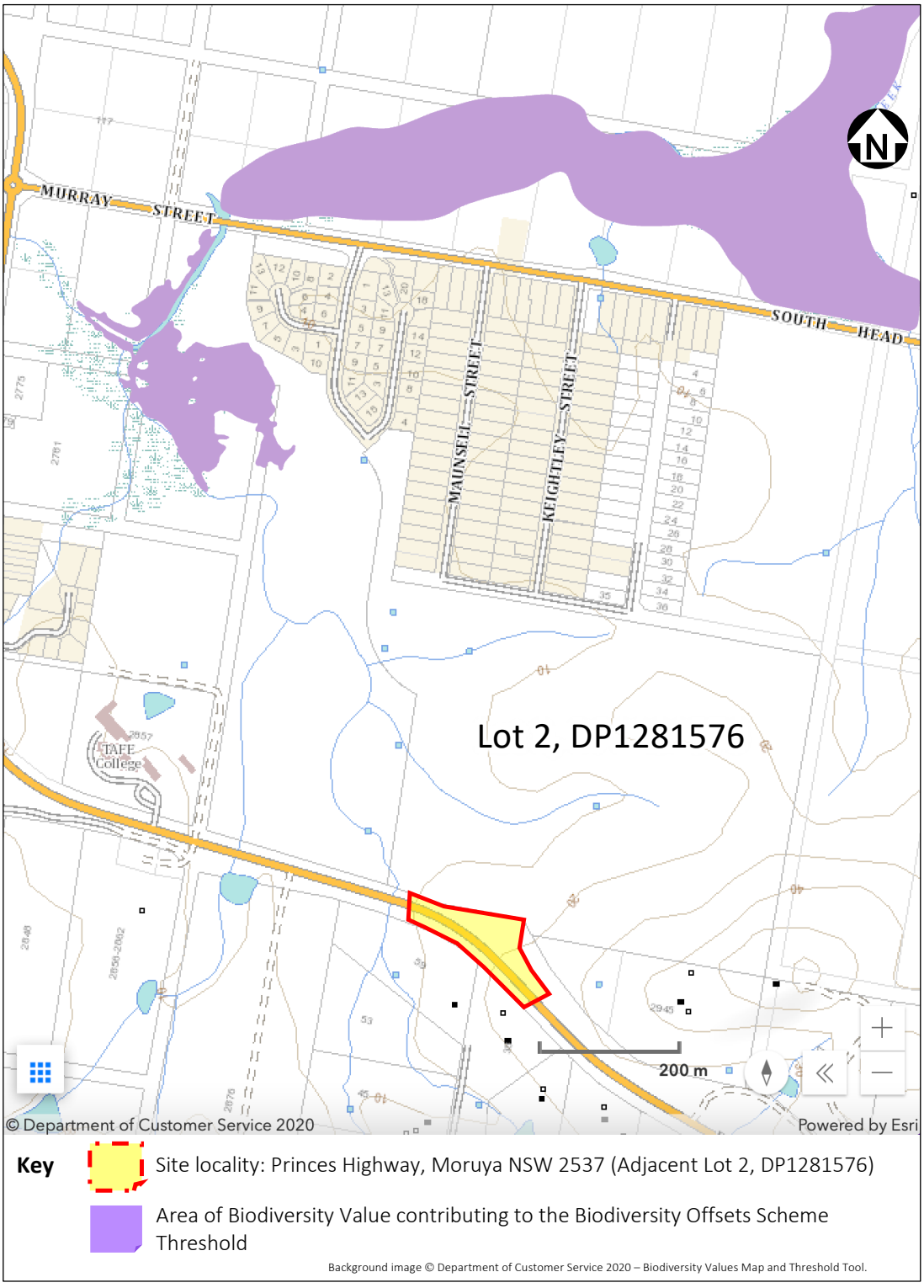


Figure 5. Biodiversity values map.

https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap

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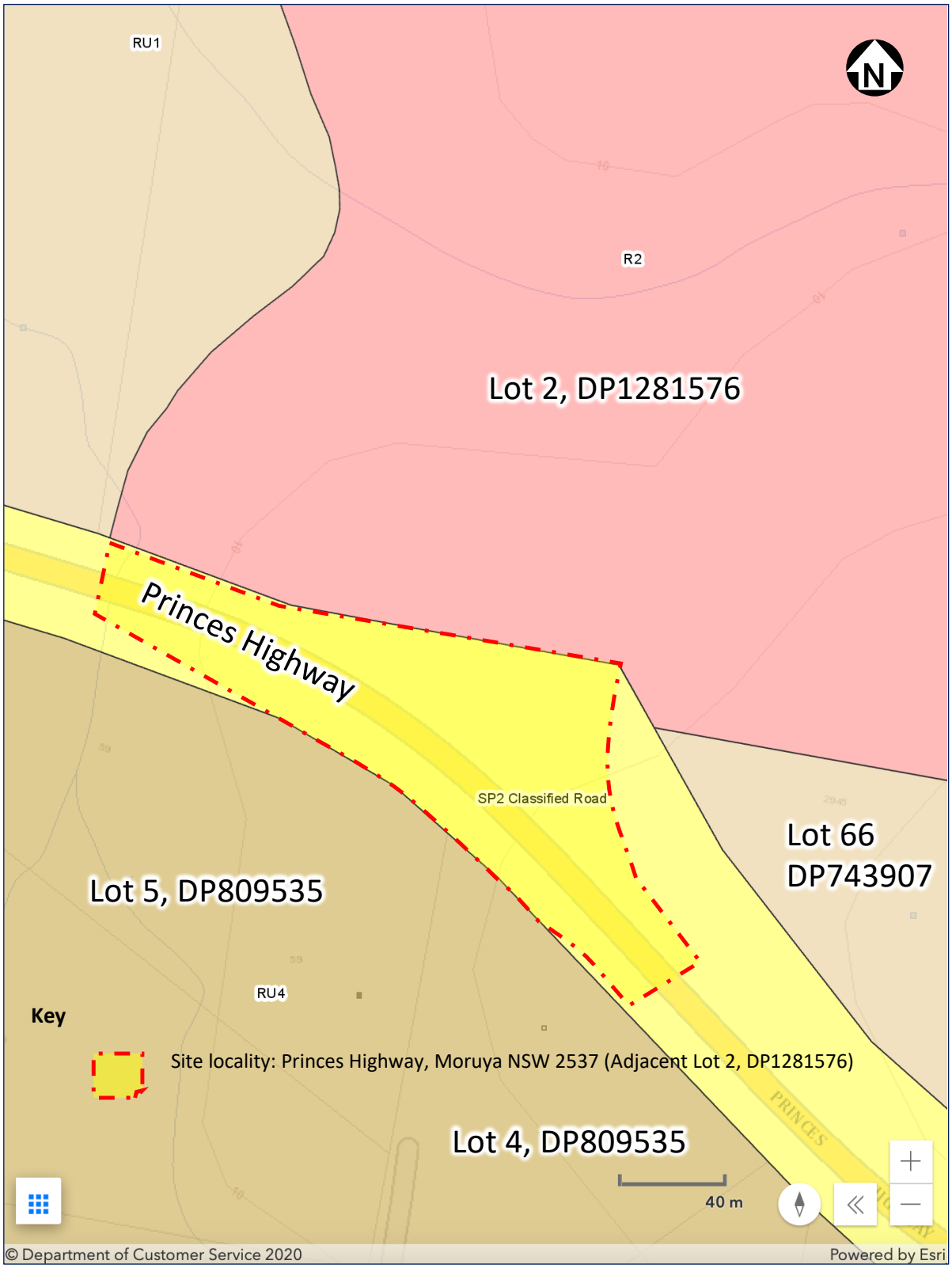


Figure 6. Site LEP zone map.

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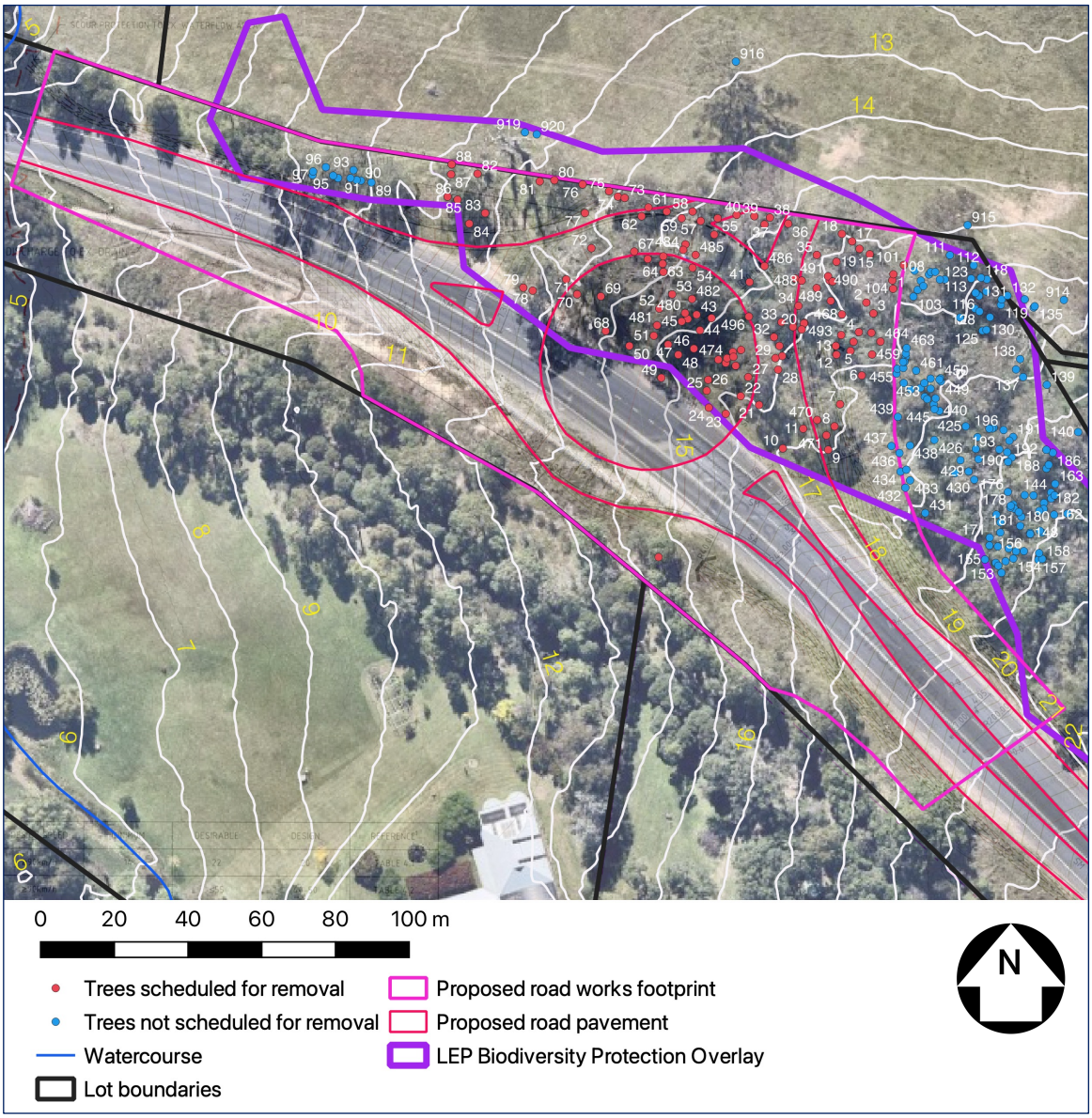


Figure 7. Aerial diagram with site proposal layered over.

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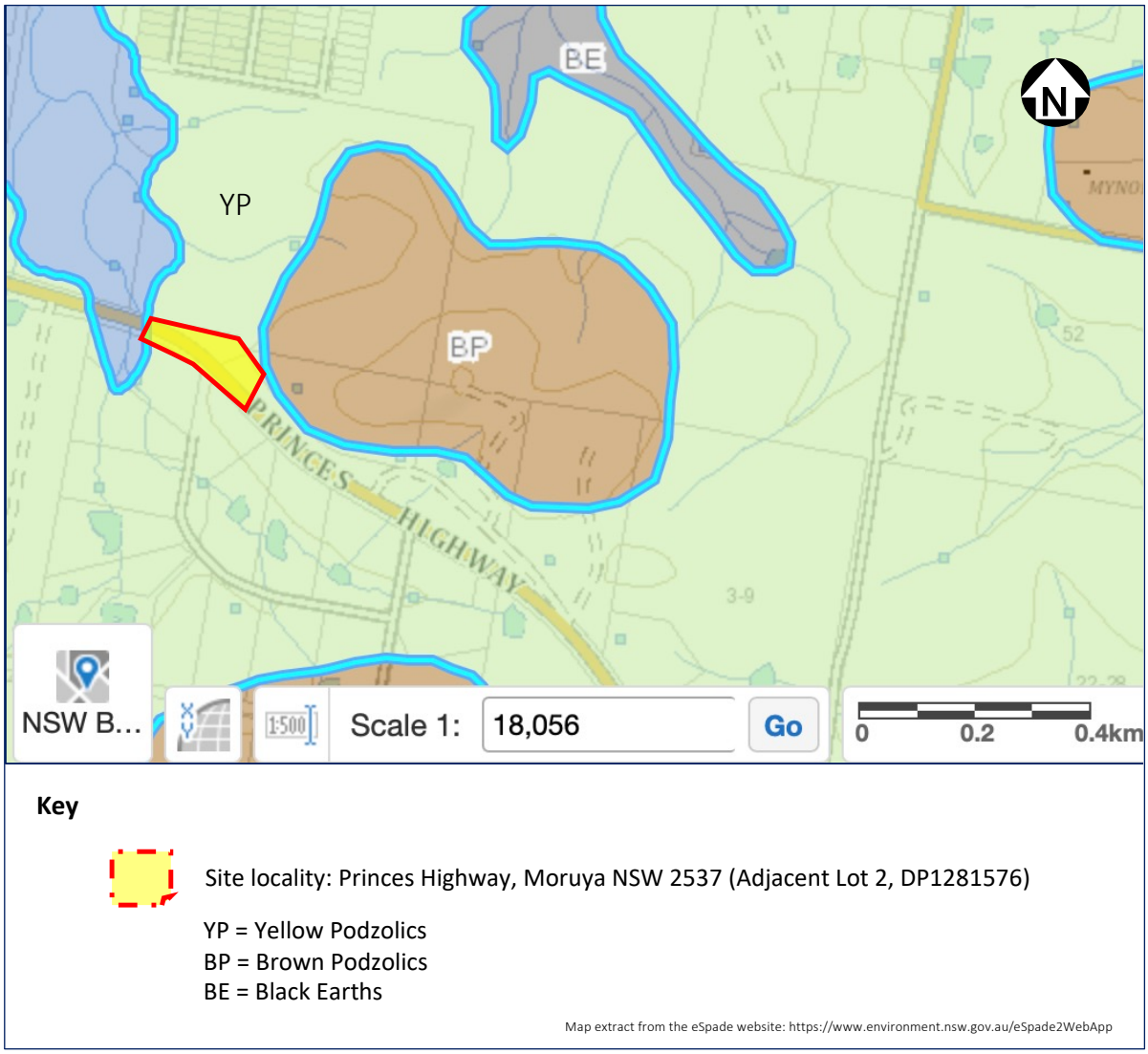
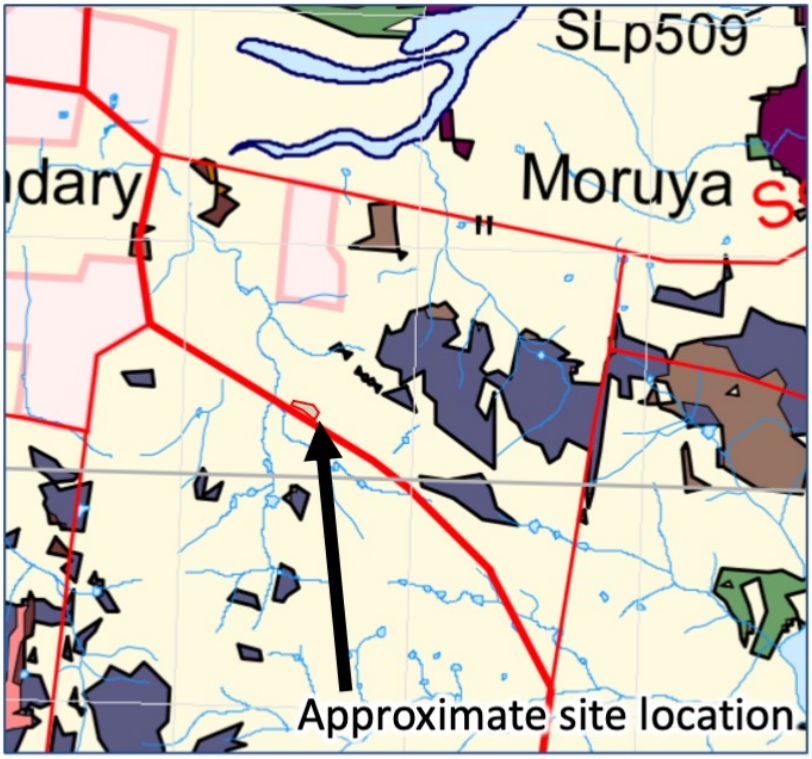


Figure 8. Soil Landscapes of site and surrounding area.

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Key (for Tozer 2010 maps)

Approximate site location	Southeast Lowland Grassy Woodland
Modified or disturbed land	South Coast Lowland Swamp Woodland
South Coast River Flat Forest	Coastal Sandstone Ridgetop Woodland
Cumberland River Flat Forest	Coastal Freshwater Lagoon
Temperate Dry Rainforest	

M.G. Tozer et. al (2010) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands

Figure 9. Vegetation map for the site and surrounding area.

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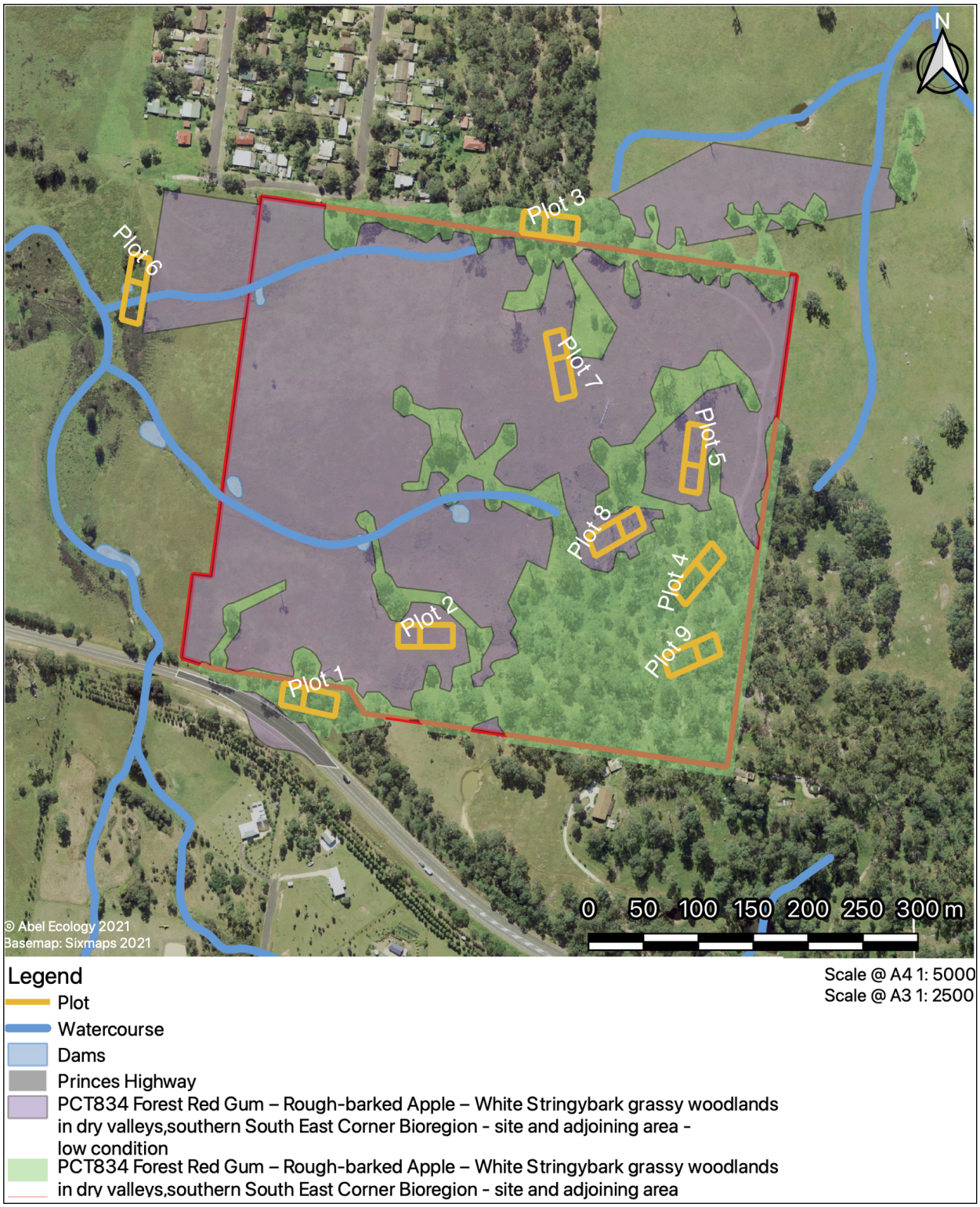


Figure 10. Vegetation PCT, vegetation zone and BAM plots locations.

Map extract from the SEED website:
https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU

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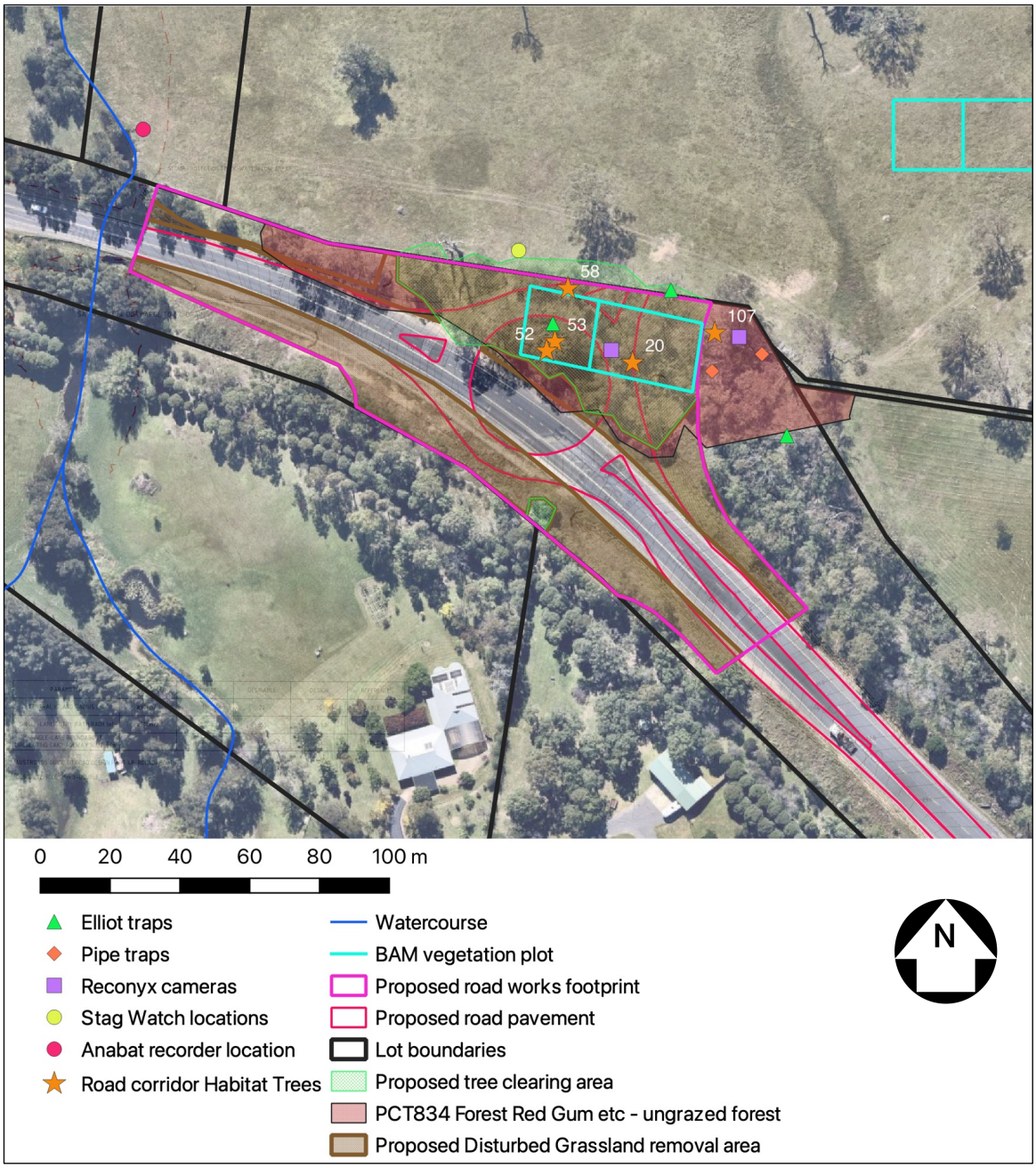


Figure 11. Survey method map.

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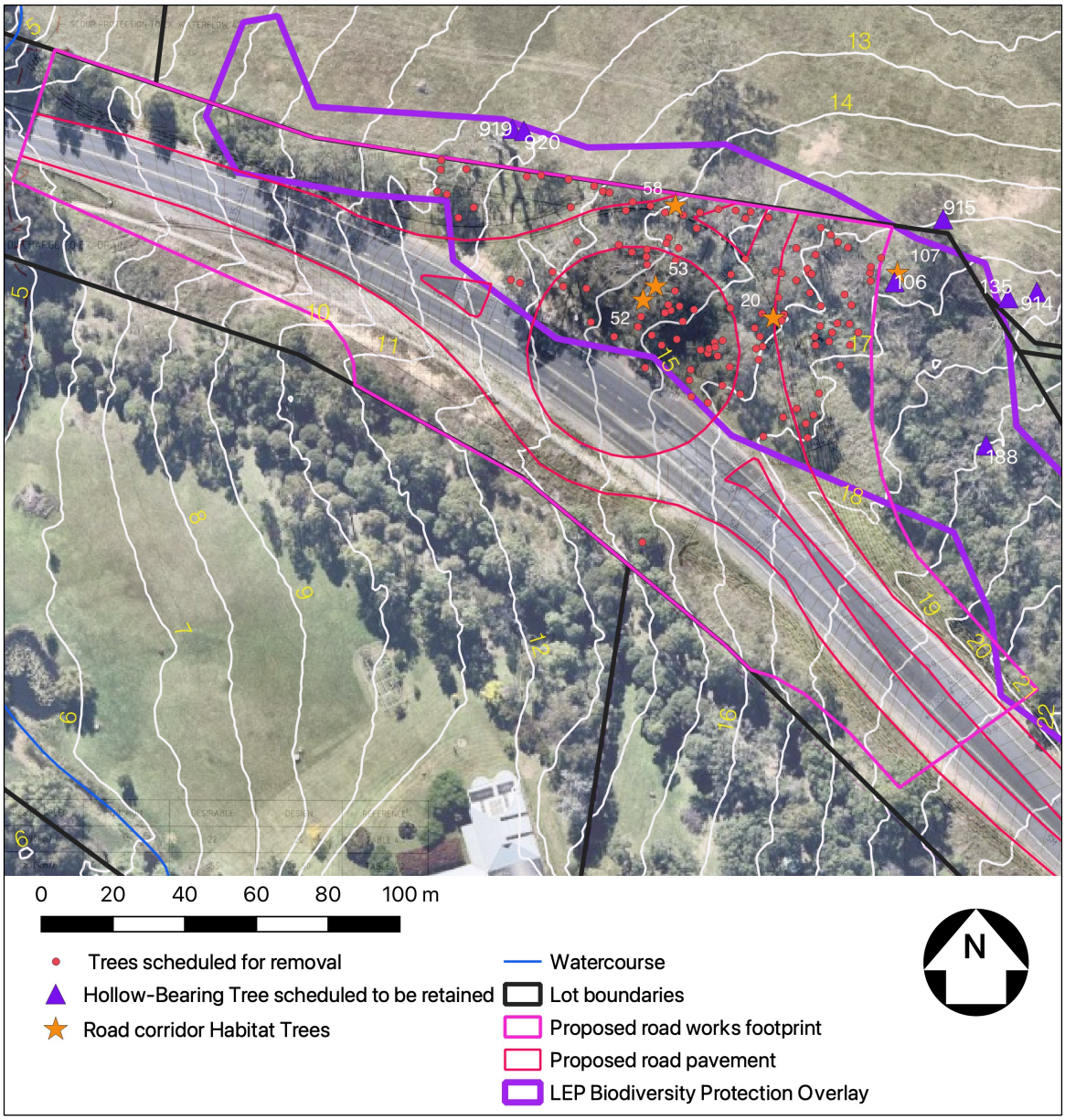


Figure 12. Location of site hollow-bearing trees and LEP Biodiversity Protection Planning Overlay.

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1. Introduction

1.1 Legislative context

This Prescribed Ecological Actions Report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

This Prescribed Ecological Actions Report meets the requirements of the *Biodiversity Conservation Act 2016* to enable a determining authority to assess a proposed activity and grant an approval under Part 5 of the EP&A Act.

When assessing a Part 5 activity under the EP&A Act, the authority must only consider 'Threshold Trigger 3' to determine is further assessment through a BDAR or SIS is required: Threshold Trigger 3: A "significant effect" on threatened species or ecological communities

A biodiversity survey of the proposed development site and adjoining area along the Princess Highway road corridor adjacent Lot 2, DP 1281576, Moruya NSW ('the site' –Figure 2) was undertaken on two separate occasions, the 12th, 13th and 14th of April 2021 and the 25th, 26th, 27th 28th and 29th of October 2021.

This Prescribed Ecological Actions Report investigates whether the impacts of a proposal for a new roundabout on the Princes Highway - to give access to Lot 2, DP 1281576 will require further assessment. The *Eurobodalla Local Environmental Plan 2012* lists and maps the site vegetation, as an endangered ecological community on the local Terrestrial Biodiversity Planning Map that will need consideration.

This assessment addresses both 'endangered' and 'vulnerable', as required by the *Biodiversity Conservation Act 2016*. Throughout this report 'threatened' refers to those species and communities listed as 'endangered' or 'vulnerable' in Schedules 1 & 2 of the BC Act 2016.

If Threshold Trigger 3 is triggered, then a Biodiversity Development Assessment Report (BDAR) or a Species Impact Assessment (SIS) must be prepared by an accredited assessor for the Authority to issue an approval and a calculation of offsetting required.

Other triggers for Part 4 assessments and entry into the BOS scheme

The following two triggers provide potential entry into the BOS when assessing a Part 4 assessment. They are included here to provide background only.

Threshold Trigger 1: Exceeding the clearing threshold on an area of native vegetation – Not Applicable to Part 5 activity under the EP&A Act.

Threshold Trigger 2: Development or a prescribed activity is carried out on land included in the Biodiversity Values Land Map (Refer to Figure 5).

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1.2 The proposal

The works proposed under this REF (Figure 4, and Figure 7) for a new roundabout on the Princes Highway to give access to Lot 2, DP 1281576 consists of the following:

a) Construction of a new roundabout located on Princes Highway;
b) Road works to Lot 2, DP 1281576 to accommodate future access from this roundabout;
c) Ancillary road and public domain works;
d) Ancillary electricity reticulation and street lighting;
e) Stormwater drainage; and
f) Clearing native vegetation and exotic pastures.

Table 1. Details of proposed native vegetation clearing.

Component of site	Area m^2
Extent of proposed native vegetation clearing (PCT834 Forest Red Gum – Rough-barked Apple – White Stringybark grassy woodland in dry valleys, southern South East Corner Bioregion). This is considered equivalent to the Endangered Ecological Community *Lowland Grassy Woodland in the South East Corner Bioregion*.	2,890
Disturbed grassland	2,840

1.3 Sources of information used in this assessment

Literature reviewed in order to assess possible issues relating to this site include:

- Air photo (SIX maps, NearMap)
- Survey map (PTC Consultants)
- Vegetation map (Tozer et al., 2010)
- Schedules to the BC Act 2016
- Schedules to the EPBC Act 1999
- State Environmental Planning Policy (Biodiversity and Conservation) (SEPP 2021) - Koala habitat protection 2020/2021
- Approved Recovery Plan: The Koala (DECC 2008)
- OEH Atlas of NSW Wildlife

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2. Landscape features of the site and the locality

2.1 Site description

For the purposes of this report, the site (Figure 2, Figure 4) is partly defined by the property boundaries of the Princes Highway road corridor adjacent Lot 2, DP 1281576, Moruya NSW. The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot 2, DP 1281576, a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north is a small residential subdivision called Mynora Estate.

The full boundaries of the proposal area are displayed in Figure 4. It is approximately 1.1133 ha. in size and the elevation is approximately 5 - 24 metres above sea level. The site is zoned SP2 Classified Road (Figure 6)

The site is defined as the proposal footprint of the proposed roundabout within the Princes Highway road corridor. The roundabout will have three entry points (N, W, E) and this defines the shape of the site. The development area of the site is approximately 215 metres long and approximately 106 metres at its widest point. The site slopes evenly to the west with the local high point being the eastern work limit.

There are no water bodies or creeks within the site boundary, however almost immediately adjacent the western work limit is an un-named tributary to Racecourse Creek.

Stormwater management is by engineered structures and sediment control measures.

The adjacent properties (Figure 1, Figure 2, Figure 6) are a mix of residential and grazing agricultural land uses.

The vegetation (Figure 9) is described in detail in Section 4 below and fauna habitat is detailed in Section 6 below.

2.2 History of the site

A historical image of the site from the NSW Historical Imagery Viewer is provided as Figure 3.

The site is part of an agricultural landscape comprising cropping and grazing. These activities have likely been carried out for more than 100 years.

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2.3 Geology

Devonian I-type granites.

Lithology; I-type granite. These granites are interpreted to form by melting of igneous source rocks. Common minerals are quartz, feldspar, and biotite. The presence of amphibole is characteristic.

https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU&runWorkflow=AppendLayerCatalog&CatalogLayer=Industry_Map_Catalog.42.Unit%20Boundaries%20and%20Faults,Industry_Map_Catalog.42.Rock%20Unit%20Pattern%20Fills,Industry_Map_Catalog.42.Rock%20Unit%20Polygon%20Colours)

2.4 Site Soils

There are three Great Soil Groups on site, consisting of yellow podzolic soils, brown podzolic soils, and black earths (Figure 8).

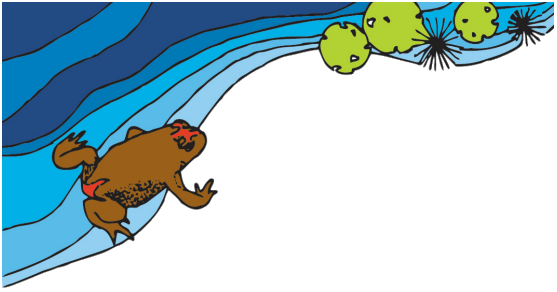
2.5 Landscape features

2.5.1 Site landscape features - The following landscape features are present on the site (Table 2).

Table 2. Significant features and observations

Significant features	Observations
Shelter/nesting/roosting sites and diversity	There is a presence of hollow-bearing trees in the site (proposal footprint). These habitat trees have been found to provide nesting and roosting sites for several species. On one occasion, an insectivorous bat was seen entering a hollow. Several brush-tailed possums were seen emerging from hollows.
Food resources	Eucalyptus, Acacia, and Angophora provide food resources of blossoms and seeds. Low cover of fallen and rotting material is present near the base of remnant trees.
Vegetation layers and density of cover	Leaf litter presence is low/rare in the grassland habitat. Leaf litter presence was moderate in the woodland habitat. The canopy provides approximately 50-75% cover in the remnant woodland. The tree cover in the grassland is <1%.
Clearing	The age classes of the trees within the retained forest within the proposal footprint suggest that disturbance has occurred historically. This is also consistent with the historic air photo.
Fire damage and regrowth status	Nil
Vehicle traffic and road mortality	No road kill was observed on the site, but road mortality is expected to have been historically high.

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3. Field survey methods

3.1 BioNet Atlas of NSW Wildlife website search

Records from the BioNet Atlas of NSW Wildlife website were accessed using the following search criteria:

Licensed Report of all Valid Records of Threatened (listed on *BC Act 2016*) or Commonwealth listed Entities for a 5 km radius of the site (selected area [North: -35.87, West: 150.04, East: 150.15, South: -35.97]). Records since 01 Jan 2000 returned a total of 87 records of 26 threatened flora and fauna species.

Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^^ rounded to 0.01°). Copyright the State of NSW through the Office of Environment and Heritage.

These species (Table 3) were considered in designing field survey targets and methods. Unsuitable candidates were eliminated on the basis of habitat requirements (Appendix 4).

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Table 3: BioNet threatened flora & fauna species records for a 5 km radius of the site since 1 Jan 2000.

Scientific Name	Common Name	NSW status	Comm. status
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P	
Lophoictinia isura	Square-tailed Kite	V,P,3	
Haematopus longirostris	Pied Oystercatcher	E1,P	
Thinornis cucullatus cucullatus	Eastern Hooded Dotterel	E4A	V
Numenius madagascariensis	Eastern Curlew	P	CE,C,J,K
Callocephalon fimbriatum	Gang-gang Cockatoo	V,P,3	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2	
Glossopsitta pusilla	Little Lorikeet	V,P	
Lathamus discolor	Swift Parrot	E1,P,3	CE
Ninox strenua	Powerful Owl	V,P,3	
Tyto novaehollandiae	Masked Owl	V,P,3	
Calamanthus fuliginosus	Striated Fieldwren	E1,P	
Anthochaera phrygia	Regent Honeyeater	E4A,P	CE
Stagonopleura guttata	Diamond Firetail	V,P	
Dasyurus maculatus	Spotted-tailed Quoll	V,P	E
Phascolarctos cinereus	Koala	V,P	V
Petaurus australis	Yellow-bellied Glider	V,P	
Petaurus norfolcensis	Squirrel Glider	V,P	
Petauroides volans	Greater Glider	P	V
Petauroides volans	Greater Glider population in the Eurobodalla local government area	E2,P	V
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V,P	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P	
Myotis macropus	Southern Myotis	V,P	
Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P	
Persicaria elatior	Tall Knotweed	V	V

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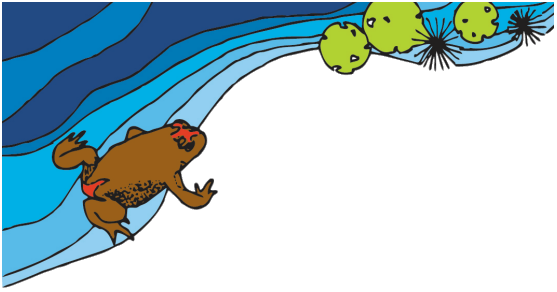
Table 4: Threatened species targeted in survey and 5 part tests.

Scientific Name	Common Name	NSW status	Comm. status
Hieraaetus morphnoides	Little Eagle	V,P	
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	
Lophoictinia isura	Square-tailed Kite	V	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2	
Glossopsitta pusilla	Little Lorikeet	V,P	
Lathamus discolor	Swift Parrot	E1,P,3	CE
Ninox strenua	Powerful Owl	V,P,3	
Tyto novaehollandia	Masked Owl	V,P,3	
Daphoenositta chrysoptera	Varied Sittella	V	
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	
Phascolarctos cinereus	Koala	V,P	E
Petaurus australis	Yellow-bellied Glider	V,P	
Petaurus norfolcensis	Squirrel Glider	V,P	
Petauroides volans	Greater Glider	P	V
Petauroides volans	Greater Glider population in the Eurobodalla local government area	E2,P	V
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V,P	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P	
Myotis macropus	Southern Myotis	V,P	
Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P	
Thesium australae	Austral toadflax	V	V
	Lowland Grassy Woodland in the South East Corner Bioregion	EEC	

Species for which suitable habitat occurs on the site within the range of the species but which did not appear in the Atlas record were added to Appendix 4.

Targeted surveys were made for relevant threatened species (Table 4).

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3.2 General comment about field work

The field work results discussed in this report combines fieldwork within the new roundabout and associated road work proposal area as well as the adjoining site to the north. The vegetated habitat within the new roundabout and associated road work area is broadly similar to the adjoining site to the north.

3.3 Field work effort

From the 12th to the 14th of April, a total of 51 hours were spent undertaking survey work on the site and surrounding habitat areas From the 25th to the 29th of October, a total of 258.8 hours were spent undertaking survey work on the site and surrounding habitat areas.

Note: the survey work describes both the new roundabout and associated road work footprint and the adjoining site.

Table 5. Survey dates and weather conditions.

Date	Time	Temperature (°C)	Task	Hours (hrs x no. people)
12APR2021	1pm to 6:30pm	19ºC to 15ºC	Random meander method of site survey was used to collect list of flora species found on site.	5.5 x 2 = 11
13APR2021	8am to 6:40pm	7ºC to 16ºC	Systematic collection of flora data for arborist report, and continuous fauna search	10 x 2 = 20
14APR2021	7:15am to 6:45pm	15ºC to 18ºC	Systematic collection of flora data for arborist report, and continuous fauna search	10 x 2 = 20
25OCT2021	4pm to 5:30pm 7pm to 9pm	10ºC to 19ºC	Spotlighting, arborist records, vegetation surveys	1.5 x 7 = 10.5 2 x 7 = 14
26OCT2021	8:10am to 5:30pm 6:30pm to 9:30pm	6ºC to 19ºC	Spotlighting, arborist records, setting Elliot traps, setting camera traps, setting ANABAT, vegetation surveys	9.6 x 7 = 67.2 3 x 4 = 12
27OCT2021	8:30am to 5:20pm 7pm to 9:15pm	13ºC to 22ºC	Spotlighting, arborist records, checking Elliot traps, checking camera traps, checking ANABAT, vegetation surveys	8.8 x 7 = 61.6 2.25 x 3 = 6.75
28OCT2021	8am to 6:10	13ºC to 27ºC	Spotlighting, arborist records, checking Elliot traps, checking camera traps, checking ANABAT, vegetation surveys	10.1 x 7 = 70.7
29OCT2021	8:40am to 11am	14ºC to 29ºC	Packing up camera traps, Elliot traps and pipe traps.	2.3 x 7 = 16.1

Survey effort was concentrated within the site boundaries, although adjacent surrounding vegetation was noted.

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3.4 Flora survey method, vegetation community and habitat classification

A flora survey was conducted in April 2021 to compile vegetation descriptions and species lists for the site. One quadrat of 20 m x 20 m was used to record grass and forb species. An arborist report was conducted and used to compile a list of SEPP 2021 koala habitat trees.

Trees were surveyed for habitat value.

Vegetation quality is assessed as described below (Section 3.5). The plant community/communities on site were classified according to the NSW VIS.

3.5 Simplified vegetation integrity assessment

On-site vegetation may be described according to a simplified vegetation integrity classification for each vegetation zone / habitat type. The simplified vegetation integrity assessment is based upon a modified version of the vegetation integrity assessment described in the NSW Biodiversity Assessment Method (BAM) 2017. This simplified assessment is based upon a qualitative assessment; no quantitative assessment was undertaken and no vegetation integrity score is calculated. The assessment requires the assessor to compare the observed vegetation with the vegetation type presumed to be present prior to 1750 (high quality native vegetation). Vegetation with good or moderate integrity usually provide higher quality habitat for a diverse range of indigenous species.

Four main qualitative classes of vegetation integrity are recognised. There is variation within each class, and in addition the class boundaries are somewhat fluid where one grades into the other.

Good integrity vegetation

Characteristics: Relatively high indigenous species diversity, diversity of flora species growth form (mix of trees, shrubs and groundcovers etc), diversity of tree size, canopy layer regeneration observed, fallen logs present on the ground, dead vegetative litter (leaves, twigs etc) cover present, weed invasion absent or minimal

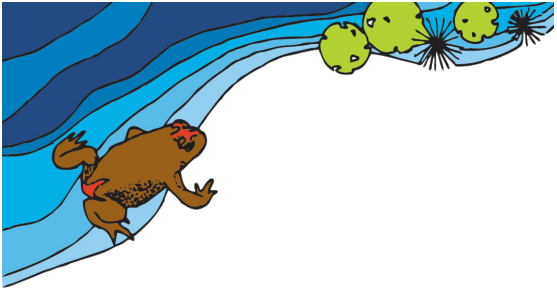
Moderate integrity vegetation

Characteristics: Remnants and regenerating areas that have experienced disturbance but appear to retain the capability of recovery. Weed invasion may be moderate.

Poor integrity vegetation

Characteristics: The vegetation is highly disturbed. It typically consists of scattered trees/shrubs or clumps of trees and shrubs. Tree size diversity significantly reduced. The groundcover layer is comprised of a mix of indigenous species and exotic species. Fallen logs rare to absent, ground vegetative litter lacking.

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Cleared class

Characteristics: Indigenous canopy species are absent and the indigenous understorey (shrubs/climbers/scramblers/groundcovers) are approximately less than 50%.

Note: some vegetation types naturally lack some of the characteristics. For example, trees are rare to absent in saltmarshes, sedge swamps, alpine herbfields and arid shrublands. However, providing the other characteristics are consistent with a natural undisturbed area of the same vegetation type then these vegetation types are classified as having "good integrity".

3.6 Fauna survey method

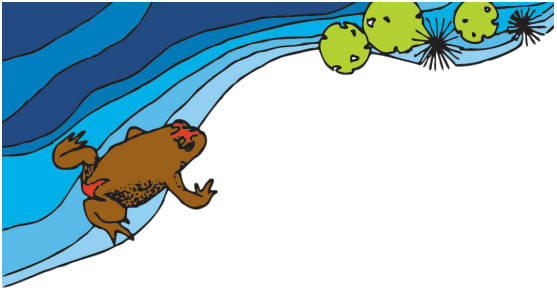
The methods of survey undertaken to detect the various faunal groups or their habitat are outlined below. Locations for specific survey methodologies are shown in Figure 11. Targeted surveys were made for threatened species based on records of sightings from the BioNet Atlas website, and the Ecologist's knowledge.

During the survey period from 12th to 14th April 2021, a **stag watch of hollow habitat trees** was conducted for fauna. This consisted of quiet watching of a hollow tree for 30 minutes before dusk and 30 minutes after dusk to see what fauna emerged. Surveys for diurnal fauna species were conducted concurrently with flora surveys. Roads were briefly inspected when travelling to and from the site for road-kill fauna. Hollow bearing trees were surveyed by day for birds and night for nocturnal fauna.

During the survey period from the 25th to 29th October 2021, stag watches were also undertaken. This consisted of quiet watching of a hollow tree for 30 minutes before and 30 minutes after dusk to see what fauna emerged. Surveys for diurnal fauna species were conducted concurrently with flora surveys. Roads were briefly inspected when travelling to and from the site for road-kill fauna. Hollow bearing trees were surveyed by day for birds and night for nocturnal fauna. Searches were made on the basis of known local species records or habitat availability (Appendix 3).

Dates, weather and temperatures of all fieldwork were recorded and are tabulated in Section 4.2 above.

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3.6.1 Call playback

Call playback was undertaken on the site **near to the proposal area** for the following species:

- Powerful Owl Ninox strenua
- Sooty Owl Tyto tenebricosa (Generally restricted to tall Wet Sclerphyll Forest)
- Masked Owl Tyto novaehollandiae
- Barking Owl Ninox connivens
- Yellow-bellied Glider Petaurus australis
- Koala Phascolarctos cinereus

3.6.2 Diurnal fauna searches

Searching, opportunistic observations and call recording provides an indication of types of species using a site. These methods are used to identify and record live animals, or record indirect evidence of animal presence on the site. On occasions, specific surveys may be conducted for a targeted group or species, such as searching the margins of a dam for frogs. Generally though, birds, reptiles, frogs and mammals, or evidence of them, may all be present in the same habitat at the time of survey, therefore searching for these faunal groups is generally run concurrently. This involved:

a) Searching shelter sites, basking sites, opportunistic observation, and assessment of shelter site diversity suitability for reptiles.

b) Searching shelter sites, calling sites, egg deposition sites, spotlighting and triangulation on calling males for frogs.

c) Opportunistic observations and identification of calls of species, and search for indirect evidence such as nests, feathers, scratchings and feeding signs for birds.

d) Searching for indirect evidence, such as diggings, droppings, runways and burrows, and opportunistic observations for mammals.

While rigorous surveys are likely to find more species, high species richness for birds can be recorded in a relatively short amount of time. Bird surveys are used as a simple indicator of other parameters, such as biodiversity and the functioning of the ecosystem.

3.6.3 Trapping

Elliott and hair-tube trapping target small and medium-sized mammals. One trap site was placed within the proposal area. Two medium Elliot Live Traps (32 x 9 x 10 cm) were placed on the ground. One large Elliot Live Trap (46 x 15 x 15 cm) was placed on the ground. Three hair tubes were placed at each trap station, one with oat bait at ground level, one with oat bait, tree mounted, and one with fish bait alternating at ground level and tree mounted. Oat bait was a mixture of peanut butter, rolled oats, honey and sesame oil.

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3.6.4 Reconyx Wildlife camera

Two Reconyx cameras were deployed on the 12th and 13th April 2021 at approximately 5 pm and remained in their position until we returned to the site the following morning. The camera locations can be seen in Figure 11. The cameras faced towards suspected habitat trees. We sprayed honey water on the base of the tree, in view of the camera, as to attract any local fauna.

Two Reconyx cameras were also deployed on the 26th of October 2021 at approximately 4pm and remained in their position until the 29th of October.

The cameras were installed on trees approximately 1 metre above ground level facing downwards. Honey water and bait were distributed in view of the camera to attract fauna.

3.6.5 Stag watching

Stag watching was conducted on the 12th, 13th and 14th April 2021 for approximately 1hour, 30min before and after sunset. Stag watching was also conducted on the 25th, 26th and 27th of October 2021 for the same timeframe.

A Jetbeam BC40 Pro LED spotlight was used to maximise detection by eyeshine and movement of fauna (Wotherspoon, D, (2019) Handheld spotlights for Night Field Survey. *Consulting Ecology* (43): 10-11.; Wotherspoon and Mackinnon (2020) Jetbeam BC40 Pro Handheld Spotlights for Night Field Survey. *Consulting Ecology* (45): 9-11).

3.6.6 Nocturnal fauna searches

Spotlighting was undertaken by 2 people for a total of 1 man-hour on (12th, 13th and 14th April 2021), each person using a Jetbeam BC40 Pro LED and 10 x 50 binoculars (see Figure 11).

On the 25th, 26th, 27th and 28th of October 2021 spotlighting was undertaken by three people for a total of 32.7 man-hours, each person using a Jetbeam BC40 Pro LED and 10 x 50 binoculars.

Nocturnal searches may encompass all the surveying methods used during the day, but generally consist of either locating a live animal or recording its call. Nocturnal species, such as arboreal mammals, large forest owls, flying-foxes and calling male frogs, are specifically targeted. Survey methods for microbats are outlined below in 3.4.7.

A Jetbeam BC40 Pro LED spotlight was used to maximise detection by eyeshine and movement of fauna (Wotherspoon, D, (2019) Handheld spotlights for Night Field Survey. *Consulting Ecology* (43): 10-11.; Wotherspoon and Mackinnon (2020) Jetbeam BC40 Pro Handheld Spotlights for Night Field Survey. *Consulting Ecology* (45): 9-11).

3.6.7 Microbat ultrasonic call recording

The method for identifying free-flying bats by their species-specific echolocation calls is one that has become standard in the last two decades (*Richards 2001*). Insectivorous bats were surveyed on this site by Anabat

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recordings directly to cf storage zcaim, overnight (*Duffy et al. 2000*). Any other bat survey methods, such as brief survey time, is certain to miss bat species scheduled by the BC Act 2016. Scheduled species are recorded on average within 1.5 hours (94 ±64 minutes) of recording but up to four hours is required to record all threatened species present (Richards 2001). Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* has the largest home range and takes up to four hours to reliably appear at any point in its range. For a small site, any bats that appear in the first half hour are likely to be roosting nearby, with probability of recording 57% in the first half hour and 68% in the first whole hour (*Richards 2001*). Storage to zcaim provides high quality call recordings with very little noise, enabling high reliability in call identification. Flying-foxes and insectivorous bats were sought by nocturnal spotlight transects and searching for roost sites, and Anabat recordings were analysed. Opportunistic observations during fieldwork were noted.

Table 6. Anabat recording dates and weather conditions.

Date	Times	Temperatures (^{O}C)	Weather
12APR2021	5:30 pm to 6:30 pm	17 ^{O}C to 15 ^{O}C	Fine
13APR2021	5:40pm to 6:40pm	17ºC to 16ºC	Fine
14APR2021	5:30pm to 6:30pm	23ºC to 18	Fine
25OCT2021	7pm to 8am	10ºC to 19ºC	Fine
26OCT2021	7pm to 8am	6ºC to 19ºC	Fine
27OCT2021	7pm to 8am	13ºC to 22ºC	Fine
28OCT2021	7pm to 8am	13ºC to 27ºC	Fine

3.7 Species likely to occur

Species to be listed as 'likely to occur' or 'expected' (see Appendix 3), are common species generally found in the region, which are likely to occur on site if suitable habitat is present.

Native flora may include species local to the area (occurring in local remnants). Structure and species composition will depend upon locally occurring communities.

Expected species are common and, by definition, are not threatened species.

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3.8 Limitations of the survey

Flora and fauna surveys were conducted on two occasions, in April 2021 and October 2021.

The first survey was conducted in April 2021, in the autumn season. This was not suitable for species sensitive to colder weather, and spring/early summer blooming flowers. The temperature during the survey dropped to 16ºC and dropped below 14ºC during the night, which may have limited the activity of some species preparing for the coming cold temperatures. The day temperatures ranged from cool temperatures on the 12th and 13th, unsuitable for reptiles, to a warm sunny day on 14th April 2021. The days were sunny and clear.

A second survey was conducted in October 2021, in the spring season. This survey was more suitable for species sensitive to colder weather such as bats. Some spring/early summer flowers were blooming. The temperature during the survey dropped below 14ºC during the night, which may have limited the activity of some species such as bats. The day temperatures ranged from cool temperatures on October the 25th and 26th, to warm sunny days on the 28th and 29th.

Species that may use the site were not detected during the survey for the following reasons:

a) The species was present during the survey but was not detected due to dormancy, inactivity or cryptic habits.

b) The species use the site at other times of the year, but was not present during the survey due to being nomadic or migratory.

4. Survey Results: Vegetation and habitat description

4.1 Site habitat descriptions

The site habitat within the principle development area is described below. The distribution of vegetation/habitat types on the site and surrounding areas is shown in Figure 9. The location of vegetation survey plots are identified in Figure 10. Habitat zones are illustrated in Figure 11. The location of individual trees and the LEP Biodiversity Protection Overlay (mapped Endangered Ecological Community) are overlaid on the proposal in Figure 7.

4.2 Habitat 1: Woodland

The woodland is mostly intact, with several hollow-bearing trees (Figure 12) but historically it has been disturbed.

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4.3 Habitat 2: Grassland

Grassland is prepsent adjacent to the Princes Highway. It appears to be periodically slashed. African Love Grass dominates the grassland habitat, but there is a presence of native grasses. There are several hollow-bearing trees in this habitat, including confirmed roosting/nesting trees for native mammal species.

Specific habitat features, rather than types, are listed below in Section 4.4.

4.4 Specific habitat features

Important habitat features that have significance for fauna occupation of the site are discussed below (Table 9). These include both site disturbance and natural features. Potential habitat trees ~~of~~ were observed within the proposal area. There is generally a moderate supply of fallen logs and dead wood/coarse woody debris within the woodland habitat.

Table 7. Significant features and observations for the site.

Significant features	Observations
Frequency of large trees (approx. > 80 cm DBH)	Rare
Tree regeneration and Tree stem-size diversity	All canopy species regenerating
Logs, woody debris and litter cover	Logs, woody debris and leaf litter –moderate
Food resources	Eucalyptus and Acacia provide food resources of blossoms and seeds. Low cover of fallen and rotting material is present near the base of remnant trees.

4.5 Pasture

Exotic grasses present within or near the proposal area include: Paspalum *Paspalum dilatatum* and Carpet Grass *Axonopus fissifolius*.

The following native species were also observed within or near the proposal area: Redleg Grass *Bothriochloa macra*, Lovegrass *Eragrostis leptostachya*, Weeping Grass *Microlaena stipoides* and Rat-tail Grass *Sporobolus creber*.

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4.6 Woodland

Dominant trees include Forest Red gum *Eucalyptus tereticornis*, Stringybark *Eucalyptus eugenioides* and Broad-leaved Apple *Angophora subvelutina* and Rough-barked Apple *Angophora floribunda*. Rare small trees include *Acacia implexa* and *Exocarpus cupressiformis.* The forest has numerous fallen trees, logs and coarse woody debris. The vegetation is consistent with a form of the Endangered Ecological Community known as Lowland Grassy Woodland in the South East Corner Bioregion. The woodland extends into the road reserve of the highway on the southern boundary of the site.

Table 8: Dominant tree species within or near the proposal area.

Species	Common name
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus bosistoana	Coast Grey Box
Eucalyptus eugenioides	Thin-leaved Stringybark
Angophora floribunda	Rough-barked Apple

The vegetation within this zone is classified as moderate integrity vegetation.

4.7 Off-site habitat

Off-site habitat consists of similar habitat types, large open grassland habitats with woodlands. A small estuarine waterway that flows into Moruya River occurs nearby.

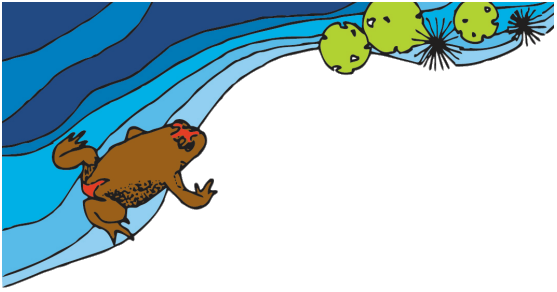
4.8 Species and Communities of conservation concern

The site trees are all remnants of, or are a form of, the lowland grassy woodland ecological community. This community is listed as endangered ecological community in NSW and critically endangered by the EPBC Act 1999.

4.9 Weeds

The *NSW Noxious Weeds Act 1993* has been repealed and the *Biosecurity Act 2015* has replaced it. The *Biosecurity Act 2015* requires each landholder and/or occupier to control biosecurity matter (weeds) on their property. The

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landholder and/or occupier is to develop an effective control strategy and plan to ensure they meet their General Biosecurity Duty.

The General Biosecurity Duty (GBD) is imposed on any person who deals with biosecurity matter (weeds), and who knows (or ought reasonably to know) of the biosecurity risk posed (or likely to be posed). Such a person has a biosecurity duty to ensure that the risk associated with those weeds is prevented, eliminated or minimised - so far as is reasonably practicable. A requirement is that all public and private land owners or managers and all other people who deal with weed species (biosecurity matter) must use the most appropriate approach to prevent, eliminate or minimise the negative impact (biosecurity risk) of those weeds.

Council may issue a Biosecurity Direction when any owner/occupier fails in their biosecurity duty to control weeds on their land. The owner/occupier must comply with this biosecurity direction. A penalty notice or prosecution may follow if the owner/occupier fails to comply with the Biosecurity Direction.

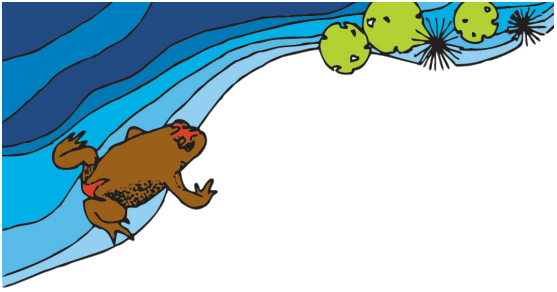
List of Weeds of National Significance
http://weeds.dpi.nsw.gov.au/WeedListPublics/CategoryResults?showImages=True&categoryId=1&pageTitle=Weeds%20of%20National%20Significance/

List of National Environmental Alert List Weeds
<http://weeds.dpi.nsw.gov.au/WeedListPublics/CategoryResults?showImages=True&categoryId=5&pageTitle=National%20Environmental%20Alert%20List%20weeds>

Table 9: Weeds Of National Significance (WONS), Priority Weeds (PW) and High Threat Exotics (HTE) present on the within the proposal area and on the adjoining site

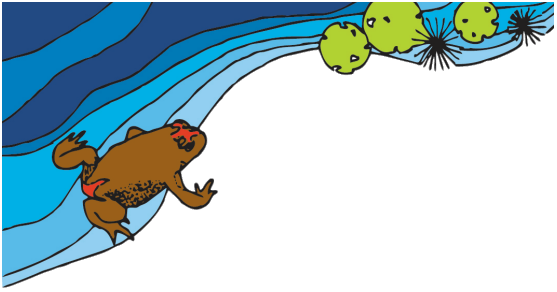
Scientific Name	Common Name	Weed Status
* *Agrostis capillaris*	Browntop Bent	*HTE*
* *Aloe maculata*	Common Soap Aloe	
* *Ammi majus*	Bishop's-weed	
* *Anagallis arvensis*	Scarlet pimpernel	
* *Anthoxanthum odoratum*	Sweet Vernal Grass	
* *Asparagus aethiopicus*	Ground Asparagus	*HTE*
* *Aster subulatus*	Wild Aster	
* *Axonopus fissifolius*	Carpet Grass	*HTE*
* *Bidens pilosa*	Cobblers Pegs	*HTE*
* *Briza maxima*	Quaking Grass	
* *Briza minor*	Shivery Grass	
* *Briza subaristata*	Chilean quaking grass	*HTE*
* *Bromus catharticus*	Prairie Grass	

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Scientific Name	Common Name	Weed Status
* *Cenchrus clandestinus*	Kikuyu	*HTE*
* *Chlorophytum comosum*	Spider Plant	
* *Cirsium vulgare*	Spear Thistle	
* *Conyza bonariensis*	Flaxleaf Fleabane	
* *Conyza sp.*		
* *Cyperus eragrostis*	Umbrella Sedge	*HTE*
* *Cyperus sesquiflorus*		
* *Dimorphotheca ecklonis*	Cape Daisy	
* *Echinochloa crus-galli*	Barnyard Grass	
* *Ehrharta erecta*	Panic Veldtgrass	*HTE*
* *Eragrostis curvula*	African Lovegrass	
* *Euchiton sphaericus*	Star cudweed	
* *Facelis retusa*	Annual trampweed	
* *Gamochaeta americana*	Cudweed	
* *Grona (Desmodium) varians*	Slender Tick-trefoil	
* *Holcus lanatus*	Yorkshire Fog	
* *Hypochaeris radicata*	Flatweed	
* *Juncus cognatus*	Forked rush	
* *Lamiaceae*		
* *Leontodon saxatilis*	Lesser Hawkbit	
* *Ligustrum sinense*	Small-leaved Privet	*HTE*
* *Lolium perenne*	Perennial Ryegrass	
* *Modiola caroliniana*	Red-flowered Mallow	
* *Ochna serrulata*	Mickey Mouse Plant	*HTE*
* *Olea europaea subsp. cuspidata*	African Olive	
* *Paspalum*		
* *Paspalum dilatatum*	Paspalum	*HTE*
* *Paspalum sp.*		
* *Paspalum sp.*		
* *Paspalum urvillei*	Vasey Grass	
* *Petrorhagia (nanteuilii)*	Childing pink	
* *Phalaris canariensis*	Canary Grass	

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Scientific Name	Common Name	Weed Status
* *Phalaris sp.*		
* *Phytolacca octandra*	Inkweed	
* *Plantago lanceolata*	Lambs Tongue	
* *Plantago major*	*Large Plantain*	
* *Poa annua*	Winter Grass	
* *Poa pratensis*	Kentucky Bluegrass	
* *Polycarpon tetraphyllum*	Four-leaved Allseed	
* *Pyracantha angustifolia*	Orange Firethorn	
* *Romulea rosea*	Onion Grass	*HTE*
* *Rosa rubiginosa*	Sweet Briar	*HTE*
* *Rubus anglocandican*	*Blackberry*	
* *Rumex conglomeratus*	Clustered Dock	
* *Rumex crispus*	Dock	
* *Senecio madagascariensis*	Fireweed	*HTE*
* *Setaria parviflora*	Pigeon Grass	
* *Setaria sp.*		
* *Setaria sp.*		
* *Sherardia arvensis*	Field Madder	
* *Sida rhombifolia*	Paddy's Lucerne	
* *Silene gallica*	French Catchfly	
* *Sisyrinchium micranthum*	Blue Pigroot	
* *Sisyrinchium sp. A*	Scourweed	
* *Solanum nigrum*	*Black-berry Nightshade*	
* *Sonchus oleraceus*	Common Sowthistle	
* *Sonchus oleraceus*	Common Sowthistle	
* *Sporobolus africanus*	Parramatta Grass	
* *Taraxacum officinalis*	Common Dandelion	
* *Trifolium dubium*	Yellow Suckling Clover	
* *Verbena bonariensis*	Purpletop	
* *Verbena officinalis*	Common Verbena	
* *Vulpia sp.*		

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5. Survey Results: Fauna

5.1 Species of conservation concern

Micronmus norfolkensis (Vulnerable) was found on the adjoining site on two separate nights during the April 2021 survey, determined by the Anabat recordings. ANABAT data from the survey in October 2021 is yet to be analysed.

5.2 Fauna results

A total of 114 species were detected, including mammals, birds, frogs and reptiles within the proposal area and on the adjoining site. It is important to emphasize that the majority of the species were observed on the adjoining site. However, many of the species would also likely occur within the proposal footprint. Species listed as 'likely to occur' in the area are presented in Appendix 3. All the species listed as 'likely to occur' are common throughout the locality and the region. It is unlikely that protected species will be significantly affected at a local, regional or state-wide scale by the proposal.

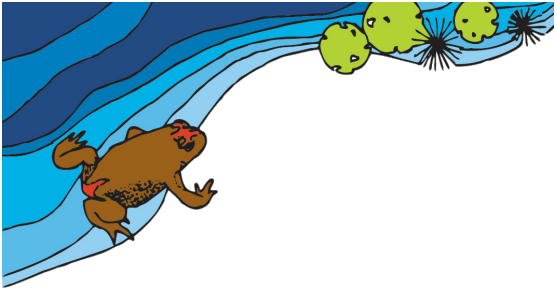
The habitats for threatened species that occur in the area are tabulated in Appendix 4.

Table 10. List of fauna detected on the site for 12th to 14th April 2021

Common Name	Scientific Name	Conservation Status	Recorded AE
Frogs			
Common Eastern Froglet	*1. Crinia signifera*		W
N=	1		

Common Name	Scientific Name	Conservation Status	Recorded AE
Birds			
Australian Wood Duck	*1. Chenonetta jubata*		O
Nankeen Kestrel	*1. Falco cenchroides*		O
Purple Swamphen	*1. Porphyrio porphyrio*		O
Yellow-tailed Black-cockatoo	*1. Calyptorhynchus funereus*		O
Galah	*1. Eolophus roseicapilla*		O
Long-billed Corella	*1. Cacatua tenuirostris*		O
Sulphur-crested Cockatoo	*1. Cacatua galerita*		O

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Common Name	Scientific Name	Conservation Status	Recorded AE
Rainbow Lorikeet	*1. Trichoglossus haematodus*		O
Laughing Kookaburra	*1. Dacelo novaeguineae*		W, O
Red Wattlebird	*1. Anthochaera carunculata*		W,O
Noisy Miner	*1. Manorina melanocephala*		O
Magpie-lark	*1. Grallina cyanoleuca*		O
Willie Wagtail	*1. Rhipidura leucophrys*		O
Black-faced Cuckoo-shrike	*1. Coracina novaehollandiae*		O
Australian Magpie	*1. Cracticus tibicen*		O
Australian Raven	*1. Corvus coronoides*		O
White-Bellied Sea Eagle	*1. Haliaeetus leucogaster*		O
N =	17		

Common Name	Scientific Name	Conservation Status	Recorded AE
Birds			
Australian Wood Duck	*1. Chenonetta jubata*		O
Nankeen Kestrel	*1. Falco cenchroides*		O
Purple Swamphen	*1. Porphyrio porphyrio*		O
Yellow-tailed Black-cockatoo	*1. Calyptorhynchus funereus*		O
Galah	*1. Eolophus roseicapilla*		O
Long-billed Corella	*1. Cacatua tenuirostris*		O
Sulphur-crested Cockatoo	*1. Cacatua galerita*		O
Rainbow Lorikeet	*1. Trichoglossus haematodus*		O
Laughing Kookaburra	*1. Dacelo novaeguineae*		W, O
Red Wattlebird	*1. Anthochaera carunculata*		W,O
Noisy Miner	*1. Manorina melanocephala*		O
Magpie-lark	*1. Grallina cyanoleuca*		O
Willie Wagtail	*1. Rhipidura leucophrys*		O
Black-faced Cuckoo-shrike	*1. Coracina novaehollandiae*		O
Australian Magpie	*1. Cracticus tibicen*		O
Australian Raven	*1. Corvus coronoides*		O

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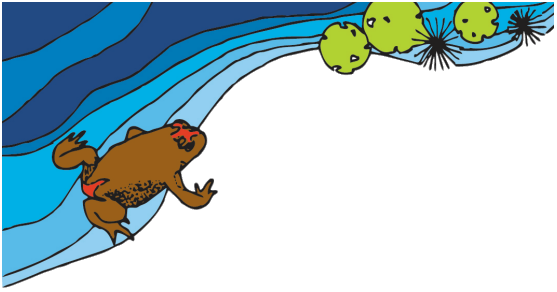
Common Name	Scientific Name	Conservation Status	Recorded AE
White-Bellied Sea Eagle	*1. Haliaeetus leucogaster*		O
N =	17		

Common Name	Scientific Name	Conservation Status	Recorded AE
Mammals			
Common Brushtail Possum	*1. Trichosurus vulpecula*		O
Grey-headed Flying-fox	*1. Pteropus poliocephalus*		O
Yellow-bellied Sheathtail-bat	*1. Saccolaimus flaviventris*		A-Po
White-striped Freetail-bat	*1. Austronomus australis*		A-C
Eastern Freetail-bat	*1. Mormopterus norfolkensis*		A-C
Chocolate Wattled Bat	*1. Chalinolobus morio*		A-C
Greater Broad-nosed Bat	*1. Scoteanax rueppellii*		A_Po
Ride's freetail bat	*1. Ozimops ridei*		A-C
Fox*	*1. Vulpes vulpes*		O
Rabbit*	*1. Oryctolagus cuniculus*		O
N=	10		

Table 11: List of fauna detected on the site for October 25th to 29th 2021

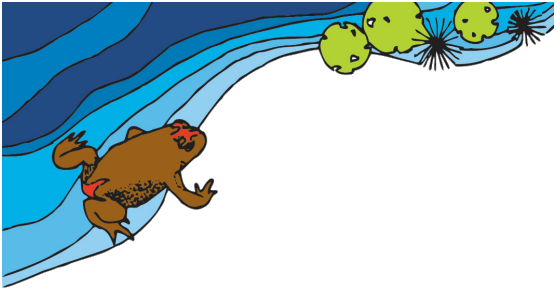
Common Name	Scientific Name	Conservation Status	Recorded AE
Frogs			
Spotted grass frog	*Limnodynastes tasmaniensis*		W
Pobblebonk	*Limnodynastes dumerilii*		W
Common Eastern Froglet	*Crinia signifera*		W
N=	3		

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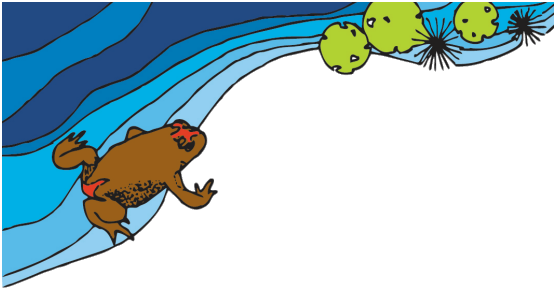
Common Name	Scientific Name	Conservation Status	Recorded AE
Birds			
Australian Wood Duck	*Chenonetta jubata*	Observed	O
Pacific Black Duck	*Anas superciliosa*	Observed	O
White-faced Heron	*Egretta novaehollandiae*	Observed	O
Brown Goshawk	*Accipiter fasciatus*	Observed	O
Nankeen Kestrel	*Falco cenchroides*	Observed	O
Purple Swamphen	*Porphyrio porphyrio*	Observed	O
Yellow-tailed Black-cockatoo	*Calyptorhynchus funereus*	Animal remains / Feathers	Z
Galah	*Eolophus roseicapilla*	Observed	O
Crimson Rosella	*Platycercus elegans*	Observed	O
Eastern Rosella	*Platycercus eximius*	Observed	O
Channel-billed Cuckoo	*Scythrops novaehollandiae*	Calls	W
Southern Boobook	*Ninox novaeseelandiae*	Calls	W
Laughing Kookaburra	*Dacelo novaeguineae*	Observed	O
Sacred Kingfisher	*Todiramphus sanctus*	Observed	O
Superb Fairy-wren	*Malurus cyaneus*	Observed	O
Yellow Thornbill	*Acanthiza nana*	Observed	O
Buff-rumped Thornbill	*Acanthiza reguloides*	Calls	W
Yellow-faced Honeyeater	*Lichenostomus chrysops*	Observed	O
Eastern Yellow Robin	*Eopsaltria australis*	Calls	W
Grey Shrike-thrush	*Colluricincla harmonica*	Observed	O
Willie Wagtail	*Rhipidura leucophrys*	Observed	O
Grey Butcherbird	*Cracticus torquatus*	Observed	O
Australian Magpie	*Cracticus tibicen*	Observed	O
Pied Currawong	*Strepera graculina*	Calls	W
Australian Raven	*Corvus coronoides*	Observed	O
Common Starling*	*Sturnus vulgaris*	Observed	O
Brown Falcon	*Falco berigora*	Observed	O
Double-barred Finch	*Taeniopygia bichenovii*	Observed	O
Skylark	*Alauda arvensis*	Observed	O

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Common Name	Scientific Name	Conservation Status	Recorded AE
Little Corella	*Cacatua sanguinea*	Observed	O
Rose Robin	*Petroica rosea*	Observed	O
Red-rumped Parrot	*Psephotus haematonotus*	Observed	O
Weebill	*Smicrornis brevirostris*	Calls	W
Dusky Woodswallow	*Artamus cyanopterus*	Observed	O
Masked Woodswallow	*Artamus personatus*	Observed	O
Striated Pardelote	*Pardalotus striatus*	Observed	O
Hooded Robin	*Melanodryas cucullata*	Observed	O
Yellow-rumped thornbill	*Acanthiza chrysorrhoa*	Observed	O
Varied sitella	*Daphoenositta chrysoptera*	Observed	O
Rufous Whistler	*Pachycephala rufiventris*	Calls	W
Diamond Firetail	*Stagonopleura guttata*	Observed	O
Common Bronzewing	*Phaps chalcoptera*	Observed	O
Wedge-tailed Eagle	*Aquila audax*	Observed	O
Brown-headed Honeyeater	*Melithreptus brevirostris*	Observed	O
Tree Martin	*Petrochelidon nigricans*	Observed	O
Pallid Cuckoo	*Cacomantis pallidus*	Calls	W
Shining Bronze cuckoo	*Chrysococcyx lucidus*	Calls	W
Little pied Cormorant	*Microcarbo melanoleucos*	Observed	O
Cattle Egret	*Bubulcus ibis*	Observed	O
Noisy Friarbird	*Philemon corniculatus*	Observed	O
White-bellied Sea Eagle	*Haliaeetus leucogaster*	Observed	O
Powerful owl	*Ninox strenua*	Observed	O
Barn owl	*Tyto alba*	Observed	O
Pacific Heron	*Ardea pacifica*	Observed	O
N=	54		

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Common Name	Scientific Name	Conservation Status	Recorded AE
Fish			
Longfinned Eel	*Anguilla reinhardtii*		O
Plague Minnow	*Gambusia holbrooki*		O
N=	2		

Common Name	Scientific Name	Conservation Status	Recorded AE
Mammals			
Sugar Glider	*Petaurus breviceps*		O
Common Ringtail Possum	*Pseudocheirus peregrinus*		S
Common Brushtail Possum	*Trichosurus vulpecula*		O
Eastern Grey Kangaroo	*Macropus giganteus*		S
Swamp Wallaby	*Wallabia bicolor*		O
Fox*	*Vulpes vulpes*		
Rabbit*	*Oryctolagus cuniculus*		O
Domestic Sheep*			O
Echidna	*Tachyglossus aculeatus*		S
Goat*	*Capra aegagrus hircus*		Z
Black rat*	*Rattus rattus*		O
N=	10		

Key

*	=	Introduced fauna	O	=	Observed
A – C	=	Anabat – Confident	S	=	Scats
A – Po	=	Anabat – Possible	W	=	Calls heard
D	=	Diggings	Z	=	Animal remains

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5.3 Fauna Summary

The fauna records include both the proposal area and the adjoining site.

Mammals

A total of 15 individual Common Brush Tail Possums as well as microbats were recorded on primarily on the site adjoining the proposal area between the 12th and 14th of April 2021.

Approximately 20 individual Common Brush Tail Possums were recorded on site between the 25th and 29th of October 2021.

Reptiles

No reptile species were detected on the site in April 2021.

During the October 2021 survey we found common lace monitor *Varanus varius* and eastern small-eyed snake *Rhinoplocephalus nigrescens* within the grazing site.

Frogs

One frog species was detected on the site between April 12th and 14th 2021. Several individual Common Eastern Froglets were heard on site.

Three frog species were detected on the site between October 25th and 29th 2021. The calls of Common Eastern Froglets, Pobblebonks and Spotted grass frogs were heard on site.

Birds

During the survey period from the 12th to 14th of April 2021, a total of 12 bird species were detected on the site. There was an abundance of Rainbow Lorikeets observed on site, as well several individuals seen to be nesting in hollow bearing trees on site. A Nankeen Kestrel was observed on site on the 12th and 13th April 2021 and appeared to be using the site as hunting grounds. Galahs, Sulphur Crested Cockatoos, and Corellas were observed flying over and roosting in the trees on site. Laughing Kookaburras and Red Wattlebirds were also heard and observed on site. A White-Bellied Sea Eagle was also observed flying over the site on the 12th and 14th April 2021.

During the survey period from the 25th to 29th of October 2021, a total of 53 bird species were detected on the site. There was an abundance of Rainbow Lorikeets and Galahs on site, with both species observed nesting in hollow bearing trees on site.

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5.4 Microbats

Four common bat species and three threatened bat species were detected on the adjoining site. Where calls were easily identifiable to species, they were classed as Confident. Where the calls were most likely to represent a particular species, they were classed as Probable. Where calls were likely to belong to a species but the quality or length of the call precluded a confident identification, they were classed as Possible. Where the calls could have belonged to two or more species, they were classified into a species group. Any calls of very poor quality, which could not be reliably placed into any species or species group category, were classified as Unknown. The vast majority of calls were of very good quality and the poor ones most likely represented bats flying just within the bat detector's outer detection limits.

A total of 796 call sequences were recorded, of which 236 call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, 69 call sequences (29 %) were able to be confidently identified (those classified as either definite or probable identifications) to species level (Table 3-1). Species recorded confidently within the site include:

- *Austronomus australis* (White-striped Free-tailed Bat)
- *Chalinolobus gouldii* (Gould's Wattled Bat)
- *Chalinolobus morio* (Chocolate Wattled Bat)
- *Micronomus norfolkensis* (Eastern coastal Free-tailed Bat) (V)
- *Ozimops ridei* (Ride's Free-tailed Bat)

Two other Vulnerable species noted as "possible" were *Saccolaimus flaviventris* and *Scoteanax rueppellii.*

Foraging Habitat

This site provides potentially suitable foraging habitat for six of the eight possible threatened species. *Myotis macropus* (syn. *Myotis adversus*) has suitable foraging habitat in the form of open water bodies, although they are quite small. *Kerivoula papuensis* is only likely to forage in areas within a few kilometres of rainforest or rainforest gullies.

Roosting Habitat

This site has tree hollows (Figure 12) that provide suitable roosting habitat for *Falsistrellus tasmaniensis, Mormopterus norfolkensis, Scoteanax rueppellii, Myotis macropus, Miniopterus australis* and *Saccolaimus flaviventris*. This site has no caves, culverts, bridges, buildings and other suitable (often human-made) structures that provide potentially suitable roosting habitat for *Chalinolobus dwyeri, Miniopterus schreibersii oceanensis, Myotis macropus. Kerivoula papuensis* normally roosts in hanging bird nests or trees in rainforest gullies so is very unlikely to roost in the surveyed site.

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5.5 SEPP Biodiversity and Conservation 2021 - Koala Habitat Protection

From the associated Fact Sheet (March 2022) for the Biodiversity and Conservation SEPP 2021:

• 'Chapter 4 – Koala habitat protection 2021' contains the land-use planning and assessment framework from the Koala SEPP 2021 for koala habitat within Metropolitan Sydney and the South Coast and applies to all zones except RU1, RU2 and RU3 in the short term – it will apply to all zones once the Koala SEPP 2020 is repealed."

The site falls within the South Coast Koala management area.

The following five species were found in the proposal area: *Eucalyptus bosistoana, Eucalyptus eugenioides, Eucalyptus tereticornis, Allocasuarina littoralis,* and *Angophora floribunda* (Refer to Table 12).

The result is positive. More than 15% of the trees within the proposal area and on the site are Scheduled SEPP species (Refer to Table 13). The site is therefore potential Koala habitat.

One Koala has been recorded within 2 km of the site in the last 18 years. However, Koalas, or evidence of Koalas, was not seen on site and it is unlikely that any Koalas use the site. The site is not considered core Koala habitat.

Table 12. Koala tree survey results

Species	Count	Percentage of trees within PDA	Feed tree or use
Eucalyptus bosistoana	38	13.8%	High Use
Eucalyptus eugenioides	55	20%	High Use
Eucalyptus tereticornis	75	27.8%	High Preferred Use
Allocasuarina littoralis	24	8.7%	Occasional Use
Angophora floribunda	38	13.8%	Occasional Use
Total	230 of 275	84.1%	

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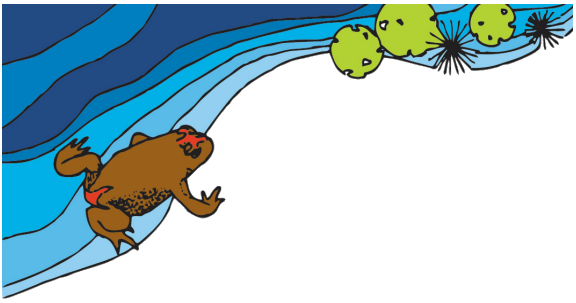


Table 13. Koala tree species for the South Coast Koala management area

From the Shoalhaven region to the Victorian border on the New South Wales south coast including Bega Valley, Eurododalla, Kiama and Shoalhaven Local Government Areas. The following species list is sourced from the NSW Department of Planning and Environment website: www.environment.nsw.gov.au, as of 17 May 2022. This list contains the same species as in Schedule 3 of the SEPP.
https://legislation.nsw.gov.au/view/html/inforce/current/epi-2021-0722#sch.3

Common Name	Scientific Name
High Preferred Use	
Monkey Gum	*Eucalyptus cypellocarpa*
White Stringybark	*Eucalyptus globoidea*
Woollybutt	*Eucalyptus longifolia*
Maidens Blue Gum	*Eucalyptus maidenii*
Grey Gum	*Eucalyptus punctata*
Forest Red Gum	*Eucalyptus tereticornis*
High Use	
Coast Grey Box	*Eucalyptus bosistoana*
Yertchuk	*Eucalyptus consideniana*
Narrow-leaved or Thin-leaved Stringybark	*Eucalyptus eugenioides*
Mugga or Red Ironbark	*Eucalyptus tricarpa*
Significant Use	
Messmate	*Eucalpytus obliqua*
Sydney Blue Gum	*Eucalyptus saligna*
Occasional Use	
Black She-oak	*Allocasuarina littoralis*
Rough-Barked Apple	*Angophora floribunda*
Red Bloodwood	*Corymbia gummifera*
Spotted Gum	*Corymbia maculata*
Blue-leaved Stringybark	*Eucalyptus agglomerata*
Blue Box	*Eucalyptus baueriana*
River Peppermint	*Eucalyptus elata*
Brown Barrel	*Eucalyptus fastigata*
Yellow Stringybark	*Eucalyptus muelleriana*

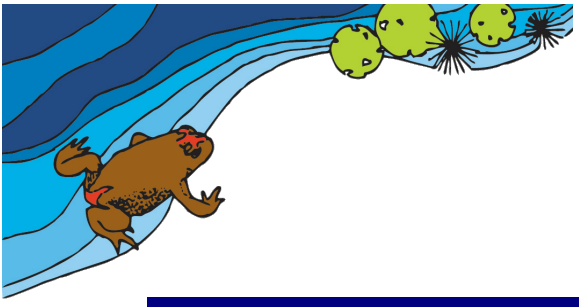
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Common Name	Scientific Name
Grey Ironbark	*Eucalyptus paniculata*
Blackbutt	*Eucalyptus pilularis*
Sydney Peppermint	*Eucalyptus piperita*
Hard-leaved Scribbly Gum	*Eucalyptus sclerophylla*
Silvertop Ash	*Eucalyptus sieberi*
Ribbon Gum	*Eucalyptus viminalis*

5.6 Feral fauna

Fox and black rat were observed on adjacent land. Both species are likely to visit the site on occasions.

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6. Discussion of results

The new roundabout and associated road work area is a disturbed road reserve with mostly regrowth trees and a few hollow bearing trees.

Shrub diversity is moderate and the herb layer has varying density of groundcovers, mostly grasses. The site has avoided bushfire for some years so coarse woody debris is accumulating.

Weed indicator species are present, indicating a high disturbance regime of some parts of the new roundabout and associated road work area. Native faunal indicator species, small forest birds and magpie, are consistent with an open forest habitat. Feral indicator species, Red Fox, indicates that native fauna abundance for some species is likely to be low.

7. Impact on biodiversity

7.1 Five-part test summary

Habitat requirements for locally occurring threatened faunal species, and the presence or absence of such habitat on the site, is tabulated in Appendix 4.

Under Section 7.3 of the *Biodiversity Conservation Act 2016* several factors (listed in Appendix 1) need to be considered in deciding whether there is likely to be a Significant effect on threatened species, populations or ecological communities, or their habitats. If there is likely to be a significant effect on threatened species, etc., the proposal must be accompanied by a Biodiversity Development Assessment Report.

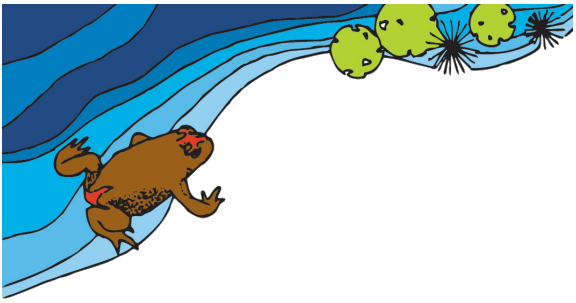
While the overall proposal incorporates mitigating considerations and offsets, these are not taken into account in determining the outcome of the five-part tests.

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Table 14. Summary of the five-part tests shown in full in Appendix 1.

Scientific Name	Common Name	NSW status	Comm. status
Hieraaetus morphnoides	Little Eagle	V,P	
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	
Lophoictinia isura	Square-tailed Kite	V	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2	
Glossopsitta pusilla	Little Lorikeet	V,P	
Lathamus discolor	Swift Parrot	E1,P,3	CE
Ninox strenua	Powerful Owl	V,P,3	
Tyto novaehollandia	Masked Owl	V,P,3	
Daphoenositta chrysoptera	Varied Sittella	V	
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	
Phascolarctos cinereus	Koala	V,P	E
Petaurus australis	Yellow-bellied Glider	V,P	
Petaurus norfolcensis	Squirrel Glider	V,P	
Petauroides volans	Greater Glider	P	V
Petauroides volans	Greater Glider population in the Eurobodalla local government area	E2,P	V
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V,P	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P	
Myotis macropus	Southern Myotis	V,P	
Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P	
Thesium australae	Austral toadflax	V	V
	Lowland Grassy Woodland in the South East Corner Bioregion	EEC	

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Key

P = Protected

V = Vulnerable

E = Endangered

E1 = Endangered Species

CE = Critically Endangered

C = China-Australia Migratory Bird Agreement

J = Japan-Australia Migratory Bird Agreement

K = Republic of Korea-Australia Migratory Bird Agreement

There is no significant effect so a Biodiversity Development Assessment Report is not required.

8. Conclusion and Recommendations

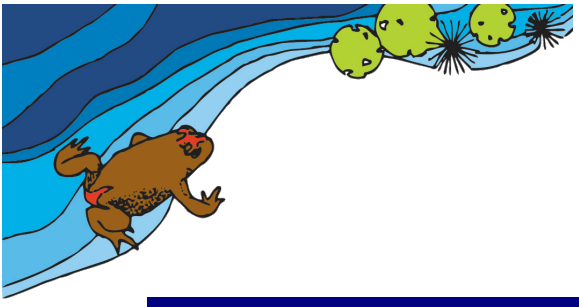
A Biodiversity Development Assessment Report (BDAR) is not required.

A Species Impact Assessment (SIS) is not required.

An approval may be issued with the following conditions:

A preclearance survey is to be conducted for hollow trees (Figure 12) to relocate resident fauna, and hollows relocated under the provisions of a Hollow Management Guideline document.

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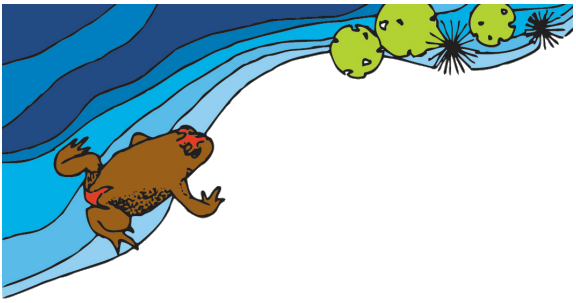
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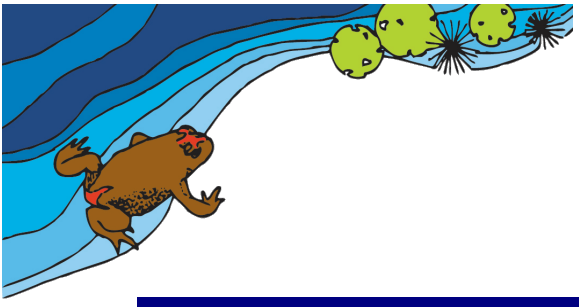
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Appendix 1. Five-part tests

While the overall proposal incorporates mitigating considerations and offsets, these are not taken into account in determining the outcome of the five-part tests.

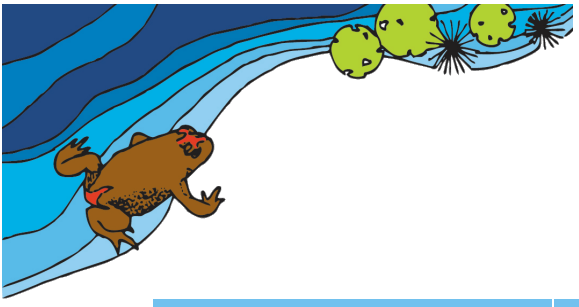
The Assessment of Significance (Office of Environment and Heritage (OEH)) states that

> *"Proposed measures that mitigate, improve or compensate for the action, development or activity should not be considered in determining the degree of the effect on threatened species, populations or ecological communities, unless the measure has been used successfully for that species in a similar situation."*

Species addressed are as follows

Scientific Name	Common Name	NSW status	Comm. status
Hieraaetus morphnoides	Little Eagle	V,P	
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	
Lophoictinia isura	Square-tailed Kite	V	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2	
Glossopsitta pusilla	Little Lorikeet	V,P	
Lathamus discolor	Swift Parrot	E1,P,3	CE
Ninox strenua	Powerful Owl	V,P,3	
Tyto novaehollandia	Masked Owl	V,P,3	
Daphoenositta chrysoptera	Varied Sittella	V	
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	
Phascolarctos cinereus	Koala	V,P	E
Petaurus australis	Yellow-bellied Glider	V,P	
Petaurus norfolcensis	Squirrel Glider	V,P	
Petauroides volans	Greater Glider	P	V
Petauroides volans	Greater Glider population in the Eurobodalla local government area	E2,P	V
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V,P	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P	
Myotis macropus	Southern Myotis	V,P	

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Scientific Name	Common Name	NSW status	Comm. status
Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P	
Thesium australae	Austral toadflax	V	V
	Lowland Grassy Woodland in the South East Corner Bioregion	EEC	

Key

P = Protected

V = Vulnerable

E = Endangered

E1 = Endangered Species

CE = Critically Endangered

C = China-Australia Migratory Bird Agreement

J = Japan-Australia Migratory Bird Agreement

K = Republic of Korea-Australia Migratory Bird Agreement

7.2 Development or activity "likely to significantly affect threatened species"

(1) For the purposes of this Part, development or an activity is **"likely to significantly affect threatened species"** if:

(a) it is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in section 7.3, or

(b) the development exceeds the biodiversity offsets scheme threshold if the biodiversity offsets scheme applies to the impacts of the development on biodiversity values, or

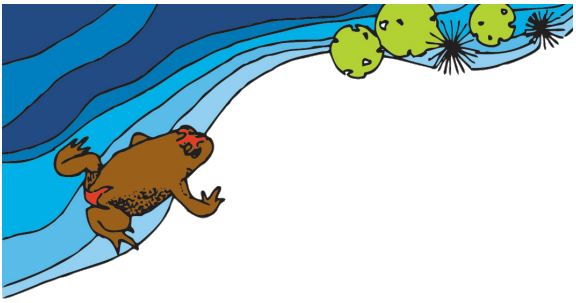
(c) it is carried out in a declared area of outstanding biodiversity value.

(2) To avoid doubt, subsection (1) (b) does not apply to development that is an activity subject to environmental impact assessment under Part 5 of the *Environmental Planning and Assessment Act 1979*.

7.3 Test for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats

(1) The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

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(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

(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

(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,

(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

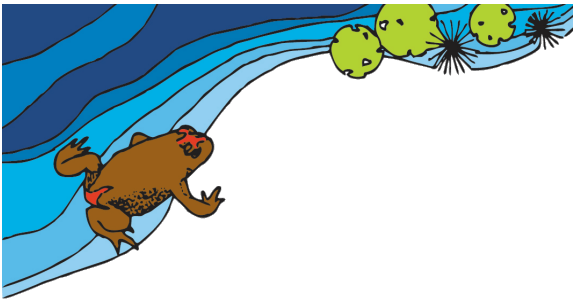
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(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,

(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),

(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.

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Diurnal Raptors

Scientific name	Common name	NSW status	Comm. status
Hieraaetus morphnoides	Little Eagle	V,P	-
Haliaeetus leucogaster	White-bellied Sea Eagle	V,P	-
Lophoictinia isura	Square-tailed Kite	V,P	-

Key

V = Vulnerable

P = Protected

Little Eagle *Hieraaetus morphnoides*

http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20131

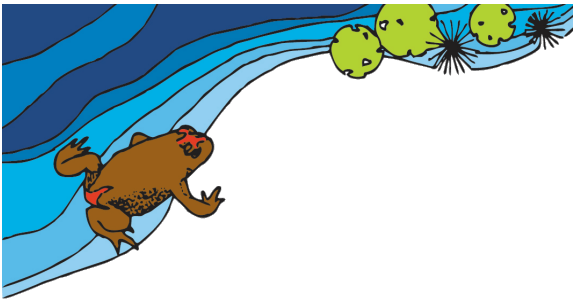
- Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used.
- Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.
- Lays two or three eggs during spring, and young fledge in early summer.
- Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.

White-bellied Sea Eagle *Haliaeetus leucogaster*

https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20322

- Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea.
- Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh.
- Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).
- Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have

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emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.

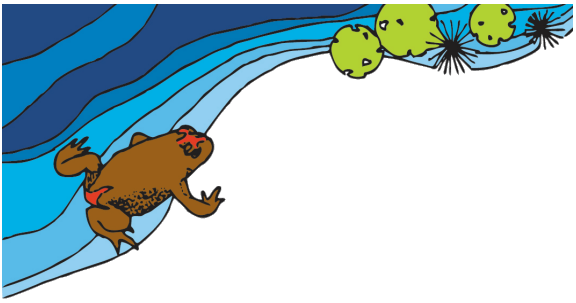
- Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion.
- Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground.
- May be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young.
- Typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days.

Square-tailed Kite *Lophoictinia isura*

https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10495

- Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.
- In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland.
- Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.
- Appears to occupy large hunting ranges of more than 100km2.
- Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.

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Woodland Birds and Nocturnal Raptors

Scientific name	Common name	NSW status	Comm. status
Callocephalon fimbriatum	Gang-gang Cockatoo	V,P	-
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P	-
Glossopsitta pusilla	Little Lorikeet	V,P	-
Lathamus discolor	Swift Parrot	E1,P	CE
Ninox strenua	Powerful Owl	V,P	-
Tyto novaehollandiae	Masked Owl	V,P	-
Daphoenositta chrysoptera	Varied Sittella	V,P	-
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P	-

Key

CE = Critically Endangered

E1 = Endangered Species

E = Endangered

V = Vulnerable

P = Protected

Gang-gang Cockatoo ***Callocephalon fimbriatum***

https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10975

- In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests.
- In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands,particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.
- May also occur in sub-alpine Snow Gum (*Eucalyptus pauciflora*) woodland and occasionally in temperate rainforests.
- Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.

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Glossy Black Cockatoo ***Calyptorhynchus lathami***

https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10140

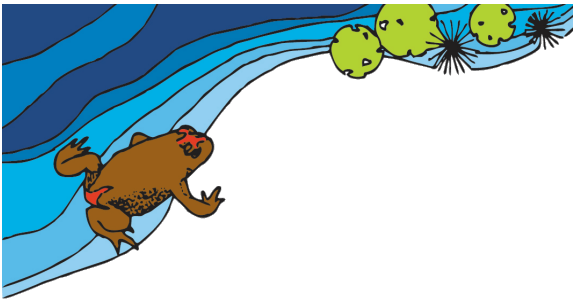
- Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods.
- Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, Allocasuaraina diminuta, and A. gymnathera. Belah is also utilised and may be a critical food source for some populations.
- In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (*Casuarina cristata*).
- Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill.
- Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.

Little Lorikeet *Glossopsitta pusilla*

http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20111

- Forages primarily in the canopy of open *Eucalyptus* forest and woodland, yet also finds food in *Angophora, Melaleuca* and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.
- Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.
- Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards.
- Gregarious, travelling and feeding in small flocks (<10), though often with other lorikeets. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries.
- Roosts in treetops, often distant from feeding areas.
- Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like *Allocasuarina*.

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Swift Parrot ***Lathamus discolor***

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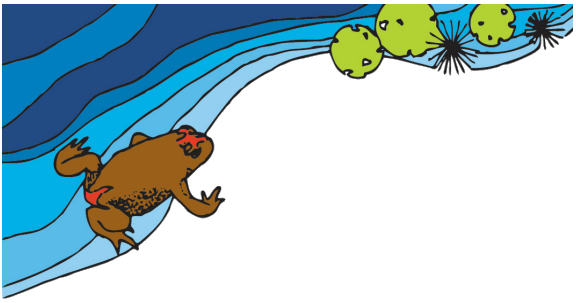
- Migrates to the Australian south-east mainland between February and October.
- On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.
- Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Forest Red Gum *E. tereticornis*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*.
- Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana*, Blackbutt *E. pilularis*, and Yellow Box *E. melliodora*.
- Return to some foraging sites on a cyclic basis depending on food availability.
- Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *Eucalyptus globulus*.

Powerful Owl ***Ninox strenua***

https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10562

- The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.
- The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species.
- The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls. Flying foxes are important prey in some areas; birds comprise about 10-50% of the diet depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl.

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- Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400 can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha.
- Powerful Owls nest in large tree hollows (at least 0.5 metres deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 metres) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him.
- Powerful Owls are monogamous and mate for life. Nesting occurs from late autumn to mid-winter, but is slightly earlier in north-eastern NSW (late summer - mid autumn). Clutches consist of two dull white eggs and incubation lasts approximately 38 days.

Masked Owl ***Tyto novaehollandiae***

https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10820

- Lives in dry eucalypt forests and woodlands from sea level to 1100 metres.
- A forest owl, but often hunts along the edges of forests, including roadsides.
- The typical diet consists of tree-dwelling and ground mammals, especially rats.
- Pairs have a large home-range of 500 to 1000 hectares.
- Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.

Varied Sittella *Daphoenositta chrysoptera*

http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20135

- Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland.
- Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.
- Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.

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Dusky Woodswallow *Artamus cyanopterus cyanopterus*

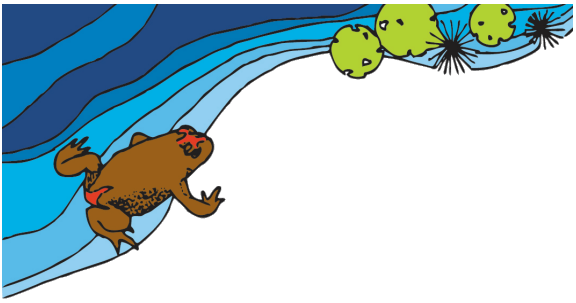
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Habitat and ecology

- Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.
- Primarily eats invertebrates, mainly insects, which are captured whilst hovering or sallying above the canopy or over water. Also frequently hovers, sallies and pounces under the canopy, primarily over leaf litter and dead timber. Also occasionally take nectar, fruit and seed.
- Depending on location and local climatic conditions (primarily temperature and rainfall), the dusky woodswallow can be resident year round or migratory. In NSW, after breeding, birds migrate to the north of the state and to southeastern Queensland, while Tasmanian birds migrate to southeastern NSW after breeding.

  Migrants generally depart between March and May, heading south to breed again in spring. There is some evidence of site fidelity for breeding. Although dusky woodswallows generally breed as solitary pairs or occasionally in small flocks, large flocks may form around abundant food sources in winter. Large flocks may also form before migration, which is often undertaken with other species.
- Nest is an open, cup-shape, made of twigs, grass, fibrous rootlets and occasionally casuarina needles, and may be lined with grass, rootlets or infrequently horsehair, occasionally unlined. Nest sites vary greatly, but generally occur in shrubs or low trees, living or dead, horizontal or upright forks in branches, spouts, hollow stumps or logs, behind loose bark or in a hollow in the top of a wooden fence post. Nest sites may be exposed or well concealed by foliage.

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Koala

Scientific name	Common name	NSW status	Comm. status
Phascolarctos cinereus	Koala	V	E

Key

V = Vulnerable

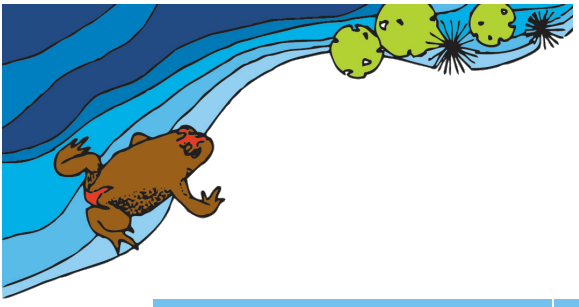
E = Endangered

Koala *Phascolarctos cinereus*

http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10616

- Inhabit eucalypt woodlands and forests.
- Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.
- Inactive for most of the day, feeding and moving mostly at night.
- Spend most of their time in trees, but will descend and traverse open ground to move between trees.
- Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.
- Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery.
- Females breed at two years of age and produce one young per year.

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Scientific name	Common name	NSW status	Comm. status
Petaurus australis	Yellow-bellied Glider	V,P	

Habitat and ecology

- Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.
- orest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.
- Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein.
- Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar.
- Live in small family groups of two - six individuals and are nocturnal.
- Den, often in family groups, in hollows of large trees.
- Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.

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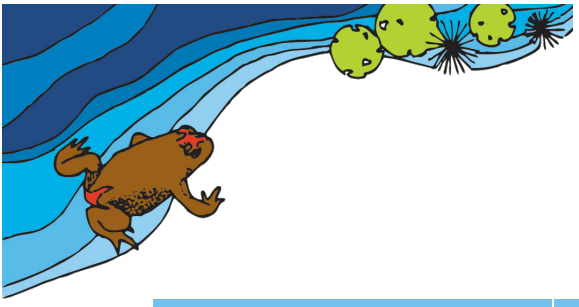
Scientific name	Common name	NSW status	Comm. status
Petaurus norfolcensis	Squirrel Glider	V,P	

Habitat and ecology

- Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.
- Prefers mixed species stands with a shrub or Acacia midstorey.
- Live in family groups of a single adult male one or more adult females and offspring.
- Require abundant tree hollows for refuge and nest sites.
- Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.

https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10604

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Scientific name	Common name	NSW status	Comm. status
Petauroides volans	Greater Glider	P	V
Petauroides volans	Greater Glider population in the Eurobodalla local government area	E2,P	V

Distribution

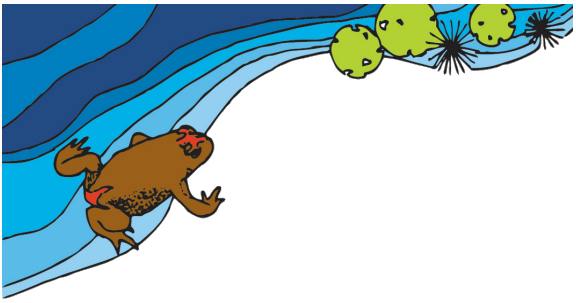
The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia from noth east Queensland to the Central Highlands of Victoria. This population of Greater Gliders on the south coast of NSW is bounded by the Moruya River to the north, Coila Lake to the south and the Princes Highway and cleared land exceeding 700 m in width to the west. These barriers greatly restrict dispersal of Greater Gliders and this population is therefore isolated from other occurrences of the species in Moruya State Forest and Deua National Park to the west. The boundaries of the population encompass an area of just over 6000 ha, half of which supports native vegetation. This vegetation occurs principally in two blocks of 2040 and 1120 ha, which are poorly connected by scattered trees. It is estimated that approximately 1800 ha of the native vegetation in the population area is of a type suitable for occupation by Greater Gliders. Of the total native vegetation in the population area, 25% is in Eurobodalla National Park, the remainder being primarily freehold.

Habitat and ecology

- Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.
- Shelter during the day in tree hollows and will use up to 18 hollows in their home range.
- Occupy a relatively small home range with an average size of 1 to 3 ha.
- Give birth to a single young in late autumn or early winter which remains in the pouch for approximately 4 months and is independent at 9 months of age.
- Usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent.
- Can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees.
- Very loyal to their territory.

https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20056

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Grey-headed Flying-fox

Scientific name	Common name	NSW status	Comm. status
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V

Key

V = Vulnerable

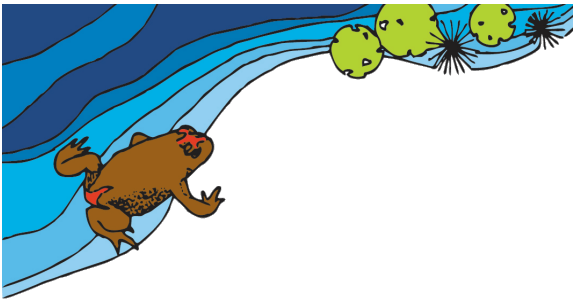
P = Protected

Habitat and ecology

http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10697

- Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.
- Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.
- Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.
- Annual mating commences in January and conception occurs in April or May; a single young is born in October or November.
- Site fidelity to camps is high; some camps have been used for over a century.
- Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.
- Feed on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines.
- Also forage in cultivated gardens and fruit crops.

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Insectivorous bats

Scientific name	Common name	NSW status	Comm. status
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P	-
Mormopterus norfolkensis	Eastern Freetail-bat	V,P	-
Chalinolobus dwyeri	Large-eared Pied Bat	V,P	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P	-
Miniopterus orianae oceanensis	Eastern Bentwing-bat	V,P	-
Scoteanax rueppellii	Greater Broad-nosed Bat	V,P	Near Threatened

Key

V = Vulnerable

P = Protected

Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*

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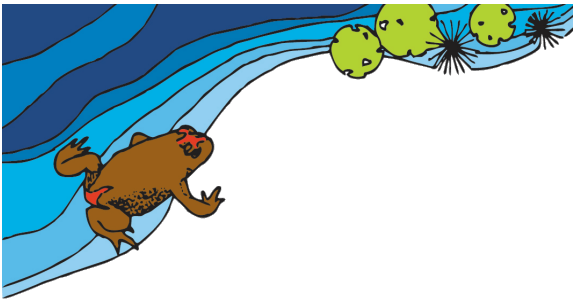
Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.

Eastern Freetail-bat *Mormopterus norfolkensis*

http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10544

Eastern Freetail-bat occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.

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Large-eared Pied Bat *Chalinolobus dwyeri*

http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10157

Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Petrochelidon ariel), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Likely to hibernate through the coolest months. It is uncertain whether mating occurs early in winter or in spring.

Eastern False Pipistrelle *Falsistrellus tasmaniensis*

http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10331

Prefers moist habitats, with trees taller than 20 metres. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer.

Eastern Bentwing-bat *Miniopterus orianae oceanensis*

http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10534

Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops.

This species has recently been renamed to *Miniopterus orianae oceanensis* or the large bent-winged bat, from Miniopterus schreibersii subsp. oceanensis or the eastern bent-wing bat.

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Greater Broad-nosed Bat *Scoteanax rueppellii*

http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10748

Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young.

a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

No. While some of these species have occurred in within a 5 km radius and the site contains potential foraging habitat for these species, the extent of habitat modification is minor. The proposal will involve the construction of a road. The proposal is unlikely to affect the life cycles of these species such that a viable local population will be placed at risk of extinction. These species will continue to forage on site and in the surrounding area.

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

Not applicable. This test is for a group of threatened species.

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

Not applicable. This test is for a group of threatened species.

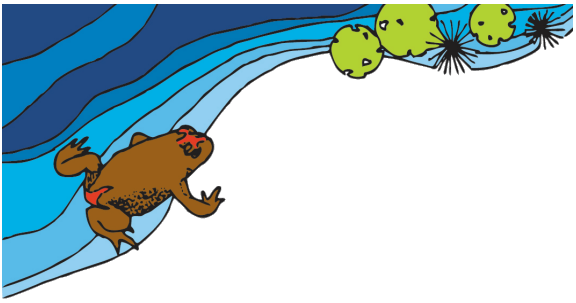
c. in relation to the habitat of a threatened species, population or ecological community:

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

This proposal will involve the clearing of 0.33ha of native vegetation for the proposal.

The groundcover vegetation is predominately exotic and weed species, with the native vegetation being rare or absent.

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Edge effect in the form of changes to soil hydrology and nutrient status may occur on the downslope side of any construction. Edge effect as invasion by exotic vegetation is possible.

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

No. The proposal will involve construction on an already partly and disturbed area. Connectivity will remain across the rest of the site in the form of a continuous woodland spanning across multiple properties and providing connectivity to large areas of quality woodland habitat to the north, south, west and east.

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

Negligible.

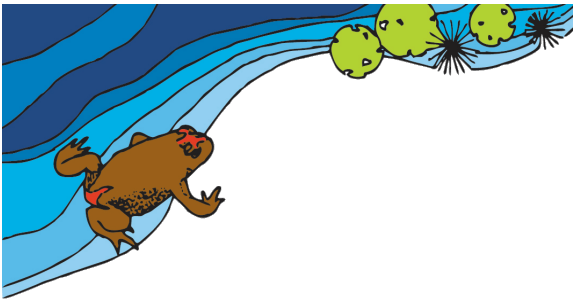
Criterion	Comment
Area and quality of habitat within the locality	The locality is an agricultural and woodland matrix. Areas of degraded or cleared natural vegetation occur on and surrounding agricultural landscape used for grazing. Areas of woodland stretch around these areas and provide habitat for local fauna species.
Area and quality of habitat on site in relation to the area and quality of habitat in the locality	Similar habitat is available on nearby and adjacent properties. There are large areas of quality habitat north, east, west and south of the site.
Role of habitat to be affected in sustaining habitat connectivity in the locality	Site habitat provides additional connectivity to fragmented vegetation to the North, west, east and south. Development of the site is not expected to affect these species' ability to move across the landscape.
Ecological integrity of habitat to be affected on site, in relation to the ecological integrity, tenure and security of the habitat which will remain both on site and in locality.	This woodland zone is an area of endangered ecological community and shows signs of extensive long-term disturbance. Canopy species remain healthy while native understorey species remain dominated by exotic weed species.

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),

No. This proposal will involve the construction of a road.

e. whether the proposed development or activity constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

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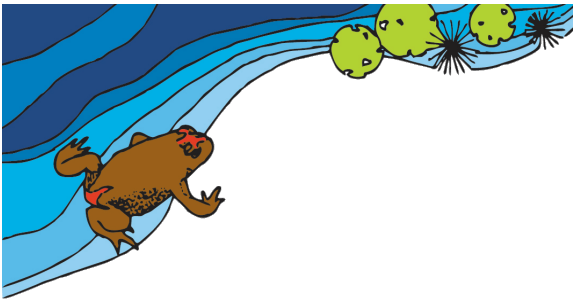


Yes. The proposed development will require the "Clearing of native vegetation", which is a key threatening process relevant to these species. Key threatening processes are listed under the *Biodiversity Conservation Act, 2016* and the *Commonwealth's EPBC Act, 1999*.

Conclusion

The proposed activity is unlikely to have a significant effect on the Little Eagle, Square-tailed Kite, Gang-gang Cockatoo, Glossy Black-Cockatoo, Little Lorikeet, Swift Parrot, Powerful Owl, Masked Owl, Varied Sittella, Dusky Woodswallow, Koala, Yellow-bellied Glider, Squirrel Glider, Greater Glider, Greater Glider population in the Eurobodalla local government area, Grey-headed Flying-fox, Eastern Coastal Freetail-bat, Eastern False Pipistrelle, Southern Myotis, Greater Broad-nosed Bat, Little Bent-winged Bat or Large Bent-winged Bat. Therefore, neither a BDAR, nor a SIS are recommended.

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Threatened Ecological Community

Scientific name	NSW status	Comm. status
Lowland Grassy Woodland in the South East Corner Bioregion	Part 3 of Schedule 1 E	

Key

E = Endangered

Description

Lowland Grassy Woodland in the South East Corner bioregion is the name given to the ecological community associated with rainshadow areas of the south coast and hinterland of New South Wales. Typically the community comprises an open tree canopy, a near-continuous groundcover dominated by grasses and herbs, sometimes with layers of shrubs and/or small trees. Undisturbed stands of the community may have a woodland or forest structure. Small trees or saplings may dominate the community in relatively high densities after partial or total clearing. The community also includes 'derived' native grasslands which result from removal of the woody strata from the woodlands and forests.

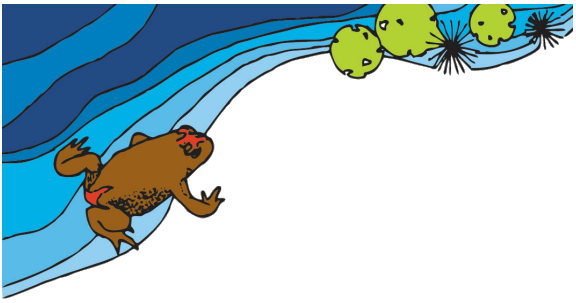
Distribution

Lowland Grassy Woodland in the South East Corner bioregion is currently known to occur within the Bega Valley, Eurobodalla and Palerang Local Government Areas, but may occur elsewhere in the bioregion. Major occurrences are found to the west of Batemans Bay, around Moruya, in the Araluen valley, in the Cobargo - Bega – Candelo area, the Towamba Valley and near Tanja.

Habitat and ecology

- Lowland Grassy Woodland communities in the South East Corner bioregion are located in rainshadow areas receiving less rainfall than more elevated terrain that partially surrounds them, with mean annual rainfall typically in the range of 700-1100 mm.
- The community typically occurs in undulating terrain up to 500 metres in elevation on granitic substrates (e.g. adamellites, granites, granodiorites, gabbros, etc.) but may also occur on locally steep sites and on acid volcanic, alluvial and fine-grained sedimentary substrates.
- Contemporary tree-dominated stands of the community are largely relics or regrowth of originally taller forests and woodlands, which are likely to have had scattered shrubs and a largely continuous grassy groundcover. At some sites, mature trees may exceed 40 metres, although regrowth stands may be shorter than 10 metres.

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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 the species is likely to be placed at risk of extinction,

Not applicable. This five-part test is for an endangered ecological community.

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.

There is currently (Final Determination 2019) no published extent of this community.

http://www.environment.gov.au/biodiversity/threatened/communities/maps/pubs/82-map.pdf

Part of the local occurrence (approximately 2.7 km^2) of this endangered ecological community will be either removed or modified on the site.

Local occurrence (on site) = 2.7 km^2.

Area of removal = 0.33 ha

This endangered ecological community appears to be reasonably extensive in the locality, so its local occurrence is unlikely to be placed at risk of extinction by the proposal. Furthermore, the native vegetation marked for removal occur on the outer fringes of the EEC. Due to the position of the trees, their removal will not impact or fragment the existing woodland on site from the woodland on surrounding properties. Their removal is unlikely to affect the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

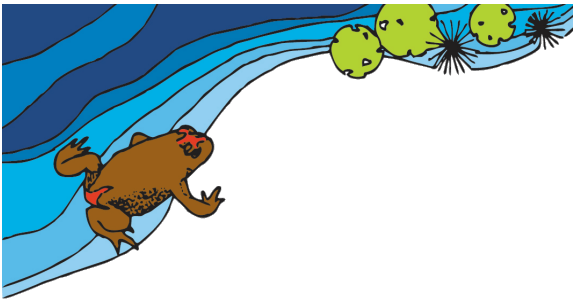
ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

No. The composition of this endangered ecological community will be retained on the site. The component species can be found throughout the site and on adjacent sites. The proposal is unlikely 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.

c. in relation to the habitat of a threatened species, population 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,

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This proposal will involve the clearing of 0.33ha of native canopy and grassland vegetation for the proposal.

The groundcover vegetation is predominately exotic and weed species, with the native vegetation being rare or absent. The total clearing is approximately 0.33ha.

Edge effect in the form of changes to soil hydrology and nutrient status may occur on the downslope side of any construction. Edge effect as invasion by exotic vegetation is possible.

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**

No. The proposal will involve construction of road pavement and batters. Connectivity will remain across the site. Continuous habitat will remain off-site in the locality to the north, west, south, and east.

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

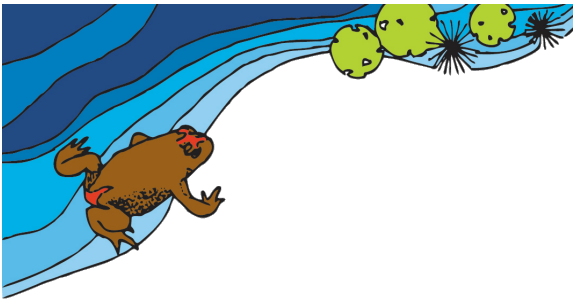
Negligible.

Criterion	Comment
Area and quality of habitat within the locality	The locality is an agricultural and woodland matrix. Areas of degraded or cleared natural vegetation occur on and surrounding agricultural landscape used for grazing. Areas of woodland stretch around these areas and provide habitat for local fauna species.
Area and quality of habitat on site in relation to the area and quality of habitat in the locality	Similar habitat is available on nearby and adjacent properties. There are large areas of variable quality habitat north, east, and south of the site.
Role of habitat to be affected in sustaining habitat connectivity in the locality	Site habitat provides additional connectivity to fragmented vegetation to the North, east, west and south. Development of the site is not expected to affect fauna species' ability to move across the landscape.
Ecological integrity of habitat to be affected on site, in relation to the ecological integrity, tenure and security of the habitat which will remain both on site and in locality.	This woodland zone is an area of endangered ecological community and shows signs of extensive long-term disturbance. Canopy species remain healthy while native understorey species are dominated by exotic weed species.

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),**

No. The proposal will have no direct or indirect effect on the area of outstanding biodiversity value.

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e. whether the proposed development or activity constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Yes. The proposed development will require the "Clearing of native vegetation", which is a key threatening process relevant to this community. Key threatening processes are listed under the *Biodiversity Conservation Act 2016,* and the Commonwealth's EPBC Act, 1999. However, the extent of clearing is minimal and contained to the southern edge of the woodland.

Conclusion

The proposed activity is unlikely to have a significant effect on Lowland Grassy Woodland in the South East Corner bioregion. Therefore, neither a BDAR nor a SIS is recommended.

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Woodland plant Species

Scientific Name	Common Name	NSW status	Comm. status
Thesium australae	Austral toadflax	V	V

Key

E1 = Endangered Species

E = Endangered

V = Vulnerable

P = Protected

Habitat and ecology

- Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.
- Often found in association with Kangaroo Grass (Themeda australis).
- A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.

a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

No. The species was not observed within the proposal area. The proposal is unlikely to have an adverse effect on the lifecycle of this species such that a local viable population would 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

Not applicable. This test is for a threatened species.

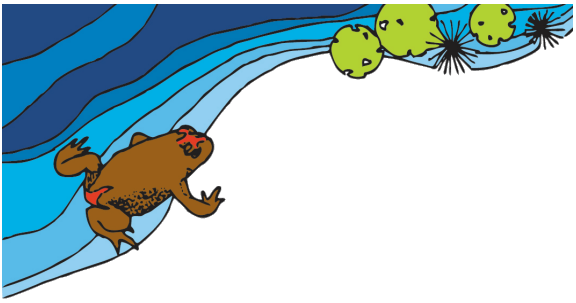
ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable. This test is for a threatened species.

c. in relation to the habitat of a threatened species, population 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

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This proposal will involve the clearing of 0.33ha of native vegetation for the proposal.

The groundcover vegetation is predominately exotic and weed species.

Edge effect in the form of changes to soil hydrology and nutrient status may occur on the downslope side of any construction. Edge effect as invasion by exotic vegetation is possible.

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**

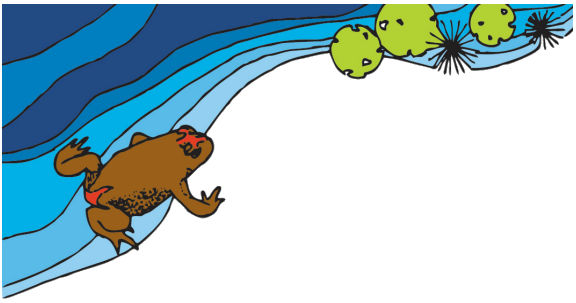
No. The proposal will involve construction within the road reserve, being previously disturbed and partly clear at present. Connectivity will remain across the rest of the site in the form of a continuous woodland spanning across multiple properties and providing connectivity to large areas of quality woodland habitat to the north, west, south and east.

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

Negligible.

Criterion	Comment
Area and quality of habitat within the locality	The locality is an agricultural and woodland matrix. Areas of degraded or cleared natural vegetation occur on and surrounding agricultural landscape used for grazing. Areas of woodland stretch around these areas and provide habitat for local fauna species.
Area and quality of habitat on site in relation to the area and quality of habitat in the locality	Similar habitat is available on nearby and adjacent properties. There are large areas of quality habitat north, east, west and south of the site.
Role of habitat to be affected in sustaining habitat connectivity in the locality	Site habitat provides additional connectivity to fragmented vegetation to the North, west, east and south. Development of the site is not expected to affect these species' ability to move across the landscape.
Ecological integrity of habitat to be affected on site, in relation to the ecological integrity, tenure and security of the habitat which will remain both on site and in locality.	This woodland zone is an area of endangered ecological community and shows signs of extensive long-term disturbance. Canopy species remain healthy while native understorey species remain dominated by exotic weed species.

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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),

No. This proposal will involve the construction of a road.

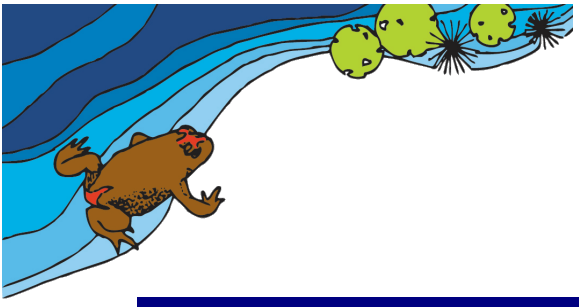
e. whether the proposed development or activity constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Yes. The proposed development will require the "Clearing of native vegetation", which is a key threatening process relevant to this species. Key threatening processes are listed under the *Biodiversity Conservation Act, 2016* and the *Commonwealth's EPBC Act, 1999*.

Conclusion

The proposed activity is unlikely to have a significant effect on Austral toadflax. Therefore, neither a BDAR nor a SIS is required.

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Appendix 2. Flora species list

The grid reference for this locality is 237895 East, 6020800 North (GDA 2020 MGA56)

* Denotes an introduced species

Plants recorded within or near the new roundabout and associated road work proposal area.

Scientific Name	Common Name
* *Ammi majus*	Bishop's-weed
* *Anthoxanthum odoratum*	Sweet Vernal Grass
* *Bidens pilosa*	Cobblers Pegs
* *Briza maxima*	Quaking Grass
* *Briza subaristata*	Chilean quaking grass
* *Ehrharta erecta*	Panic Veldtgrass
* *Gamochaeta americana*	Cudweed
* *Hypochaeris radicata*	Flatweed
* *Ligustrum sinense*	Small-leaved Privet
* *Lolium perenne*	Perennial Ryegrass
* *Ochna serrulata*	Mickey Mouse Plant
* *Paspalum urvillei*	Vasey Grass
* *Pyracantha angustifolia*	Orange Firethorn
* *Rosa rubiginosa*	Sweet Briar
* *Senecio madagascariensis*	Fireweed
* *Sida rhombifolia*	Paddy's Lucerne
* *Sporobolus africanus*	Parramatta Grass
* *Taraxacum officinalis*	Common Dandelion
* *Verbena bonariensis*	Purpletop
Acacia falcata	Hickory wattle
Acacia longifolia	Sydney golden wattle
Allocasuarina littoralis	Black she-oak
Angophora floribunda	Rough-barked Apple
Caesia parviflora var. parviflora	Pale Grass-lily
Carex (longibrachiata)	Australian sedge
Commelina cyaena	Scurvy weed

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Scientific Name	Common Name
Cynodon dactylon	Common couch
Dichelachne inaequiglumis	
Dichondra repens	Kidney Weed
Einadia hastata	Berry Saltbush
Entolasia marginata	Bordered Panic
Eragrostis leptostachya	Paddock Lovegrass
Eucalyptus bosistoana	Coast grey box
Eucalyptus eugenioides	Thin-leaved Stringybark
Eucalyptus tereticornis	Forest Red Gum
Glycine tabacina	Glycine
Grona (Desmodium) varians	Slender Tick-trefoil
Juncus usitatus	Common Rush
Leucopogon juniperinus	Prickly Beard-heath
Microlaena stipoides	Weeping grass
Oxalis (yellow flowered group)	
Pandorea pandorana	Wonga wonga vine
Pittosporum undulatum	Native Daphne
Plantago lanceolata	Lambs Tongue
Plectranthus parviflorus	Cockspur flower
Rytidosperma tenuius	Purplish wallaby grass
Solanum prinophyllum	Forest Nightshade
Themeda australis	Kangaroo Grass

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Table 15 Tree species identified

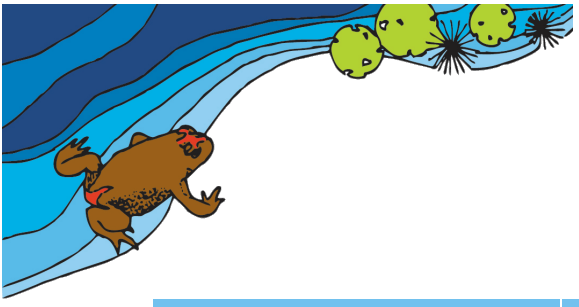
Species name	Common name	Count
Eucalyptus tereticornis	Forest Red Gum	207
Eucalyptus bosistoana	Coast Grey Box	50
Eucalyptus eugenioides	Thin-leaved Stringybark	185
Angophora floribunda	Rough-barked Apple	76
Eucalyptus sieberi	Silvertop Ash	5
Acacia implexa	Hickory Wattle	6
Allocasuarina littoralis	Black She-oak	29
Pittosporum undulatum	Sweet Pittosporum	1
Grevillea robusta	Silky Oak	1
Exocarpus cupressiformis	Native Cherry	9
Ligustrum sinense	Small-leaved Privet	1
	Unidentified species	28
	Stags (dead)	26
	Total	624

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Table 16 Consolidated Plant List displayed species recorded within the proposal area as well as on the adjoining site to the north.

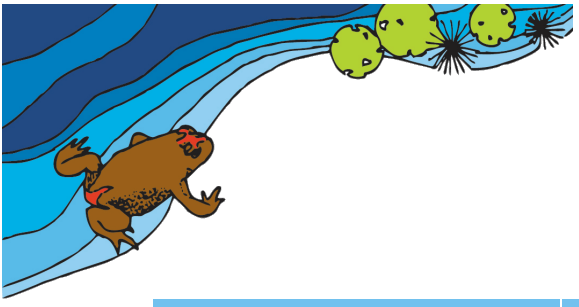
Botanical name	Common name	Grassland Plot 1 NE quarter of site	Grassland-swales-small dams	Woodland Plot 2 Hilltop	Weed status
MAGNOLIOPSIDA					
DICOTYLEDONS					
AMARANTHACEAE					
Alternanthera denticulata		Y	Y (dam)		
APIACEAE					
Centella asiatica			Y	Y	
ASTERACEAE					
* Aster subulatus		Y			E
* Cirsium vulgare	Spear Thistle	Y	Y		E
* Conyza sp. (bonariensis)	Fleabane	Y	Y		E
Euchiton sphaericum				Y	
* Gnaphalium americanum	Cudweed			Y	E
* Hypochaeris radicata	Flatweed	Y	Y	Y	E
* Pseudognaphalium luteoalbum	Jersey Cudweed		Y	Y	
* Senecio madagascariensis	Fireweed	Y	Y		WONS
* Sonchus oleraceus	Common Sowthistle		Y		E
* Taraxacum officinale	Catsear	Y	Y	Y	E
CAMPANULACEAE					
Wahlenbergia gracilis	Bluebell		Y	Y	
CASUARINACEAE					
Casuarina glauca	Swamp Oak	Y			

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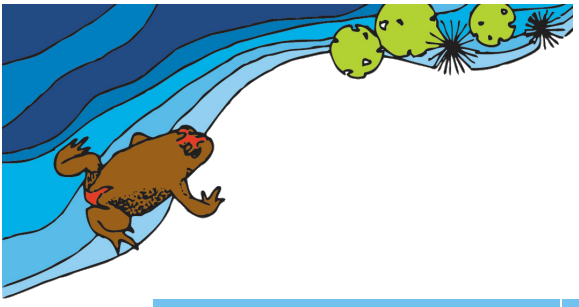
Botanical name	Common name	Grassland Plot 1 NE quarter of site	Grassland-swales-small dams	Woodland Plot 2 Hilltop	Weed status
CONVOLVULACEAE					
Dichondra repens	Kidney Weed		Y	Y	
FABACEAE					
Acacia implexa	Hickory		Y		
Acacia parvipinnula	Silver-stem Wattle				
Oxytes brachypodum (syn. Desmodium brachypodum)	Tick-trefoil		Y		
Glycine sp.	Glycine		Y	Y	
Zornia dyctiocarpa var. dyctiocarpa	Zornia		Y		
GERANIACEAE					
Geranium solanderi			Y		
HYPERICACEAE					
Hypericum gramineum	Small St. John's Wort		Y	Y	
LOBELIACEAE					
Lobelia purpurascens	Whiteroot		Y	Y	
LYTHRACEAE					
Lythrum hyssopifolia	Hyssop Loosestrife	Y	Y (swales)		

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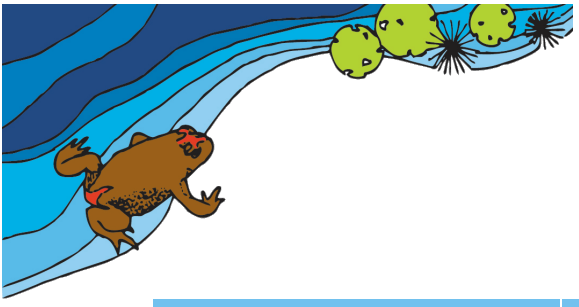
Botanical name	Common name	Grassland Plot 1 NE quarter of site	Grassland-swales-small dams	Woodland Plot 2 Hilltop	Weed status
MYRTACEAE					
Angophora floribunda	*Rough-barked Apple*		Y		
Angophora subvelutina	Broadleaf Apple		Y		
Eucalyptus eugenioides	Thin-leaved Stringybark		Y		
Eucalyptus tereticornis	Forest Red Gum		Y		
ONAGRACEAE					
Epilobium sp.	Willow-herb		Y (dam, swales)	Y	
Ludwigia peploides subsp. Montevidensis	Water Primrose		Y (dam, swales)		
OXALIDACEAE					
Oxalis sp.	Oxalis			Y	(?)
PLANTAGINACEAE					
* Callitriche (stagnalis)	Starwort		Y (dam)		E
Gratiola pedunculata			Y (swales)		
* Plantago lanceolata	Lambs Tongue	Y	Y		E
POLYGONACEAE					
Persicaria decipiens	Knotweed	Y	Y		
Rumex brownii	Swamp Dock		Y		
* Rumex crispus	Dock	Y	Y		E
POTAMOGETONACEAE					
Potamogeton tricarinatus	Pondweed		Y (dam)		

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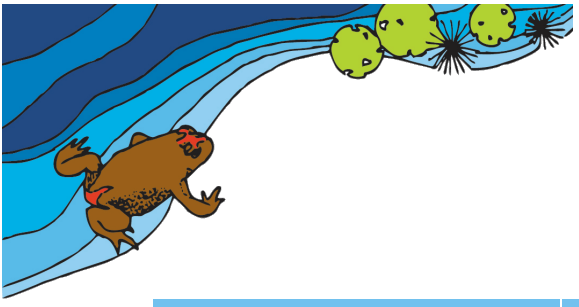
Botanical name	Common name	Grassland Plot 1 NE quarter of site	Grassland-swales-small dams	Woodland Plot 2 Hilltop	Weed status
RHAMNACEAE					
Cryptandra (amara)			Y		
ROSACEAE					
* Rubus anglocandicans	Blackberry				HTE
SOLANACEAE					
* Solanum americanum	Nightshade	Y	Y		E
VERBENACEAE					
* Verbena bonariensis	Purpletop		Y		E
* Verbena officinalis	Common Verbena	Y	Y		E
* Verbena rigida	Veined verbena		Y		E
MONOCOTYLEDONS					
ANTHERICACEAE					
Dichopogon fimbriatus	Chocolate Lily		Y		
COMMELINACEAE					
Commelina cyanea	Scurvy weed		Y		
CYPERACEAE					
Carex longebrachiata		(Y)	Y	Y	
Carex appressa		Y	Y (dam, swales)		
* Cyperus brevifolius					E
* Cyperus eragrostis	Umbrella Sedge	Y	Y		HTE
Cyperus gracilis	Slender Flat-sedge		Y		
Cyperus sanguinolentus		Y	Y	Y	

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Botanical name	Common name	Grassland Plot 1 NE quarter of site	Grassland-swales-small dams	Woodland Plot 2 Hilltop	Weed status
* Cyperus sesquiflorus		Y	Y		E
Cyperus sphaeroideus			Y		
Fimbristylis dichotoma	Common Fringe-sedge		Y	Y	
* Isolepis prolifera			Y		E
Eleocharis dietrichiana		Y	Y (dam, swales)		
HYPOXIDACEAE					
Hypoxis hygrometrica	Golden Weathergrass		Y	Y	
JUNCACEAE					
* Juncus acutus	Sharp Rush		Y (swale, on W bdy)		HTE
Juncus articulatus			Y (dam, swales)		
* Juncus cognatus	Forked rush	Y			E
Juncus prismatocarpus	Branching rush				
Juncus subsecundus			Y (dam)		
ORCHIDACEAE					
Spiranthes sinensis	Ladies' Tresses	Y	Y		
POACEAE					
* Axonopus fissifolius	Carpet Grass	Y	Y	Y	E
Bothriochloa macra	Red Grass		Y	Y	
* Briza maxima	Blowfly Grass		Y	Y	E
* Briza minor	Shivery Grass		Y	Y	E
* Cenchrus clandestinus	Kikuyu	Y	Y		HTE
Cymobopogon refractus	Barbwire Grass			Y	

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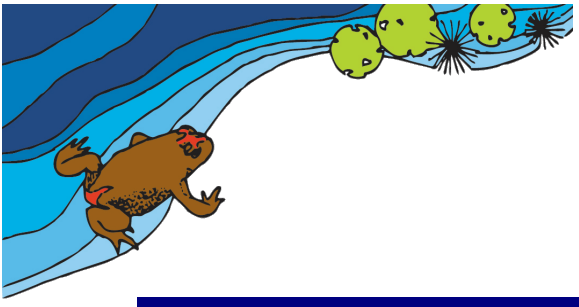


Botanical name	Common name	Grassland Plot 1 NE quarter of site	Grassland-swales-small dams	Woodland Plot 2 Hilltop	Weed status
* Cynodon dactylon	Common Couch	Y	Y	Y	(E)
*Echinochloa crus-galli	Barnyard Grass	Y	Y		E
Ehrharta erecta	Panic Veldtgrass	Y	Y		E
Eragrostis leptostachya	Paddock Lovegrass	Y	Y	Y	
Eragrostis sp.	Lovegrass		Y	Y	
* Holcus lanatus	Yorkshire Fog	Y	Y		E
Lachnagrostis filiformis		Y	Y		
Lolium perenne	*Perennial Ryegrass*	Y	Y		E
Microlaena stipoides	Weeping Grass		Y	Y	
* Paspalum dilatatum	Paspalum	Y	Y		
Paspalum distichum	Water Couch		Y (dam, swales)		
* Phalaris sp.	Phalaris	Y	Y		E
Rytidosperma (racemosa)	Wallaby Grass		Y		
* Setaria parviflora	Pigeon Grass	Y	Y		E
Sporobolus creber	Western Rat-tail Grass			Y	
Themeda triandra	Kangaroo Grass		Y		

Key

Weed on the site / Exotic HTE High Threat Exotic WONS Weed of National Significance

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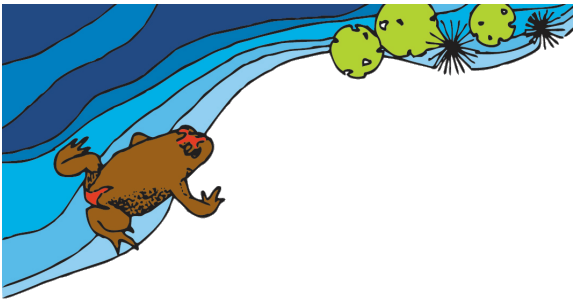


Appendix 3. Expected fauna species for Eurobodalla

Mammals

Common name	Scientific name
White-striped Freetail-bat	*Tadarida australis*
Gould's Wattled Bat	*Chalinolobus gouldii*
Chocolate Wattled Bat	*Chalinolobus morio*
Lesser Long-eared Bat	*Nyctophilus geoffroyi*
Gould's Long-eared Bat	*Nyctophilus gouldi*
Bush Rat	*Rattus fuscipes*
Swamp Rat	*Rattus lutreolus*
Long-nosed Bandicoot	*Perameles nasuta*
Brown Antechinus	*Antechinus stuartii*
Dusky Antechinus	*Antechinus swainsonii*
Yellow-footed Antechinus	*Antechinus flavipes*
Common Wombat	*Vombatus ursinus*
Common Ringtail Possum	*Pseudocheirus peregrinus*
Sugar Glider	*Petaurus breviceps*
Feathertail Glider	*Acrobates pygmaeus*
Eastern Grey Kangaroo	*Macropus giganteus*
Large Forest Bat	*Vespadelus darlingtoni*
Little Forest Bat	*Vespadelus vulturnus*
Common Wallaroo	*Macropus robustus*
Red-necked Wallaby	*Macropus rufogriseus*
Swamp Wallaby	*Wallabia bicolor*
Common Brushtail Possum	*Trichosurus vulpecula*
Greater Glider	*Petauroides volans*
Short-beaked Echidna	*Tachyglossus aculeatus*
Fox	*Vulpes vulpes*
Black Rat	*Rattus rattus*
Rabbit	*Oryctolagus cuniculus*

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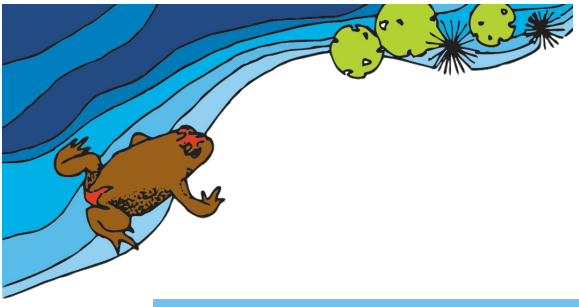
Frogs

Common Name	Scientific Name
Green Tree Frog	*Litoria caerulea*
Blue Mountains Tree Frog	*Litoria citropa*
Bleating Tree Frog	*Litoria dentata*
Eastern Dwarf Tree Frog	*Litoria fallax*
Jervis Bay Tree Frog	*Litoria jervisiensis*
Broad-palmed Frog	*Litoria latopalmata*
Peron's Tree Frog	*Litoria peronii*
Leaf-green Tree Frog	*Litoria phyllochroa*
Tyler's Tree Frog	*Litoria tyleri*
Verreaux's Frog	*Litoria verreauxii*
Common Eastern Froglet	*Crinia signifera*
Eastern Banjo Frog	*Limnodynastes dumerilii*
Ornate Burrowing Frog	*Limnodynastes ornatus*
Brown-striped Frog	*Limnodynastes peronii*
Spotted Grass Frog	*Limnodynastes tasmaniensis*
Haswell's Froglet	*Paracrinia haswelli*
Smooth Toadlet	*Uperoleia laevigata*
Tyler's Toadlet	*Uperoleia tyleri*

Reptiles

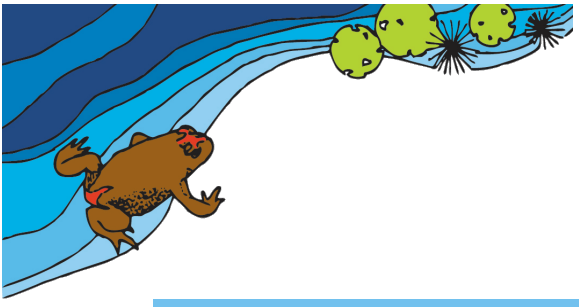
Common Name	Scientific Name
Diamond Python	*Morelia spilota spilota*
Common Death Adder	*Acanthophis antarcticus*
Yellow-faced Whip Snake	*Demansia psammophis*
Common Tree Snake	*Dendrelaphis punctulatus*
Golden-crowned Snake	*Cacophis squamulosus*
Eastern Small-eyed Snake	*Cryptophis nigrescens*
Red-naped Snake	*Furina diadema*
Black-bellied Swamp Snake	*Hemiaspis signata*

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Common Name	Scientific Name
Tiger Snake	*Notechis scutatus*
Red-bellied Black Snake	*Pseudechis porphyriacus*
Eastern Brown Snake	*Pseudonaja textilis*
Dwyer's Snake	*Parasuta dwyeri*
Bandy Bandy	*Vermicella annulata*
Blackish Blind Snake	*Ramphotyphlops nigrescens*
Wood Gecko	*Diplodactylus vittatus*
Lesueur's Velvet Gecko	*Oedura lesueurii*
Broad-tailed Gecko	*Phyllurus platurus*
Thick-tailed Gecko	*Underwoodisaurus milii*
Burton's Snake-lizard	*Lialis burtonis*
Common Scaly-foot	*Pygopus lepidopodus*
Jacky Lizard	*Amphibolurus muricatus*
Bearded Dragon	*Pogona barbata*
Punctate Worm-skink	*Anomalopus swansoni*
Eastern Blue-tongue	*Tiliqua scincoides*
Southern Rainbow-skink	*Carlia tetradactyla*
Cream-striped Shinning-skink	*Cryptoblepharus virgatus*
Robust Ctenotus	*Ctenotus robustus*
Copper-tailed Skink	*Ctenotus taeniolatus*
Mainland She-oak Skink	*Cyclodomorphus michaeli*
Pink-tongued Skink	*Cyclodomorphus gerrardii*
Cunningham's Skink	*Egernia cunninghami*
Black Rock Skink	*Egernia saxatilis*
White's Skink	*Liopholis whitii*
Eastern Water-skink	*Eulamprus quoyii*
Barred-sided Skink	*Eulamprus tenuis*
Dark-flecked Garden Sunskink	*Lampropholis delicata*
Pale-flecked Garden Sunskink	*Lampropholis guichenoti*
Weasel Skink	*Saproscincus mustelinus*
Red-throated Skink	*Acritoscincus platynota*
Three-toed Skink	*Saiphos equalis*

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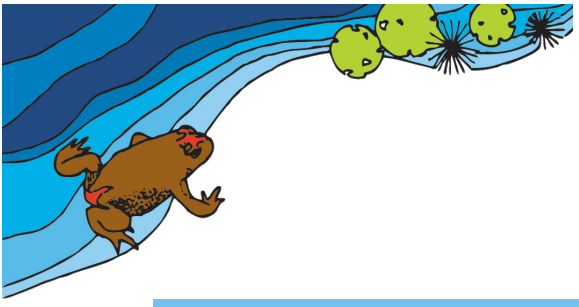


Common Name	Scientific Name
Lace Monitor	*Varanus varius*
Eastern Snake-necked Turtle	*Chelodina longicollis*

Birds

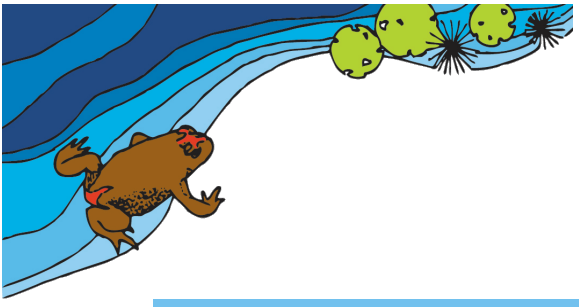
Common Name	Scientific Name
Brown Quail	*Coturnix ypsilophora*
Black Swan	*Cygnus atratus*
Australian Wood Duck	*Chenonetta jubata*
Mallard	*Anas platyrhynchos*
Pacific Black Duck	*Anas superciliosa*
Grey Teal	*Anas gracilis*
Chestnut Teal	*Anas castanea*
Australasian Grebe	*Tachybaptus novaehollandiae*
Great Crested Grebe	*Podiceps cristatus*
Hoary-headed Grebe	*Poliocephalus poliocephalus*
Little Pied Cormorant	*Microcarbo melanoleucos*
Little Black Cormorant	*Phalacrocorax sulcirostris*
Great Cormorant	*Phalacrocorax carbo*
Australian Pelican	*Pelecanus conspicillatus*
White-faced Heron	*Egretta novaehollandiae*
Little Egret	*Egretta garzetta*
White-necked Heron	*Ardea pacifica*
Great Egret	*Ardea alba*
Cattle Egret	*Ardea ibis*
Intermediate Egret	*Ardea intermedia*
Australian White Ibis	*Threskiornis molucca*
Straw-necked Ibis	*Threskiornis spinicollis*
Royal Spoonbill	*Platalea regia*
Black-shouldered Kite	*Elanus axillaris*
Whistling Kite	*Haliastur sphenurus*

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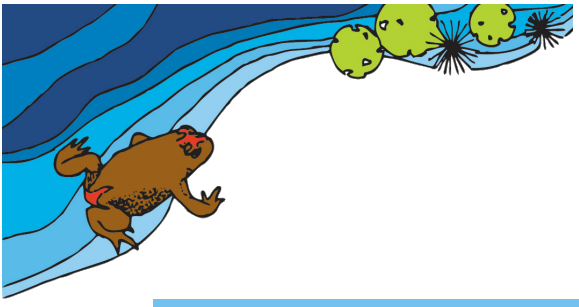
Common Name	Scientific Name
Wedge-tailed Eagle	*Aquila audax*
White-bellied Sea-eagle	*Haliaeetus leucogaster*
Swamp Harrier	*Circus approximans*
Brown Goshawk	*Accipiter fasciatus*
Collared Sparrowhawk	*Accipiter cirrocephalus*
Brown Falcon	*Falco berigora*
Australian Hobby	*Falco longipennis*
Nankeen Kestrel	*Falco cenchroides*
Buff-banded Rail	*Gallirallus philippensis*
Purple Swamphen	*Porphyrio porphyrio*
Dusky Moorhen	*Gallinula tenebrosa*
Eurasian Coot	*Fulica atra*
Latham's Snipe	*Gallinago hardwickii*
Black-winged Stilt	*Himantopus himantopus*
Black-fronted Dotterel	*Elseyornis melanops*
Masked Lapwing	*Vanellus miles*
Silver Gull	*Chroicocephalus novaehollandiae*
Rock Dove	*Columba livia*
White-headed Pigeon	*Columba leucomela*
Spotted Turtle-dove	*Streptopelia chinensis*
Brown Cuckoo-dove	*Macropygia amboinensis*
Emerald Dove	*Chalcophaps indica*
Common Bronzewing	*Phaps chalcoptera*
Crested Pigeon	*Ocyphaps lophotes*
Bar-shouldered Dove	*Geopelia humeralis*
Wonga Pigeon	*Leucosarcia picata*
Topknot Pigeon	*Lopholaimus antarcticus*
Yellow-tailed Black-cockatoo	*Calyptorhynchus funereus*
Galah	*Eolophus roseicapilla*
Long-billed Corella	*Cacatua tenuirostris*
Little Corella	*Cacatua sanguinea*
Sulphur-crested Cockatoo	*Cacatua galerita*

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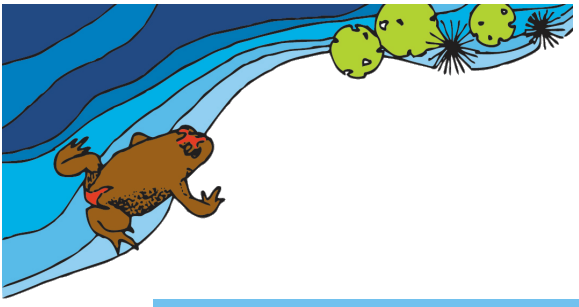
Common Name	Scientific Name
Rainbow Lorikeet	*Trichoglossus haematodus*
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*
Musk Lorikeet	*Glossopsitta concinna*
Australian King-parrot	*Alisterus scapularis*
Crimson Rosella	*Platycercus elegans*
Eastern Rosella	*Platycercus eximius*
Fan-tailed Cuckoo	*Cacomantis flabelliformis*
Horsfield's Bronze-cuckoo	*Chalcites basalis*
Channel-billed Cuckoo	*Scythrops novaehollandiae*
Asian Koel	*Eudynamys scolopaceus*
Southern Boobook	*Ninox novaeseelandiae*
Barn Owl	*Tyto alba*
Tawny Frogmouth	*Podargus strigoides*
White-throated Nightjar	*Eurostopodus mystacalis*
Australian Owlet-nightjar	*Aegotheles cristatus*
White-throated Needletail	*Hirundapus caudacutus*
Laughing Kookaburra	*Dacelo novaeguineae*
Sacred Kingfisher	*Todiramphus sanctus*
Rainbow Bee-eater	*Merops ornatus*
Dollarbird	*Eurystomus orientalis*
Superb Lyrebird	*Menura novaehollandiae*
Satin Bowerbird	*Ptilonorhynchus violaceus*
Superb Fairy-wren	*Malurus cyaneus*
Variegated Fairy-wren	*Malurus lamberti*
Spotted Pardalote	*Pardalotus punctatus*
White-browed Scrubwren	*Sericornis frontalis*
Large-billed Scrubwren	*Sericornis magnirostra*
Brown Gerygone	*Gerygone mouki*
White-throated Gerygone	*Gerygone albogularis*
White-throated Treecreeper	*Cormobates leucophaea*
Brown Thornbill	*Acanthiza pusilla*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*

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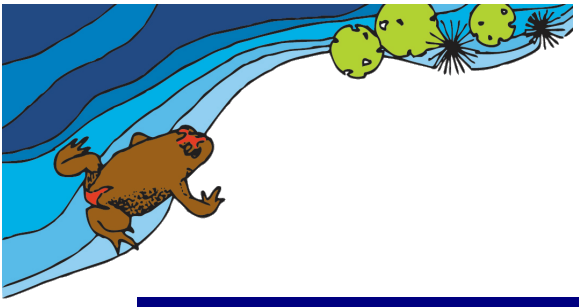
Common Name	Scientific Name
Yellow Thornbill	*Acanthiza nana*
Striated Thornbill	*Acanthiza lineata*
Buff-rumped Thornbill	*Acanthiza reguloides*
Red Wattlebird	*Anthochaera carunculata*
Little Wattlebird	*Anthochaera chrysoptera*
Noisy Friarbird	*Philemon corniculatus*
Bell Miner	*Manorina melanophrys*
Noisy Miner	*Manorina melanocephala*
Lewin's Honeyeater	*Meliphaga lewinii*
Yellow-faced Honeyeater	*Lichenostomus chrysops*
White-plumed Honeyeater	*Lichenostomus penicillatus*
Brown-headed Honeyeater	*Melithreptus brevirostris*
White-naped Honeyeater	*Melithreptus lunatus*
New Holland Honeyeater	*Phylidonyris novaehollandiae*
Eastern Spinebill	*Acanthorhynchus tenuirostris*
Scarlet Honeyeater	*Myzomela sanguinolenta*
Jacky Winter	*Microeca fascinans*
Rose Robin	*Petroica rosea*
Eastern Yellow Robin	*Eopsaltria australis*
Eastern Whipbird	*Psophodes olivaceus*
Crested Shrike-tit	*Falcunculus frontatus*
Golden Whistler	*Pachycephala pectoralis*
Rufous Whistler	*Pachycephala rufiventris*
Grey Shrike-thrush	*Colluricincla harmonica*
Black-faced Monarch	*Monarcha melanopsis*
Leaden Flycatcher	*Myiagra rubecula*
Restless Flycatcher	*Myiagra inquieta*
Magpie-lark	*Grallina cyanoleuca*
Rufous Fantail	*Rhipidura rufifrons*
New Zealand Fantail	*Rhipidura fuliginosa*
Willie Wagtail	*Rhipidura leucophrys*
Spangled Drongo	*Dicrurus bracteatus*

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Common Name	Scientific Name
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
White-bellied Cuckoo-shrike	*Coracina papuensis*
Olive-backed Oriole	*Oriolus sagittatus*
Dusky Woodswallow	*Artamus cyanopterus*
Grey Butcherbird	*Cracticus torquatus*
Australian Magpie	*Cracticus tibicen*
Pied Currawong	*Strepera graculina*
Australian Raven	*Corvus coronoides*
White-winged Chough	*Corcorax melanorhamphos*
Apostlebird	*Struthidea cinerea*
Eurasian Skylark	*Alauda arvensis*
Australasian Pipit	*Anthus novaeseelandiae rogersi*
House Sparrow	*Passer domesticus*
Red-browed Finch	*Neochmia temporalis*
Double-barred Finch	*Taeniopygia bichenovii*
Mistletoebird	*Dicaeum hirundinaceum*
Welcome Swallow	*Hirundo neoxena*
Tree Martin	*Petrochelidon nigricans*
Fairy Martin	*Petrochelidon ariel*
Cicadabird	*Coracina tenuirostris*
Red-whiskered Bulbul	*Pycnonotus jocosus*
Australian Reed-warbler	*Acrocephalus australis*
Little Grassbird	*Megalurus gramineus*
Golden-headed Cisticola	*Cisticola exilis*
Silvereye	*Zosterops lateralis*
Eurasian Blackbird	*Turdus merula*
Common Starling	*Sturnus vulgaris*
Common Myna	*Sturnus tristis*

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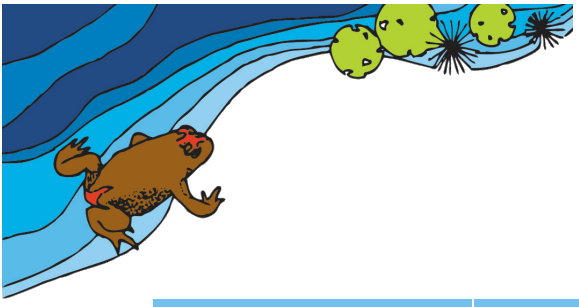


Appendix 4. Habitat requirements for locally-occurring threatened bird and mammal species

Birds

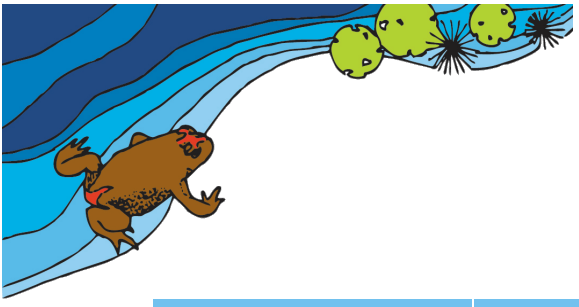
Common name *Scientific name* Schedule listing	Preferred habitat	Comment
Australasian Bittern *Botaurus poiciloptilus* BC Act, Sch. 2, Vul.	Inhabits wetlands that generally have permanent fresh water and dense vegetation of sedges, rushes and reeds.	No suitable natural habitat occurs on the site.
Spotted Harrier *Circus assimilis* BC Act Sch. 2, Vul.	Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	No suitable natural habitat occurs on the site.
Little Eagle *Hieraaetus morphnoides* BC Act Sch. 2, Vul.	Occupies open Eucalypt forest, woodland or open woodland. She-oak or acacia woodlands and riparian woodlands are also used. Builds a stick nests in winter in tall living trees within remnant patches	Suitable natural habitat occurs on the site.
White-bellied Sea-Eagle *Haliaeetus leucogaster* BC Act Sch. 2, Vul.	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.	Suitable natural habitat occurs on the site.
Square-tailed Kite *Lophoictinia isura* BC Act, Sch. 2, Vul.	Inhabits coastal forest and woodlands. Most commonly associated with ridge and gully forests dominated by Woollybutt, Spotted Gum or Peppermint Gum.	Suitable natural habitat occurs on the site.
Pied Oystercatcher *Haematopus longirostris* BC Act, E	Intertidal zone.	No suitable natural habitat occurs on the site.
Eastern Hooded Dotterel *Thinornis cucullatus cucullatus*	Hooded Plovers prefer sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone for feeding, much beachcast seaweed, and backed by sparsely vegetated sand-dunes for shelter and nesting. Occasionally	No suitable natural habitat occurs on the site.

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Common name *Scientific name* Schedule listing	Preferred habitat	Comment
BC Act, CE EPBC Act V	Hooded Plovers are found on tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches, and small beaches in lines of cliffs. They regularly use near-coastal saline and freshwater lakes and lagoons, often with saltmarsh.	
Eastern Curlew *Numenius madagascariensis* BC Act, not listed EPBC Act CE	It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts	No suitable natural habitat occurs on the site.
Gang-gang Cockatoo *Callocephalon fimbriatum* BC Act, Sch. 2, Vul.	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands – also in urban areas including parks and gardens. Requires tree hollows for nesting	Suitable natural habitat occurs on the site.
Glossy Black-cockatoo *Calyptorhynchus lathami* BC Act, Sch. 2, Vul.	Found in open forests with Allocasuarina species and hollows for nesting.	Suitable natural habitat occurs on the site.
Little Lorikeet *Glossopsitta pusilla* BC Act, Sch. 2, Vul.	Inhabits the open forests and dead timber alongside watercourses. Also occurs in eucalypt forest in mountainous regions.	Suitable natural habitat occurs on the site.
Swift Parrot *Lathamus discolor* BC Act, Sch. 2, Vul. EPBC Act, End.	Occurs in a variety of Eucalypt forests. Migrates from Tasmania to the mainland during the winter/autumn months to feed mostly on winter flowering Eucalypts	Suitable natural habitat occurs on the site.
Barking Owl *Ninox connivens* BC Act, Sch. 2, Vul.	Found in open forests, woodlands, dense scrubs, river red gums and other large trees near watercourses.	Suitable natural habitat occurs on the site.
Powerful Owl *Ninox strenua* BC Act, Sch. 2, Vul.	Pairs occupy permanent territories in mountain forests, gullies and forest margins, sparser hilly woodlands, coastal forests, woodlands and scrubs.	Suitable natural habitat occurs on the site.
Masked Owl *Tyto novaehollandiae* BC Act, Sch. 2, Vul.	Forests, open woodlands and farms with large trees, e.g. river red gums adjacent to cleared country.	Suitable natural habitat occurs on the site.
Sooty Owl *Tyto tenebricosa* BC Act, Sch. 2, Vul.	Tall, wet forests in sheltered mountain gullies, usually with an east and Southeast aspect.	No suitable natural habitat occurs on the site.

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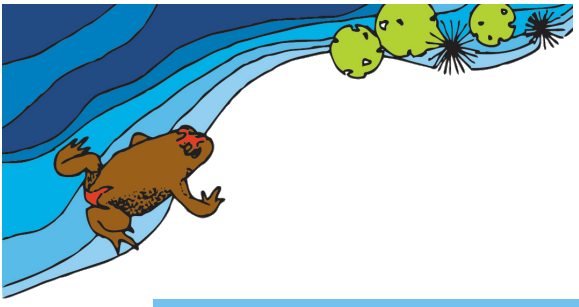


Common name *Scientific name* Schedule listing	Preferred habitat	Comment
Striated Fieldwren *Calamanthus fuliginosus*	Mainly a bird of ground and understorey vegetation, and can be found in swampy, coastal heathlands, tussocky grasslands, low shrubby vegetation and margins of swamps.	No suitable natural habitat occurs on the site.
Regent Honeyeater Anthochaera Phrygia BC Act, CE EPBC Act, C End.	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	No suitable natural habitat occurs on the site.
Speckled Warbler *Pyrrholaemus sagittatus* BC Act Sch. 2, Vul.	Inhabits Eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	No suitable natural habitat occurs on the site.
Varied Sittella *Daphoenositta chrysoptera* BC Act Sch. 2, Vul.	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland	Suitable natural habitat occurs on the site.
Dusky Woodswallow *Artamus cyanopterus cyanopterus* BC Act Sch. 2, Vul.	Often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests.	Suitable natural habitat occurs on the site.
Flame Robin *Petroica phoenicea* BC Act Sch. 2, Vul.	In NSW it breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. It migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains	No suitable natural habitat occurs on the site.
Diamond Firetail *Stagonopleura guttata* BC Act Sch. 2, Vul	Mostly inhabits grassy eucalypt woodlands, also occurring in open forest and riparian areas within these. Feeds exclusively on the ground, occurring in flocks between five to 40+ birds	No suitable natural habitat occurs on the site.

Mammals

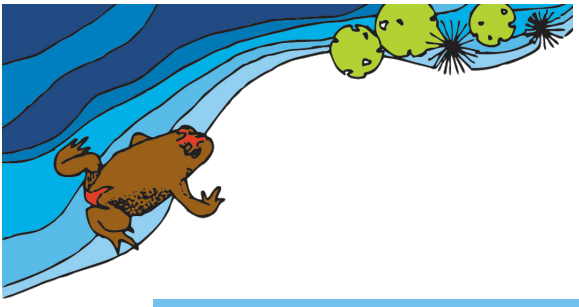
Common name *Scientific name* Schedule listing	Preferred habitat	Comment
Spotted-tailed Quoll *Dasyurus maculatus* BC Act, Sch. 2, Vul. EPBC Act, End.	Occurs mostly in sclerophyll forest and woodlands as well as coastal heath lands and rainforests. Requires suitable den sites such as hollows or caves and large areas of intact vegetation.	No suitable natural habitat occurs on the site.

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Common name *Scientific name* Schedule listing	Preferred habitat	Comment
Koala *Phascolarctos cinereus* BC Act, Sch. 2, Vul.	Eucalypt forests rich in Swamp Mahogany (E. robusta), Forest Red Gum (E. tereticornis), and Grey Gum (E. punctata).	Suitable natural habitat occurs on the site.
Yellow-bellied Glider *Petaurus australis* BC Act, Sch. 2, Vul.	Restricted to tall, mature sclerophyll forests in regions of high rainfall. Requires nesting hollows and a year-round supply of flowering trees.	Suitable natural habitat occurs on the site.
Squirrel Glider *Petaurus norfolcensis* BC Act, Sch. 2, Vul.	Inhabits dry sclerophyll forest and woodland. Requires abundant hollow-bearing trees and a mix of Eucalypts, acacias and Banksias. At least one floral species should flower heavily in the winter and one or more species of Eucalypts need to be smooth-barked.	Suitable natural habitat occurs on the site.
Greater Glider Petauroides Volans BC Act, not listed EPBC Act, V Greater Glider population in the Eurobodalla local government area BC Act, E2 endangered population EPBC Act, V	Tall open forest and woodlands with live and dead hollow-bearing trees for denning, feed trees, large trees, habitat connectivity across the landscape.	Suitable natural habitat occurs on the site.
Grey-headed Flying-fox *Pteropus poliocephalus* BC Act, Sch. 2, Vul. EPBC Act, Vul.	Found in rainforest, wet and dry sclerophyll forest and mangroves. Camps are usually in gullies, close to water and in vegetation with a dense canopy. Feeds on a wide variety of flowering and fruiting plants.	Suitable foraging habitat occurs on the site.
Eastern Coastal Free-tail Bat *Micronomus norfolkensis* BC Act, Sch. 2, Vul.	Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in man-made structures.	Suitable foraging habitat occurs on the site.
Large-eared Pied Bat *Chalinolobus dwyeri* BC Act, Sch. 2, Vul.	Found in well-timbered areas containing gullies.	Suitable foraging habitat occurs on the site.
Eastern False Pipistrelle *Falsistrellus tasmaniensis* BC Act, Sch. 2, Vul.	Little known of habitat. Has been found roosting in stem holes of living Eucalypts	Suitable foraging habitat occurs on the site.

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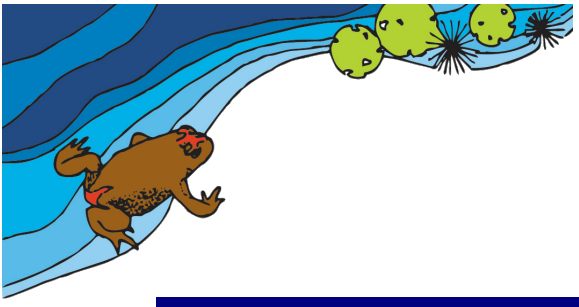
Common name *Scientific name* Schedule listing	Preferred habitat	Comment
Large Bent-winged Bat *Miniopterus orianae oceanensis* BC Act, Sch. 2, Vul.	Well-timbered valleys. Roosts in caves and storm-water channels and similar structures. Does not roost in tree hollows.	Suitable foraging habitat occurs on the site.
Southern Myotis *Myotis macropus* BC Act, Sch. 2, Vul.	Requires open areas of water over which it hunts. Roosts in caves, under bridges and buildings and sometimes in dense foliage in rainforests. May roost in tree hollows.	Suitable natural habitat occurs on the site.
Greater Broad-nosed Bat *Scoteanax rueppellii* BC Act, Sch. 2, Vul. EPBC Act, Lower risk (near threatened)	Found in woodlands, moist and dry sclerophyll forests and rainforests. Prefers gullies. Roosts in tree hollows only.	Suitable foraging habitat occurs on the site.

9.1 Likelihood of Occurrence

- Factors determining the likelihood of occurrence for a particular species include:
- Specific habitat requirements (e.g. aquatic, seasonal, tree hollows, rock outcrop, woody debris, etc),
- Geological / edaphic (soil) characteristics,
- Known distribution (records),
- Climate.

Probability	Description
Unlikely (none)	No suitable habitat or connectivity to suitable habitat offsite. Not known from local area. Not detected on site.
Low	Low value suitable habitat (e.g. highly disturbed conditions; Small habitat/forage areas; High-level weed-invasion; Cleared with fragmented regrowth). Not known from local area. Not detected on site.
Moderate	Moderate value suitable habitat (e.g. Disturbed, weed-invaded; Foraging/roosting habitat present; Habitat corridor). Not detected on site.
High	High value suitable habitat (e.g. breeding/foraging/roosting habitat present; Low or nil weed presence; Habitat corridor). Not detected on site.
Known	Species known to occur within the site (e.g. breeding and foraging habitat; foraging habitat; Habitat corridor). Detected on or adjacent to the site.

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Appendix 5. Endangered Ecological Community Lowland Grassy Woodland in the South East Corner Bioregion

Lowland Grassy Woodland communities in the South East Corner bioregion are located in rainshadow areas receiving less rainfall than more elevated terrain that partially surrounds them, with mean annual rainfall typically in the range of 700-1100 mm.

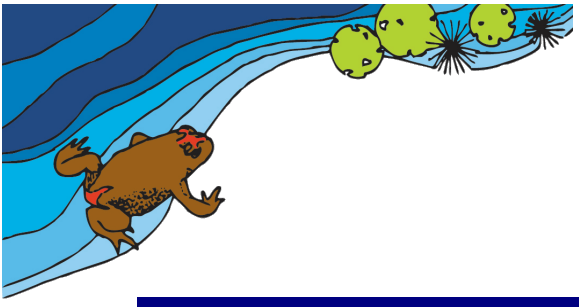
- The community typically occurs in undulating terrain up to 500 metres in elevation on granitic substrates (e.g. adamellites, granites, granodiorites, gabbros, etc.) but may also occur on locally steep sites and on acid volcanic, alluvial and fine-grained sedimentary substrates.
- Contemporary tree-dominated stands of the community are largely relics or regrowth of originally taller forests and woodlands, which are likely to have had scattered shrubs and a largely continuous grassy groundcover. At some sites, mature trees may exceed 40 metres, although regrowth stands may be shorter than 10 metres.

Appendix 6. Matters of National Environmental Significance

The Protected Matters Search Tool was used to find relevant Matters of National Environmental Significance (MNES) on or near the site.

No World Heritage Properties, National Heritage Places or Wetlands of International Importance are recorded for the area.

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Appendix 7. Company Profile

Abel Ecology has been in the biodiversity consulting business since 1991, starting in the Sydney Region, and progressively more state wide in New South Wales since 1998, and now also in Victoria. During this time extensive expertise has been gained with regard to Master Planning, Environmental Impact assessments including flora and fauna, bushfire reports, Vegetation Management Plans, Management of threatened species, Review of Environmental Factors, Species Impact Statements, Biodiversity Development Assessment Reports and as Expert Witness in the Land and Environment Court. We have done consultancy work for industrial and commercial developments, golf courses, civil engineering projects, tourist developments as well as residential and rural projects. This process has also generated many connections with relevant government departments and city councils in NSW. Our team consists of four scientists and two administrative staff, plus casual assistants as required.

Licences

NPWS s132C Scientific licence number is SL100780 expires 23 January 2023

NPWS GIS data licence number is CON95034

DG NSW Dept of Primary Industries Animal Care and Ethics Committee Approval expires 8 November 2022

DG NSW Dept of Primary Industries Animal Research Authority expires 8 November 2022

The Consultancy Team

Dr Danny Wotherspoon

BSc, DipEd, MA, PhD, Grad Dip Bushfire Protection,

MECA NSW, MEPLA, MNELA, MESA, MEIANZ, White card.

Danny has practised as an ecological and bushfire consultant since 1991.

He is a consulting ecologist to private developers, State Government agencies and various City Councils on a regular basis, for development applications, government projects, and as expert witness in the NSW Land and Environment Court.

Danny's PhD researched fragmented vegetation and fauna habitat use. He has special expertise in fauna habitat use. Danny has presented invited papers at international conferences since 2001 in Australia, China, South Africa,

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Sri Lanka and Israel on his PhD and other research, including golf course habitat management. Danny's scientific papers have been published in both international and Australian academic journals.

Dr Daniel McDonald

BScAgr, MAgr, PhD, MLinSoc NSW, White card, Snr first aid cert, EWP certificate, QTRA, VTA.

Daniel is an experienced ecologist with expertise in fauna, plant species identification, vegetation assessment, agriculture, conservation genetics and seed collection and preservation. He is accredited both for BioBanking assessments and Biodiversity Certification. His present research interest is in Eastern Suburbs Banksia Scrub and fragmented endangered ecological communities.

Daniel's BAM Assessor Accreditation number is BAAS17056.

Mark Mackinnon

Qualifications: B Env. Sci. (Hons), Grad Dip Bushfire Protection

MEIANZ, White Card,

Accredited Practitioner Level 3 - Bushfire Planning & Design (BPAD), Accreditation number 36395.

Mark is a passionate and enthusiastic scientist who thrives in the field of natural resource management. He has experience in threatened species, fire ecology, bushfire management, pest plant and animals, and landscape restoration. In particular he specializes in ornithology and bushfire management. Mark has a number of specialized field-based skills including: nest box installation, simple and complex tree climbing, working at heights, general firefighter departmental fire accreditation, venomous snake and reptile handling, immunization to handle bat species, and an A - class bird banding licence with mist-net endorsement. Mark is also skilled in ArcGIS mapping, first-aid, four -wheel-driving.

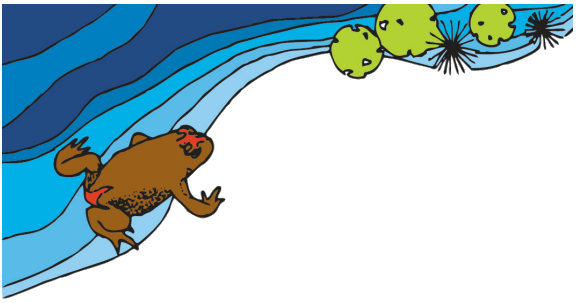
Dr Warwick Fear

Qualifications: B App. Sci. (Hons); PhD; Grad. Dip. in Bushfire Protection

Bushfire Planning & Design (BPAD), Accredited Practitioner Level 2. Accreditation number 48550, White Card.

Warwick has a background in a number of scientific disciplines and applications. Previous roles include public and private sector work within the human biological sciences and secondary school Science teaching. Warwick has worked within the field of bushfire protection since 2016 and his current role within Abel Ecology is as a Bushfire Scientist.

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Dr Alison Hewitt

BSc (Hons), PhD

MESA, MAPS, MASBS, Snr 1st Aid cert, White card

Alison has researched and published on the reproductive biology and ecology of Australian Melaleuca species, native plant responses to fire and the vegetation of western Sydney. Alison's interests include plant ecology and flora survey methodology, bush regeneration, plant identification and gardening. Alison teaches Botany and Ecology sessionally with Western Sydney University.

Alison's BAM Assessor Accreditation number is BAAS19044.

Mark Sherring

BM, MAABR, Cert. Hort., Cert. Bush Regen, Cert. Rural Ops, White Card.

Member of the Australian Association of Bush Regenerators

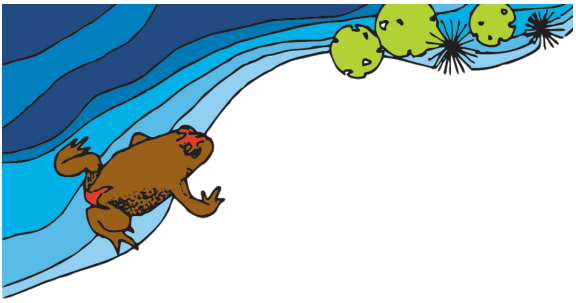
Mark has extensive knowledge and experience of plant species in New South Wales. He has built up his expert knowledge on NSW native plant species over the many years that he has practised as a Botanist. He is regularly asked to contribute to the extensive (ongoing) flora surveys of the Sydney Basin and Blue Mountains carried out by the Royal Botanic Gardens, Sydney. Mark has extensive field survey experience, having worked for over ten years in various plant-related roles. His role in Abel Ecology is to provide expert advice on flora and on the full range of flora management issues encountered and in the design and management of environmental monitoring projects.

Dr Stephanie Clark

Qualifications: B Sc (Hons), PhD

Stephanie has over 30 years experience in the collection, identification and taxonomy of marine, estuarine, freshwater and terrestrial molluscs. She has conducted numerous targeted surveys for endangered and threatened species (particularly land and freshwater molluscs) in both Australia and the United States. She is particularly interested in the systematics, taxonomy, morphology (external and internal), population and conservation genetics and conservation of molluscs particularly terrestrial (especially the Helicoidea) and freshwater (especially the Hydrobiidae and related families) groups.

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Jesse Cass

BSc (Zoology), MEScM (enrolled)

White Card, Working Safely at Heights

Trainee Botanist

Jesse has a bachelor degree and is currently studying his Masters of Environmental Science and Management, online at UNE, as a pathway for a PhD. He is practicing and learning plant identification, as well as fauna identification within the Sydney Basin. His role in Abel Ecology is to provide assistance on field visits and report writing, while gaining knowledge and experience in flora identification.

Nathan Sharman

BSc (Environmental Biology)

Trainee Botanist/Ecologist

Nathan has completed his Bachelor of Environmental Biology at the University of Technology Sydney (UTS). Nathan has experience in bush regeneration, where he developed a strong knowledge of weed species in the Blue Mountains area. He is a keen bushwalker and outdoor enthusiast with a passion for exploring nature. Nathan has roles in both administration and ecology works and is training to become a botanist.

Harry Kirk

BSc (Environmental Biology), Dip., Arb (enrolled)

4WD Training, White Card, NSW LAA (LAA001488)

Trainee Arborist

Harry has a Bachelor of Environmental Biology at the University of Technology Sydney (UTS). Harry has spent the last few years as a Health, Safety & Environment Consultant working on large and national scale projects. Transferring his wide consulting skills to Abel Ecology, Harry has roles in undertaking field work and report writing while completing his Diploma of Arboriculture.

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27 April 2022

Dr Catherine Dale
General Manager
Eurobodalla Shire Council
PO Box 99, Moruya NSW 2537

Dear Catherine,

RE: Princes Highway Roundabout Upgrade – Review of Environmental Factors

Notification under State Environmental Planning Policy (Transport and Infrastructure) 2021

We are writing to inform you of a project being carried out under *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP) as part of the construction of a new roundabout and site access on Princes Highway, Moruya. Health Infrastructure NSW proposes to undertake a range of road and infrastructure works to facilitate the future development of a large greenfield lot located between the Princes Highway and South Head Road, Moruya.

The scope of works is classified as Development Permitted without Consent under the TISEPP and accordingly, a Review of Environmental Factors (REF) is being prepared in accordance with the provisions of the *Environmental Planning and Assessment Act 1979* and the *Environmental Planning and Assessment Regulation 2000*.

For your information, a plan indicating the location and extent of the work is enclosed. Generally, the proposed activity comprises the following:

- Construction of a new roundabout on Princes Highway.
- Introduction of new in ground electricity infrastructure including lighting to suit new roadway.

Table 1 below outlines the relevant clauses of the TISEPP under which the works can be undertaken.

Table 1 TISEPP Permissibility

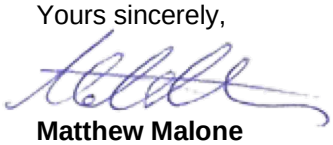
Works proposed	Relevant Infrastructure SEPP Section
Construction of new roundabout on Princes Highway	Section 2.108(a)
Construction of new in ground electricity infrastructure including lighting	Section 2.44(1)

In accordance with Section 2.12 of the TISEPP, we are notificing Council of our intention to carry out the activity. Health Infrastructure NSW will take into consideration comments received within 21 calendar days of the date of this notification. We request you provide any comments regarding the proposal in writing within this 21 day period.

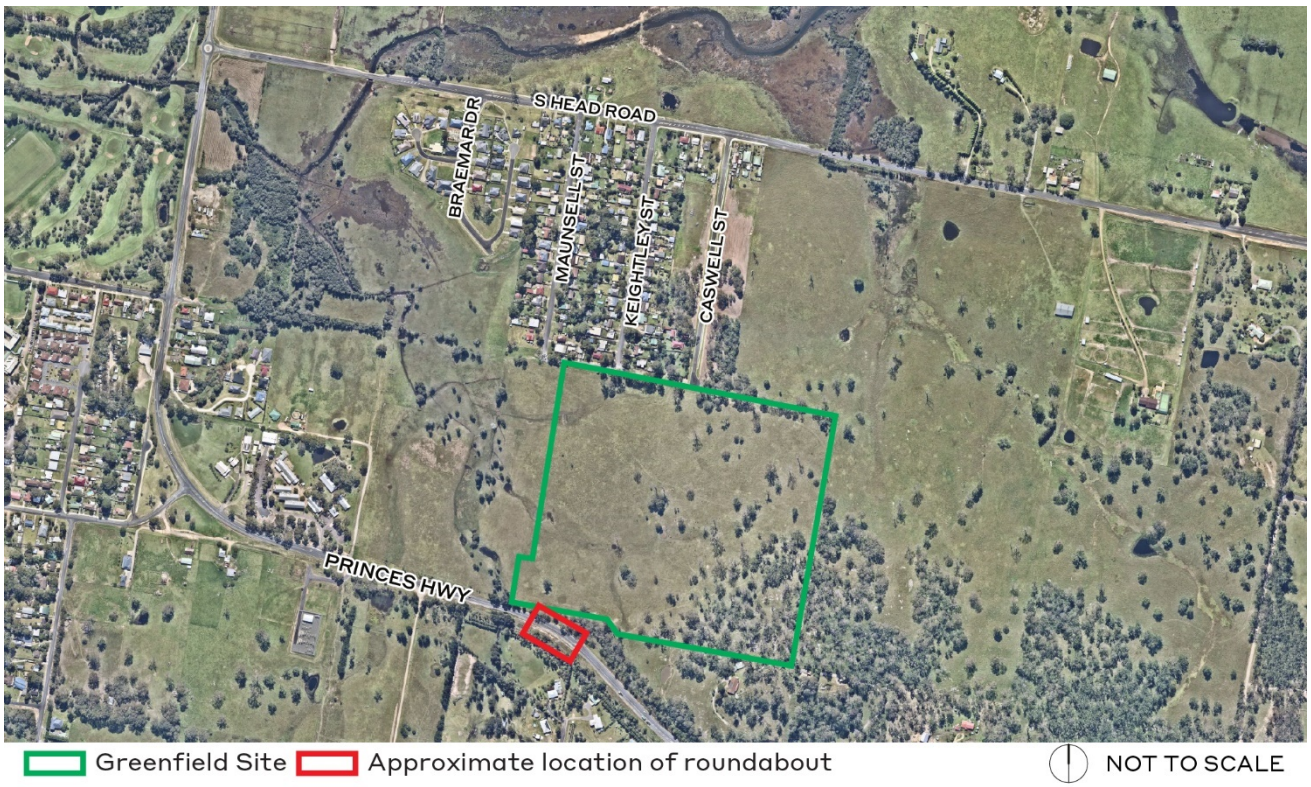
Health Infrastructure ABN 89 600 377 397
1 Reserve Road, St Leonards NSW 2065 | Locked Bag 2030, St Leonards NSW 1590
T 02 9978 5402 | W hinfra.health.nsw.gov.au

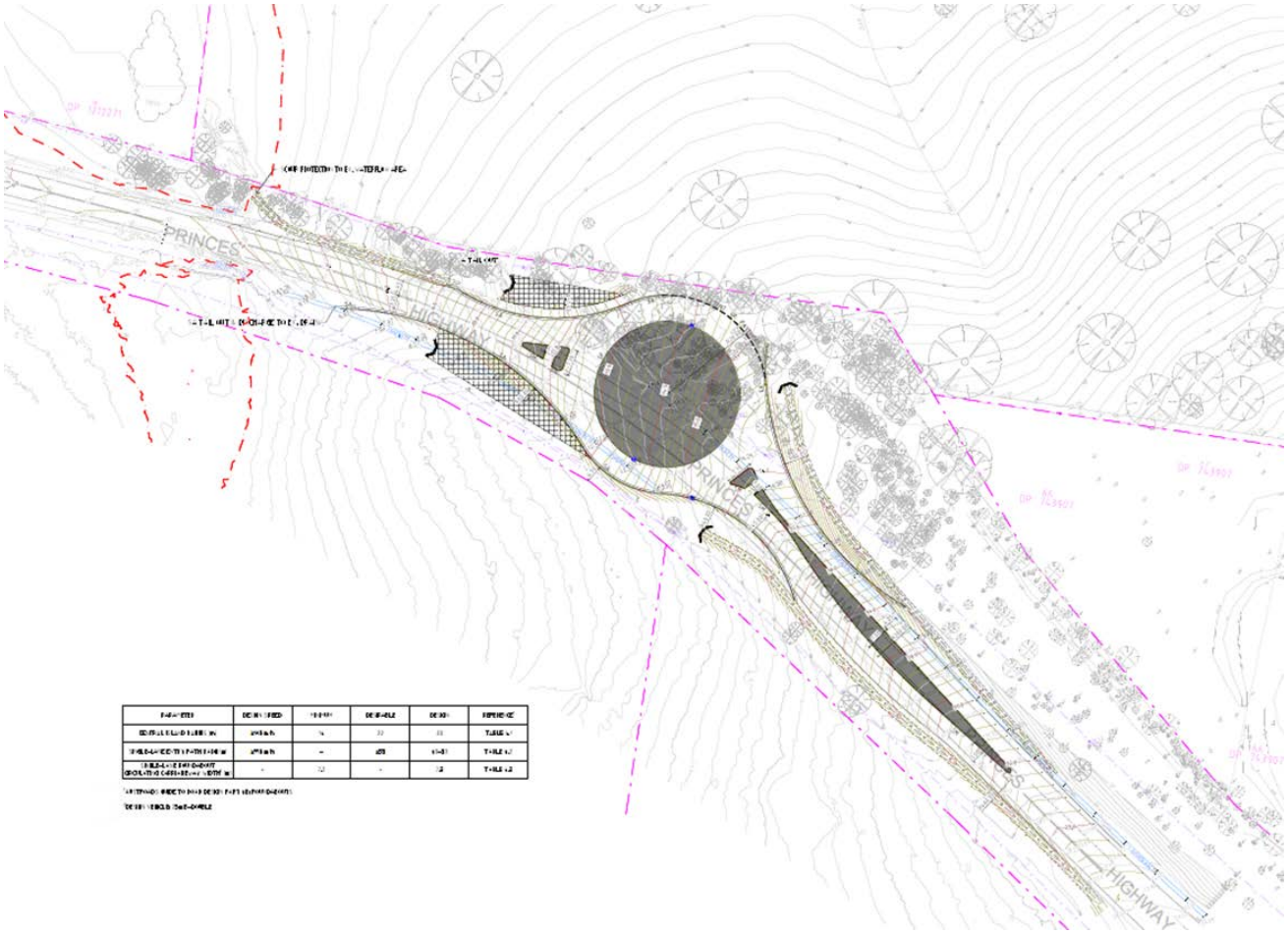
If you wish to comment on the proposal, please provide your feedback to the undersigned at matthew.malone1@health.nsw.gov.au or NSW Health Infrastructure, Attention Matthew Malone, Locked Bag 2030, St Leonards, NSW 1590.

Yours sincerely,



Matthew Malone
Senior Project Director
Health Infrastructure
0434 609 853
matthew.malone1@health.nsw.gov.au


S HEAD ROAD
BRAEMAR DR
MAUNSELL ST
KEIGHTLEY ST
CASWELL ST
PRINCES HWY
Greenfield Site
Approximate location of roundabout
NOT TO SCALE


PRINCES
HIGHWAY

27 April 2022

Mr Colin Malone
South East Zone Commander
NSW State Emergency Services
56-58 Knox Street, Goulburn NSW 2580

Dear Mr Malone,

RE: Princes Highway Roundabout Upgrade – Review of Environmental Factors

Notification under State Environmental Planning Policy (Transport and Infrastructure) 2021

We are writing to inform you of a project being carried out under *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP) as part of the construction of a new roundabout and site access on Princes Highway, Moruya. Health Infrastructure NSW proposes to undertake a range of road and infrastructure works to facilitate the future development of a large greenfield lot located between the Princes Highway and South Head Road, Moruya.

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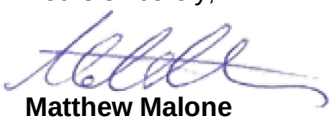
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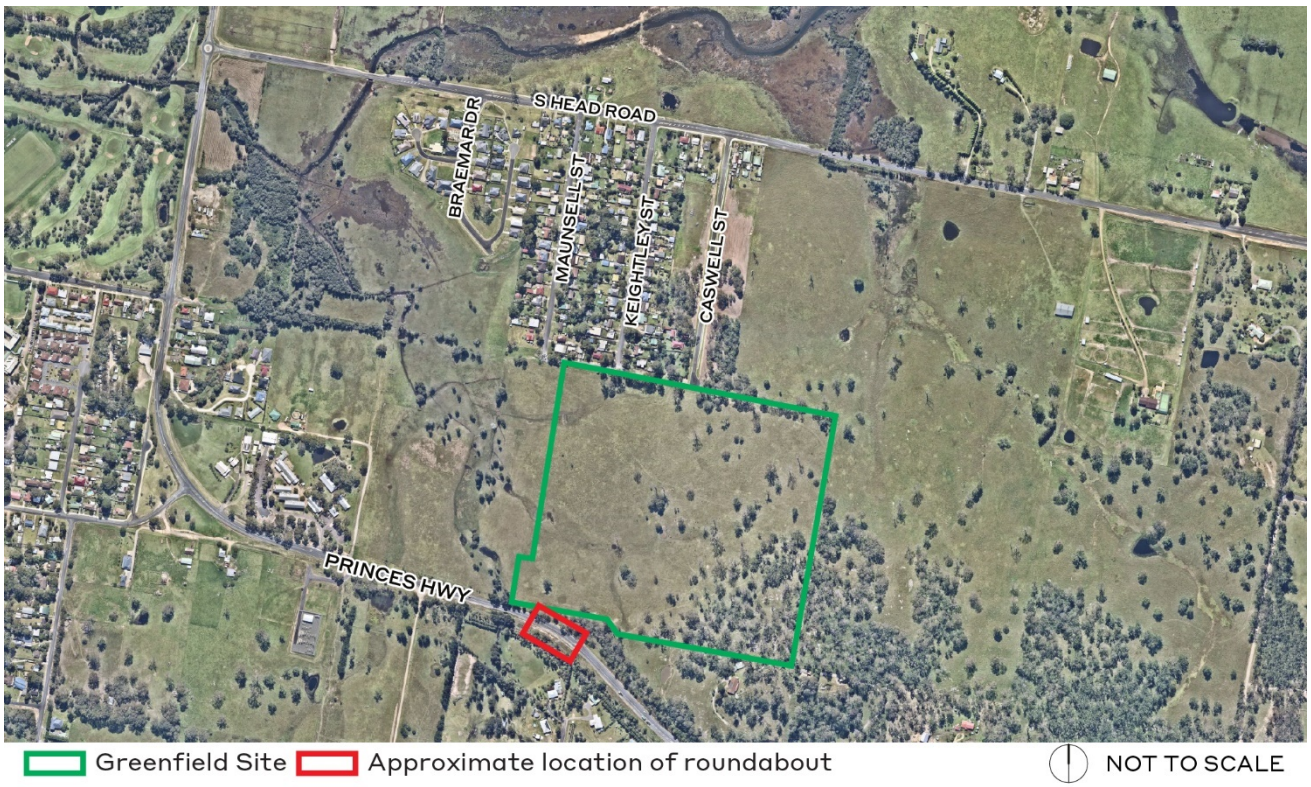
In accordance with Section 2.13 of the TISEPP, we are notifying NSW State Emergency Services of our intention to carry out the activity. Health Infrastructure NSW will take into consideration comments received within 21 calendar days of the date of this notification. We request you provide any comments regarding the proposal in writing within this 21 day period.

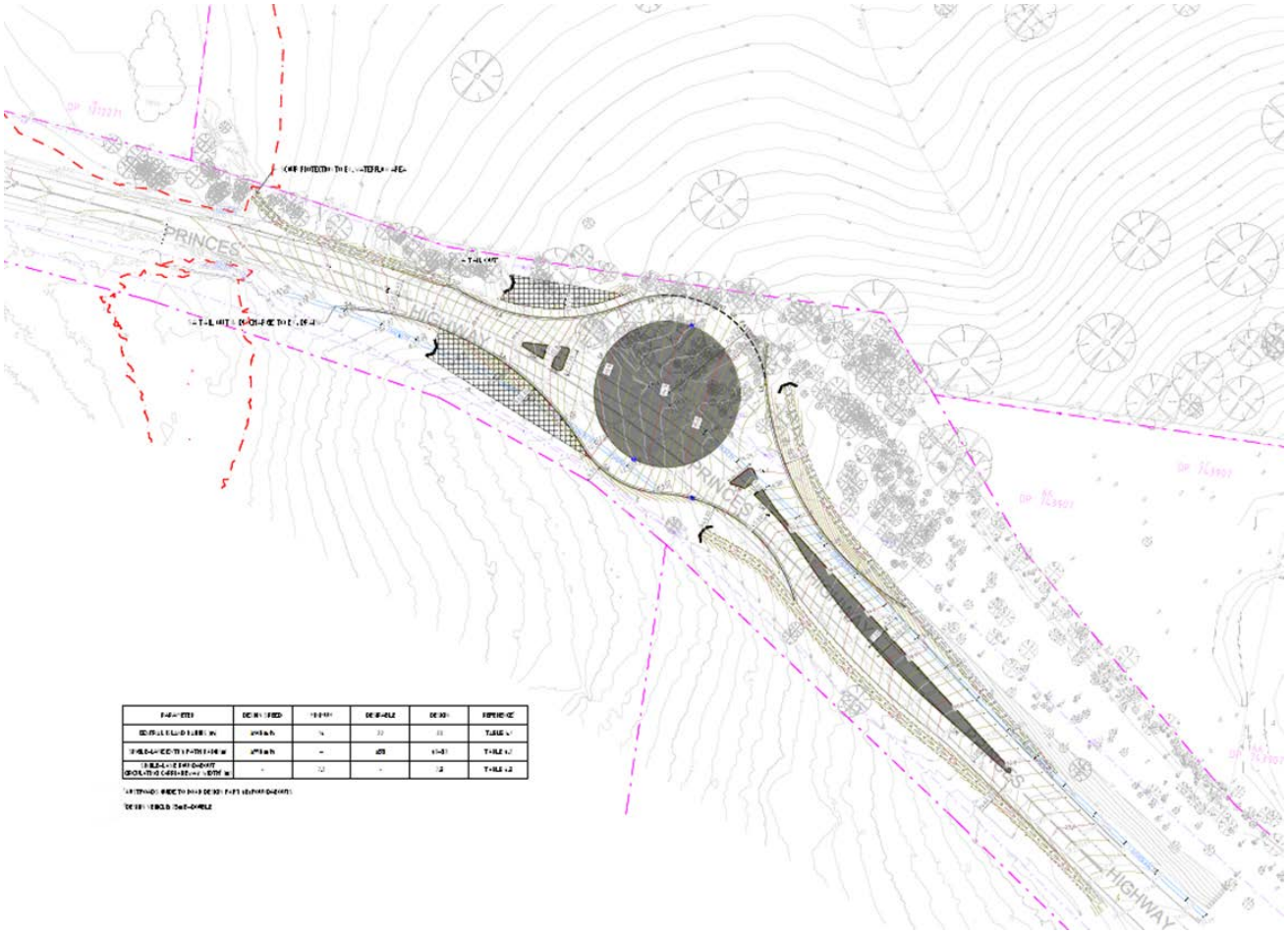
If you wish to comment on the proposal, please provide your feedback to the undersigned at matthew.malone1@health.nsw.gov.au or NSW Health Infrastructure, Attention Matthew Malone, Locked Bag 2030, St Leonards, NSW 1590.

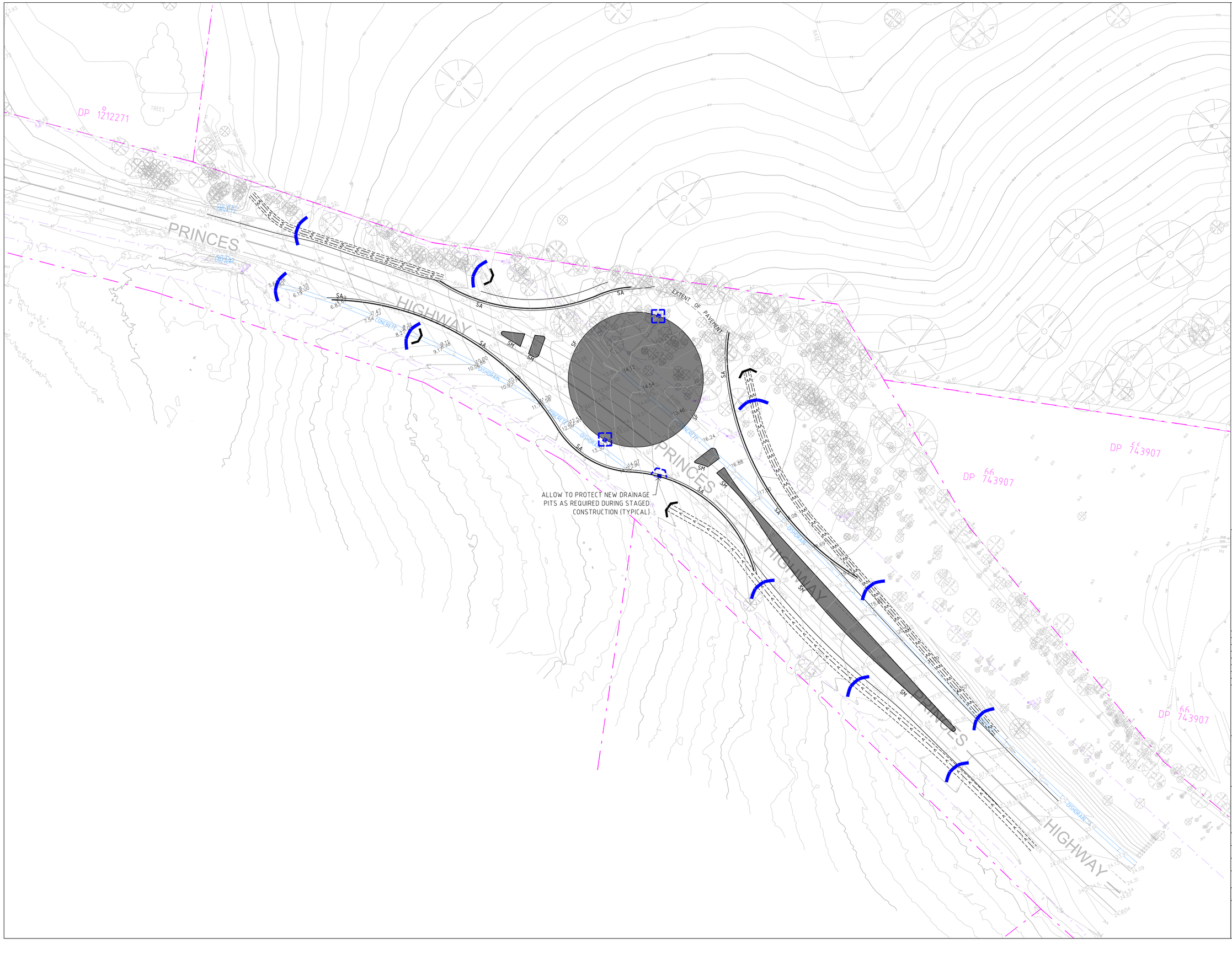
Yours sincerely,



Matthew Malone
Senior Project Director
Health Infrastructure
0434 609 853
matthew.malone1@health.nsw.gov.au


S HEAD ROAD
BRAEMAR DR
MAUNSELL ST
KEIGHTLEY ST
CASWELL ST
PRINCES HWY
Greenfield Site
Approximate location of roundabout
NOT TO SCALE


PRINCES HIGHWAY



EROSION & SEDIMENT CONTROL LEGEND:

- GEOTEXTILE PIT FILTER 2
- KERB INLET SEDIMENT TRAP
- STRAW BALE
- STRAW BALE MINI SEDIMENT BASIN

DRAWING KEY

REV	DATE	DESCRIPTION	DRAWN	REVIEWED
P1	19/04/22	FOR APPROVAL	SC	SN

PROJECT

PRINCES HIGHWAY ROUNDABOUT WORKS, MORUYA

DRAWING TITLE

EROSION AND SEDIMENT CONTROL PLAN

ptc.
Suite 502, 1 James Place
North Sydney NSW 2060
t +61 2 8920 0800
ptcconsultants.co

CLIENT	HEALTH INFRASTRUCTURE
DRAWING #	SK-0101
PROJECT #	21-3123
SCALE	1 : 500 @ A1 1 : 1000 @ A3

FOR APPROVAL

REV P1

Abel Ecology

5 May 2022

2210065

Introduction

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

Site Description

The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot 2, DP 1281576, a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north is a small residential subdivision called Mynora Estate.

The approximate location of the roundabout is shown in **Figure 1** below. It is noted that ancillary inground works may extend beyond this location.

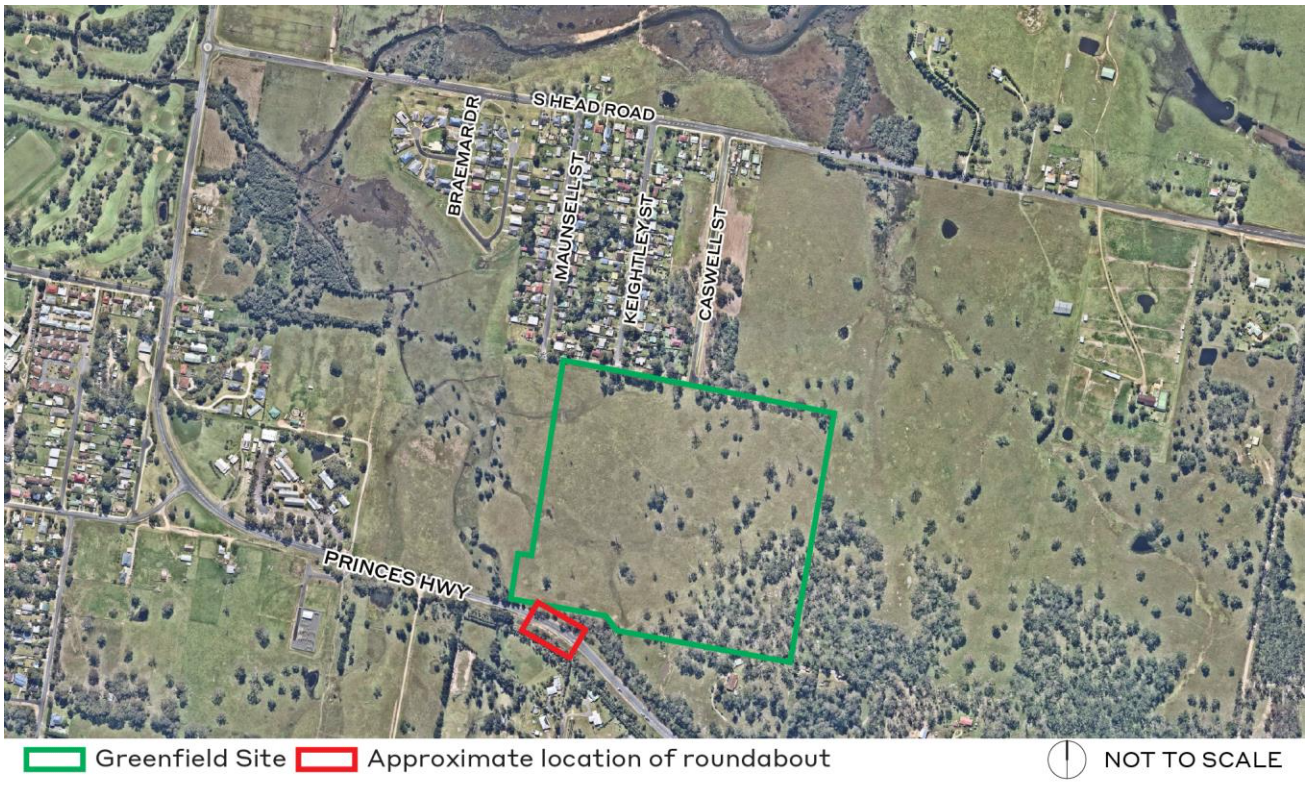
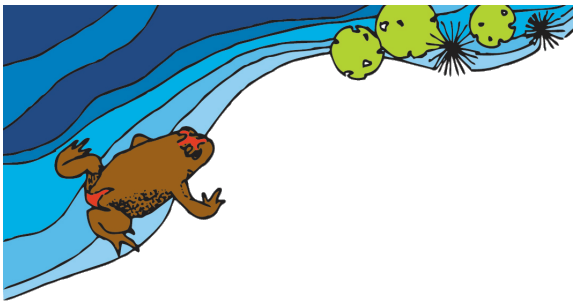


Figure 1 Approximate location of the proposed works. Proposed Works

BAM Ecology Pty Ltd (T/A Abel Ecology)
2 Samuel 20:18
ACN 626 221 467 – ABN 37 626 221 467

PO Box 495, Springwood, NSW, 2777
Unit 2, 10-11 Ferguson Road,
Springwood, NSW, 2777
56 Sharp Street, Cooma, NSW, 2630

T (02) 4751 9487
E info@abelecology.com.au
W www.abelbushfire.com.au
W www.abelecology.com.au



The works proposed under this REF include the following:

- Construction of a new roundabout located on Princes Highway.
- Ancillary road and public domain works.
- Ancillary electricity reticulation and street lighting.

A further detailed description of the proposed works is contained in the Review of Environmental Factors report prepared by Ethos Urban.

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Abel Ecology

Arborist assessment report

For

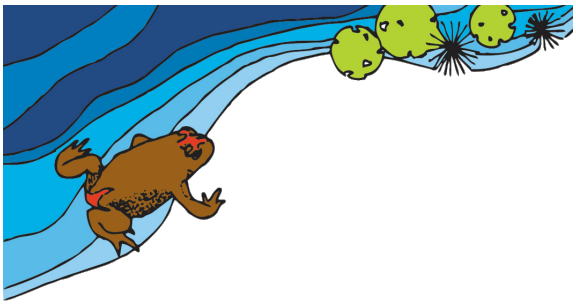
Road Reserve on Princes Highway, Moruya NSW 2537, adjacent Lot 2, DP 1281576

Prepared for:	Health Infrastructure
Report No:	AE22-2434-REP-ISS-2 proposal for the construction of a new roundabout and associated road works
Prepared by:	Abel Ecology
Date:	17 May 2022

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Disclaimer

No tree is entirely without hazard potential. No responsibility is accepted for any damage or injury that may be caused by any trees on the site. All measures outlined should minimise damage inflicted on the trees if carefully implemented.

This report does not provide an assessment of risk of harm posed from tree hazards. Information may be provided about the structure, function, defects or tree pests and/or diseases, vitality, condition and life expectancy. However, no assessment of targets, frequency of use by potential targets or guidance of risk of harm is included in this report.

This report is an arboricultural impact assessment; it is not a risk assessment.

No internal examination of any kind has been undertaken on any tree described in this report, unless expressly stated. On occasions, a mallet may be used as an auditory guide to assist in determining the presence of internal hollows.

I confirm that I have read the NSW Land and Environment Court Practice Note commencing on 14 May 2007, Division 2, Part 31 of the Uniform Civil Procedure Rules 2005 and the Expert Witness Code of Conduct in Schedule 7 to the Uniform Civil Procedure Rules 2005. I have prepared this advice in accordance with the requirements of the Practice Note and Code of Conduct and believe this report is consistent with the requirements of the Practice Note and the Code of Conduct. I agree to be bound by the Practice Note and Code of Conduct.

Document History

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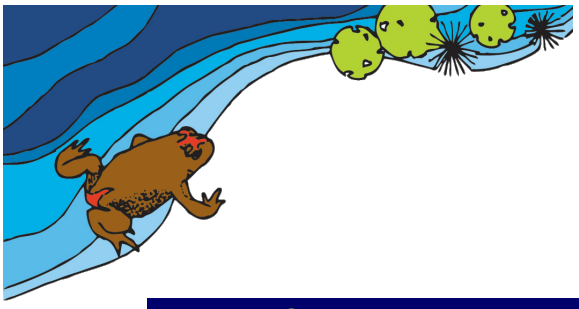


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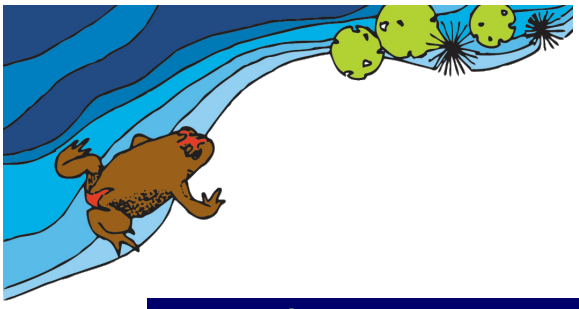


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List of Abbreviations

d.b.h.	Diameter at breast height (~1.4 m)
SRZ	Structural Root Zone
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment
LGA	Local Government Area
APZ	Asset Protection Zone
IPA	Inner Protection Area

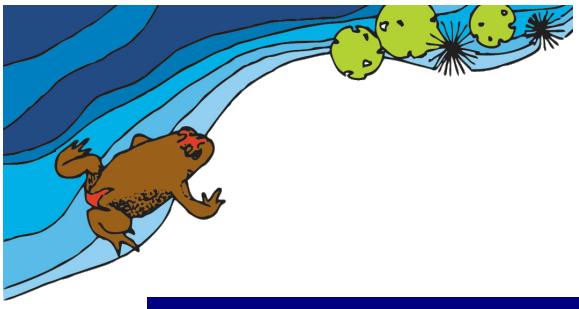
Note regarding maps in this report

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Land and property Information NSW. Spatial Information eXchange (SIX) website 2017

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Glossary

Explanation of Tree assessment terminology and rationale:

Amenity - Trees with recreational, functional, environmental, ecological, social, health or aesthetic value rather than for production purposes (Standards Australia 2007).

A desirable or useful feature or facility of a building or place; the pleasantness or attractiveness of a place (Google Dictionary 2017). An assessment of amenity value is to some extent subjective and qualitative, however it also includes Arboricultural assessments of structure and health of the tree.

Arborist - A person with training to AQF Level 3 in Arboriculture, or above, or equivalent recognized and relevant experience that enables the person to perform the tasks required by the Australian Standards for Arboricultural practice (AS4373-2007 Pruning of amenity trees and AS4970-2009 Protection of trees on development sites).

Australian Qualification Framework (AQF) - A national framework for all educational and training purposes in Australia.

Codominant stems - Stems or trunks of about the same size originating from the same position from the main stem.

Condition - An evaluation of the structural status of the tree including defects that may affect the useful life of an otherwise healthy specimen. Such influencing factors include cavities and decay, weak unions between scaffolds (major branches) or trunks and faults of form or habit.

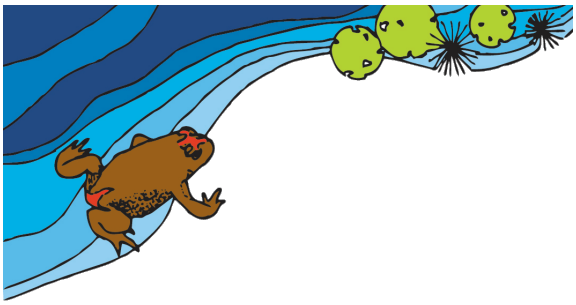
Coppiced - Cutting a trunk close to ground level in order to stimulate the production of multiple new stems (epicormic shoots).

DBH (Diameter at breast height) –A standard Arboricultural measurement used to calculate the Tree Protection Zone (TPZ), taken at 1.4 m from the ground.

Epicormic Growth - The production of epicormic growth from dormant buds is a response to stress, fire and damage, including poor pruning methods. 'Epi's' can occur on branches, stems and from the rhizome base of the tree. Arising from the cambium (actively growing bark region) they are often weakly attached. Epicormic shoots arising from rhizomes is an adaptive strategy in many Australian native plants including Eucalypts and plants in the Proteacea family, occurring commonly after fire, damage, or drought.

Mycorrhizae/Rhizosphere - Mycorrhizae are fungi that grow in symbiotic association with tree roots (especially the fine root hairs) and are attributed with increasing the uptake of nutrients, particularly phosphorus, and reducing infection from soil borne pathogens. They greatly increase the surface area of a tree's root system. Mycorrhizae require aerobic soil conditions and are reduced in number by compaction, waterlogging and overuse of soil fertilisers. Forest litter or similar mulch provides ideal conditions for the proliferation of Mycorrhizae. Rhizosphere is a term describing the peripheral area of a tree's root system where this symbiotic association most commonly occurs.

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Remedial (restorative) pruning - Removing damaged, diseased, or lopped branches, taking the cut back to undamaged tissue, in order to induce the production of shoots from latent or adventitious buds, from which a new crown will be established.

Stem - Organ supporting the branches, leaves, flowers, and fruit, and connecting the upper parts of the tree to the root system; may also be referred to as 'the trunk'.

Visual Tree Assessment (VTA) - using external characteristics as indicators of the internal conditions and structural stability of a tree. It is described by *Mattheck and Breloer (1994)*, the first step of the method is to visually examine a tree to find external symptoms of internal defects. It is generally used in some form by Arborists in Australia for tree assessment.

A full VTA is comprised of three steps. This report does not undertake a full VTA. Only the first step, a visual inspection is described in this report. No internal examination was be undertaken. On occasions, a mallet may be used as an auditory guide for the presence of internal hollows. The assessment described in this report is ground based assessment. No climbing of any tree was done as part of an assessment.

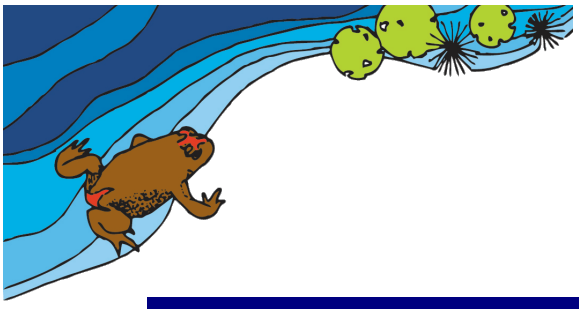
Vitality - Indicates the energy reserves of the tree and is determined by the observed crown colour and density, the percentage of dead/dying branches and epicormic growth, and the tree's response to wounding, disease, and decay pathogens. Poor vitality compromises the tree's ability to initiate internal defence systems (including compartmentalisation of damage or decay) is reduced and it can also become predisposed to attack by insects and pathogens. Often used synonymously in Arboricultural writing with 'vigour' or 'health'.

Tree Hazard Potential - An assessment of the risks associated with retaining a tree in its existing or proposed surroundings. Factors to consider are the growth characteristics of the species, tree vitality, condition and the frequency and type of potential targets. The impact the proposed works can have on any individual tree can only be assumed from general principals about trees.

This report does not provide an assessment of risk of harm posed from tree hazards. Information may be provided about the structure, function, defects or tree pests and/or diseases, vitality, condition and life expectancy. However, no assessment of targets, frequency of use by potential targets or guidance of risk of harm is included in this report.

Tree Protection Zone (TPZ) – Based on the DBH measurement of the tree. It specifies an area around the tree to protect the upper parts as well as the underground root system from impacts of development works. Specifications for TPZ may include maintenance actions such as application of mulch and irrigation.

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Executive summary

Abel Ecology carried out a tree assessment survey at Road Reserve on Princes Highway, Moruya NSW 2537, adjacent Lot 2, DP 1281576 on behalf of Health Infrastructure, Eurobodalla Health Services, to assess the likely impacts of 275 on trees on the site, and to address issues pertaining to tree protection.

The proposal is to build an entry roundabout on Princes Highway to provide access into the lot to allow for its future development.

A total of 125 trees will be impacted for the purpose of this proposal, including the removal of 121 trees and relocation of 4 hollow-bearing fauna habitat trees.

One tree on the south road reserve was unable to be assessed at the time of field work. This trees will need to be removed to facilitate the finalised proposal.

A stormwater detention basin is likely to be required to intercept and treat runoff from the site before discharge into adjacent waterways.

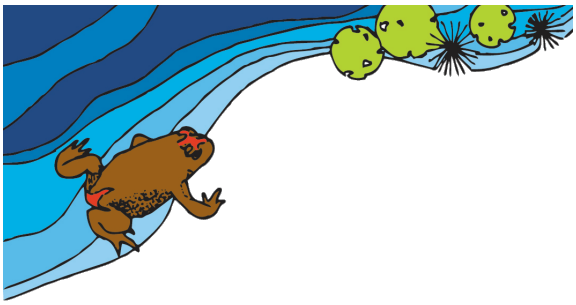
Items of concern on the site are as follows (

Table 1):

Table 1. Items of concern

Tree	Problem	Recommendation
20, 52, 53, 58.	Habitat trees either within the proposal footprint or affected by the proposal.	Relocate hollows
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 54, 55, 56, 57, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 104, 105, 437, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496.	Within the construction footprint	Remove or relocate trees

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The following recommendations apply:

a) Engage a project arborist to ensure and certify that tree protection measures are satisfactorily implemented and to provide advice as applicable. The arborist will inspect the site at least once within every six months during construction, and once upon completion of construction.

b) Construct tree protection fence(s) at a minimum radius distance(s), measuring from the centre of the tree, prior to construction to prevent unnecessary root damage (See figure showing tree protection fence diagram). Construct tree protection fences using chain wire mesh panels to a height of 1.8 metre high. Fences are to be held in place with secure footing (Figure 6).

c) Exclude all site activity from tree protection zones during demolition, construction and demobilisation phases (see 'Tree protection guidelines' in Appendix 3).

d) Do not remove tree protection fences until construction is completed, at which time the arborist will sign-off on fence removal and provide further advice as applicable.

e) Apply mulch 100-150 mm deep with a radius of at least two (2) metres, (or to the edge of the calculated tree protection zone where possible) around retained trees adjacent to excavation works prior to construction to stimulate growth of absorbing roots.

f) Re-apply mulch annually to ameliorate impacts of root loss.

g) Water fenced trees during periods of low rainfall. This will boost the vitality and adaptability of the trees, creating visual and shade assets that complement the site.

h) Cleanly cut any roots with a thickness of 2 cm or more encountered during excavation to reduce damage to roots from tearing, splitting, and cracking.

i) Show tree locations and protective fencing on all construction plans used on site.

j) Engage a qualified ecologist to inspect hollow-bearing trees before they are removed. The ecologist will provide further advice as applicable.

k) Potential habitat trees are to be inspected for hollows before removal by a qualified ecologist.

l) Any trees found to have hollows that have not previously been identified as a habitat tree, must be inspected by a qualified ecologist, and all hollows removed and relocated.

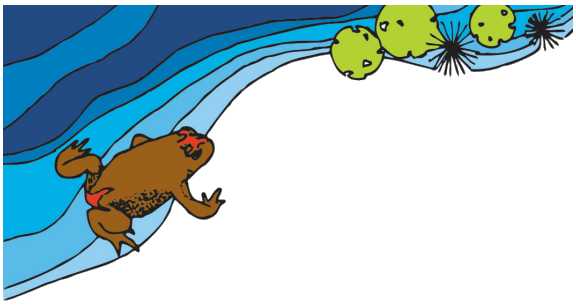
m) Protective fencing is to be placed at a minimum of the TPZ radius distance around trees in close proximity to construction zones.

n) All site activity must be excluded from tree protection zones during demolition and construction phases (see 'Tree protection guidelines' in Appendix 2).

o) Route all trenching for underground services outside the TPZs of retained trees. If any underground service installation or underground boring will occur within TPZs, engage an arborist to supervise the activity.

p) Crown pruning must comply with the appropriate class of pruning described in AS4373-2007 Pruning of amenity trees and be undertaken by a qualified arborist practising modern arboricultural methods.

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q) Advice must be sought from a suitably skilled and experienced project arborist wherever roots over 40 mm diameter are encountered during excavation. The tearing of roots must be avoided, and root pruning undertaken as directed by the nominated arborist.

r) Any and all landscaping or gardening for the proposal must use species that are native to the remnant Lowland Grassy Woodland ecological community. Species native to this community which are suitable for landscaping include:

- *Acacia implexa*
- *Angophora floribunda*
- *Bursaria spinosa*
- *Bossiaea buxifolia*
- *Eucalyptus tereticornis*
- *Eucalyptus eugenioides*
- *Eucalyptus bosistoana*
- *Dianella longifolia*
- *Dianella revoluta*
- *Hardenbergia violacea*
- *Jacksonia scorparia*
- *Lomandra longifolia*
- *Rubus parvifolius*
- *Themeda australis*

s) In line with Health Infrastructures Policies, replacement tree plantings are at minimum to be a 1:1 ratio with the amount of trees removed. Therefore there must be at least 120 tree plantings as part of this project.

t) An environmental offset area must be established to ameliorate the impacts of the proposal. The vegetation planted within the offset must be native to the Lowland Grassy Woodland ecological community. Specifications can be finalised with a Vegetation Management Plan (VMP).

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1. Introduction

A survey of the proposed development site at Lot 2 (DP 1281576) Braemar Drive and Princes Highway, Moruya NSW 2537 and adjacent road reserve ('the site' – Figure 1) was undertaken on 12th April 2021 to 15th April 2021, and 25th October to 29th October 2021.

The main aim of this survey was to assess the trees on the site (road reserve) and prepare a report that addresses issues pertaining to the proposal and tree protection.

This report will provide a description of individual trees and assess the anticipated impact of the construction of a new roundabout and associated road works to the trees on site.

1.1 Site description

The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot 2, DP 1281576, a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north is a small residential subdivision called Mynora Estate

For the purpose of this report the site is defined as the north road reserve on Princes Highway, Moruya NSW 2537, adjacent Lot 2 (DP 1281576) (Figure 1).

The site is approximately 1.5 ha and the elevation is approximately 19 metres above sea level.

The north road reserve extends between the edge of Princes Highway and the property boundary fence of Lot 2 (DP 1281576). The groundcover contains both native and exotic grass species and has a similar canopy composition and cover to, and is contiguous with, that on the south end Lot 2 (DP 1281576).

The adjacent properties are a mix of residential and grazing agricultural land uses.

The trees on site are all remnant natives of the Lowland Grassy Woodland ecological community.

The soil is shallow over massive granite bedrock.

1.2 The proposal

The works proposed include the following:

- Construction of a new roundabout located on Princes Highway.
- Ancillary road and public domain works.
- Ancillary electricity reticulation and street lighting.

Up to 4 hollow-bearing fauna habitat trees will be relocated for the development.

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2. Method

Tree assessments were undertaken on 12th, 13th, 14th, 15th April 2021, and 25th, 26th, 27th, 28th, and 29th October 2021. Dr Danny Wotherspoon, Jesse Cass and Mark Sherring conducted the field assessment at the site. Harry Kirk undertook a desktop review of previously collected data and documents to produce this report.

Eurobodalla Shire Council TPO/DCP defines a "tree" as "a perennial plant with at least one self-supporting woody of fibrous stems which:

I. Is three (3) metres of more in height or

II. Has a trunk circumference of 400 mm or more measured at ground level or

III. Has a crown/branch span of three (3) metres diameters or more"

Eurobodalla Shire Council, 2010,

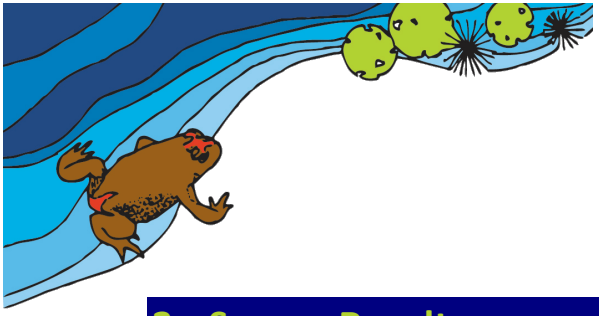
https://www.horizontotaltreeservice.com.au/wp-content/uploads/2017/06/Tree-Preservation-Code.pdf

The vitality and condition of trees were assessed from ground level using the VTA (Visual Tree Assessment) method (*Mattheck & Breleor, 1994*). Tree heights were determined by visual estimation, using a five (5) metre measuring pole for reference. Trees were marked using nails and numbered aluminium tags, which correspond with the tree identification numbers used in this report.

The Tree Protection Zone (TPZ) of each tree was determined using the formula "TPZ = d.b.h. X 12", and Structural Root Zone (SRZ) was calculated using the formula "SRZ radius = (Base Diameter X 50) $^{0.42}$ X 0.64". Formulae used to calculate TPZs and SRZs are provided in the Australian Standard for Protection of Trees On Development Sites AS4970-2009 (Standards Australia, 2010).

Tree locations are shown in Figure 4. Trees are individually described in Appendix 2.

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3. Survey Results

3.1 Condition and vitality of trees on site

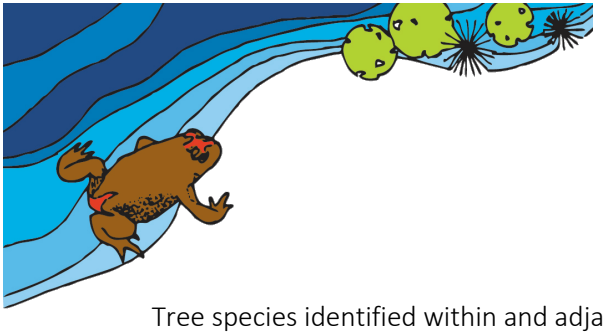
For the trees on site, the majority have fair vitality and condition or better. These values vary across the site and appear to partially correlate with age class, species and location in the landscape. A small proportion of trees have poor condition and/or vitality.

Trees of low vitality and/or poor structural integrity include the following (Table 2):

Table 2 Trees with poor structure and vitality

Tree #	Species	Problem (e.g. history of failure, weed, poor structure/vitality)	Remove/Retain Tree Recommendation
26	*E. tereticornis*	Poor condition and vitality	Located within construction footprint. Remove Tree
33	*A. floribunda*	Poor condition and vitality	Located within construction footprint. Remove Tree
82	*E. tereticornis*	Poor vitality	Located within construction footprint. Remove Tree
95	*E. eugenioides*	Poor condition and vitality	Outside construction footprint. Retain tree on site
117	*Unidentified*	Poor condition, health and vitality	Outside construction footprint. Retain tree on site
120	*E. eugenioides*	Poor condition and vitality	Outside construction footprint. Retain tree on site
919	*E. tereticornis* (Habitat Tree)	Poor structure and vitality	Outside construction footprint Retain as a Habitat Tree on site.
920	*E. tereticornis* (Habitat Tree)	Poor structure and vitality	Outside construction footprint Retain as a Habitat Tree on site.

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Tree species identified within and adjacent to the site include the following (Table 3).

Table 3 Tree species identified

Species name	Common name	Count
Eucalyptus tereticornis	Forest Red Gum	75
Eucalyptus bosistoana	Coast Grey Box	38
Eucalyptus eugenioides	Thin-leaved Stringybark	55
Angophora floribunda	Rough-barked Apple	38
Acacia implexa	Hickory Wattle	2
Allocasuarina littoralis	Black She-oak	24
Exocarpus cupressiformis	Native Cherry	7
	Unidentified species	23
	Stags (dead trees)	13
	Total	**275**

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4. Anticipated impact of the development to trees on site

4.1 Tree Retention

The following trees are marked for retention and do not occur within construction zones and are recommended to retain:

89, 90, 91, 92, 93, 94, 95, 96, 97, 98.

101, 102, 103, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200.

425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463.

914, 915, 916, 919, 920.

4.2 Tree removal

The following trees occur within (or close to) construction zones and are marked for removal (included in Table 4 following):

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 54, 55, 56, 57, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 104, 105, 437, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496.

One tree on the south road reserve was not assessed during field work as it was not impacted by the provided preliminary plans. This tree is now expected to be impacted by the finalised proposal and will need to be removed to facilitate this. The tree is marked on Figure 4.

4.3 Tree relocation

The following trees are habitat trees and occur within (or close to) construction zones and are marked for relocation (included in Table 4 following):

20, 52, 53, 58.

The following trees in Table 4 are to be removed or relocated:

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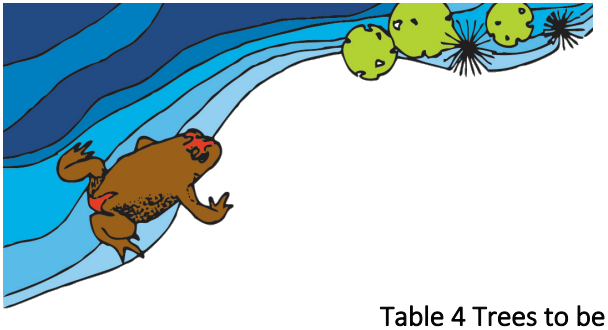
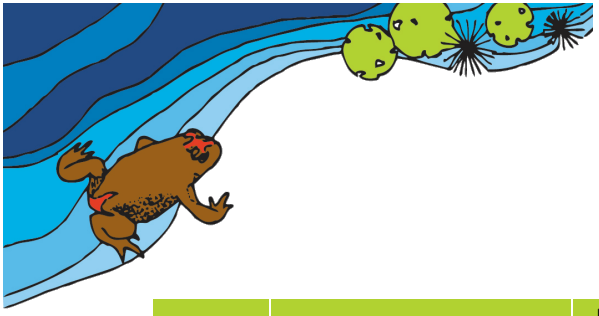


Table 4 Trees to be removed or relocated from the construction footprint

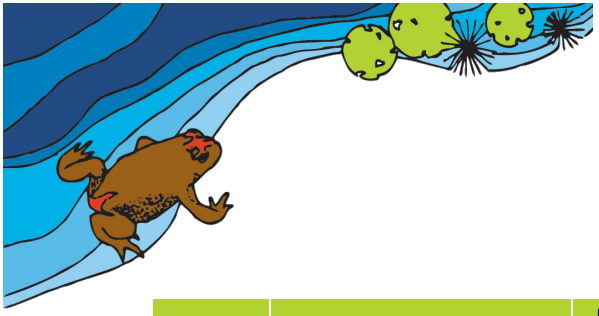
Tree #	Species	Remove / Relocate	Reason
1	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
2	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
3	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
4	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
5	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
6	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
7	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
8	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
9	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
10	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
11	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
12	*Angophora floribunda*	Remove	Inside construction footprint.
13	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
14	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
15	*Angophora floribunda*	Remove	Inside construction footprint.
16	*Eucalyptus tereticornis*	Remove	Too close to construction footprint and would be significantly negatively affected.
17	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
18	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
19	*Eucalyptus tereticornis*	Remove	Too close to construction footprint and would be significantly negatively affected.
20	*Eucalyptus bosistoana*	Relocate	Too close to construction footprint and would be significantly negatively affected; Habitat tree that requires relocation to maintain ecological integrity.
21	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
22	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
23	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
24	*Allocasuarina littoralis*	Remove	Inside construction footprint.
25	*Angophora floribunda*	Remove	Inside construction footprint.
26	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
27	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
28	*Eucalyptus tereticornis*	Remove	Inside construction footprint.

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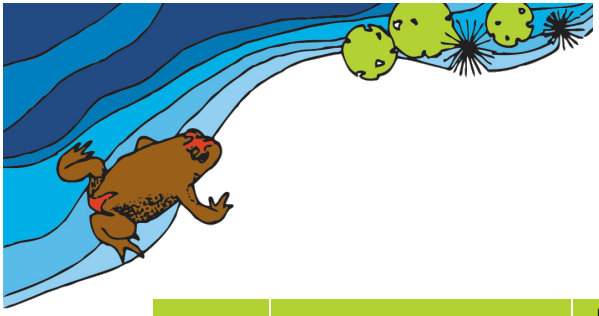
Tree #	Species	Remove / Relocate	Reason
29	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
30	*Angophora floribunda*	Remove	Inside construction footprint.
31	*Angophora floribunda*	Remove	Inside construction footprint.
32	*Angophora floribunda*	Remove	Inside construction footprint.
33	*Angophora floribunda*	Remove	Inside construction footprint.
34	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
35	*Angophora floribunda*	Remove	Inside construction footprint.
36	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
37	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
38	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
39	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
40	*Eucalyptus eugenioides*	Remove	Inside construction footprint.
41	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
42	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
43	*Angophora floribunda*	Remove	Inside construction footprint.
44	*Allocasuarina littoralis*	Remove	Inside construction footprint.
45	*Angophora floribunda*	Remove	Inside construction footprint.
46	*Allocasuarina littoralis*	Remove	Inside construction footprint.
47	*Allocasuarina littoralis*	Remove	Inside construction footprint.
48	*Allocasuarina littoralis*	Remove	Inside construction footprint.
49	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
50	*Allocasuarina littoralis*	Remove	Inside construction footprint.
51	*Allocasuarina littoralis*	Remove	Inside construction footprint.
52	*Eucalyptus bosistoana*	Relocate	Inside construction footprint; Habitat tree that requires relocation to maintain ecological integrity.
53	*Eucalyptus bosistoana*	Relocate	Inside construction footprint; Habitat tree that requires relocation to maintain ecological integrity.
54	*Angophora floribunda*	Remove	Inside construction footprint.
55	*Angophora floribunda*	Remove	Inside construction footprint.
56	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
57	*Angophora floribunda*	Remove	Inside construction footprint.

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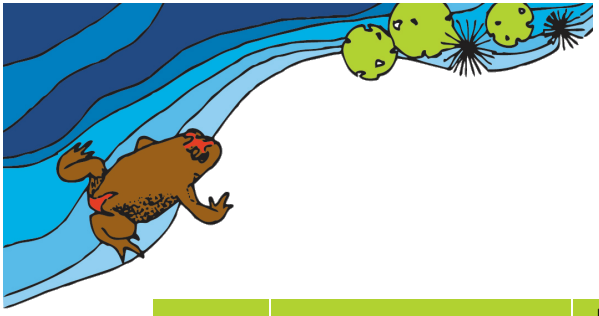
Tree #	Species	Remove / Relocate	Reason
58	*Eucalyptus tereticornis*	Relocate	Inside construction footprint; Habitat tree that requires relocation to maintain ecological integrity.
59	*Angophora floribunda*	Remove	Inside construction footprint.
60	*Eucalyptus bosistoana*	Remove	Too close to construction footprint and would be significantly negatively affected.
61	*Eucalyptus bosistoana*	Remove	Too close to construction footprint and would be significantly negatively affected.
62	*Angophora floribunda*	Remove	Too close to construction footprint and would be significantly negatively affected.
63	*Angophora floribunda*	Remove	Inside construction footprint.
64	*Angophora floribunda*	Remove	Inside construction footprint.
65	*Angophora floribunda*	Remove	Inside construction footprint.
66	*Angophora floribunda*	Remove	Inside construction footprint.
67	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
68	*Allocasuarina littoralis*	Remove	Inside construction footprint.
69	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
70	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
71	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
72	*Exocarpus cupressiformis*	Remove	Inside construction footprint.
73	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
74	*Angophora floribunda*	Remove	Inside construction footprint.
75	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
76	*Angophora floribunda*	Remove	Inside construction footprint.
77	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
78	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
79	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
80	*Angophora floribunda*	Remove	Inside construction footprint.
81	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
82	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
83	*Angophora floribunda*	Remove	Inside construction footprint.
84	*Eucalyptus eugenioides*	Remove	Inside construction footprint.
85	*Eucalyptus eugenioides*	Remove	Inside construction footprint.
86	*Eucalyptus eugenioides*	Remove	Inside construction footprint.

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Tree #	Species	Remove / Relocate	Reason
87	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
88	*Angophora floribunda*	Remove	Inside construction footprint.
104	*Exocarpus cupressiformis*	Remove	Inside construction footprint.
105	*Exocarpus cupressiformis*	Remove	Inside construction footprint.
437	*STAG*	Remove	Inside construction footprint.
464	*Eucalyptus eugenioides*	Remove	Inside construction footprint.
465	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
466	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
467	*Eucalyptus bosistoana*	Remove	Inside construction footprint.
468	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
469	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
470	*Angophora floribunda*	Remove	Inside construction footprint.
471	*Unidentified*	Remove	Inside construction footprint.
472	*Eucalyptus tereticornis*	Remove	Inside construction footprint.
473	*Eucalyptis bosistoana*	Remove	Inside construction footprint.
474	*Allocasuarina littoralis*	Remove	Inside construction footprint.
475	*Allocasuarina littoralis*	Remove	Inside construction footprint.
476	*Allocasuarina littoralis*	Remove	Inside construction footprint.
477	*Allocasuarina littoralis*	Remove	Inside construction footprint.
478	*Allocasuarina littoralis*	Remove	Inside construction footprint.
479	*Allocasuarina littoralis*	Remove	Inside construction footprint.
480	*Allocasuarina littoralis*	Remove	Inside construction footprint.
481	*Angopohora floribunda*	Remove	Inside construction footprint.
482	*Angopohora floribunda*	Remove	Inside construction footprint.
483	*Acacia implexa*	Remove	Inside construction footprint.
484	*Allocasuarina littoralis*	Remove	Inside construction footprint.
485	*Angopohora floribunda*	Remove	Inside construction footprint.
486	*Angopohora floribunda*	Remove	Inside construction footprint.
487	*Angopohora floribunda*	Remove	Inside construction footprint.
488	*Eucalyptus tereticornis*	Remove	Inside construction footprint.

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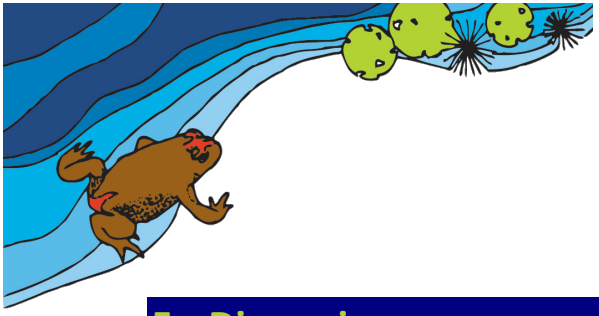


Tree #	Species	Remove / Relocate	Reason
489	*Eucalyptis bosistoana*	Remove	Inside construction footprint.
490	*Allocasuarina littoralis*	Remove	Inside construction footprint.
491	*Eucalyptis bosistoana*	Remove	Inside construction footprint.
492	*E. tereticornis*	Remove	Inside construction footprint.
493	*Allocasuarina littoralis*	Remove	Inside construction footprint.
494	*Allocasuarina littoralis*	Remove	Inside construction footprint.
495	*Allocasuarina littoralis*	Remove	Inside construction footprint.
496	*Allocasuarina littoralis*	Remove	Inside construction footprint.

4.4 Services

Services will be located underground. All excavated trenching is to be routed outside the tree protection zones. Where this is not achievable underboring may be an acceptable method after consultation with an arborist.

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5. Discussion

Site inspection and field survey identified 275 trees, including 13 confirmed and potential habitat trees.

A total of 121 trees will be removed for this proposal and 4 habitat trees will need to be relocated, totalling 125 trees impacted by the proposal.

Potential habitat trees were not found to have any visible hollows but were suspected to be potentially hollow bearing. Before removal of trees marked as potential habitat trees, a qualified ecologist must conduct a thorough inspection to identify any potential hollows. If any hollows are found, they must be carefully removed and relocated. Subsequently, any trees observed to have a hollow that has not previously been identified as a habitat tree, should be inspected, and have all hollows removed and relocated. All hollows can be relocated or replaced by a combination of the following methods (Central Coast Council 'Guideline for the Relocation of Large Tree Hollows'):

- Relocating the entire trunk of a habitat tree and re-erecting the trunk with suitable support.
- Removing the hollows and placed (with support) in retained trees or on constructed poles; or
- Replaced with nest boxes.

The first two of these three methods are preferred, as nest boxes require more maintenance, can break down and require replacing. Tree hollows should be relocated and installed within the environmental offset area onsite. Management, relocation and installation of tree hollows can be discussed and finalised with a vegetation management plan.

Given that the proposal will impact 125 trees, the proposal must include amelioration. The trees on site are part of a remnant patch of an endangered ecological community, the Lowland Grassy Woodland. The removal of 125 trees will reduce the extent of this endangered ecological community.

The 'high value offset area' is so-called because of the significantly higher chance of survival and growth rate planted trees and vegetation will be subject to, as opposed to the entire 'recommended offset area'. The number of trees and diversity required for a sufficient offset can be finalised within a vegetation management plan.

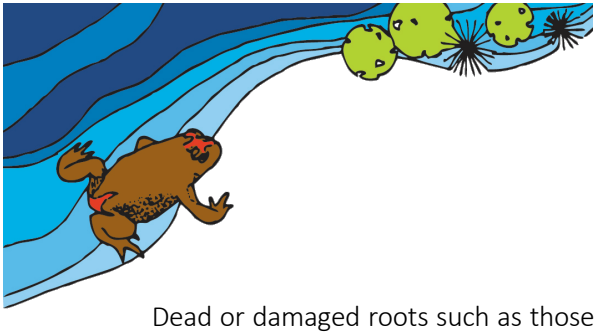
The standard practice is to construct tree protection fences at the edge of the TPZ, and majority of trees on site will be adequately protected using this method. However, due to the geology of the site, construction within 10-20 metres of the large habitat trees may compromise their ground-water source. It is for this reason that construction be avoided, where possible, within 20 metres of marked habitat trees. The proposal will involve construction near numerous large trees and some small trees.

One tree on the south road reserve was not assessed during field work as it was not impacted by the provided preliminary plans. This tree is now expected to be impacted by the finalised proposal and will need to be removed to facilitate this. The tree is marked on Figure 4.

Scar trees are cultural significant aboriginal heritage trees and must be protected. However, no scar trees were identified within the construction footprint of the proposed works.

The establishment of generous protection areas and maintenance of stringent site controls will be essential in preventing damage during construction. Landscaping must also accommodate existing roots and provide favourable conditions for normal root function.

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Dead or damaged roots such as those resulting from cattle grazing or vehicle access may indicate increase failure potential. Excavation across a tree's root crown decreases stability by severing roots. Trees can usually survive with only a small operational root system, however their ability to respond to stress and environmental factors is reduced depending on the extent of root loss (*Matheny & Clark, 1994*).

Roots grow opportunistically in response to favourable environments. A favourable environment is one that offers adequate supply of oxygen, water, mineral nutrients, physical support, and warmth (*Perry, 1982*). A large proportion of tree roots are likely to be found in the direction of the nearest watercourse.

Roots cannot grow without oxygen, and they cannot survive in compacted soils. Any activity that buries or cuts roots such as a soil stockpile or service trench will result in death of a corresponding portion of the canopy (*Perry, 1982*). It follows, then, that a large soil stockpile near the base of the tree will remove oxygen for a significant proportion of the root system, and thus impact the live crown.

Trees are commonly observed to survive when more than 50% of their roots are severed (*Hamilton, 1989*). The root ball size of transplanted trees is usually as little as 3-5 times trunk diameter (*Solfjeld & Hansen, 2004; Levinsson, 2015*), which means that a loss of more than 50% root zone is standard practice in the transplant industry. Transplanted trees are managed quite differently to the way established trees are managed on construction sites. Transplanted trees are valuable commodities purchased at great cost, attracting much care, and that level of care can be the difference between a tree that survives construction and one that is killed by it.

Section 3.3.3 of the Australian Standard for tree protection (Standards Australia, 2010) says the following with regard to encroaching in TPZs by more than 10%:

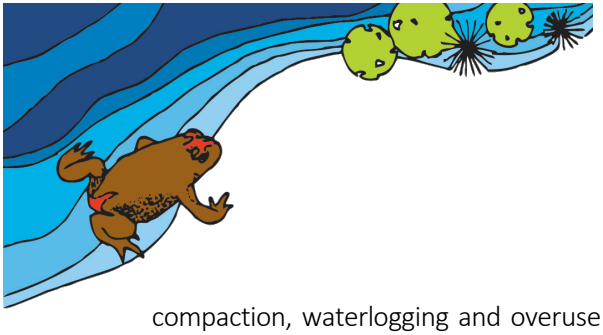
> *3.3.3 Major encroachment*
>
> *If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ (see Clause 3.3.5), the project arborist must demonstrate that the tree(s) would remain viable. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non-destructive methods and consideration of relevant factors listed in Clause 3.3.4.*

Levinsson (*2015*) suggests effective management may be more valuable to tree survival than beginning with a vigorous specimen. In the context of trees on or adjacent to development sites, effective management is simply a matter of adequate protection, mulching, and regular irrigation, as this satisfies the most common limiting factors for tree growth (*Harris et al., 2004; Mauseth, 2009*). Additionally, wood chip and leaf litter mulches are effective and cost-efficient methods for stimulating new root growth and improving soil quality in compacted urban soils (*Scharenbroch, & Watson, 2014*).

Root loss will be compensated by applying mulch to a depth of approximately 100-150 mm around the base of each tree at least one month prior to trenching, and by regularly watering the trees (*Roberts et al, 2006*). This will boost vitality and stimulate the growth of new absorbing roots.

Mycorrhizae are fungi that grow in symbiotic association with tree roots (especially the fine root hairs) and are attributed with increasing the uptake of nutrients, particularly phosphorus, and reducing infection from soil borne pathogens. They greatly increase the surface area of a tree's root system. Mycorrhizae are reduced in number by

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compaction, waterlogging and overuse of soil fertilisers, as they require aerobic soil conditions, that is, they need oxygen. Forest litter or similar mulch provides ideal conditions for the proliferation of Mycorrhizae (*Harris et al., 2004*).

Adequately insulated soils allow small absorbing roots to grow in the upper 150 mm of soil, whereas exposed soils are prone to become hot enough that roots are restricted to greater depths because absorbing roots cannot survive in the upper layer of soil (*Harris et al., 2004*).

The vast majority of roots are found within the top metre of soil, though this is highly dependent on the soil type. Roots systems are shallow in poorly aerated clay soils, deep in well-aerated sandy soils, and widespread in desert environments, all according to the availability of oxygen, water, and soil nutrients (*Dobson, 1995*).

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6. Recommendations

The following recommendations apply:

a) Engage a project arborist to ensure and certify that tree protection measures are satisfactorily implemented and to provide advice as applicable. The arborist will inspect the site at least once within every six (6) months during construction, and once upon completion of construction.

b) Construct tree protection fence(s) at a minimum radius distance(s), measuring from the centre of the tree, prior to construction to prevent unnecessary root damage (See figure showing tree protection fence diagram). Construct tree protection fences using chain wire mesh panels to a height of 1.8 metre high. Fences are to be held in place with secure footing (Figure 6).

c) Exclude all site activity from tree protection zones during demolition, construction and demobilisation phases (see 'Tree protection guidelines' in Appendix 3).

d) Do not remove tree protection fences until construction is completed, at which time the arborist will sign-off on fence removal and provide further advice as applicable.

e) Apply mulch 100-150 mm deep with a radius of at least 2 metres, (or to the edge of the calculated tree protection zone where possible) around retained trees adjacent to excavation works prior to construction to stimulate growth of absorbing roots.

f) Re-apply mulch annually to ameliorate impacts of root loss.

g) Water fenced trees during periods of low rainfall. This will boost the vitality and adaptability of the trees, creating visual and shade assets that complement the site.

h) Cleanly cut any roots with a thickness of 2 cm or more encountered during excavation to reduce damage to roots from tearing, splitting, and cracking.

i) Show tree locations and protective fencing on all construction plans used on site.

j) Engage a qualified ecologist to inspect hollow-bearing trees before they are removed. The ecologist will provide further advice as applicable.

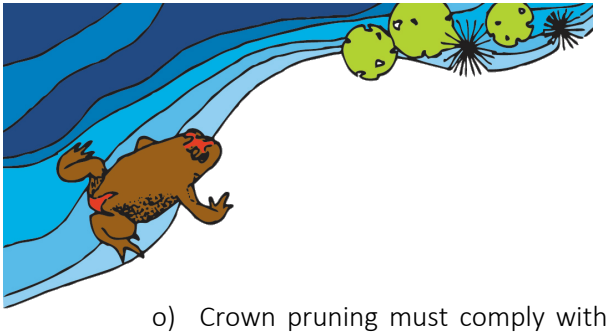
k) Potential habitat trees are to be inspected for hollows before removal by a qualified ecologist.

l) Any trees found to have hollows that have not previously been identified as a habitat tree, must be inspected by a qualified ecologist, and all hollows removed and relocated in accordance with methods from Central Coast Council 'Guideline for the Relocation of Large Tree Hollows'. Hollows should be relocated on site if possible, otherwise a suitable alternative must be found.

m) Protective fencing is to be placed at a minimum of the TPZ radius distance around trees in close proximity to construction zones.

n) Route all trenching for underground services outside the TPZs of retained trees. If any underground service installation or underground boring will occur within TPZs, engage an arborist to supervise the activity.

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o) Crown pruning must comply with the appropriate class of pruning described in AS4373-2007 Pruning of amenity trees and be undertaken by a qualified arborist practising modern arboricultural methods.

p) Advice must be sought from a suitably skilled and experienced project arborist wherever roots over 40 mm diameter are encountered during excavation. The tearing of roots must be avoided, and root pruning undertaken as directed by the nominated arborist.

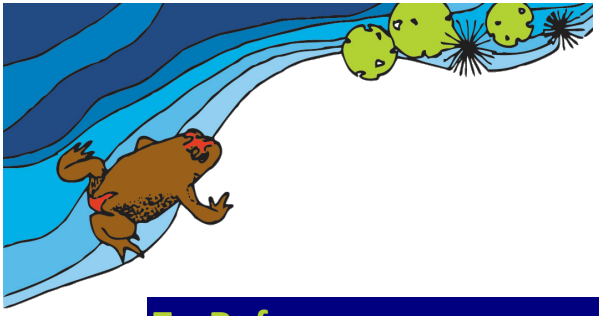
q) Any and all landscaping or gardening for the proposal must use species that are native to the remnant Lowland Grassy Woodland ecological community. Species native to this community which are suitable for landscaping include:

- *Acacia implexa*
- *Angophora floribunda*
- *Bursaria spinosa*
- *Bossiaea buxifolia*
- *Eucalyptus tereticornis*
- *Eucalyptus eugenioides*
- *Eucalyptus bosistoana*
- *Dianella longifolia*
- *Dianella revoluta*
- *Hardenbergia violacea*
- *Jacksonia scorparia*
- *Lomandra longifolia*
- *Rubus parvifolius*
- *Themeda australis*

r) In line with Health Infrastructures Policies, replacement tree plantings are at minimum to be a 1:1 ratio with the amount of trees removed. Therefore there must be at least 120 tree plantings as part of this project

s) An environmental offset area must be established to ameliorate the impacts of the proposal. The vegetation planted within the offset must be native to the Lowland Grassy Woodland ecological community. Specifications can be finalised with a vegetation management plan.

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Appendix 1. Figures

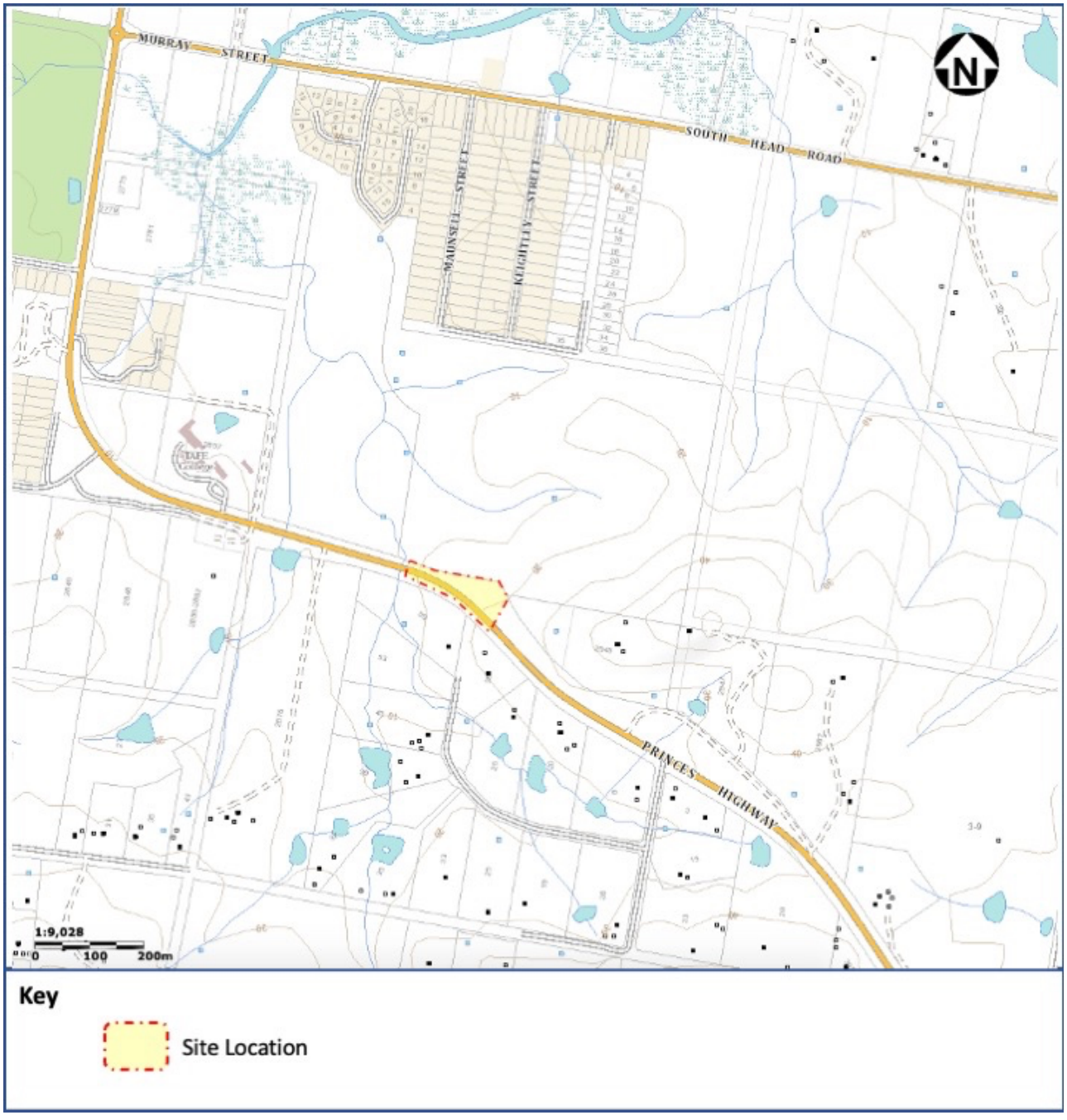


Figure 1. Locality map for Road Reserve on Princes Highway, Moruya NSW 2537.

Land and property Information NSW. Spatial Information eXchange (SIX) website 2021.

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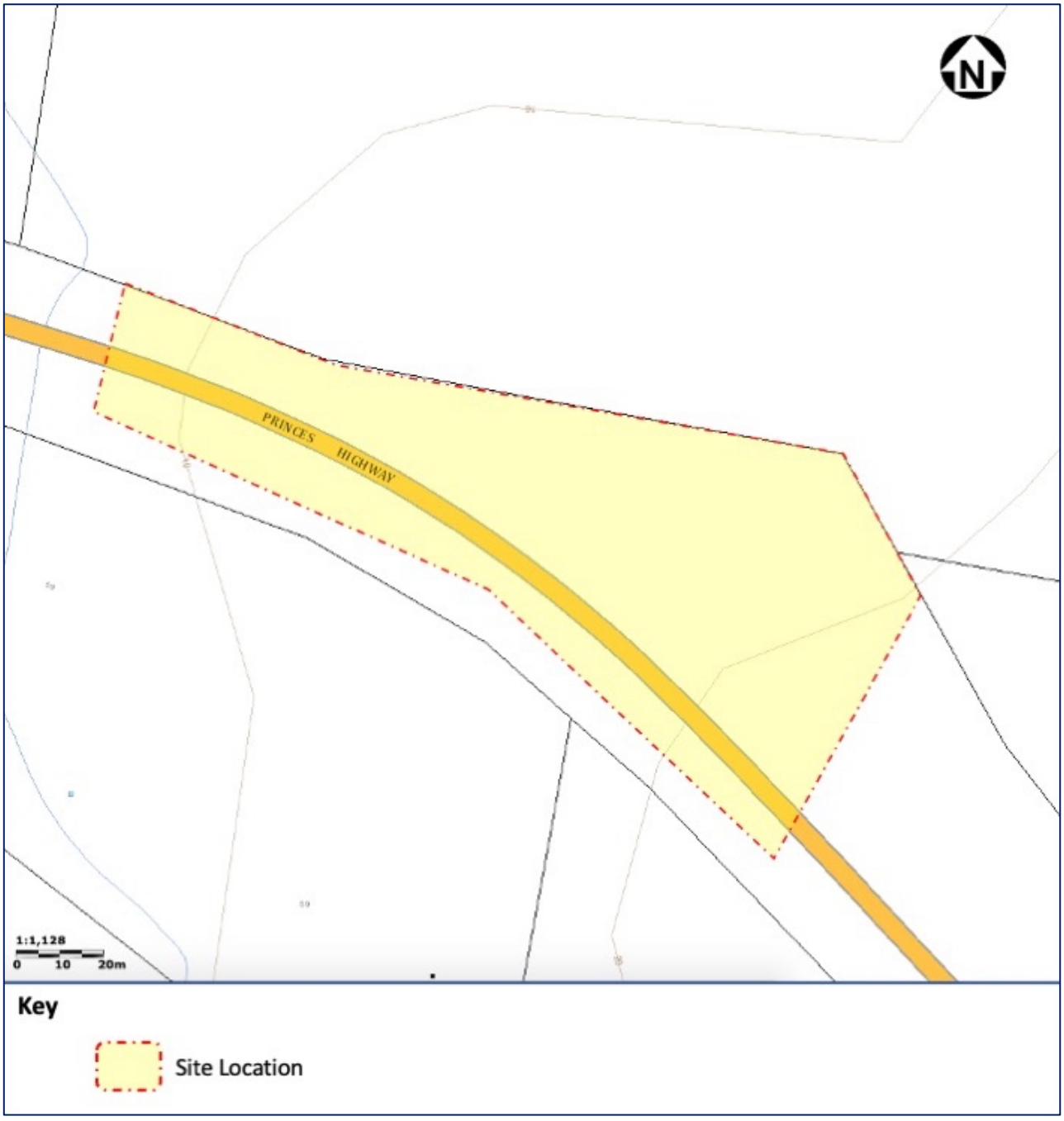


Figure 2. Topographic map of site.

Land and property Information NSW. Spatial Information eXchange (SIX) website 2021.

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Figure 3. Aerial map of site.

Land and property Information NSW. Spatial Information eXchange (SIX) website 2021.

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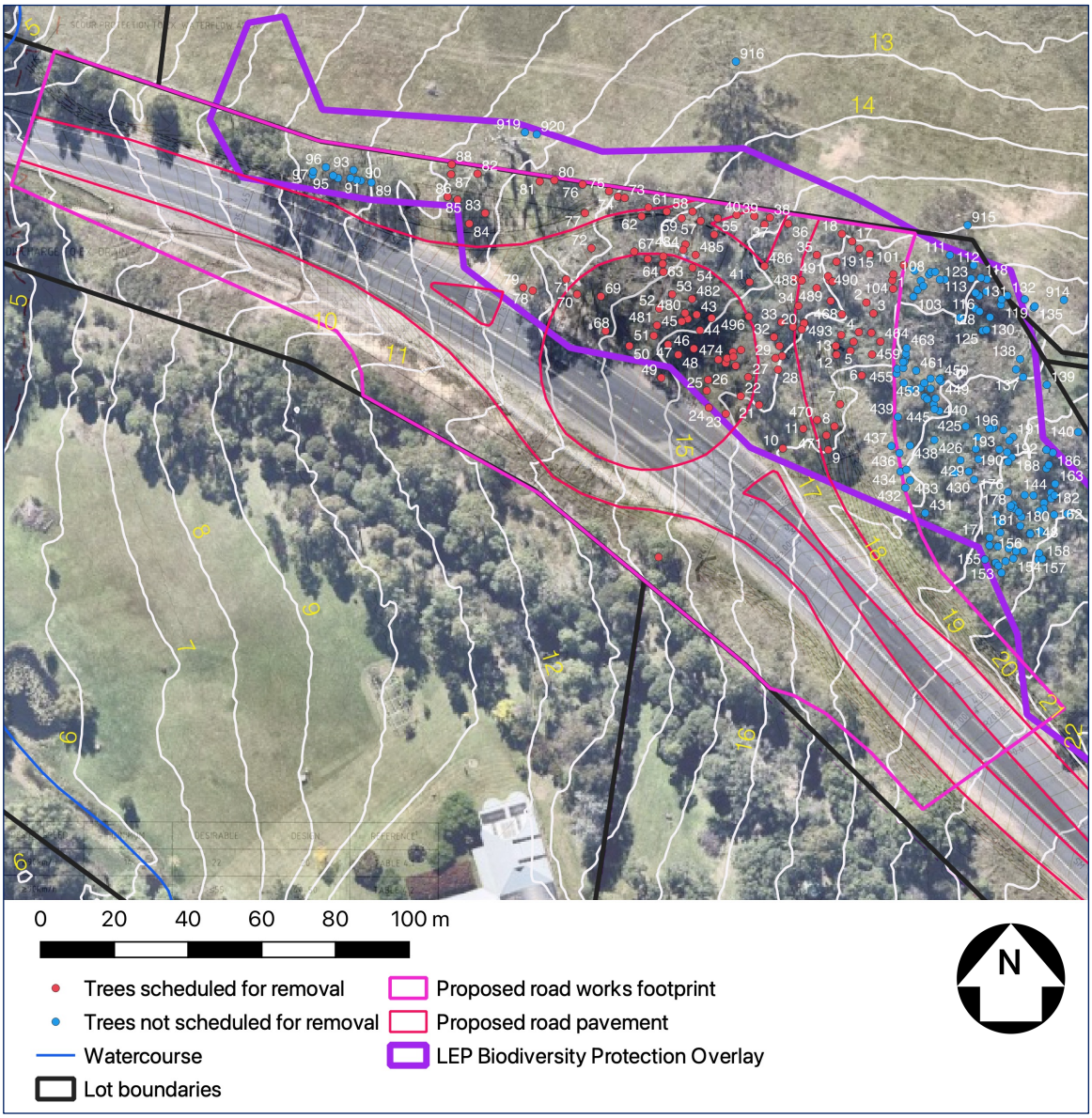


Figure 4. Aerial shot of site with tree locations.

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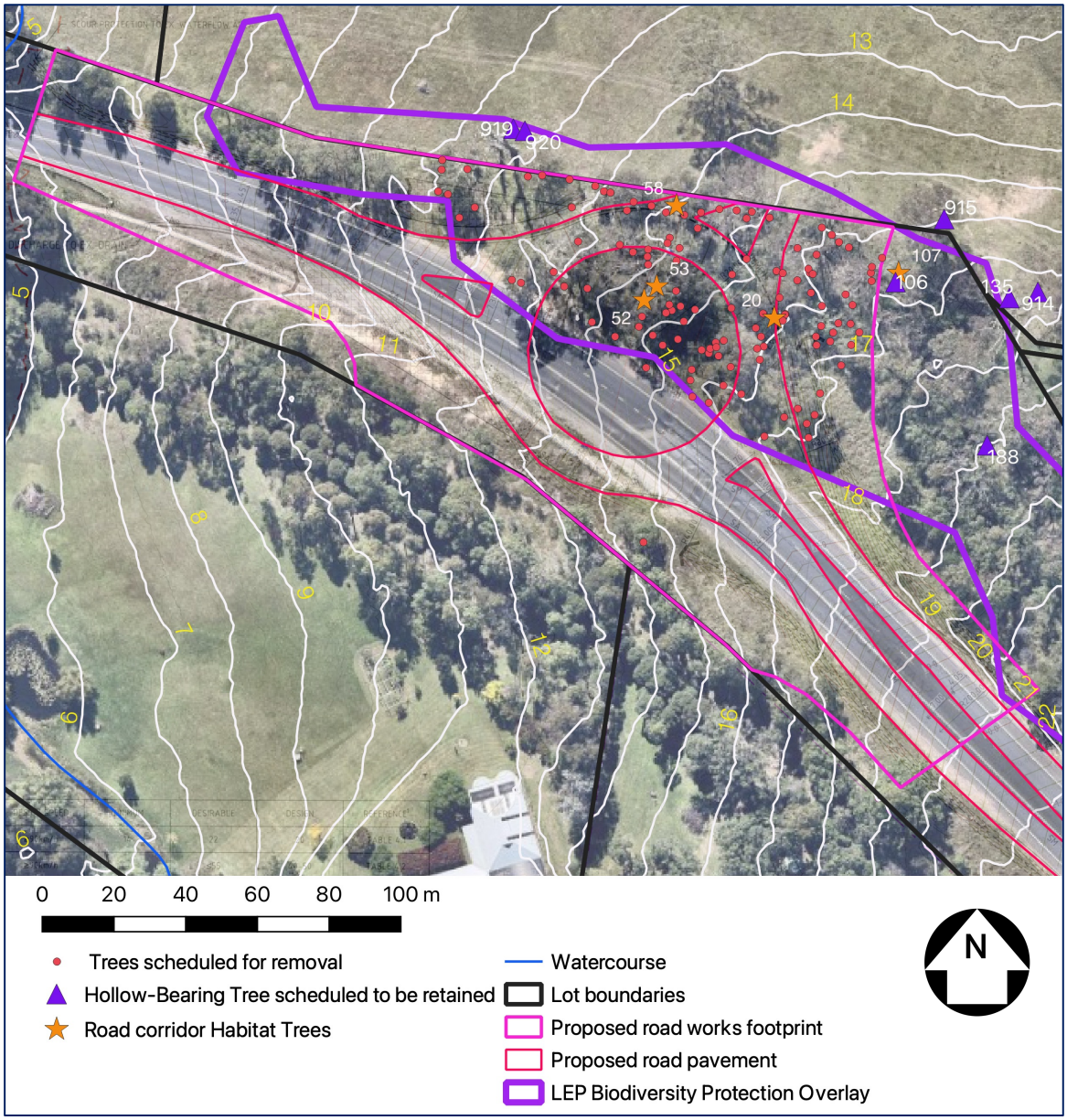
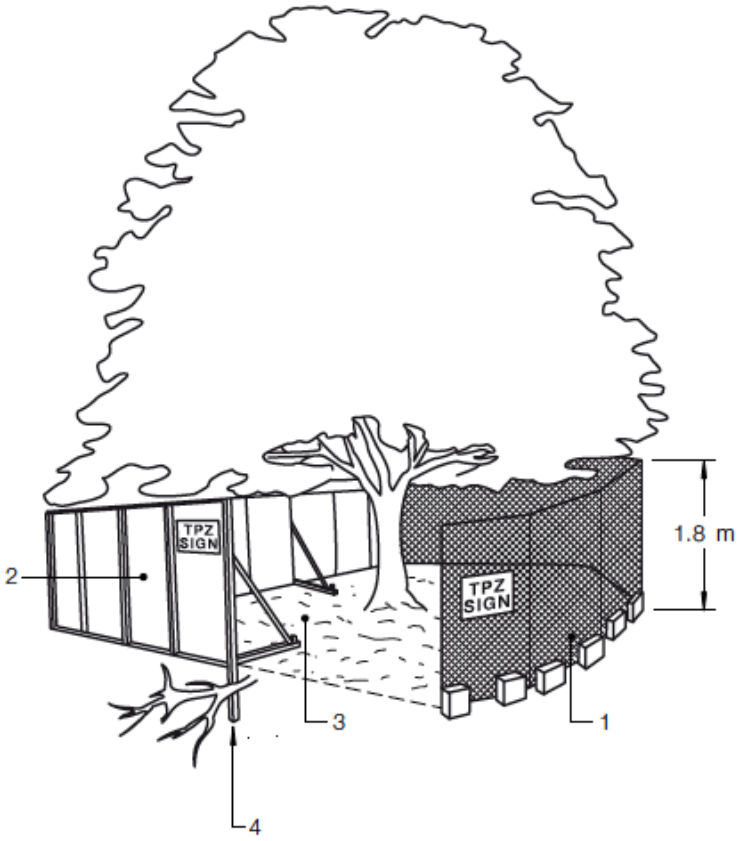


Figure 5. Location of Habitat Trees.

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LEGEND:

1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Figure 6 Extract from Section 3 of AS 4970-2009: Protective fencing.

Standards Australia (2010) Protection of Trees on Development Sites (AS 4970-2009 – incorporating Amendment No. 1).

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Appendix 2. Tree Protection Zone data

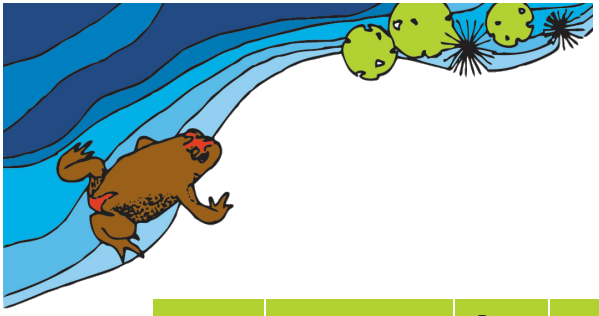
Table 5 Tree Protection Zones (TPZ)

A small number of trees (eg. T101, T103) may be close to the final position of the proposed entrance road; construction works will need to be aware of potential impacts.

Note: bdy -= boundary

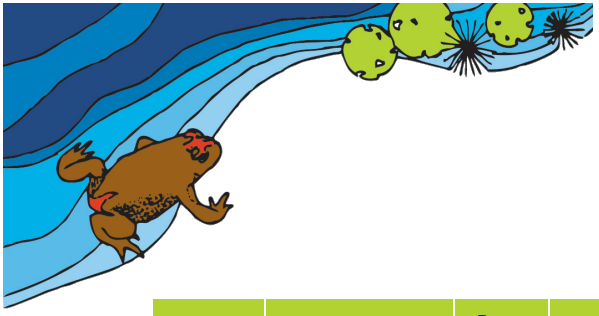
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
1	*Eucalyptus bosistoana*	64	54	6.48	4.46	2.74	Offsite. large tree, leaning S. Some dieback. Trunk bark v.similar to Grey Box
2	*Eucalyptus tereticornis*	17	17	2.04	1.40	1.57	small tree, leaning N, slight damage at 1 m.
3	*Eucalyptus tereticornis*	19	16	1.92	1.32	1.65	Small tree, leaning S, some dieback.
4	*Eucalyptus tereticornis*	21	17	2.04	1.40	1.72	Small tree, slight lean S.
5	*Eucalyptus tereticornis*	15	10	1.2	0.83	1.49	Sapling, lean S.
6	*Eucalyptus tereticornis*	59	33, 28	5.19	3.57	2.65	Two trunks. Dieback. Slight lean S.
7	*Eucalyptus tereticornis*	52	34	4.08	2.81	2.51	Some dieback. Canopy bias W
8	*Eucalyptus tereticornis*	25	20	2.4	1.65	1.85	Slender sapling. canopy elevated, suppressed on N side.
9	*Eucalyptus tereticornis*	55	40	4.8	3.3	2.57	Trunk & canopy bias to S. Many upper branches.
10	*Eucalyptus tereticornis*	26	20	2.4	1.65	1.88	Slender tree, canopy elevated, virgate.
11	*Eucalyptus tereticornis*	50	36, 10, 8	4.59	3.15	2.47	Fork at 0.5m. Fork at 1.3 m. virgate.
12	*Angophora floribunda*	36	29	3.48	2.39	2.15	Canopy bias Ss and E.
13	*Eucalyptus tereticornis*	17	15	1.8	1.24	1.57	Sapling, some dieback.
14	*Eucalyptus tereticornis*	10	7	0.84	0.58	1.26	Sapling.
15	*Angophora floribunda*	19	13	1.56	1.07	1.65	Canopy bias to S. Suppressed by adjacent E.tereticornis.
16	*Eucalyptus tereticornis*	60	54	6.48	4.46	2.67	At 1m from bdy fence. Canopy bias N over fence. Some dieback. Fork at 2.5 m.

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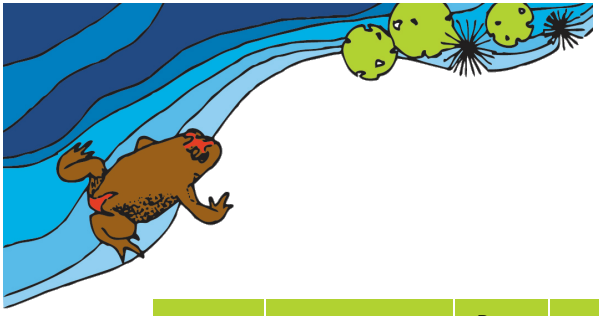
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
17	*Eucalyptus tereticornis*	50	40	4.8	3.3	2.47	Some dieback. Slender vertical form. At 1m from bdy fence. Scratches - photo.
18	*Eucalyptus tereticornis*	105	55, 38, 24	8.52	5.86	3.38	Mature tree. Leaning N over fence. Two trunks from ground level.
19	*Eucalyptus tereticornis*	68	59	7.08	4.87	2.81	Trunk damage on E side at 1.5 m. Canopy elevated, virgate. Nest in upper canopy. Dieback.
20	*Eucalyptus bosistoana*	80	66	7.92	5.45	3.01	Potential habitat. Canopy bias to S. Dieback. Measured height 19 m.
21	*Eucalyptus tereticornis*	66	57	6.84	4.70	2.78	Canopy elevated. Fork at 3 m. Some dieback. Three (3) saplings nearby to 3 m each.
22	*Eucalyptus tereticornis*	39	29	3.48	2.39	2.23	Trunk Leaning 5-10 deg S, Canopy all S, suppressed by T21.
23	*Eucalyptus tereticornis*	66	30, 9, 6	3.83	2.63	2.78	Leaning SW, suppressed by T22. Branch from base.
24	*Allocasuarina littoralis*	14	11	1.32	0.91	1.45	Slight lean S, slight Canopy bias S.
25	*Angophora floribunda*	31	26	3.12	2.15	2.02	Lean SW. Dieback. Suppressed by adjacent trees.
26	*Eucalyptus tereticornis*	21	14	1.68	1.16	1.72	Stressed, sparse foliage, dieback.
27	*Eucalyptus eugenioides*	41	22, 10	2.90	1.99	2.28	Forked from base. Epicormics. Box saplings to 1 m and 2.5 adjacent.
28	*Eucalyptus tereticornis*	18	12	1.44	0.99	1.61	Sapling leaning S.
29	*Eucalyptus tereticornis*	21	12	1.44	0.99	1.72	Leaning S, away from T30.
30	*Angophora floribunda*	30	24, 21	3.83	2.63	2.00	Slight lean S. Dieback.
31	*Angophora floribunda*	20	13, 10	1.97	1.35	1.68	Dieback. Upper foliage only.
32	*Angophora floribunda*	14	10	1.2	0.83	1.45	Dieback, upper foliage only.
33	*Angophora floribunda*	13	12	1.44	0.99	1.40	Dieback. Poor foliage.
34	*Eucalyptus tereticornis*	21	16	1.92	1.32	1.72	Slender tree. Canopy elevated.

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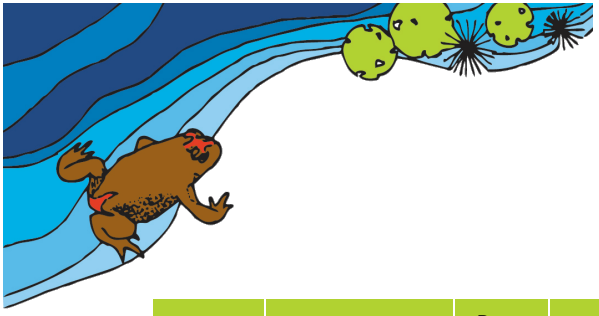
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
35	*Angophora floribunda*	25	18	2.16	1.49	1.85	At 1 m from bdy fence. Some dieback.
36	*Eucalyptus tereticornis*	80	67	8.04	5.53	3.01	Sparse foliage. Dieback. On bdy fence.
37	*Eucalyptus tereticornis*	70	17, 17	2.88	1.98	2.85	Beside T36. Leaning N over bdy fence.
38	*Eucalyptus bosistoana*	57	47	5.64	3.88	2.61	At 1 m from bdy fence. Slight lean W. *Parsonsia* up trunk.
39	*Eucalyptus tereticornis*	70	33, 36	5.86	4.029	2.85	Fork from 0.3m above ground. On bdy fence. Virgate from.
40	*Eucalyptus eugenioides*	14	10	1.2	0.83	1.45	Some Dieback of b.small branches (10 mm), otherwise foliage healthy.
41	*Eucalyptus tereticornis*	45	32, 15	4.24	2.92	2.37	Forked at 0.6 m. Some small dieback.
42	*Eucalyptus tereticornis*	14	10	1.2	0.825	1.45	Sapling beside T41. Leaning S, canopy to S, suppressed. Small amounts dieback.
43	*Angophora floribunda*	18	11	1.32	0.91	1.61	Leaning S, suppressed.
44	*Allocasuarina littoralis*	32	21	2.52	1.73	2.05	Leaning 10deg S. Dense upper canopy foliage.
45	*Angophora floribunda*	20	15	1.8	1.24	1.68	Suppressed, some dieback.
46	*Allocasuarina littoralis*	20	14	1.68	1.16	1.68	Suppressed, leaning S.
47	*Allocasuarina littoralis*	16	9	1.08	0.74	1.53	Suppressed, leaning 15 deg S.
48	*Allocasuarina littoralis*	24	17	2.04	1.40	1.82	Suppressed, leaning S. Fork at 1.5 m.
49	*Eucalyptus tereticornis*	12	12	1.44	0.99	1.36	Poor foliage, stressed, dieback.
50	*Allocasuarina littoralis*	19	9	1.08	0.74	1.65	Fruit. Near road edge.
51	*Allocasuarina littoralis*	15	10	1.2	0.83	1.49	Two trunks, 0.2 m apart. Leaning S.
52	*Eucalyptus bosistoana*	97	79	9.48	6.52	3.27	Potential habitat. Spreading form, large branches, Dieback, sparse foliage. Near road. Another *E.bosistoana* beside.
53	*Eucalyptus bosistoana*	63	51	6.12	4.21	2.73	Potential habitat. Spreading form. Dieback.

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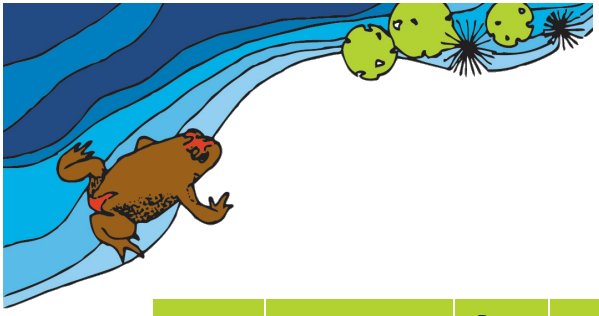
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
54	*Angophora floribunda*	17	11	1.32	0.91	1.57	Small amount dieback.
55	*Angophora floribunda*	21	12	1.44	0.99	1.72	Two trunks 0.3 m apart. At 1 m from fence.
56	*Eucalyptus bosistoana*	22	16	1.92	1.32	1.75	Sapling by T55. Small dead branch. Slight lean N.
57	*Angophora floribunda*	26	21	2.52	1.73	1.88	Mid-trunk leaning 35 deg N over bdy fence Suppressed by adjacent T58.
58	*Eucalyptus tereticornis*	100	55, 30	7.52	5.17	3.31	Two trunks from ground. Dieback. Upper canopy N over bdy fence. Potential habitat.
59	*Angophora floribunda*	19	14	1.68	1.16	1.65	Canopy elevated, suppressed.
60	*Eucalyptus bosistoana*	24	15	1.8	1.24	1.82	About 1m from fence. With *Pittosporum undulatum* at base.
61	*Eucalyptus bosistoana*	52	45	5.4	3.72	2.51	About 1.2 m from bdy fence. Upper branches N over bdy fence. Branches suppressed on SW side by T62.
62	*Angophora floribunda*	37	25	3	2.06	2.18	Canopy bias to S and W.
63	*Angophora floribunda*	23	10, 8	1.54	1.06	1.79	Two stems from ground. Poor foliage, dieback, bias E.
64	*Angophora floribunda*	25	10, 17	2.37	1.63	1.85	Two stems from ground. Small dieback.
65	*Angophora floribunda*	19	10	1.2	0.83	1.65	Kink at base. Small dieback.
66	*Angophora floribunda*	18	15	1.8	1.24	1.61	Dead small branches, epicormics. Beside T67.
67	*Eucalyptus bosistoana*	47	37	4.44	3.05	2.4	Leaning N. dieback. Small bole at 2 m.
68	*Allocasuarina littoralis*	18	14	1.68	1.16	1.61	Many branches.
69	*Eucalyptus bosistoana*	39	33	3.96	2.72	2.23	Near road. Stressed, sparse foliage. Beside 2 other Boxes.
70	*Eucalyptus bosistoana*	43	40	4.8	3.3	2.32	Near road, beside 2 other Boxes. Trunk leaning N, kink at 6 m. Dieback.
71	*Eucalyptus bosistoana*	74	63	7.56	5.20	2.92	Near road. Stressed, sparse foliage. Beside 2 other Boxes. Spreading form.
72	*Exocarpus cupressiformis*	26	20	2.4	1.65	1.88	Dense foliage, spreading form, top branch dead.

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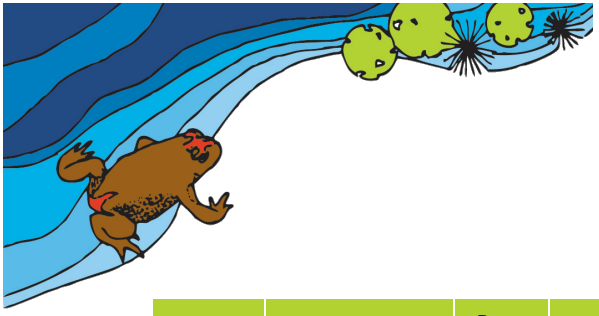
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
73	*Eucalyptus tereticornis*	57	42	5.04	3.47	2.61	Small amount dieback, one small dead branch. Upper canopy over bdy fence.
74	*Angophora floribunda*	19	22	2.64	1.82	1.65	Beside T73. Epicormics. Canopy bias N
75	*Eucalyptus tereticornis*	28	19	2.28	1.57	1.94	Beside bdy fence.
76	*Angophora floribunda*	31	13	1.56	1.07	2.02	Beside bdy fence. Trunk pruned, small stem regrowth.
77	*Eucalyptus bosistoana*	27	17	2.04	1.40	1.91	Sapling, sparse foliage, stressed.
78	*Eucalyptus tereticornis*	57	46	5.52	3.80	2.61	By road. Beside T79. Lean SE. Sparse foliage. One branch S to road.
79	*Eucalyptus tereticornis*	58	52	6.24	4.29	2.63	Beside T78. Stressed. Dieback.
80	*Angophora floribunda*	33	15, 20	3	2.06	2.08	Leaning E. By bdy fence. Two trunks from 0.3 m.
81	*Eucalyptus tereticornis*	55	41, 30	6.10	4.19	2.57	By bdy fence. Many branches from mid-trunk. Some dieback, foliage healthy.
82	*Eucalyptus tereticornis*	66	48	5.76	3.96	2.78	Spreading form. Clumping foliage. Dieback. Some medium dead branches. By bdy fence, near 2 large stags.
83	*Angophora floribunda*	17	13	1.56	1.07	1.57	Small tree. Sparse foliage.
84	*Eucalyptus eugenioides*	26	19	2.28	1.57	2.00	Canopy bias E. Suppressed by adjacent 86
85	*Eucalyptus eugenioides*	30	23	2.76	1.90	2.00	Healthy foliage.
86	*Eucalyptus eugenioides*	30	19	2.28	1.57	2.00	Upper branches suppressed on E side.
87	*Eucalyptus bosistoana*	34	27	3.24	2.23	2.10	Lower branches dropped. Canopy bias to S.
88	*Angophora floribunda*	24	20	2.4	1.65	1.82	On bdy fence. Poor foliage. Dieback.
89	*Eucalyptus bosistoana*	37	34	4.08	2.81	2.18	Near road. Canopy suppressed, biased to E. Some dieback. Fire scars.
90	*Eucalyptus eugenioides*	60	27, 22	4.18	2.87	2.67	Leaning E away from other *E. eugenioides* in small stand. Fire scars
91	*Eucalyptus eugenioides*	59	8, 10, 32	4.14	2.84	2.65	STAG. Fire scars.

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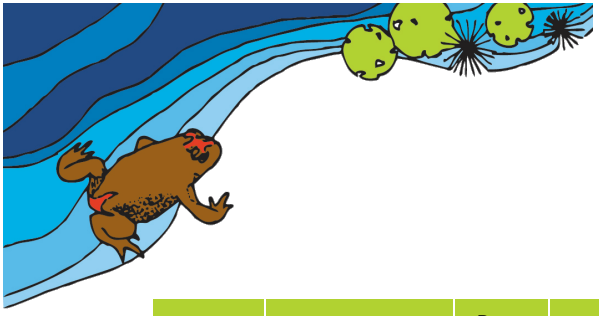
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
92	*Eucalyptus eugenioides*	22	16	1.92	1.32	1.75	Leaning S. Slender tree.
93	*Eucalyptus eugenioides*	34	25	3	2.06	2.10	Slender tree, by road, in stand, fire scars, sparse foliage.
94	*Eucalyptus tereticornis*	50	39	4.68	3.22	2.47	Virgate, upper canopy only, By road.
95	*Eucalyptus eugenioides*	28	19	2.28	1.57	1.94	Senescent, most foliage & branches dead. Leaning N to fence.
96	*Eucalyptus tereticornis*	25	21	2.52	1.73	1.85	Foliage healthy.
97	*Eucalyptus tereticornis*	48	33	3.96	2.72	2.43	Canopy stressed, some dieback. Slight trunk contortion
98	*Eucalyptus eugenioides*	21	16	1.92	1.32	1.72	Canopy elevated. Beside T97. Some dieback.
101	*Unidentified*	21	18	2.16	1.49	1.72	Minor dieback
102	*Unidentified*	39	32	3.84	2.64	2.23	Damage to trunk, minor dieback
103	*Unidentified*	20	15	1.8	1.24	1.68	Minor dieback
104	*Exocarpus cupressiformis*	19	5, 12, 7, 6	1.91	1.31	1.65	3 trunks in close proximity, possibly all the one plant
105	*Exocarpus cupressiformis*	12	7, 4	0.97	0.67	1.36	-
106	*Stag*	21	21	2.52	1.73	1.72	Stag, habitat tree
107	*Eucalyptus eugenioides*	33	23	2.76	1.90	2.08	Triple stem, one stem dead, dieback
108	*Unidentified*	14	10	1.2	0.83	1.45	Minor dieback
109	*Unidentified*	19	16	1.92	1.32	1.65	Minor dieback, canopy strong north preference
110	*Unidentified*	33	26	3.12	2.15	2.08	Minor dieback
111	*Eucalyptus eugenioides*	30	22	2.64	1.82	2.00	'Widowmaker'
112	*Unidentified*	30	23	2.76	1.90	2.00	Cracks up trunk
113	*Unidentified*	18	15	1.8	1.24	1.61	2 stems
114	*Stag*	15	10	1.2	0.83	1.49	Stag
115	*Stag*	26	21	2.52	1.732	1.88	Stag
116	*Unidentified*	13	10	1.2	0.83	1.40	Major dieback, borer holes, dying
117	*Unidentified*	14	9, 6	1.30	0.89	1.45	Strong north lean, dieback

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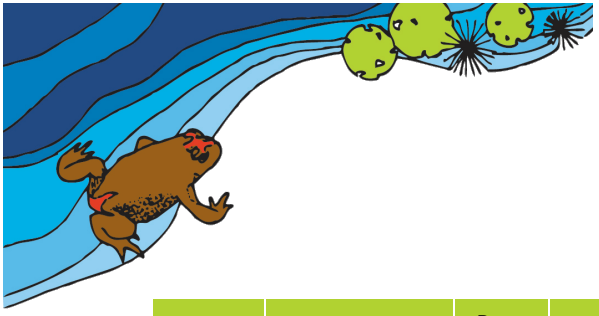
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
118	*Unidentified*	17	15	1.8	1.24	1.57	Minor dieback
119	*Unidentified*	51	44	5.28	3.63	2.49	Strong NE lean, dieback
120	*Eucalyptus eugenioides*	15	10	1.2	0.83	1.49	Epicormick growth, dieback, north lean
121	*Eucalyptus eugenioides*	23	16, 12	2.4	1.65	1.79	Dieback, north lean,
122	*Eucalyptus tereticornis*	53	45	5.4	3.71	2.53	Minor dieback
123	*Exocarpus cupressiformis*	13	8, 7	1.28	0.88	1.40	NW lean
124	*Eucalyptus bosistoana*	64	58	6.96	4.79	2.74	Minor dieback, potential small hollow,
125	*Exocarpus cupressiformis*	18	16	1.92	1.32	1.61	
126	*Stag*	45	35	4.2	2.89	2.37	Stag, exfoliating bark
127	*Exocarpus cupressiformis*	34	33	3.96	2.72	2.10	-
128	*Exocarpus cupressiformis*	29	23	2.76	1.90	1.97	-
129	*Eucalyptus bosistoana*	13	11	1.32	0.91	1.40	Minor dieback
130	*Eucalyptus tereticornis*	41	30	3.6	2.48	2.28	-
131	*Eucalyptus bosistoana*	17	13, 9	1.90	1.30	1.57	-
132	*Eucalyptus eugenioides*	16	13	1.56	1.07	1.53	-
133	*Angophora floribunda*	13	10	1.2	0.83	1.40	-
134	*Eucalyptus bosistoana*	22	20	2.4	1.65	1.75	-
135	*Stag*		97	11.64	8.00	3.44	9 hollows
136	*Eucalyptus tereticornis*	57	48	5.76	3.96	2.61	-
137	*Unidentified*	15	9	1.08	0.74	1.49	-
138	*Unidentified*	10	8	0.96	0.66	1.26	-
139	*Unidentified*	22	16	1.92	1.32	1.75	-
140	*Unidentified*	11	8	0.96	0.66	1.31	-

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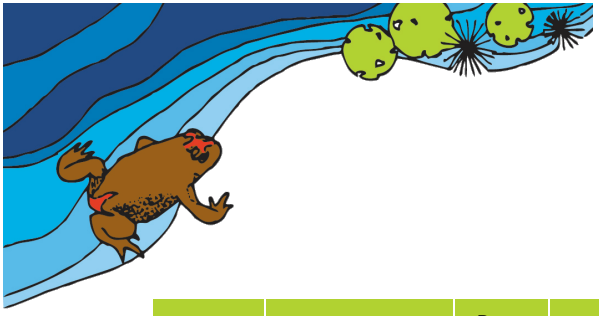
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
141	*Unidentified*	12	9	1.08	0.74	1.36	-
142	*Eucalyptus tereticornis*	24	19	2.28	1.57	1.82	-
143	*Eucalyptus bosistoana*	14	9	1.08	0.74	1.45	-
144	*Eucalyptus bosistoana*	16	14	1.68	1.16	1.53	-
145	*Angophora floribunda*	30	20	2.4	1.65	2.00	-
146	*Angophora floribunda*	35	28	3.36	2.31	2.13	-
147	*Eucalyptus tereticornis*	28	22	2.64	1.82	1.94	-
148	*Angophora floribunda*	42	29	3.48	2.39	2.30	-
149	*Eucalyptus bosistoana*	27	24	2.88	1.98	1.91	-
150	*Allocasurina littoralis*	10	4	0.48	0.33	1.26	-
151	*Eucalyptus eugenioides*	12	9	1.08	0.74	1.36	-
152	*Eucalyptus eugenioides*	26	17	2.04	1.406	1.88	-
153	*Eucalyptus eugenioides*	40	32	3.84	2.64	2.25	-
154	*Stag*		22	2.64	1.82	0	-
155	*Unidentified*	20	13, 10	1.97	1.35	1.68	2 stems
156	*Eucalyptus eugenioides*	38	27, 10	3.46	2.38	2.20	-
157	*Eucalyptus eugenioides*	13	8	0.96	0.66	1.40	-
158	*Eucalyptus eugenioides*	20	14	1.68	1.16	1.68	-
159	*Eucalyptus eugenioides*	33	24	2.88	1.98	2.08	-
160	*Eucalyptus tereticornis*	36	25	3	2.06	2.15	-
161	*Unidentified*	12	10	1.2	0.83	1.36	-

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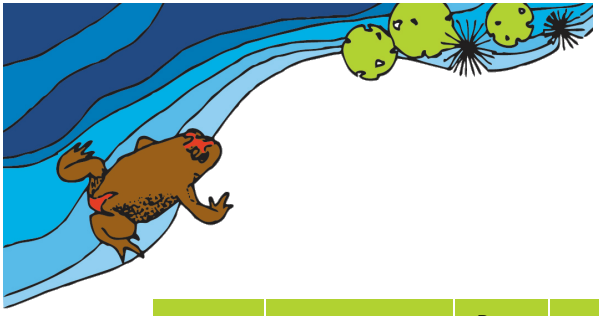
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
162	*Eucalyptus eugenioides*	25	18	2.16	1.49	1.85	-
163	*Angophora floribunda*	18	13	1.56	1.07	1.61	-
164	*Eucalyptus bosistoana*	12	13	1.56	1.07	1.36	-
165	*Eucalyptus bosistoana*	13	10	1.2	0.83	1.40	-
166	*Eucalyptus eugenioides*	23	17	2.04	1.40	1.79	-
167	*Eucalyptus bosistoana*	24	18	2.16	1.49	1.82	-
168	*Eucalyptus eugenioides*	11	11	1.32	0.91	1.31	-
169	*Eucalyptus eugenioides*	26	19	2.28	1.57	1.88	-
170	*Eucalyptus bosistoana*	17	11	1.32	0.91	1.57	-
171	*Eucalyptus eugenioides*	38	21, 19	3.40	2.34	2.20	-
172	*Eucalyptus eugenioides*	23	19	2.28	1.57	1.78	-
173	*Eucalyptus eugenioides*	15	12	1.44	0.99	1.49	-
174	*Eucalyptus eugenioides*	21	17	2.04	1.40	1.72	-
175	*Eucalyptus tereticornis*	19	13	1.56	1.07	1.65	-
176	*Eucalyptus tereticornis*	14	10	1.2	0.83	1.445	-
177	*Eucalyptus eugenioides*	18	11	1.32	0.91	1.61	-
178	*Eucalyptus eugenioides*	26	18	2.16	1.49	1.88	-
179	*Eucalyptus eugenioides*	16	13	1.56	1.07	1.53	-
180	*Eucalyptus tereticornis*	19	13	1.56	1.07	1.65	-

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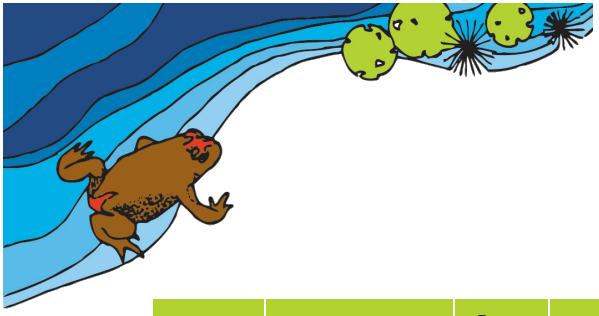
Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
181	*Eucalyptus eugenioides*	27	18	2.16	1.49	1.91	-
182	*Eucalyptus eugenioides*	25	16, 7	2.10	1.44	1.85	-
183	*Eucalyptus tereticornis*	13	11	1.32	0.91	1.40	-
184	*Eucalyptus bosistoana*	15	12	1.44	0.99	1.49	-
185	*Eucalyptus tereticornis*	31	24	2.88	1.98	2.02	-
186	*Eucalyptus eugenioides*	16	12	1.44	0.99	1.53	-
187	*Eucalyptus bosistoana*	18	13	1.56	1.07	1.61	-
188	*Eucalyptus eugenioides*	98	83	9.96	6.85	3.28	Many hollows, mostly dead
189	*Eucalyptus bosistoana*	21	15	1.8	1.24	1.72	-
190	*Eucalyptus bosistoana*	20	14	1.68	1.16	1.68	-
191	*Eucalyptus eugenioides*	16	11	1.32	0.91	1.53	-
192	*Eucalyptus tereticornis*	25	13	1.56	1.07	1.85	-
193	*Eucalyptus tereticornis*	24	14	1.68	1.16	1.82	-
194	*Eucalyptus eugenioides*	40	29	3.48	2.39	2.25	-
195	*Eucalyptus tereticornis*	16	8	0.96	0.66	1.53	-
196	*Eucalyptus bosistoana*	14	8	0.96	0.66	1.45	-
197	*Eucalyptus eugenioides*	13	10	1.2	0.83	1.40	-
198	*Eucalyptus bosistoana*	14	10	1.2	0.83	1.45	-
199	*Eucalyptus eugenioides*	25	19	2.28	1.57	1.85	-

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Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
200	*Allocasurina littoralis*	26	21	2.52	1.73	1.88	-
425	*E. eugenioides*	21	16	1.92	1.32	1.72	-
426	*A. floribunda*	27	19	2.28	1.57	1.91	-
427	*Unidentified*	12	8	0.96	0.66	1.36	-
428	*E. eugenioides*	22	16	1.92	1.32	1.75	-
429	*E. tereticornis*	29	23	2.76	1.90	1.97	-
430	*Acacia implexa*	9	6	0.72	0.50	1.20	-
431	*STAG*	42	20, 24	3.75	2.58	2.30	-
432	*E. eugenioides*	23	15	1.8	1.24	1.79	-
433	*E. eugenioides*	22	15, 12	2.31	1.58	1.75	-
434	*E. bosistoana*	39	31	3.72	2.56	2.23	-
435	*E. eugenioides*	23	15, 16, 8	2.8	1.93	1.79	-
436	*STAG*	15	10, 7	1.46	1.0	1.49	-
437	*STAG*	15	10	1.2	0.83	1.49	-
438	*STAG*	10	5	0.6	0.41	1.26	-
439	*STAG*	10	6	0.72	0.50	1.26	-
440	*E. tereticornis*	22	18	2.16	1.49	1.75	-
441	*A. floribunda*	18	16	1.92	1.32	1.61	-
442	*E. eugenioides*	30	27	3.24	2.23	2.00	-
443	*E. tereticornis*	27	25	3	2.06	1.91	-
444	*E. tereticornis*	10	7	0.84	0.58	1.26	-
445	*E. eugenioides*	26	24	2.88	1.98	1.88	-
446	*E. tereticornis*	45	32	3.84	2.64	2.37	-
447	*E. tereticornis*	25	22	2.64	1.82	1.85	-
448	*E. eugenioides*	20	18	2.16	1.49	1.68	-
449	*E. eugenioides*	10	6	0.72	0.50	1.26	-
450	*E. tereticornis*	9	6	0.72	0.50	1.20	-
451	*E. tereticornis*	25	22	2.64	1.82	1.85	-
452	*E. eugenioides*	8	4	0.48	0.33	1.15	-
453	*Unidentified*	8	4	0.48	0.33	1.15	-

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Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
454	*E. tereticornis*	30	24	2.88	1.98	2.00	-
455	*E. tereticornis*	12	9	1.08	0.74	1.36	-
456	*E. bosistoana*	24	17	2.04	1.40	1.82	-
457	*Unidentified*	9	7	0.84	0.58	1.2	-
458	*E. eugenioides*	35	27	3.24	2.23	2.13	-
459	*A. floribunda*	22	18	2.16	1.49	1.75	-
460	*E. tereticornis*	32	28	3.36	2.31	2.05	-
461	*E. eugenioides*	11	8	0.96	0.66	1.31	-
462	*E. bosistoana*	30	25	3	2.06	2.00	-
463	*Alloc. littoralis*	55	40	4.8	3.3	2.57	-
464	*E. eugenioides*	22	15, 7	1.99	1.37	1.75	-
465	*E. tereticornis*	40	25, 15	3.50	2.41	2.25	-
466	*E. tereticornis*	10	9	1.08	0.742	1.26	-
467	*E. bosistoana*	10	7	0.84	0.58	1.26	-
468	*E. tereticornis*	10	5	0.6	0.41	1.26	-
469	*E. tereticornis*	12	10	1.2	0.825	1.36	-
470	*A. floribunda*	10	8	0.96	0.66	1.26	-
471	*Unidentified*	10	4	0.48	0.33	1.26	-
472	*E. tereticornis*	8	5	0.6	0.41	1.15	-
473	*E. bosistoana*	8	6	0.72	0.50	1.15	-
474	*Alloc. littoralis*	20	12	1.44	0.99	1.68	-
475	*Alloc. littoralis*	10	2	0.24	0.167	1.26	-
476	*Alloc. littoralis*	15	5	0.6	0.41	1.49	-
477	*Alloc. littoralis*	10	6	0.72	0.50	1.26	-
478	*Alloc. littoralis*	15	6	0.72	0.50	1.49	-
479	*Alloc. littoralis*	15	10	1.2	0.823	1.49	-
480	*Alloc. littoralis*	12	7	0.84	0.58	1.36	-
481	*A. floribunda*	10	5	0.6	0.41	1.26	-
482	*A. floribunda*	22	18	2.16	1.49	1.75	-
483	*Acacia implexa*	8	3	0.36	0.25	1.15	-
484	*Alloc. littoralis*	10	6	0.72	0.50	1.26	-
485	*A. floribunda*	10	6	0.72	0.50	1.26	-

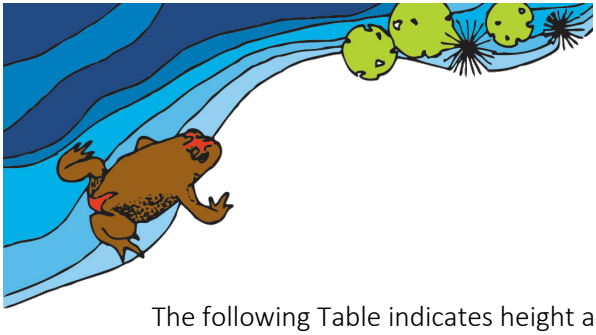
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Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
486	*A. floribunda*	8	3	0.36	0.25	1.15	-
487	*A. floribunda*	12	8	0.96	0.66	1.36	-
488	*E. tereticornis*	11	6	0.72	0.50	1.31	-
489	*E. bosistoana*	15	12	1.44	0.99	1.49	-
490	*Alloc. littoralis*	15	5	0.6	0.41	1.49	-
491	*E. tereticornis*	15	12	1.44	0.99	1.49	-
492	*E. tereticornis*	15	10	1.2	0.83	1.49	-
493	*Alloc. littoralis*	8	3	0.36	0.25	1.15	-
494	*Alloc. littoralis*	8	4	0.48	0.33	1.15	-
495	*Alloc. littoralis*	4	8	0.96	0.66	0.86	-
496	*Alloc. Littoralis*	15	5	0.6	0.41	1.49	-
914	*E. tereticornis*	185	155	18.60	12.79	4.29	
915	*E. tereticornis*	152	134	16.08	11.06	3.95	

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Tree #	*Species*	Base Diam. (cm)	DBH (cm)	TPZ (m)	Red. TPZ (m)	SRZ (m)	Photo / comment
916	*E. tereticornis*	92	103	12.36	8.50	3.20	
919	*Stag*				0	0	
920	*Stag*				0	0	

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The following Table indicates height and canopy spread for trees in the adjoining offsite road reserve.

Tree data recorded was primarily to indicate tree count and the likely vegetation community. General observations of vitality, structure and condition were also noted as part of the survey methodology, with a targeted search for potential habitat trees included.

The majority of trees recorded were regrowth, usually saplings and/or slender semi-mature trees. These were often closely spaced, especially for Angophora floribunda and Eucalyptus tereticornis, thereby with corresponding narrow canopy spread in most cases (as evident from the Table). There has been limited opportunity for natural thinning of this regrowth stand, generally inhibiting structural development of many saplings. A better example of expected vitality and condition for mature regrowth is shown in the small stand of Stringybarks on the west end (trees 90-95).

Whereas tree vitality across the reserve varies generally from 'very good' to 'good' (with a small percentage 'Fair'), tree 'condition' is often reduced due (partially) to the lack of canopy development and the accompanied dieback.

Three mature *E.tereticornis* (Tree 914, 915 and 916) are an exception;

- 914 is 'Fair' in vitality and structure, 'Poor' in condition;
- 915 is 'Fair' in vitality and conditions, 'Good' in structure; and
- 916 is 'Fair' in each of vitality, structure and condition

which is 'Fair' in each of vitality, structure and condition. Stags (dead trees) are also noted.

KEY

Ac. implexa	=	*Acacia implexa*	*E. eugenioides*	=	*Eucalyptus eugenioides*
Alloc. littoralis	=	*Allocasuarina littoralis*	*E.cupressiformis*	=	*Exocarpos cupressiformis*
A. floribunda	=	*Angophora floribunda*	*G.robusta*	=	*Grevillea robusta*
C. glauca	=	*Casuarina glauca*	*L. sinense*	=	*Ligustrum sinense*
E. tereticornis	=	*Eucalyptus tereticornis*	*P. undulatum*	=	*Pittosporum undulatum*

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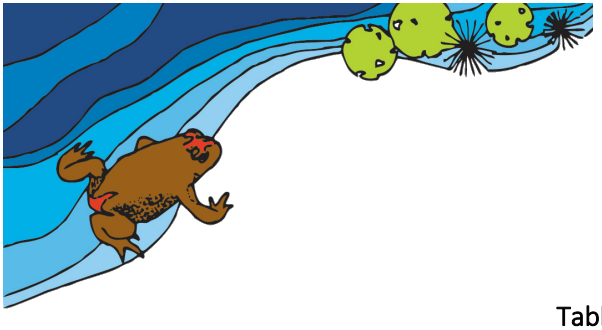
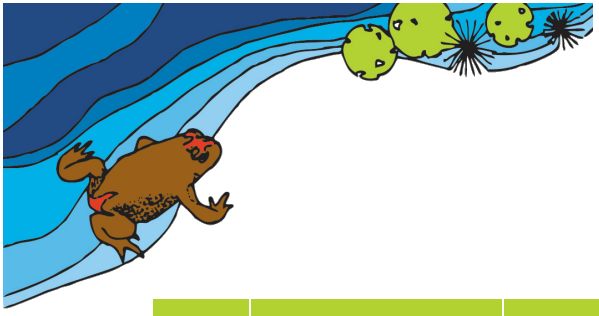


Table 6 Tree Size and Condition assessment

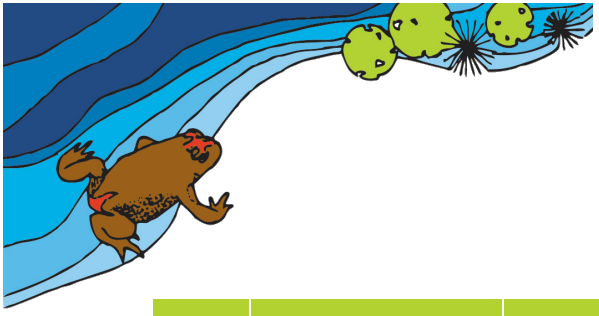
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
1	*E. bosistoana*	3	8	4	6	15 - 20	Remove	Inside construction
2	*E. tereticornis*	1	2	2	0.5	3 - 5	Remove	Inside construction
3	*E. tereticornis*	2	1	1	1	3 - 5	Remove	Inside construction
4	*E. tereticornis*	0.5	2	1	1	3 - 5	Remove	Inside construction
5	*E. tereticornis*	0	2	1	1	3 - 5	Remove	Inside construction
6	*E. tereticornis*	3.5	3	4	2	5 - 10	Remove	Inside construction
7	*E. tereticornis*	2.5	4	2	3	5 - 10	Remove	Inside construction
8	*E. tereticornis*	0	1.5	1	1	5 - 10	Remove	Inside construction
9	*E. tereticornis*	2	5	3	3	5 - 10	Remove	Inside construction
10	*E. tereticornis*	1	1	1	1	5 - 10	Remove	Inside construction
11	*E. tereticornis*	2	2	1	2	5 - 10	Remove	Inside construction
12	*A. floribunda*	0.5	4	4	2	5 - 10	Remove	Inside construction
13	*E. tereticornis*	1	1	1	1	3 - 5	Remove	Inside construction
14	*E. tereticornis*	0.5	0.5	0.5	0.5	3 - 5	Remove	Inside construction
15	*A. floribunda*	1.5	1.2	1.5	1	3 - 5	Remove	Inside construction
16	*E. tereticornis*	6	3	3	3	10 - 15	Remove	Inside construction
17	*E. tereticornis*	4	4	2	2	10 - 15	Remove	Inside construction
18	*E. tereticornis*	8	1	4	6	15 - 20	Remove	Inside construction
19	*E. tereticornis*	4	3	2	4	10 - 15	Remove	Inside construction
20	*E. bosistoana*	3	8	6	6	15 - 20	Relocate	Habitat tree; affected by construction;

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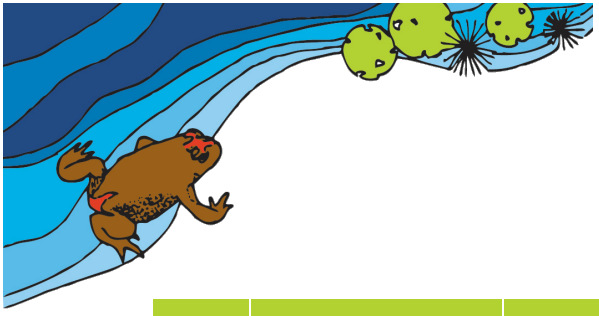
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
21	*E. tereticornis*	3	5	6	6	15 - 20	Remove	Inside construction
22	*E. tereticornis*	0	7	3	1	10 - 15	Remove	Inside construction
23	*E. tereticornis*	0	5	2	3	5 - 10	Remove	Inside construction
24	*Alloc. littoralis*	0.5	1	0.5	1.5	3 - 5	Remove	Inside construction
25	*A. floribunda*	3	4	4	4	5 - 10	Remove	Inside construction
26	*E. tereticornis*	3.5	0	1	1	5 - 10	Remove	Inside construction
27	*E. eugenioides*	1	2.5	0.5	2	5 - 10	Remove	Inside construction
28	*E. tereticornis*	1	0.5	1	0.5	3 - 5	Remove	Inside construction
29	*E. tereticornis*	0	3	2	1	3 - 5	Remove	Inside construction
30	*A. floribunda*	1	1	1	1	3 - 5	Remove	Inside construction
31	*A. floribunda*	0.5	1.5	1	1	3 - 5	Remove	Inside construction
32	*A. floribunda*	0.5	1	0.5	0.5	3 - 5	Remove	Inside construction
33	*A. floribunda*	5	1	0.5	5	3 - 5	Remove	Inside construction
34	*E. tereticornis*	1	1	1	1	5 - 10	Remove	Inside construction
35	*A. floribunda*	2	2	2	2	3 - 5	Remove	Inside construction
36	*E. tereticornis*	6	5	3	3	10 - 15	Remove	Inside construction
37	*E. tereticornis*	4	0	4	4	5 - 10	Remove	Inside construction
38	*E. bosistoana*	3	7	3	5	10 - 15	Remove	Inside construction
39	*E. tereticornis*	3	3	3	2	10 - 15	Remove	Inside construction
40	*E. eugenioides*	1	1	1	1	3 - 5	Remove	Inside construction
41	*E. tereticornis*	1	4	3	2	5 - 10	Remove	Inside construction
42	*E. tereticornis*	0	1.5	1.5	0	3 - 5	Remove	Inside construction

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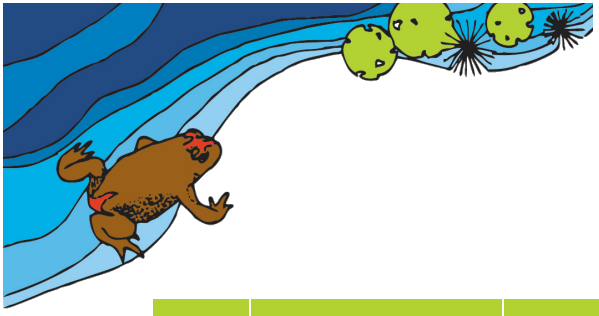
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
43	*A. floribunda*	0	1	1	1	3 - 5	Remove	Inside construction
44	*Alloc. littoralis*	0	3	3	1.5	3 - 5	Remove	Inside construction
45	*A. floribunda*	1	1	1	1	3 - 5	Remove	Inside construction
46	*Alloc. littoralis*	0	2	1.5	1.5	3 - 5	Remove	Inside construction
47	*Alloc. littoralis*	0	2	2.5	0.5	3 - 5	Remove	Inside construction
48	*Alloc. littoralis*	0.5	2.5	2	1.5	3 - 5	Remove	Inside construction
49	*E. tereticornis*	0	1.2	0.5	0.5	3 - 5	Remove	Inside construction
50	*Alloc. littoralis*	1	1	1	1	3 - 5	Remove	Inside construction
51	*Alloc. littoralis*	1	1	1	2	3 - 5	Remove	Inside construction
52	*E. bosistoana*	4	8	6	6	15 - 20	Relocate	Habitat tree; affected by construction
53	*E. bosistoana*	7	2	5	5	15 - 20	Relocate	Habitat tree; affected by construction
54	*A. floribunda*	1	5	5	5	3 - 5	Remove	Inside construction
55	*A. floribunda*	1	1	1	1	3 - 5	Remove	Inside construction
56	*E. bosistoana*	1	0	1	1	3 - 5	Remove	Inside construction
57	*A. floribunda*	0	4	2.5	1	3 - 5	Remove	Inside construction
58	*E. tereticornis*	6	3	4	5	15 - 20	Relocate	Habitat tree; affected by construction
59	*A. floribunda*	0.5	0.5	0.5	0.5	3 - 5	Remove	Inside construction
60	*E. bosistoana*	1.2	1.5	1	1	10 - 15	Remove	Inside construction
61	*E. bosistoana*	5	2	3	3	15 - 20	Remove	Inside construction
62	*A. floribunda*	3	4	3	3	5 - 10	Remove	Inside construction

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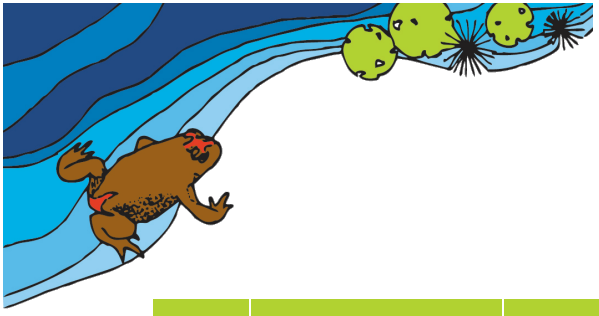
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
63	*A. floribunda*	1.5	0.5	1	0	3 - 5	Remove	Inside construction
64	*A. floribunda*	1	1	1	2	3 - 5	Remove	Inside construction
65	*A. floribunda*	1	1	1	1	3 - 5	Remove	Inside construction
66	*A. floribunda*	1	1	1	0.5	3 - 5	Remove	Inside construction
67	*E. bosistoana*	6	5	3	3	10 - 15	Remove	Inside construction
68	*Alloc. littoralis*	1	2	1	1	3 - 5	Remove	Inside construction
69	*E. bosistoana*	4	5	4	2	10 - 15	Remove	Inside construction
70	*E. bosistoana*	3	1	2	3	10 - 15	Remove	Inside construction
71	*E. bosistoana*	6	7	2.5	5	10 - 15	Remove	Inside construction
72	*E.cupressiformis*	2	2	2	2	< 3	Remove	Inside construction
73	*E. tereticornis*	5	2	2	3	10 - 15	Remove	Inside construction
74	*A. floribunda*	1	1	1	3	3 - 5	Remove	Inside construction
75	*E. tereticornis*	2	1	1	1	3 - 5	Remove	Inside construction
76	*A. floribunda*	1	1	1	1	3 - 5	Remove	Inside construction
77	*E. bosistoana*	3	2	1	2	10 - 15	Remove	Inside construction
78	*E. tereticornis*	2	4	5	0	10 - 15	Remove	Inside construction
79	*E. tereticornis*	4	1	2	4	10 - 15	Remove	Inside construction
80	*A. floribunda*	3	2	2.5	0	3 - 5	Remove	Inside construction
81	*E. tereticornis*	5	2	2	2.5	5 - 10	Remove	Inside construction
82	*E. tereticornis*	6	5	4	4	5 - 10	Remove	Inside construction
83	*A. floribunda*	1	1	1	1	3 - 5	Remove	Inside construction
84	*E. eugenioides*	1.5	1	1.5	0.5	5 - 10	Remove	Inside construction

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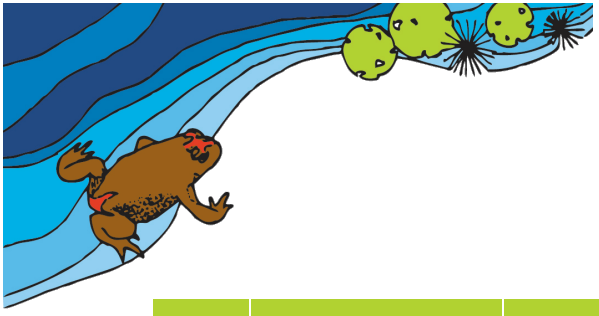
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
85	*E. eugenioides*	1	1.5	1	1	5 - 10	Remove	Inside construction
86	*E. eugenioides*	1	2.5	1.5	3	5 - 10	Remove	Inside construction
87	*E. bosistoana*	1	2	1	1	5 - 10	Remove	Inside construction
88	*A. floribunda*	1	0	1	1	3 - 5	Remove	Inside construction
89	*E. bosistoana*	3	3	4	1	5 - 10	Retain	Outside construction
90	*E. eugenioides*	2	5	3	0	5 - 10	Retain	Outside construction
91	*E. eugenioides*	5	0	1	2	5 - 10	Retain	Outside construction
92	*E. eugenioides*	5	5	5	1	5 - 10	Retain	Outside construction
93	*E. eugenioides*	2	1	1	1	10 - 15	Retain	Outside construction
94	*E. tereticornis*	3	4	1	2	10 - 15	Retain	Outside construction
95	*E. eugenioides*	3	0	1	1	5 - 10	Retain	Outside construction
96	*E. tereticornis*	3	2	1	2	3 - 5	Retain	Outside construction
97	*E. tereticornis*	4	3	1	2	10 - 15	Retain	Outside construction
98	*E. eugenioides*	0.5	0.5	0.5	0.5	5 - 10	Retain	Outside construction
101	*Eucalyptus sp.*	3	1.5	1	2	5 - 10	Retain	Outside construction
102	*Eucalyptus sp.*	2	2	3	2	10 - 15	Retain	Outside construction
103	*Eucalyptus sp.*	2	3	1	2	5 - 10	Retain	Outside construction
104	*E.cupressiformis*	3	3	3	3	5 - 10	Remove	Inside construction
105	*E.cupressiformis*	0	3	2	2	3 - 5	Remove	Inside construction
106	*STAG*	-	-	-	-	10 - 15	Retain	Outside construction
107	*E. eugenioides*	1	2	1	1	10 - 15	Retain	Outside construction
108	*Eucalyptus sp.*	1	1	1	1	3 - 5	Retain	Outside construction

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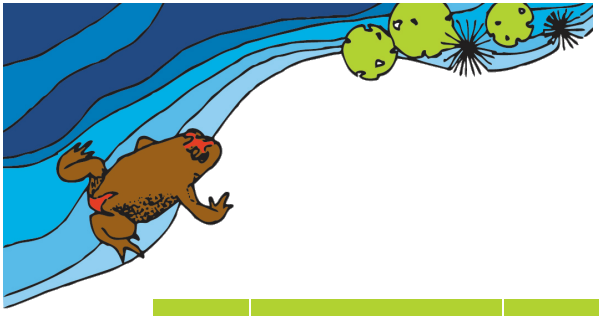
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
109	*Eucalyptus sp.*	2.5	1	3	0	5 - 10	Retain	Outside construction
110	*Eucalyptus sp.*	3	1	1	4	5 - 10	Retain	Outside construction
111	*E. eugenioides*	2.5	2	2	2	5 - 10	Retain	Outside construction
112	*E. bosistoana*	3	1	2	1	10 - 15	Retain	Outside construction
113	*Eucalyptus sp.*	2	1	1	1	5 - 10	Retain	Outside construction
114	*STAG E.eugenioides*	1	1	1	1	5 - 10	Retain	Outside construction
115	*STAG E.eugenioides*	1	1	1	1	10 - 15	Retain	Outside construction
116	*Ac. (mearnsii)*	0	1	1	2	5 - 10	Retain	Outside construction
117	*Ac. (mearnsii)*	4.5	0	0	0	3 - 5	Retain	Outside construction
118	*Eucalyptus sp.*	2	1	2	2	5 - 10	Retain	Outside construction
119	*Eucalyptus sp.*	6	1	1	2	10 - 15	Retain	Outside construction
120	*E. eugenioides*	1	0	1	1	3 - 5	Retain	Outside construction
121	*E. eugenioides*	5	1	2	1	5 - 10	Retain	Outside construction
122	*E. tereticornis*	4	2	3	2	15 - 20	Retain	Outside construction
123	*E.cupressiformis*	2	1	1	3	3 - 5	Retain	Outside construction
124	*E. bosistoana*	1	8	6	4	20 - 25	Retain	Outside construction
125	*E.cupressiformis*	2	1	1	2	3 - 5	Retain	Outside construction
126	*STAG*	-	-	-	-	10 - 15	Retain	Outside construction
127	*E.cupressiformis*	4	4	4	4	5 - 10	Retain	Outside construction
128	*E.cupressiformis*	4	3	4	2	5 - 10	Retain	Outside construction
129	*E. bosistoana*	1	1	1	1	5 - 10	Retain	Outside construction
130	*E. tereticornis*	4	3	1	3	15 - 20	Retain	Outside construction

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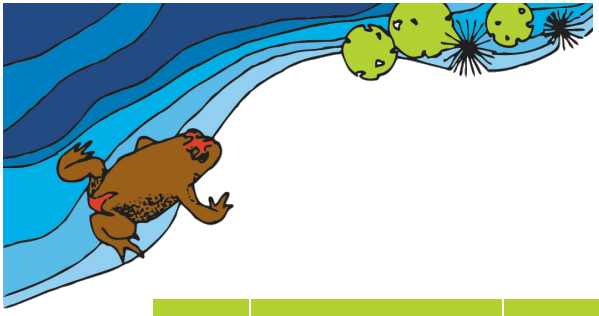
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
131	*E. bosistoana*	0	2	3	1	5 - 10	Retain	Outside construction
132	*E. eugenioides*	2	1.5	2	2	5 - 10	Retain	Outside construction
133	*A. floribunda*	2	1	1	1	3 - 5	Retain	Outside construction
134	*E. bosistoana*	2	1	2	1.5	10 - 15	Retain	Outside construction
135	*STAG*	-	-	-	-	-	Retain	Outside construction
136	*E. tereticornis*	5	5	5	6	10 - 15	Retain	Outside construction
137	*Ac. (mearnsii)*	3	0	2	1	3 - 5	Retain	Outside construction
138	*Ac. (mearnsii)*	3	2	3	2	3 - 5	Retain	Outside construction
139	*Eucalyptus sp.*	4	2.5	1	2	5 - 10	Retain	Outside construction
140	*Ac. (mearnsii)*	2	1	1	1	3 - 5	Retain	Outside construction
141	*Ac. (mearnsii)*	2	1	1	2	3 - 5	Retain	Outside construction
142	*E. tereticornis*	1	3	4	3	10 - 15	Retain	Outside construction
143	*E. bosistoana*	1	1	1	1	5 - 10	Retain	Outside construction
144	*E. bosistoana*	1	1	1	1	5 - 10	Retain	Outside construction
145	*A. floribunda*	2	2	3	3	10 - 15	Retain	Outside construction
146	*A. floribunda*	2	2	3	3	10 - 15	Retain	Outside construction
147	*E. tereticornis*	1	2	1	2	10 - 15	Retain	Outside construction
148	*A. floribunda*	2	4	3	2	10 - 15	Retain	Outside construction
149	*E. bosistoana*	4	5	4	4	10 - 15	Retain	Outside construction
150	*Alloc. littoralis*	1	1	1	1	3 - 5	Retain	Outside construction
151	*E. eugenioides*	1	1	1	1	3 - 5	Retain	Outside construction
152	*E. eugenioides*	1	3	3	1	5 - 10	Retain	Outside construction

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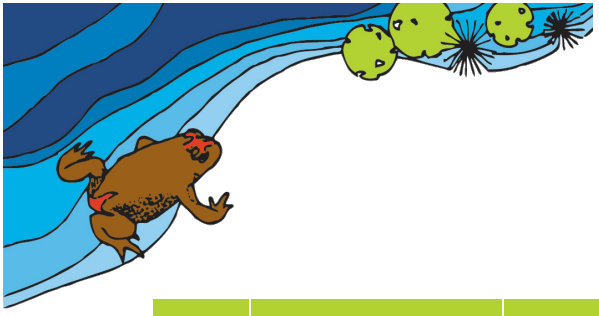
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
153	*E. eugenioides*	1	4	2	2	10 - 15	Retain	Outside construction
154	*STAG*	-	-	-	-	5 - 10	Retain	Outside construction
155	*Ac. (mearnsii)*	1	3	1	2	5 - 10	Retain	Outside construction
156	*E. eugenioides*	1	3	3	3	10 - 15	Retain	Outside construction
157	*E. eugenioides*	1	1	1	1	3 - 5	Retain	Outside construction
158	*E. eugenioides*	1	2	2	1	5 - 10	Retain	Outside construction
159	*E. eugenioides*	2	1	1	3	10 - 15	Retain	Outside construction
160	*E. tereticornis*	2	1	1	2	10 - 15	Retain	Outside construction
161	*Ac. (mearnsii)*	2	2	1	2	5 - 10	Retain	Outside construction
162	*E. eugenioides*	2	1	1	2	5 - 10	Retain	Outside construction
163	*A. floribunda*	1	1	1	1	10 - 15	Retain	Outside construction
164	*E. bosistoana*	1	1	1	1	5 - 10	Retain	Outside construction
165	*E. bosistoana*	1	1	1	1	3 - 5	Retain	Outside construction
166	*E. eugenioides*	0	4	1	2	5 - 10	Retain	Outside construction
167	*E. bosistoana*	1	1	0	1	5 - 10	Retain	Outside construction
168	*E. eugenioides*	1	3	1	1	5 - 10	Retain	Outside construction
169	*E. eugenioides*	1	3	1	1	5 - 10	Retain	Outside construction
170	*E. bosistoana*	0.5	2	1	1	3 - 5	Retain	Outside construction
171	*E. eugenioides*	1	3	2	3	10 - 15	Retain	Outside construction
172	*E. eugenioides*	1	2	2	1	10 - 15	Retain	Outside construction
173	*E. eugenioides*	1	0	0	0	10 - 15	Retain	Outside construction
174	*E. eugenioides*	1	1	1	2	5 - 10	Retain	Outside construction

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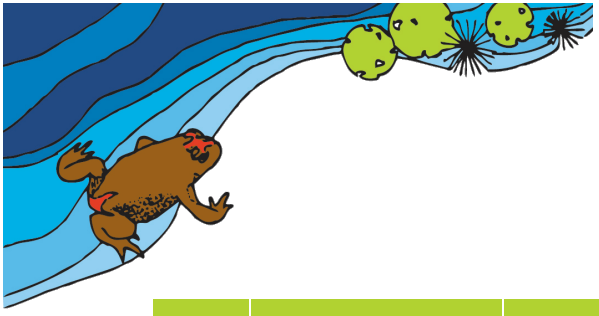
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
175	*E. tereticornis*	0.5	0.5	0.8	1	5 - 10	Retain	Outside construction
176	*E. tereticornis*	0.5	0	1	0	5 - 10	Retain	Outside construction
177	*E. eugenioides*	0	4	1	1	3 - 5	Retain	Outside construction
178	*E. eugenioides*	1	2	1	0	5 - 10	Retain	Outside construction
179	*E. eugenioides*	1	1	1	1	10 - 15	Retain	Outside construction
180	*E. tereticornis*	1	1	1	1	5 - 10	Retain	Outside construction
181	*E. eugenioides*	1	1	3	2	5 - 10	Retain	Outside construction
182	*E. eugenioides*	1	1	2	2	5 - 10	Retain	Outside construction
183	*E. tereticornis*	1	1	1	1	10 - 15	Retain	Outside construction
184	*E. bosistoana*	1	1	1	1	5 - 10	Retain	Outside construction
185	*E. tereticornis*	2	2	3	2	15 - 20	Retain	Outside construction
186	*E. eugenioides*	1	1	1	1	5 - 10	Retain	Outside construction
187	*E. bosistoana*	1	1	1	1	5 - 10	Retain	Outside construction
188	*E. eugenioides*	0	4	4	0	15 - 20	Retain	Outside construction
189	*E. bosistoana*	1	1	1	1	10 - 15	Retain	Outside construction
190	*E. bosistoana*	1	1	1	1	5 - 10	Retain	Outside construction
191	*E. eugenioides*	0	1	1	2	5 - 10	Retain	Outside construction
192	*E. tereticornis*	2	1	1	0	5 - 10	Retain	Outside construction
193	*E. tereticornis*	1	2	1	1	5 - 10	Retain	Outside construction
194	*E. eugenioides*	4	2	1	2	10 - 15	Retain	Outside construction
195	*E. tereticornis*	2	1	1	1	3 - 5	Retain	Outside construction
196	*E. bosistoana*	1	1	1	1	3 - 5	Retain	Outside construction

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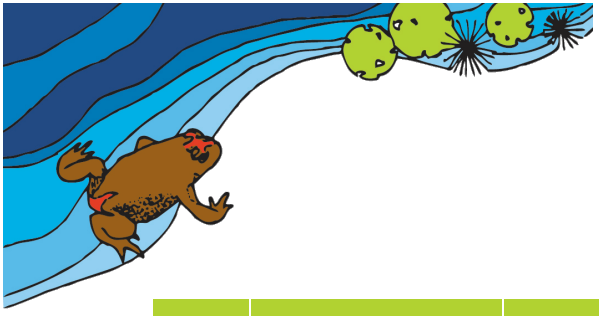
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
197	*E. eugenioides*	1	1	2	2	3 - 5	Retain	Outside construction
198	*E. bosistoana*	1	1	1	1	5 - 10	Retain	Outside construction
199	*E. eugenioides*	2	3	2	3	10 - 15	Retain	Outside construction
200	*Alloc. littoralis*	1	2	2	2	5 - 10	Retain	Outside construction
425	*E. eugenioides*	0	3	1	1	5 - 10	Retain	Outside construction
426	*A. floribunda*	2	3	1	2	10 - 15	Retain	Outside construction
427	*Ac. (mearnsii)*	0	1	2	1	3 - 5	Retain	Outside construction
428	*E. eugenioides*	1	3	1	1	5 - 10	Retain	Outside construction
429	*E. tereticornis*	3	3	3	2	5 - 10	Retain	Outside construction
430	*Acacia implexa*	0	1	1	1	< 3	Retain	Outside construction
431	*STAG*	-	-	-	-	10 - 15	Retain	Outside construction
432	*E. eugenioides*	1	2	1	2	5 - 10	Retain	Outside construction
433	*E. eugenioides*	12	1	2	1	5 - 10	Retain	Outside construction
434	*E. bosistoana*	2	3	3	2	5 - 10	Retain	Outside construction
435	*E. eugenioiodes*	0	3	1.5	3	5 - 10	Retain	Outside construction
436	*STAG (Acacia)*	-	-	-	-	3 - 5	Retain	Outside construction
437	*STAG (Acacia)*	-	-	-	-	3 - 5	Remove	Inside construction
438	*STAG (Acacia)*	-	-	-	-	3 - 5	Retain	Outside construction
439	*STAG (Acacia)*	-	-	-	-	3 - 5	Retain	Outside construction
440	*E. tereticornis*	2	1	1	2	5 - 10	Retain	Outside construction
441	*A. floribunda*	1	1	1	1	5 - 10	Retain	Outside construction
442	*E. eugenioides*	2	6	4	2	10 - 15	Retain	Outside construction

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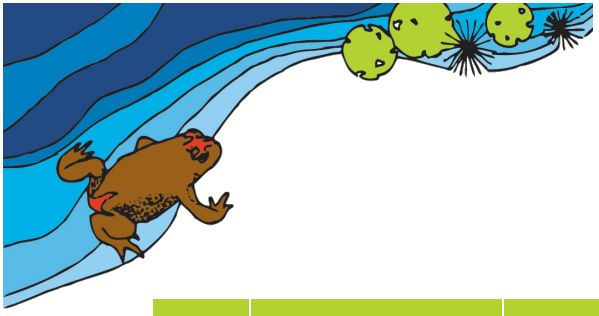
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
443	*E. tereticornis*	2	3	2	2	10 - 15	Retain	Outside construction
444	*E. tereticornis*	1	1	2	1	5 - 10	Retain	Outside construction
445	*E. eugenioides*	0	6	3	4	5 - 10	Retain	Outside construction
446	*E. tereticornis*	2	2	2	1	10 - 15	Retain	Outside construction
447	*E. tereticornis*	2	2	1	3	10 - 15	Retain	Outside construction
448	*E. eugenioides*	0	7	2	3	5 - 10	Retain	Outside construction
449	*E. eugenioides*	1	1	1	1	3 - 5	Retain	Outside construction
450	*E. tereticornis*	1	2	1	2	5 - 10	Retain	Outside construction
451	*E. tereticornis*	3	2	2	3	10 - 15	Retain	Outside construction
452	*E. eugenioides*	1	1	1	1	3 - 5	Retain	Outside construction
453	*Ac. (mearnsii)*	0	2	2	0	3 - 5	Retain	Outside construction
454	*E. tereticornis*	2	5	3	2	10 - 15	Retain	Outside construction
455	*E. tereticornis*	1.5	1	1	1	3 - 5	Retain	Outside construction
456	*E. bosistoana*	2	1	1	2	10 - 15	Retain	Outside construction
457	*Ac. (mearnsii)*	1	1	2	2	3 - 5	Retain	Outside construction
458	*E. eugenioides*	2	3	3	3	10 - 15	Retain	Outside construction
459	*A. floribunda*	1	3	2	2	5 - 10	Retain	Outside construction
460	*E. tereticornis*	3	5	3	2	10 - 15	Retain	Outside construction
461	*E. eugenioides*	1	2	1	3	5 - 10	Retain	Outside construction
462	*E. bosistoana*	3	4	2	3	10 - 15	Retain	Outside construction
463	*Alloc. littoralis*	1	6	4	6	5 - 10	Retain	Outside construction
464	*E. eugenioides*	0	3	1	1	5 - 10	Remove	Inside construction

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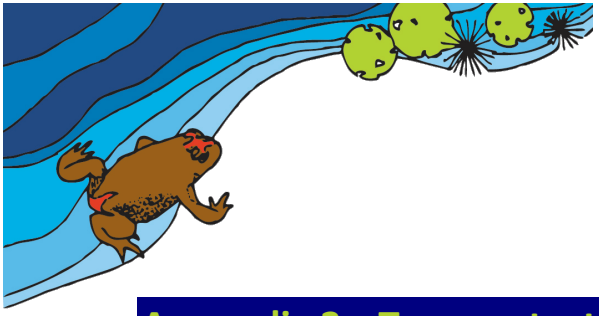
Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
465	*E. tereticornis*	1	4	4	2	10 - 15	Remove	Inside construction
466	*E. tereticornis*	0	2	1	1	5 - 10	Remove	Inside construction
467	*E. bosistoana*	0	4	1	1	< 3	Remove	Inside construction
468	*E. tereticornis*	1	2	1	2	3 - 5	Remove	Inside construction
469	*E. tereticornis*	0	2	3	2	5 - 10	Remove	Inside construction
470	*A. floribunda*	1	1	1	1	3 - 5	Remove	Inside construction
471	*Ac. (mearnsii)*	1	1	1	1	< 3	Remove	Inside construction
472	*E. tereticornis*	0	0	1	0	3 - 5	Remove	Inside construction
473	*E. bosistoana*	1	2	1	1	3 - 5	Remove	Inside construction
474	*Alloc. littoralis*	1	4	1	2	3 - 5	Remove	Inside construction
475	*Alloc. littoralis*	1	1	1	1	< 3	Remove	Inside construction
476	*Alloc. littoralis*	2	3	2	2	3 - 5	Remove	Inside construction
477	*Alloc. littoralis*	2	2	2	2	3 - 5	Remove	Inside construction
478	*Alloc. littoralis*	1	1	1	1	3 - 5	Remove	Inside construction
479	*Alloc. littoralis*	1	2	1	2	3 - 5	Remove	Inside construction
480	*Alloc. littoralis*	1	1	1	1	< 3	Remove	Inside construction
481	*A. floribunda*	1	1	1	1	< 3	Remove	Inside construction
482	*A. floribunda*	1	1	1	1	3 - 5	Remove	Inside construction
483	*Acacia implexa*	0	1	2	0	3 - 5	Remove	Inside construction
484	*Alloc. littoralis*	1	1	2	2	3 - 5	Remove	Inside construction
485	*A. floribunda*	1	1	1	0	3 - 5	Remove	Inside construction
486	*A. floribunda*	1	1	1	1	< 3	Remove	Inside construction

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Tree #	*Species*	Canopy Width (m)				Tree Height (m)	Remove/ Relocate/Retain	
		N	S	E	W		Action	Reason
487	*A. floribunda*	1	1	1	1	3 - 5	Remove	Inside construction
488	*E. tereticornis*	0	1	1	1	3 - 5	Remove	Inside construction
489	*E. bosistoana*	2	2	2	2	5 - 10	Remove	Too close to construction
490	*Alloc. littoralis*	2	2	2	2	3 - 5	Remove	Inside construction
491	*E. tereticornis*	1	2	1	1	5 - 10	Remove	Too close to construction
492	*E. tereticornis*	0	2	2	1	5 - 10	Remove	Inside construction
493	*Alloc. littoralis*	1	1	1	1	3 - 5	Remove	Inside construction
494	*Alloc. littoralis*	1	1	1	1	3 - 5	Remove	Inside construction
495	*Alloc. littoralis*	1	1	1	1	3 - 5	Remove	Inside construction
496	*Alloc. littoralis*	0	2	2	2	5 - 10	Remove	Inside construction
914	*E. tereticornis*	7	9	13	11	24	Retain	Outside construction
915	*E. tereticornis*	7	7	7	6	25	Retain	Outside construction
916	*E. tereticornis*	9	10	11	10	19	Retain	Outside construction
919	*STAG*	-	-	-	-	-	Retain	Outside construction
920	*STAG*	-	-	-	-	-	Retain	Outside construction

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Appendix 3. Tree protection guidelines

A Pre-construction/Demolition phase

The following methods are to be implemented to minimise potential damage to retained trees, e.g. from soil compaction and site activity. Trees are to be protected at all stages of the development, and growing conditions are to be improved within the Tree Protection Zone (TPZ). These guidelines are consistent with AS4970-2009 Protection of trees on development sites.

A 1. All site workers are to be aware of relevant tree protection requirements. Nominated trees will be removed or transplanted as per the tree protection plan. An arborist is to supervise tree removal, pruning and transplanting and certify the completed works.

A 2. All trees not nominated for retention are to be removed prior to any construction activity. Approved tree pruning and removal operations near retained trees are to be carried out in a way that avoids soil compaction and damage to canopy, trunk or roots. Works are to be supervised by an arborist or the person responsible for site management.

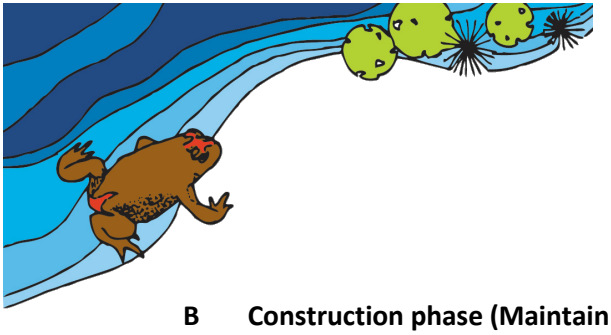
A 3. Stumps are to be ground, not dozed or dug out, if in the vicinity of retained trees. Machinery (other than stump machines) is to be kept beyond the nominated protection zones of retained trees during all operations.

A 4. Tree protection fencing is to be in place before the introduction of machinery or other materials to the site and before commencement of works. Fencing is to be located to at least the canopy dripline, be of sturdy construction and retained in-situ during works unless altered by the project arborist. All site activities are excluded from this zone. Refer to Appendix 2 for specific minimum setback distances. AS4687 specifies applicable fencing requirements.

A 5. The TPZ is to be mulched using material compatible with 'AS4454-2003 Composts, soil conditioners and mulches', e.g. decomposed leaf litter, and maintained at 50-100 mm depth. Some areas, e.g. turf, may not require mulch. Temporary irrigation may be required. Weeds are to be removed and controlled.

A 6. Pruning is to be undertaken by suitably qualified, skilled and insured people to comply with AS4373-2007, Australian Standard: Pruning of Amenity Trees. Initial pruning provides adequate clearances and general crown maintenance. Flexible branches are to be tied back, not pruned.

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B Construction phase (Maintain tree protection fencing)

B 1. Where access is required within a TPZ, temporary ground protection measures will be required (e.g. metal plates, rumble boards or exterior-grade ply over aggregate) capable of supporting the required load without deflection. Trunk protection may be required, e.g. battens wrapped around the trunk to a height of 2 metres.

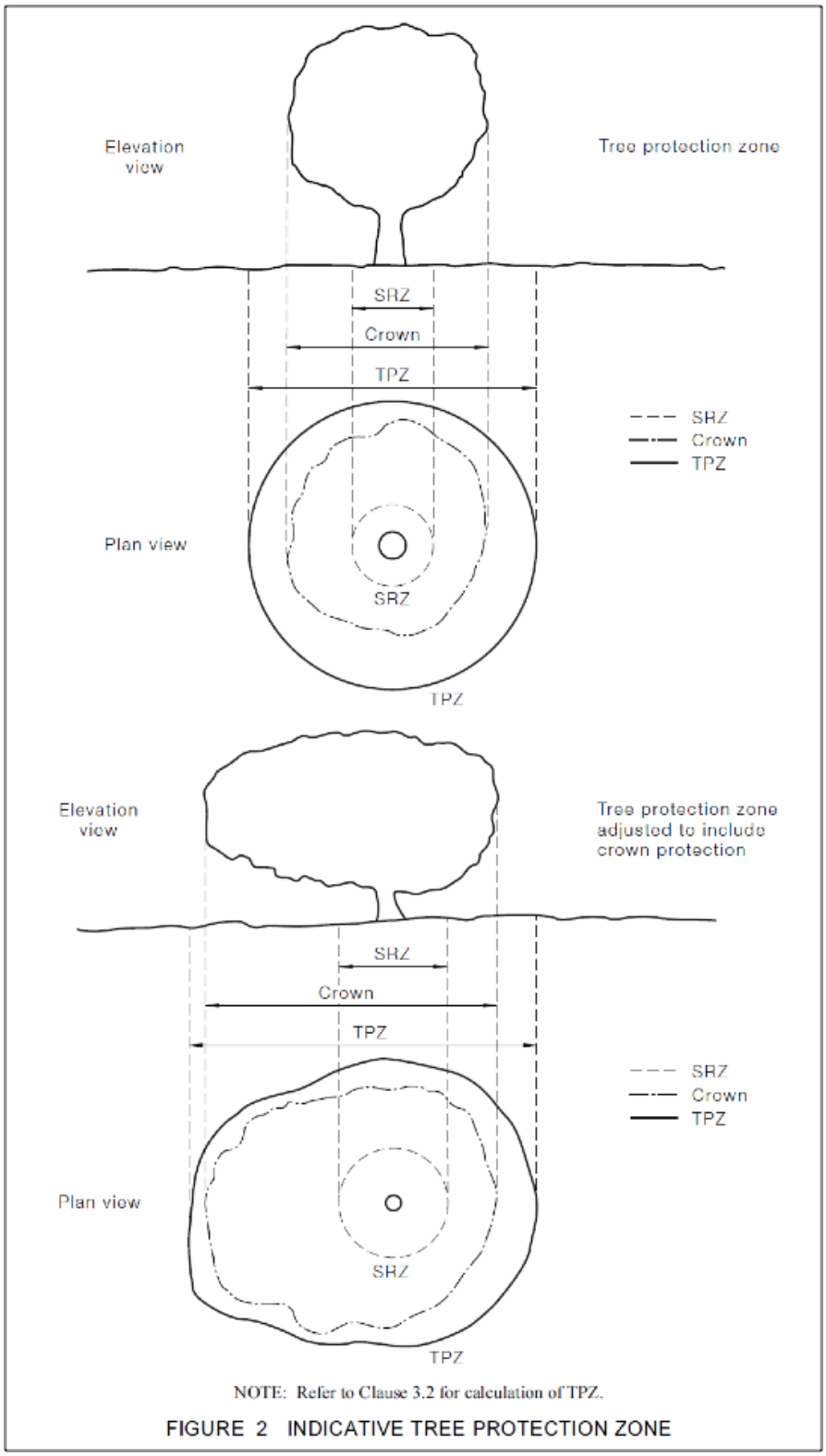
B 2. Material stockpiles or dumps, parking, excavation, site sheds, preparation of chemicals, fires, wash down areas or similar are to be located clear of TPZs. Areas designated for such requirements are not to divert drainage water into tree protection areas.

B 3. Machine trenching is to be excluded from the TPZ of retained trees. Any required root excavation inside a TPZ is to be done by hand and intact roots >40 mm in diameter are to be retained. Services are to be installed 100 mm clear of such roots. Damaged roots must be cut cleanly with sharp implements (backhoe blades and similar are excluded), with no root dressings or paints. Trenches are to be backfilled promptly to minimise soil desiccation. Underbore if no suitable alternative location is possible. All works within the TPZ are to be supervised by an arborist.

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Appendix 4. Tree protection zone and structural root zone

Extract from Section 3 of AS 4970-2009



NOTE: Refer to Clause 3.2 for calculation of TPZ.

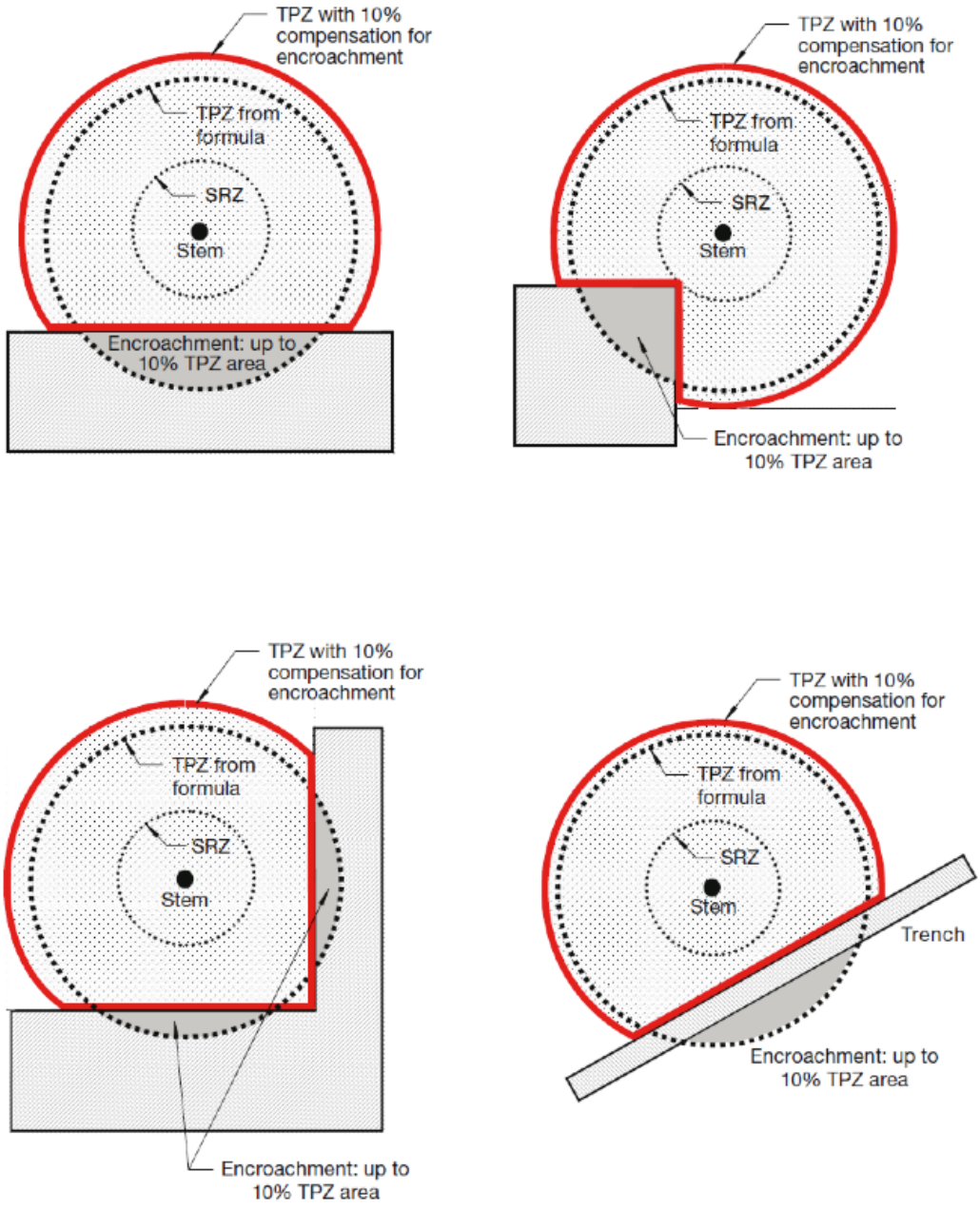
FIGURE 2 INDICATIVE TREE PROTECTION ZONE

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Appendix 5. Encroachment into tree protection zones

Extract from Appendix D of AS 4970-2009

Encroachment into the tree protection zone (TPZ) is sometimes unavoidable. Figure D1 provides examples of TPZ encroachment by area, to assist in reducing the impact of such incursions.



NOTE: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.

FIGURE D1 EXAMPLES OF MINOR ENCROACHMENT INTO TPZ

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Appendix 6. Company Profile

Abel Ecology has been in the flora and fauna consulting business since 1991, starting in the Sydney Region, and progressively more state wide in New South Wales since 1998, and now also in Victoria. During this time extensive expertise has been gained with regard to Master Planning, Environmental Impact assessments including flora and fauna, bushfire reports, Vegetation Management Plans, Management of threatened species, Review of Environmental Factors, Species Impact Statements and as Expert Witness in the Land and Environment Court. We have done consultancy work for industrial and commercial developments, golf courses, civil engineering projects, tourist developments as well as residential and rural projects. This process has also generated many connections with relevant government departments and city councils in NSW. Our team consists of five scientists and two administrative staff, plus casual assistants as required.

Licences

NPWS s132C Scientific licence number is SL100780 expires 23 January 2023

NPWS GIS data licence number is CON95034

DG NSW Dept of Primary Industries Animal Care and Ethics Committee Approval expires 8 November 2022

DG NSW Dept of Primary Industries Animal Research Authority expires 8 November 2022

The Consultancy team

Dr Danny Wotherspoon

BSc, DipEd, MA, PhD, Grad Dip Bushfire Protection,

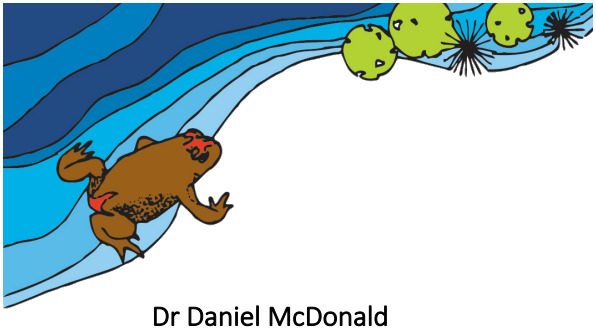
MECA NSW, MEPLA, MNELA, MESA, MEIANZ, White card.

Danny has practised as an ecological and bushfire consultant since 1991.

He is a consulting ecologist to private developers, State Government agencies and various City Councils on a regular basis, for development applications, government projects, and as expert witness in the NSW Land and Environment Court.

Danny's PhD researched fragmented vegetation and fauna habitat use. He has special expertise in fauna habitat use. Danny has presented invited papers at international conferences since 2001 in Australia, China, South Africa, Sri Lanka and Israel on his PhD and other research, including golf course habitat management. Danny's scientific papers have been published in both international and Australian academic journals.

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Dr Daniel McDonald

BScAgr, MAgr, PhD, MLinSoc NSW, White card, Snr first aid cert, EWP certificate, QTRA, VTA.

Daniel is an experienced ecologist with expertise in fauna, plant species identification, vegetation assessment, agriculture, conservation genetics and seed collection and preservation. He is accredited both for BioBanking assessments and Biodiversity Certification. His present research interest is in Eastern Suburbs Banksia Scrub and fragmented endangered ecological communities.

Daniel's BAM Assessor Accreditation number is BAAS17056.

Mark Mackinnon

Qualifications: B Env. Sci. (Hons), Grad Dip Bushfire Protection

MEIANZ, White Card,

Accredited Practitioner Level 3 - Bushfire Planning & Design (BPAD), Accreditation number 36395.

Mark is a passionate and enthusiastic scientist who thrives in the field of natural resource management. He has experience in threatened species, fire ecology, bushfire management, pest plant and animals, and landscape restoration. In particular he specializes in ornithology and bushfire management. Mark has a number of specialized field-based skills including: nest box installation, simple and complex tree climbing, working at heights, general firefighter departmental fire accreditation, venomous snake and reptile handling, immunization to handle bat species, and an A - class bird banding licence with mist-net endorsement. Mark is also skilled in ArcGIS mapping, first-aid, four -wheel-driving.

Dr Warwick Fear

Qualifications: B App. Sci. (Hons); PhD; Grad. Dip. in Bushfire Protection

Bushfire Planning & Design (BPAD), Accredited Practitioner Level 2. Accreditation number 48550, White Card.

Warwick has a background in a number of scientific disciplines and applications. Previous roles include public and private sector work within the human biological sciences and secondary school Science teaching. Warwick has worked within the field of bushfire protection since 2016 and his current role within Abel Ecology is as a Bushfire Scientist.

Dr Alison Hewitt

BSc (Hons), PhD

MESA, MAPS, MASBS, Snr 1st Aid cert, White card

Alison has researched and published on the reproductive biology and ecology of Australian Melaleuca species, native plant responses to fire and the vegetation of western Sydney. Alison's interests include plant ecology and

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flora survey methodology, bush regeneration, plant identification and gardening. Alison teaches Botany and Ecology sessionally with Western Sydney University.

Alison's BAM Assessor Accreditation number is BAAS19044.

Mark Sherring

BM, MAABR, Cert. Hort., Cert. Bush Regen, Cert. Rural Ops, White Card.

Member of the Australian Association of Bush Regenerators

Mark has extensive knowledge and experience of plant species in New South Wales. He has built up his expert knowledge on NSW native plant species over the many years that he has practised as a Botanist. He is regularly asked to contribute to the extensive (ongoing) flora surveys of the Sydney Basin and Blue Mountains carried out by the Royal Botanic Gardens, Sydney. Mark has extensive field survey experience, having worked for over ten years in various plant-related roles. His role in Abel Ecology is to provide expert advice on flora and on the full range of flora management issues encountered and in the design and management of environmental monitoring projects.

Dr Stephanie Clark

Qualifications: B Sc (Hons), PhD

Stephanie has over 30 years experience in the collection, identification and taxonomy of marine, estuarine, freshwater and terrestrial molluscs. She has conducted numerous targeted surveys for endangered and threatened species (particularly land and freshwater molluscs) in both Australia and the United States. She is particularly interested in the systematics, taxonomy, morphology (external and internal), population and conservation genetics and conservation of molluscs particularly terrestrial (especially the Helicoidea) and freshwater (especially the Hydrobiidae and related families) groups.

Jesse Cass

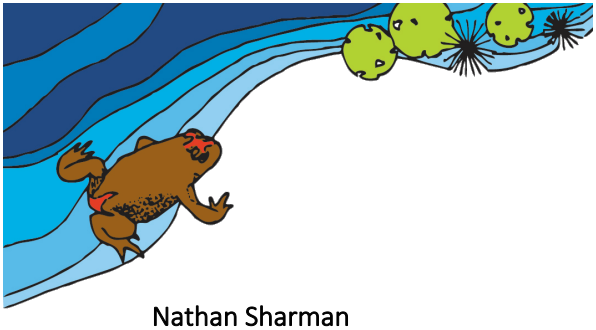
BSc (Zoology), MEScM (enrolled)

White Card, Working Safely at Heights

Trainee Botanist

Jesse has a bachelor degree and is currently studying his Masters of Environmental Science and Management, online at UNE, as a pathway for a PhD. He is practicing and learning plant identification, as well as fauna identification within the Sydney Basin. His role in Abel Ecology is to provide assistance on field visits and report writing, while gaining knowledge and experience in flora identification.

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Nathan Sharman

BSc (Environmental Biology)

Trainee Botanist/Ecologist

Nathan has completed his Bachelor of Environmental Biology at the University of Technology Sydney (UTS). Nathan has experience in bush regeneration, where he developed a strong knowledge of weed species in the Blue Mountains area. He is a keen bushwalker and outdoor enthusiast with a passion for exploring nature. Nathan has roles in both administration and ecology works and is training to become a botanist.

Harry Kirk

BSc (Environmental Biology), Dip., Arb (enrolled)

4WD Training, White Card, NSW LAA (LAA001488)

Trainee Arborist

Harry has a Bachelor of Environmental Biology at the University of Technology Sydney (UTS). Harry has spent the last few years as a Health, Safety & Environment Consultant working on large and national scale projects. Transferring his wide consulting skills to Abel Ecology, Harry has roles in undertaking field work and report writing while completing his Diploma of Arboriculture.

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ARUP

Health Infrastructure

Princes Highway Roundabout, Moruya

REF Acoustic Assessment

Reference: AC03_v3

Issue 3 | 8 May 2022

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 284639-00

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1. Introduction

This acoustic report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

1.1 Site description

The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot 2, DP 1281576, a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north is a small residential subdivision called Mynora Estate.

The approximate location of the roundabout is shown in Figure 1 below. It is noted that ancillary inground works may extend beyond this location.

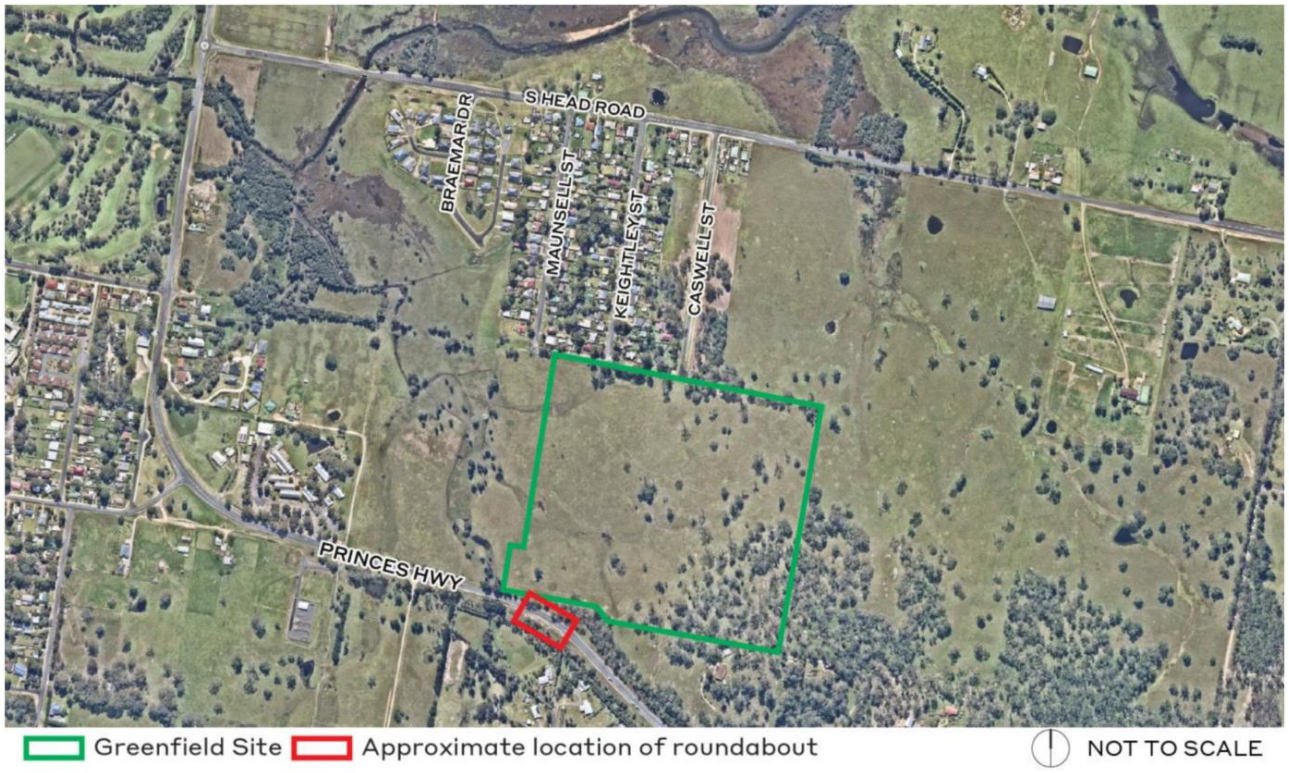


Figure 1: Approximate location of the proposed works

1.2 Proposed works

The works proposed under this REF include the following:

- Construction of a new roundabout located on Princes Highway.
- Ancillary road and public domain works.
- Ancillary electricity reticulation and street lighting.

A further detailed description of the proposed works is contained in the Review of Environmental Factors report prepared by Ethos Urban.

1.3 Scope of assessment

The works are being carried out under State Environmental Planning Policy (Transport and Infrastructure) 2021 [1] as 'Development without Consent' by Health Infrastructure NSW as a public authority.

This document provides noise and vibration advice on:

- Impact on adjacent to sensitive receivers and mitigation measures (during construction and operation.)
- Consideration of noise and vibration impacts with the proposed construction hours for REF works.
- Identification of work equipment and machinery for construction and assessment of impact on surrounding receivers.

The assessment of operational noise relates to road traffic and is therefore assessment against the NSW *Road Noise Policy* (RNP) [2].

The assessment of construction noise impacts has been carried out in accordance with the NSW *Interim Construction Noise Guidelines* [3]. As sensitive receivers may be impacted for greater than 3 weeks, a quantitative assessment is required.

Potential impacts from vibration during construction and has been quantified as per *Assessing Vibration: a technical guideline* [4].

Other standards, policies and guidelines referenced in this report include:

- BS 7385-2: 1993 Evaluation and measurement for vibration in buildings – Pt2: Guide to damage levels from groundborne vibration, (1993) [5]
- DIN 4150-3: 1999 Structural vibration – Effects of vibration on structures, (1999) [6]
- DIN 4150-2: 1999 Structural vibration – Human exposure to vibration in buildings [7]

2. Existing noise environment

2.1 Assessment locations

The reasonably most-affected residences have been grouped into Noise Catchment Areas (NCAs) based on their acoustic environment as observed on site. The assessment of residential receivers in this report is limited to the reasonably most-affected receivers listed in Table 1 and shown in Figure 2.

Table 1: Reasonably most-affected residential receivers.

Receiver ID	Address	No. of floors	NCA
R1	38 Pear Tree Place, Moruya	2	1
R2	2945 Princes Highway, Moruya	1	1
R3	36 Keightley Street, Moruya	1	2

2.2 Noise monitoring

Noise monitoring was undertaken for the purpose of deriving of noise criteria and qualifying the noise environment at nearby receivers. Long-term unattended and short-term attended monitoring was conducted at locations presented in Table 2 and shown in Figure 2.

Table 2: Monitoring locations

Measurement Type	Purpose	ID	Location
Both long-term unattended and short-term attended	Establish criteria	L1	2945 Princes Highway, Moruya
		L2	36 Keightley Street, Moruya
Short-term attended only	Quantify and qualify noise levels surrounding site	S1	End of Caswell St
		S2	36 Maunsell St

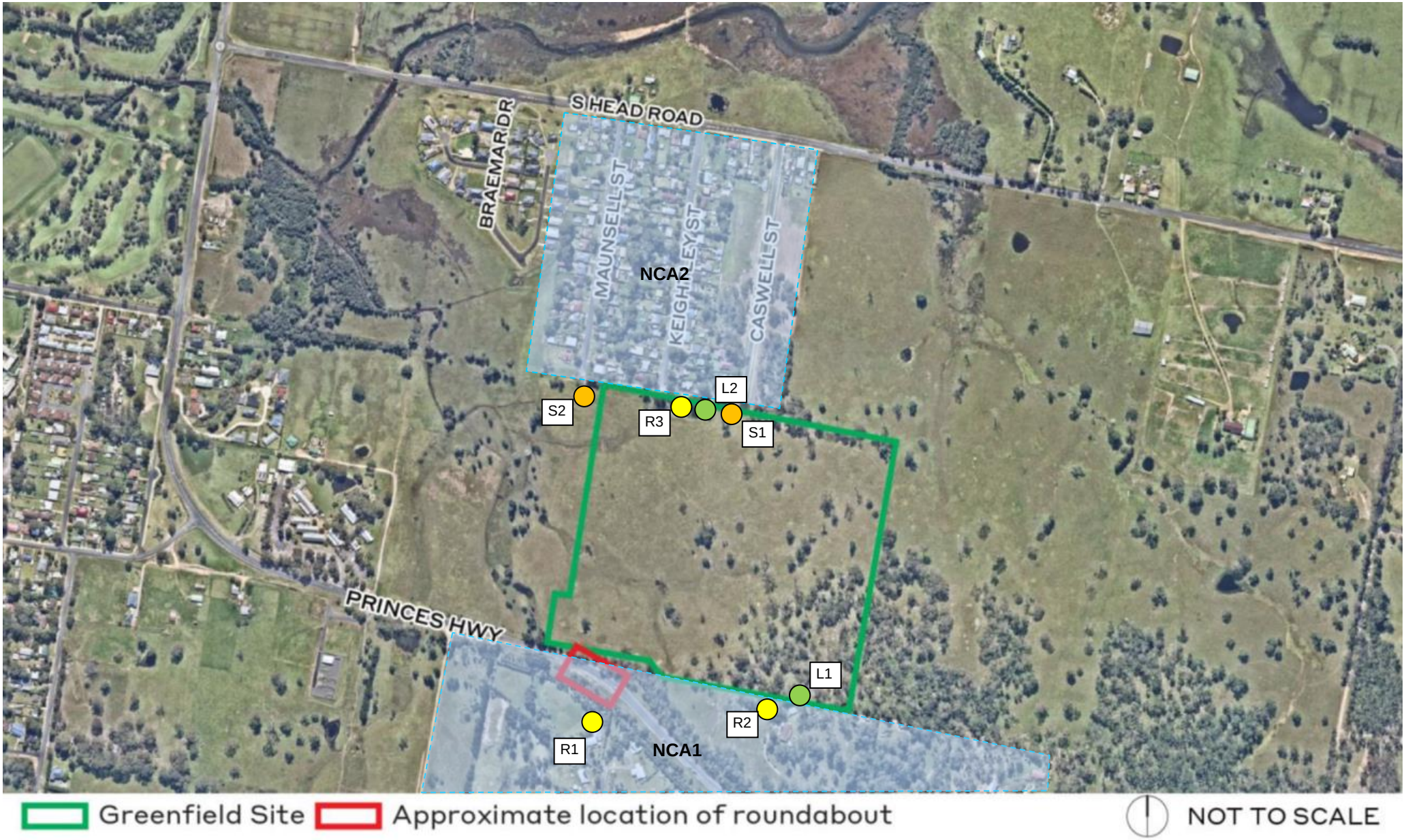


Figure 2: Noise sensitive receiver and measurement locations

2.2.1 Unattended long-term monitoring

Long-term noise monitoring was carried out on 1 December to 12 December 2021 at two locations shown in Figure 2. The long-term noise monitoring methodology and noise level graphs of the data are included in Appendix B.

Table 3 summarises the background and ambient noise level results.

Table 3: Long-term noise monitoring results, dB(A)

Location ID	NCA	Time period[1]	Rating Background Levels, dBL_{A90}	Ambient dBL_{Aeq} noise levels
L1 2945 Princes Highway	1	Day	40	53
		Evening	36	54
		Night	31	43
L2 36 Keightley Street	2	Day	37	54
		Evening	36	50
		Night	31	47

Notes:

1. The NPfI defines day, evening and night time periods as:
    - Day: the period from 7 am to 6 pm Monday to Saturday; or 8 am to 6 pm on Sundays and Public Holidays.
    - Evening: the period from 6 pm to 10 pm.
    - Night: the remaining period.

As required by the NPfI, the external ambient noise levels presented are free-field noise levels.

2.2.2 Attended short-term monitoring

Short-term 15 minute attended noise measurements were undertaken on 1 December 2021 at four locations shown in Figure 2. The measured noise levels are summarised in Table 4.

Table 4: Short-term noise monitoring results, dB(A)

Location ID	Date and start time	Measured levels		Noise sources contributions
		$dBL_{A90(15min)}$	$dBL_{Aeq(15min)}$	
L1	1 Dec 21 14:50	40	45	Dominated by traffic noise from Princes Highway, with slight contribution from South Head Road
L2	1 Dec 21 15:34	34	45	Natural sounds, with faint traffic noise from South Head Road and Princes Highway
S1	1 Dec 21 17:38	33	45	Natural sounds, with faint traffic noise from South Head Road and Princes Highway
S2	1 Dec 21 18:01	34	47	Natural sounds, with faint traffic noise from South Head Road and Princes Highway

Results show existing noise levels are similar across the northern site boundary. No industrial noise was noted during measurements.

3. Operational noise

3.1 Road traffic noise criteria

Increased traffic generated on the surrounding road network due to the operation of the development is assessed in accordance with the NSW *Road Noise Policy* (RNP) [2]. Table 3 of the RNP which sets out the assessment criteria for particular types of project, road category and land use, shown in Table 5 below.

Table 5: Road traffic criteria for traffic generating development - residential receivers.

Road category	Type of project / land use	Assessment criteria – dB(A)	
		Day (7:00am-10:00pm)	Night (10:00pm-7:00am)
Freeway/arterial/sub-arterial roads - Princes Highway	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)

Note:
These criteria are for assessment against façade corrected noise levels when measured in front of a building façade.

Regarding the application of the assessment, the RNP states:

> *In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.*

3.2 Operational traffic assessment

It is not expected that vehicular movements and traffic noise levels will significantly increase as a result of the proposed roundabout.

4. Construction noise and vibration

4.1 Construction noise and vibration criteria

4.1.1 Construction noise criteria

The NSW *Interim Construction Noise Guideline* [3] (ICNG or Guideline) provides recommended noise levels for airborne construction noise at sensitive land uses. The guideline provides construction noise management levels above which all feasible and reasonable work practices should be applied to minimise the construction noise impact. The ICNG works on the principle of a 'screening' criterion – if predicted or measured construction noise exceeds the ICNG levels then the construction activity must implement all 'feasible and reasonable' work practices to reduce noise levels.

The ICNG provides two methods for assessing construction noise, varying typically on the basis of the project duration, being either a quantitative or a qualitative assessment. A quantitative assessment is recommended for major construction projects of significant duration and involves the measurement of background noise levels for determination of noise management levels and prediction of construction noise levels. A qualitative assessment is recommended for small projects with a duration of less than three weeks and focuses on minimising noise disturbance through the implementation of reasonable and feasible work practices, and community notification.

This development is expected to warrant a quantitative assessment.

The ICNG sets out management levels for noise at noise sensitive receivers, and how they are to be applied. These noise management levels (NMLs) for residential receivers and other sensitive receivers are reproduced in Table 6.

Table 6: Construction noise management levels (NMLs) at residential receivers.

Time of day	NML[1] $L_{Aeq\ (15\ min)}$	How to apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured Laeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Time of day	NML[1] $L_{Aeq\ (15\ min)}$	How to apply
Outside recommended standard hours	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Notes:

1. Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Table 7 summarises relevant project construction noise targets for the project for residential receivers.

Table 7: Noise Management Levels for residential receivers.

Receiver ID	Address	Standard Hours[1] $dBL_{Aeq\ (15\ min)}$
R1	38 Pear Tree Place, Moruya	50
R2	2945 Princes Highway, Moruya	
R3	36 Keightley Street, Moruya	47

Note:

1. Standard hours are Monday to Friday 7 am to 6 pm and Saturday from 8 am to 1 pm.

4.1.2 Construction traffic noise criteria

Increased traffic generated on the surrounding road network due to the construction activities of the proposed works is assessed in accordance with the NSW *Road Noise Policy* (RNP) [2]. Table 3 of the RNP which sets out the assessment criteria for types of project, road category and land use, shown in Table 8 below.

Table 8: Road traffic criteria for traffic generating development – residential receivers.

Road category	Type of project / land use	Assessment criteria – dBL_{Aeq}	
		Day (7:00am-10:00pm)	Night (10:00pm-7:00am)
Freeway/ arterial/sub-arterial roads (Princes Hwy)	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)

Note:

These criteria are for assessment against façade corrected noise levels 1 metre in front of a building façade.

Regarding the application of the assessment, the RNP states:

> *In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.*

4.1.3 Construction vibration criteria

4.1.3.1 Human response

The NSW EPA's *Assessing Vibration – A Technical Guideline* [8] provides vibration criteria for maintaining human comfort within different space uses. The guideline recommends 'preferred' and 'maximum' weighted vibration levels for both continuous vibration sources, such as steady road traffic and continuous construction activity, and for impulsive vibration sources. The weighting curves are obtained from BS 6472-1:2008 [9].

For intermittent sources (e.g. passing heavy vehicles, impact pile driving, intermittent construction), the guideline uses the vibration dose value (VDV) metric to assess human comfort effects of vibration. VDV considers both the magnitude of vibration events and the number of instances of the vibration event. Intermittent events that occur less than 3 times in an assessment period (either day, 7 am to 10 pm, or night, 10 pm to 7 am) are counted as 'impulsive' sources for the purposes of assessment.

As noted in the Guideline, situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances, such as a construction or excavation projects. Notwithstanding, the recommended vibration limits for maintaining human comfort in residences and other relevant receiver types are given for continuous/impulsive and intermittent vibration Table 9 and Table 10 respectively.

Table 9: Preferred and maximum criteria for continuous and impulsive vibration

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Impulsive vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14

Notes:

1. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am

Table 10: Acceptable vibration dose values for intermittent vibration (m/s1.75).

Location	Daytime 0700-2200 h		Night-time 2200-0700 h	
	Preferred value	Maximum value	Preferred value	Maximum value
Residences	0.20	0.40	0.13	0.26

4.1.3.2 Structural damage

British Standard 7385 Part 1: 1993, defines different levels of structural damage as:

- *Cosmetic - The formation of hairline cracks on drywall surfaces, or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in mortar joints of brick/concrete block construction.*
- *Minor - The formation of large cracks or loosening of plaster or drywall surfaces, or cracks through bricks/concrete blocks.*
- *Major - Damage to structural elements of the building, cracks in supporting columns, loosening of joints, splaying of masonry cracks, etc.*

Table 1 and Section 7.4.2 of BS7385-2 sets limits for the protection against the different levels of structural damage and those levels are reproduced in Table 11 below.

Table 11: BS 7385-2 Structural damage criteria.

Group	Type of structure	Damage level	Peak component particle velocity, mm/s[1]		
			4 Hz to 15 Hz	15 Hz to 40 Hz	40 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings[3]	Cosmetic	50		
		Minor[2]	100		
		Major[2]	200		
2	Un-reinforced or light framed structures Residential or light commercial type buildings	Cosmetic	15 to 20	20 to 50	50
		Minor[2]	30 to 40	40 to 100	100
		Major[2]	60 to 80	80 to 200	200

Notes:

1. Peak Component Particle Velocity is the maximum Peak particle velocity in any one direction (x, y, z) as measured by a tri-axial vibration transducer.
2. Minor and major damage criteria established based on British Standard 7385 Part 2 (1993) Section 7.4.2

All levels relate to transient vibrations in low-rise buildings. Continuous vibration can give rise to dynamic magnifications that may require levels to be reduced by up to 50%.

The guide values in Table 11 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 11 may need to be reduced by up to 50%.

4.1.3.3 Buried services

DIN 4150-2:2016 sets out guideline values for vibration effects on buried pipework (see Table 12).

Table 12: Guideline values for short-term vibration impacts on buried pipework.

Line	Pipe material	Peak component particle velocity (PCPV) measured on pipe, mm/s
1	Steel, welded	100
2	Vitrified clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
3	Masonry, plastic	50
-	High pressure gas pipelines[1]	75 Monitoring required if predicted above 50. No piling within 15 m of pipeline without detailed assessment.

Notes:

1. Based on UK National Grid's specification [10]

- For gas and water supply pipes within 2 m of buildings, the levels given in DIN4150-3 [11] should be applied. Consideration must also be given to pipe junctions with the building structure as potential significant changes in mechanical loads on the pipe must be considered.

- For Rock breaking/hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures and it may therefore be appropriate to reduce the transient values by 50%.

Other services that maybe encountered include electrical cables and telecommunication services such as fibre optic cables. While these may sustain vibration velocity levels from between 50 mm/s and 100 mm/s, the

connected services such as transformers and switchgear, may not. Where encountered, site specific vibration assessment in consultation with the utility provider should be carried out.

4.2 Construction stages and activities

Table 13 provides an outline of the general stages and associated activities as provided by the project management team.

Table 13: Indicative construction stages for the proposed roundabout

Project stage	Tasks/activity undertaken
Stage 1	Traffic Management
	Lower Existing Telstra Services (Approval Required)
	Clear and Grub
	Setting out
	Bulk Earthworks
	Inground Services
	Subgrade / Subbase
	Construct / FRP Roundabout & Surrounding Roads
	Signage and Lighting
	Base Course / Wearing Course
	Linemarking and Road Furniture
	Open Half of Roundabout / Access to Main Site Open
Stage 2	Traffic Management Switch
	Clear and Grub
	Setting out
	Bulk Earthworks
	Inground Services
	Subgrade / Subbase
	Construct / FRP Roundabout & Surrounding Roads
	Signage and Lighting
	Base Course / Wearing Course
	Linemarking and Road Furniture
	Commissioning of Roundabout and Photovoltaic Street Lighting
	Open Roundabout

4.3 Indicative programme and schedule

The indicative construction schedule associated with the proposed roundabout is outlined in Table 14.

Table 14: Indicative construction schedule

Element	Commence	Duration
Stage 1	September 2022	3 months
Stage 2	December 2022	4 months

4.4 Construction hours

The proposed construction hours for the proposed roundabout are summarised in Table 15.

Table 15: Typical proposed construction hours

Day	Proposed construction hours
Monday to Friday	7 am to 6 pm
Saturday	8 am to 1 pm
Sunday and public holiday	No work

4.5 Construction noise

As detail of the construction noise equipment / plant to be used is not known at the time, assumptions have been made based on sources normally found on construction sites similar to the proposed development.

As both Stage 1 and Stage 2 of the construction consists of similar activities, assessment has been made on construction activities that are expected to be representative of a worst-case condition during the construction programme. Table 16 outlines the expected worst case construction activities and anticipated airborne noise levels for indicative plant items.

Table 16: Expected worst-case construction activity and indicative plant items

Construction activity	Indicative plant items	Quantity	Sound power level (per unit), dBL_{Aeq}
Lower existing Telstra services	Backhoe	1	108
	Compactor	1	115
	Crane (Franna)	1	98
	Excavator (30t) + hydraulic hammer	1	122
	Loader (Front-end) (23t)	1	112
	Generator (diesel)	1	113
	Grader	1	115
	Scraper	1	116
	Truck (>20 Tonne)	2	107
	Truck (water cart)	2	108
	Vehicle (Light Commercial e.g. 4WD)	2	111
Bulk Earthworks	Backhoe	1	108
	Compactor	1	115
	Crane (Franna)	1	98
	Excavator (30t) + hydraulic hammer	1	122
	Loader (Front-end) (23t)	1	112
	Generator (diesel)	1	113
	Grader	1	115
	Scraper	1	116
	Truck (>20 Tonne)	2	107
	Truck (water cart)	2	108
	Vehicle (Light Commercial e.g. 4WD)	2	111

Construction activity	Indicative plant items	Quantity	Sound power level (per unit), dBL_{Aeq}
Construct / FRP Roundabout & Surrounding Roads	Asphalt Paver	1	112
	Backhoe	1	108
	Compactor	1	115
	Concrete Pump	1	109
	Concrete Pump Truck	1	113
	Crane (Truck Mounted)	1	108
	Excavator (30t) + hydraulic hammer	1	122
	Loader (Front-end) (23t)	1	112
	Generator (diesel)	1	113
	Grader	1	115
	Jack Hammer	1	121
	Roller (Vibrator)	1	112
	Roller (Smooth-drum)	1	107
	Pavement Laying Machine	1	114
	Truck (>20 Tonne)	1	107
	Truck (water cart)	2	108
	Vehicle (Light Commercial e.g. 4WD)	2	111
	Welder	1	110

Equipment sound power levels (L_w) have been sourced from AS2436 – 2010 Guide to noise and vibration control on construction, demolition and maintenance sites. It should be noted that during the different construction stages, it is unlikely that all machinery would be operating at the same time (like the modelling assumes), but taking a 'worse-case' scenario approach helps to identify where noise impacts could be a concern and assists in the design of mitigation measures.

Predicted construction noise levels, considering standard construction hours, are tabulated in Table 17. Noise levels have been compared to the receiver's relevant Noise Management Level and exceedances have been highlighted.

The magnitude of construction noise impacts is dependent upon several aspects including the intensity, location of activities and the type of equipment used during the construction period. Based on these factors, the predicted construction noise levels are generally conservative and do not represent a constant noise emission that would be experienced by the community on a daily basis throughout the project construction period. The predicted noise levels would only be experienced for limited periods of time when works are occurring and should not be experienced for full daytime or night-time periods.

It is also emphasised that all the equipment listed in Table 16 is not expected to operate continuously for 15-minutes and concurrently in reality.

Table 17: Predicted noise levels at nearest affected off-site receiver locations

Location	Distance to construction works (m)	NML, $dBL_{Aeq(15\ min)}$		Predicted sound level from each construction activity, $dBL_{Aeq(15\ min)}$		
		Noise affected	Highly noise affected	Lower existing Telstra services	Bulk Earthworks	Construct / FRP Roundabout & Surrounding Roads
R1	57	50	75	78	78	81
R2	200	50	75	71	71	74
R3	450	47	75	57	57	60

Location	Distance to construction works (m)	NML, $dBL_{Aeq(15\ min)}$		Predicted sound level from each construction activity, $dBL_{Aeq(15\ min)}$		
		Noise affected	Highly noise affected	Lower existing Telstra services	Bulk Earthworks	Construct / FRP Roundabout & Surrounding Roads

Note:

Predicted sound pressure level ≤ noise affected level

Noise affected level < predicted sound pressure level ≤ highly noise affected

Highly noise affected < predicted sound pressure level

Results show that construction noise is predicted to exceed 'noise affected' levels during standard hours for several receivers, with residential receiver R1 predicted to be "highly noise affected".

In general, construction works are temporary in nature therefore potential noise impact on the community and the surrounding environment will not be permanent or continuous. Where the predicted $L_{Aeq(15min)}$ noise level is greater than the noise management levels, all feasible and reasonable work practices should be applied. However, it is unlikely mitigation measures would reduce the received noise levels below the noise management levels in all cases.

4.6 Construction traffic

Table 18 outlines the expected traffic generated per day by the proposed roundabout construction as provided by the traffic consultant.

Table 18: Indicative construction traffic vehicle movements

Indicative month	Stage 1	Stage 2
September 2022	70	-
October 2022	100	-
November 2022	150	-
December 2022	90	100
January 2023	-	150
February 2023	-	150
March 2023	-	150
April 2023	-	190

It is noted from Table 18 that the maximum amount of traffic generated by construction activities is around 190 vehicle movements per day across both construction stages. Advice has been given by the traffic consultant that 50% of the daily vehicle movements will consist of heavy vehicles.

Table 19 presents the existing day-time traffic volume of the Princes Highway, along with the potential increase in traffic noise caused by the proposed construction activity.

Table 19: Construction traffic assessment due to roundabout construction

	Light vehicles	Heavy vehicles	Total
Existing Princes Highway volume (15 hour day)	5637	985	6623
Traffic generated by roundabout construction	95	95	190
Potential increase in traffic noise level due to development, dBA	**0.10**	**0.40**	**0.50**

As the potential in traffic noise level due to construction traffic generated is less than 2 dB, the proposed construction activity can be considered as a relatively minor impact that would not significantly affect the existing environment.

4.7 Construction vibration

The nearest off-site vibration sensitive receiver locations are presented in Table 20.

Table 20: Nearest off-site vibration receivers

ID	Description	Type of receiver	Approx. distance from structure to nearest works location, m
R1	38 Pear Tree Place, Moruya	Residential	57
R2	2945 Princes Highway, Moruya	Residential	200

4.7.1 Vibration – minimum working distances

Recommended minimum working distances for vibration intensive plant, which are based on international standards and guidance, are provided in Table 21. Minimum working distances are quoted for:

- Cosmetic damage (based on the British Standard 7385 [5])
- Human comfort (based on the DECCs 'Assessing Vibration; a technical guideline' [4])

Table 21: Recommended minimum working distances for vibration intensive equipment

Plant item	Rating / description	Minimum working distance (m)			
		Cosmetic damage – screening criteria			Human response DECC Guideline
		Industrial and heavy commercial buildings BS 7385 Line 1 -25 mm/s (see note 2)	Residential and light commercial buildings BS 7385 Line 2 - 7.5 mm/s (See note 2)	Unsound structures DIN 4150 Line 3 - 3 mm/s	
Vibratory roller	< 50 kN (~ 1 to 2t)	2	5	11	15 to 20
	< 100 kN (~ 2 to 4t)	2	6	13	20
	< 200 kN (~ 4 to 6t)	5	12	26	40
	< 300 kN (~ 7 to 13t)	6	15	31	100
	> 300 kN (~ 13 to 18t)	8	20	40	100
	> 300 kN (> 18t)	10	25	50	100
Jackhammer	Hand-held	1 (nominal)	1 (nominal)	3	5
Truck movements	-	-	-	-	10

Notes:

1. Based on TRL document [12] using Godio et al formula, equation 24
2. Where vibration might give rise to resonant responses in structures

4.7.2 Vibration assessment

Noting the minimum working distances in Table 21 and the distance to the nearest sensitive receiver locations (as detailed in Table 20), it is not expected that construction activities to result in vibration impacts upon the nearest residential receivers. However, receiver R1 may be impacted from a human comfort

perspective depending on the plant item (i.e. if vibratory rollers >= 7 t or large hydraulic hammers are used during the works).

During development of the detailed Construction Noise and Vibration Management Plan an investigation of vibration impact upon nearby sensitive receivers should take place. It is expected that vibration monitoring will be required under the CNVMP.

4.8 Construction noise and vibration mitigation

Noise mitigation measures for each major construction activity are discussed in the following sections. These mitigation measures are considered to represent 'feasible and reasonable' mitigation measures suitable for implementation during construction of the project.

4.8.1 Construction noise and vibration management plan

For all construction works, the contractor would be expected to prepare a detailed Construction Noise and Vibration Management Plan (CNVMP). This plan should include but not be limited to the following:

- Roles and responsibilities
- Noise and vibration sensitive receiver locations
- Areas of potential impact
- Mitigation strategy
- Monitoring methodology
- Community engagement strategy.

General guidance on the control of construction noise and vibration impacts relevant to this study are discussed in the following sections.

4.8.2 General

In general, practices to reduce construction noise impacts will be required, and may include;

- Adherence to the standard approved working hours as outlined in the Project Approval.
- Manage noise from construction work that might be undertaken outside the recommended standard hours
- The location of stationary plant (concrete pumps, air-compressors, generators, etc.) as far away as possible from sensitive receivers
- Using site sheds and other temporary structures or screens/hoarding to limit noise exposure where possible.
- Sealing of openings in the building (temporary or permanent) prior to commencement of internal works to limit noise emission.
- The appropriate choice of low-noise construction equipment and/or methods
- Modifications to construction equipment or the construction methodology or programme. This may entail programming activities to occur concurrently where a noisy activity will mask a less noisy activity, or, at different times where more than one noisy activity will significantly increase the noise. The programming should also consider the location of the activities due to occur concurrently.
- Carry out consultation with the community during construction including, but not limited to; advance notification of planned activities and expected disruption/effects, construction noise complaints handling procedures.

4.8.3 Universal work practices

The following noise mitigation work practices are recommended to be adopted at all times on site:

- Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways to minimise noise.
- Site managers to periodically check the site and nearby residences for noise problems so that solutions can be quickly applied.
- Avoid the use of radios or stereos outdoors.
- Avoid the overuse of public address systems.
- Avoid shouting and minimise talking loudly and slamming vehicle doors.
- Turn off all plant and equipment when not in use.

4.8.4 Vibration – minimum working distances

- Recommended minimum working distances for vibration intensive plant, which are based on international standards and guidance, are provided in Table 21.

5. Conclusion

Arup has completed a noise and vibration assessment in support of a REF application for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

Regarding operations, no operational noise sources and traffic impacts are expected from the project.

Regarding the construction works, the proposed activities are predicted to exceed of the relevant noise management levels at the nearest most affected receivers. Accordingly, mitigation and management procedures will need to be considered for the works. Receiver R1 is predicted to be considered as a 'Highly noise affected' receiver during some activities, due to the proximity of the receiver to the construction area. The assessment however represents a 'worst case scenario' of all construction machinery operating continuously and concurrently, which is not expected to occur in practice.

Vibration impact to structures is not expected from the construction works. Exceedance of the human comfort criteria may occur at Receiver R1 dependent of the use and size of vibratory roller. The duration of impact is not expected to be prolonged.

A detailed Construction Noise and Vibration Management Plan (CNVMP) for the project should be prepared, in which specific attention should be given to mitigating and managing potential impacts upon the surrounding receiver locations. It is expected that the detailed CNVMP would be prepared by the contractor prior to the commencement of works.

References

[1] NSW Government, “State Environmental Planning Policy (Transport and Infrastructure) 2021,” 2021.

[2] Department of Environment, Climate Change and Water NSW, “NSW Road Noise Policy,” NSW Environmental Protection Authority, Sydney, 2011.

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[4] Department of Environment and Conservation (NSW), “Assessing Vibration: A technical guideline,” Department of Environment and Conservation (NSW), Sydney, 2006.

[5] Bristish Standard Institution, “BS 7385-2: 1993 Evaluation and measurement for vibration in buildings - Pt 2: Guide to damage levels from groundborne vibration,” Bristish Standard Institution, London, 1993.

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[10] UK National Grid, “T/SP/SSW/22 Specification for Safe Working in the Vicinity of National Grid High Pressure Gas Pipelines and Associated Installations – Requirements for Third Parties,” UK National Grid, 2006.

[11] Deustsches Institut fur Normung, “DIN4150-3 (2016) Vibrations in buildings - Part 3: Effects on structures, English translation,” DIN-Normen, Berlin, 2016.

[12] C. H. D and G. I. Miller, “Transport Reseach Laboratory (TRL), GroundBorne vibration caused by mechanised construction works,” 2000.

[13] NSW Environment Protection Authority, “NSW Noise Policy for Industry,” EPA, Sydney, 2017.

Appendix A

Acoustic Terminology

Ambient Noise Level

The ambient noise level is the overall noise level measured at a location from multiple noise sources. When assessing noise from a particular development, the ambient noise level is defined as the remaining noise level in the absence of the specific noise source being investigated. For example, if a fan located on a city building is being investigated, the ambient noise level is the noise level from all other sources without the fan running. This would include sources such as traffic, birds, people talking and other nearby fans on other buildings.

Background Noise Level

The background noise level is the noise level that is generally present at a location at all or most times. Although the background noise may change over the course of a day, over shorter time periods (e.g. 15 minutes) the background noise is almost-constant. Examples of background noise sources include steady traffic (e.g. motorways or arterial roads), constant mechanical or electrical plant and some natural noise sources such as wind, foliage, water and insects.

Assessment Background Level (ABL)

A single-number figure used to characterise the background noise levels from a single day of a noise survey. ABL is derived from the measured noise levels for the day, evening or night time period of a single day of background measurements. The ABL is calculated to be the tenth percentile of the background L_{A90} noise levels – i.e. the measured background noise is above the ABL 90% of the time.

Rating Background Level (RBL / $minL_{A90,1hour}$)

A single-number figure used to characterise the background noise levels from a complete noise survey. The RBL for a day, evening or night time period for the overall survey is calculated from the individual Assessment Background Levels (ABL) for each day of the measurement period, and is numerically equal to the median (middle value) of the ABL values for the days in the noise survey. This parameter is denoted RBL in NSW, and $minL_{A90,1hour}$ in QLD.

Decibel

The decibel scale is a logarithmic scale which is used to measure sound and vibration levels. Human hearing is not linear and involves hearing over a large range of sound pressure levels, which would be unwieldy if presented on a linear scale. Therefore a logarithmic scale, the decibel (dB) scale, is used to describe sound levels.

An increase of approximately 10 dB corresponds to a subjective doubling of the loudness of a noise. The minimum increase or decrease in noise level that can be noticed is typically 2 to 3 dB.

dB(A)

dB(A) denotes a single-number sound pressure level that includes a frequency weighting (“A-weighting”) to reflect the subjective loudness of the sound level.

The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A).

Some typical dB(A) levels are shown below.

Sound Pressure Level dB(A)	Example
130	Human threshold of pain
120	Jet aircraft take-off at 100 m
110	Chain saw at 1 m
100	Inside nightclub

Sound Pressure Level dB(A)	Example
90	Heavy trucks at 5 m
80	Kerbside of busy street
70	Loud stereo in living room
60	Office or restaurant with people present
50	Domestic fan heater at 1m
40	Living room (without TV, stereo, etc)
30	Background noise in a theatre
20	Remote rural area on still night
10	Acoustic laboratory test chamber
0	Threshold of hearing

L_{90}

The L_{90} statistical level is often used as the "average minimum" or "background" level of a sound level that varies with time.

Mathematically, L_{90} is the sound level exceeded for 90% of the measurement duration. As an example, 45 dB $L_{A90,15min}$ is a sound level of 45 dB(A) or higher for 90% of the 15 minute measurement period.

L_{eq}

The 'equivalent continuous sound level', L_{eq}, is used to describe the level of a time-varying sound or vibration measurement.

L_{eq} is often used as the "average" level for a measurement where the level is fluctuating over time. Mathematically, it is the energy-average level over a period of time (i.e. the constant sound level that contains the same sound energy as the measured level). When the dB(A) weighting is applied, the level is denoted dB $L_{Aeq.}$ Often the measurement duration is quoted, thus $L_{Aeq,15\ min}$ represents the dB(A) weighted energy-average level of a 15 minute measurement.

L_{max}

The L_{max} statistical level can be used to describe the "absolute maximum" level of a sound or vibration level that varies with time.

Mathematically, L_{max} is the highest value recorded during the measurement period. As an example, 94 dB L_{Amax} is a highest value of 94 dB(A) during the measurement period.

Since L_{max} is often caused by an instantaneous event, L_{max} levels often vary significantly between measurements.

Frequency

Frequency is the number of cycles per second of a sound or vibration wave. In musical terms, frequency is described as "pitch". Sounds towards the lower end of the human hearing frequency range are perceived as "bass" or "low-pitched" and sounds with a higher frequency are perceived as "treble" or "high pitched".

Sound Power and Sound Pressure

The sound power level (L_w) of a source is a measure of the total acoustic power radiated by a source. The sound pressure level (L_p) varies as a function of distance from a source. However, the sound power level is an intrinsic characteristic of a source (analogous to its mass), which is not affected by the environment within which the source is located.

Vibration

Waves in a solid material are called “vibration”, as opposed to similar waves in air, which are called “sound” or “noise”. If vibration levels are high enough, they can be felt; usually vibration levels must be much higher to cause structural damage.

A vibrating structure (eg a wall) can cause airborne noise to be radiated, even if the vibration itself is too low to be felt. Structureborne vibration limits are sometimes set to control the noise level in a space.

Vibration levels can be described using measurements of displacement, velocity and acceleration. Velocity and acceleration are commonly used for structureborne noise and human comfort. Vibration is described using either metric units (such as mm, mm/s and mm/s^2) or else using a decibel scale

Appendix B

Noise Monitoring Methodology

B.1 Noise monitoring

B.1.1 Equipment

Unattended and attended monitoring was carried out using the following equipment:

Table 22: Monitoring equipment details

Measurement location	Equipment/model	Serial No.	SLM Type
L1	ARL Ngara	8780A2	Class 1
L2	ARL Ngara	878002	Class 1
Short term measurements S1	B&K 2270	2754328	Class 1

Notes: All meters comply with AS IEC 61672.1 2004 “Electroacoustics - Sound Level Meters” and are designated either Class 1 or Class 2 as per Table 22, and are suitable for field use.

The equipment was calibrated prior and subsequent to the measurement period using a Bruel & Kjaer Class 4231 calibrator. No significant drift in calibration was observed.

B.1.2 Equipment

In accordance with the NPfI, any noise monitoring conducted during periods of extraneous weather conditions was excluded from the data set. The NPfI advises that data may be affected where adverse weather, such as wind speeds higher than 5 m/s or rain, occurs. During the measurement period for this assessment, periods of adverse weather occurred during three daytime periods. This was confirmed by using weather data from the Bureau of Meteorology’s (BOM) Moruya Airport automated weather station.

B.1.3 Equipment

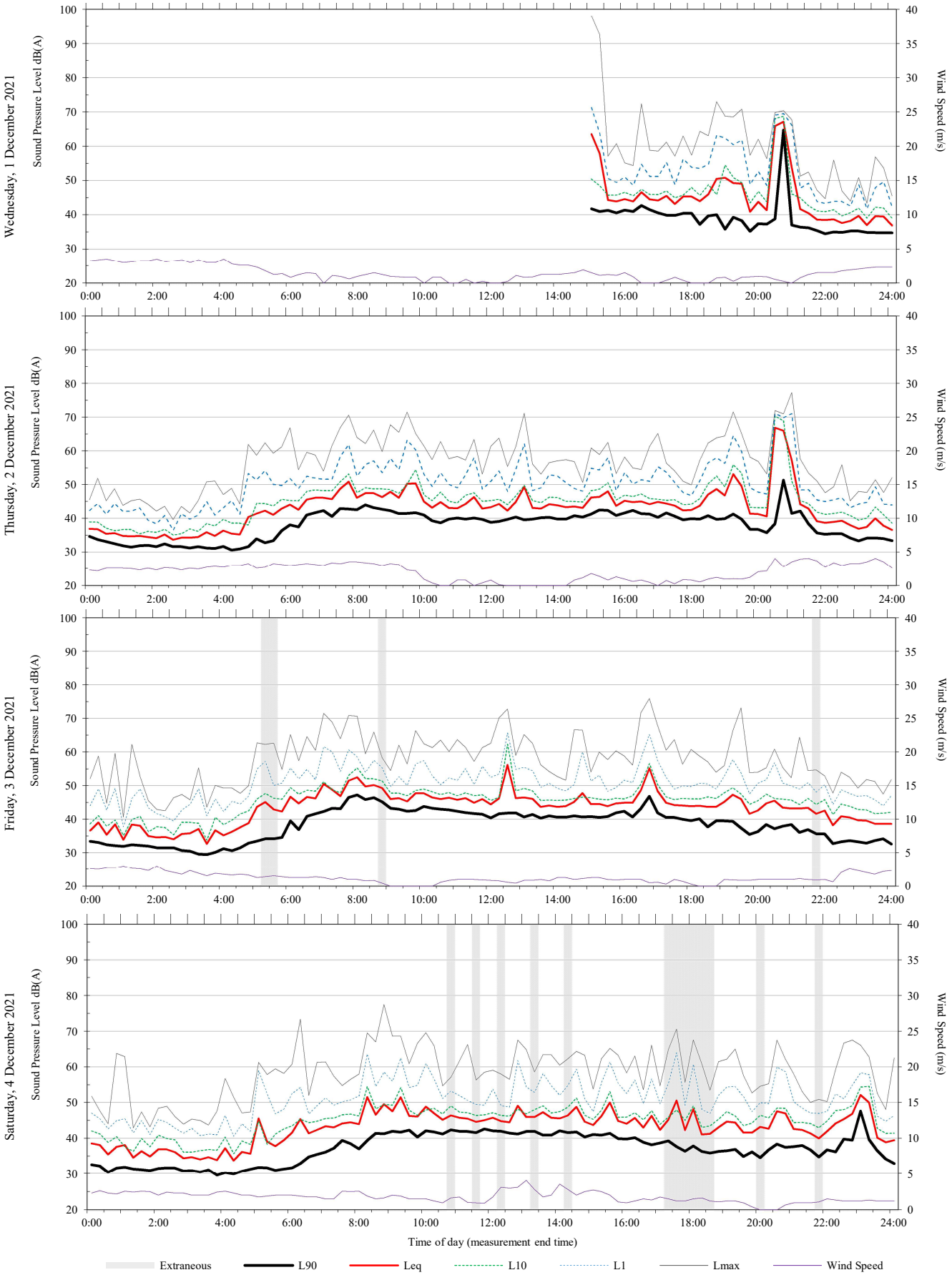
Long-term noise monitoring was carried out by Arup from Wednesday, 1 December 2021 to Monday 12 December 2021. Monitoring was conducted in accordance with Appendix B1 of the NSW *Noise Policy for Industry* (NPfI) [13]. The NPfI separates the 24-hour day into three different time periods – day, evening and night, as detailed below in Table 23.

Table 23: Standard NPfI time periods

Period	Day of Week	Time period
Day	Monday-Saturday Sunday, Public Holidays	7:00 am-6:00 pm 8:00 am-6:00 pm
Evening	Monday-Sunday	6:00 pm -10:00 pm
Night	Monday-Saturday Sunday, Public Holidays	10:00 pm -7:00 am 10:00 pm -8:00 am

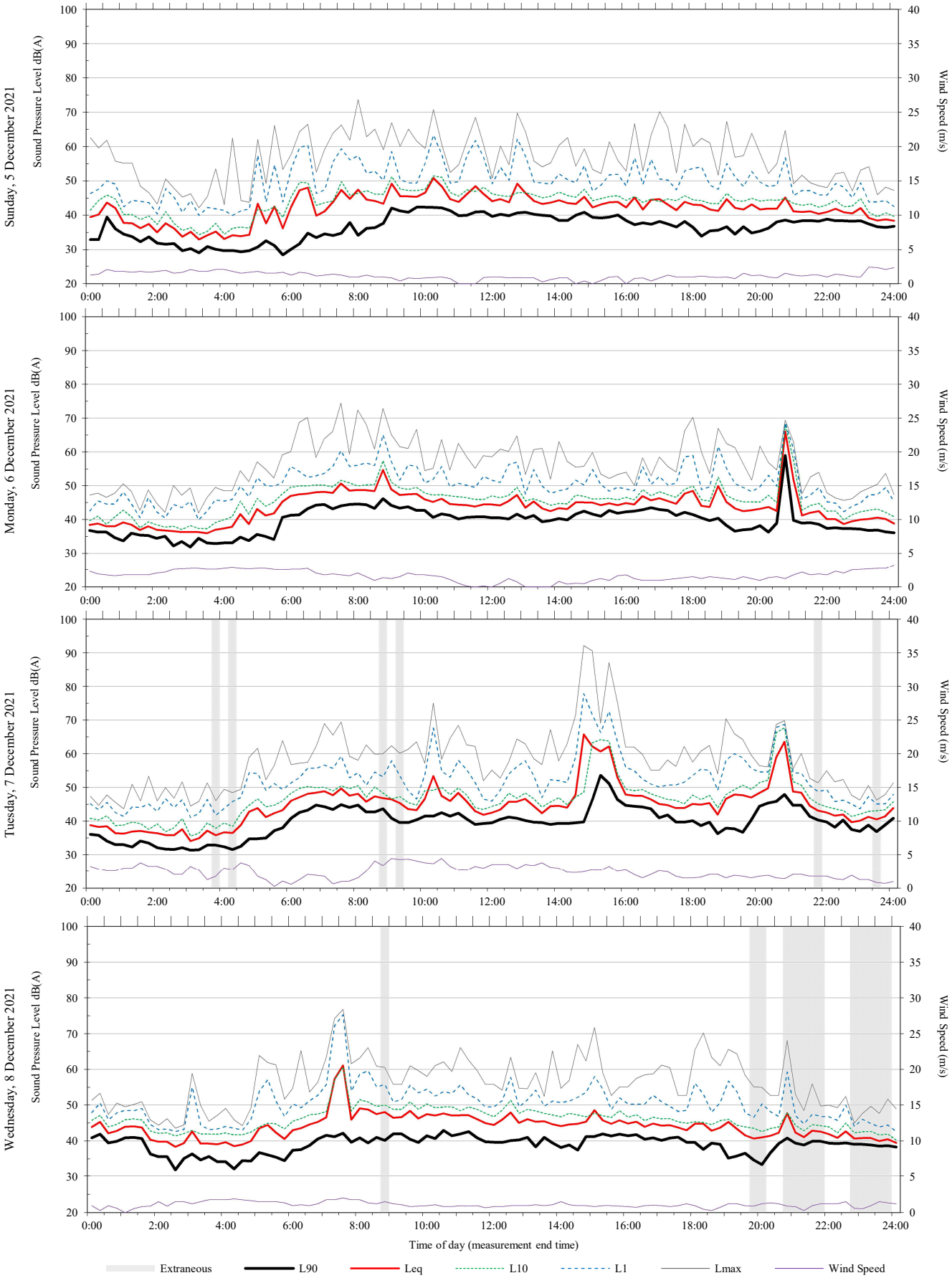
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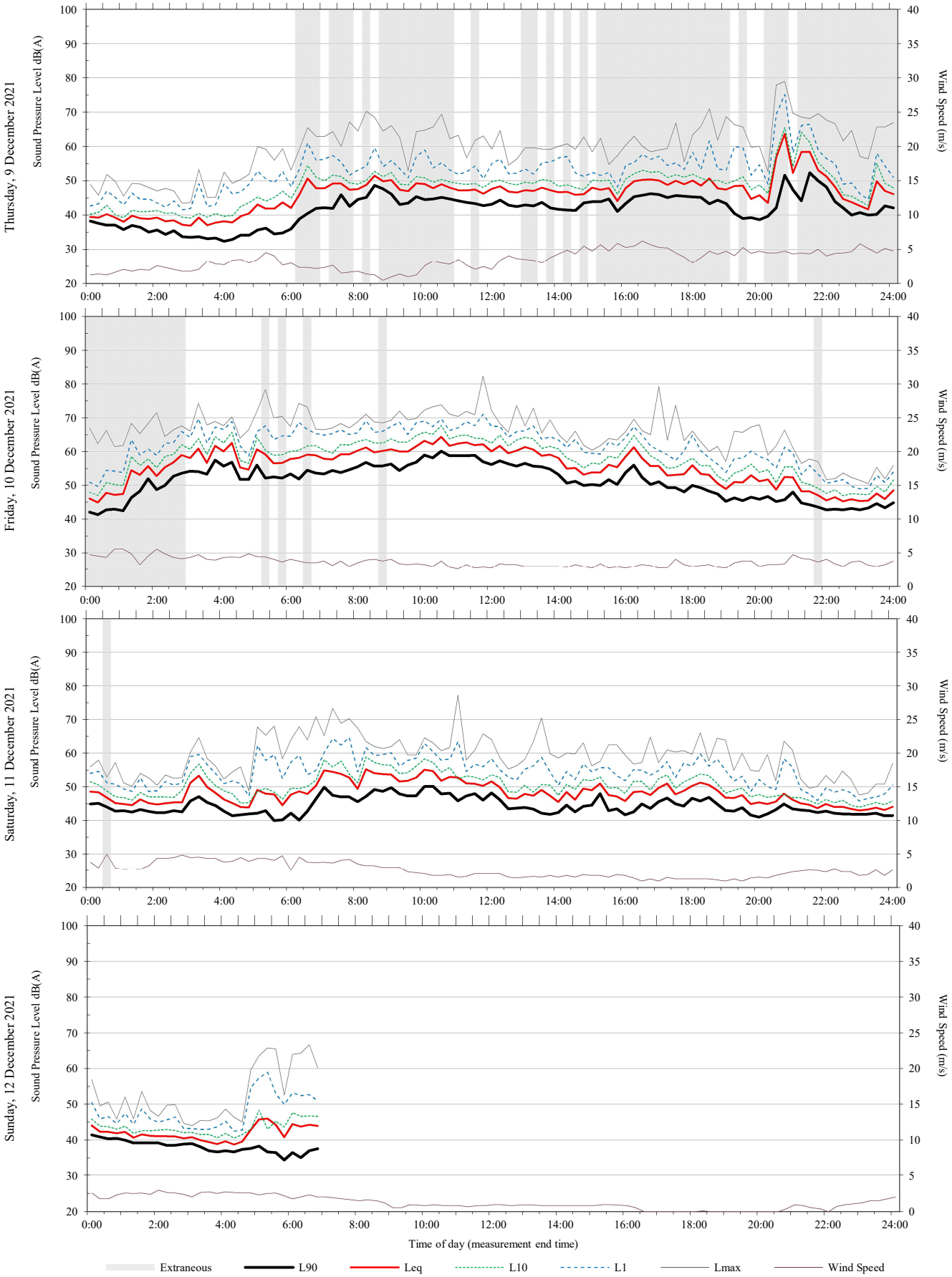
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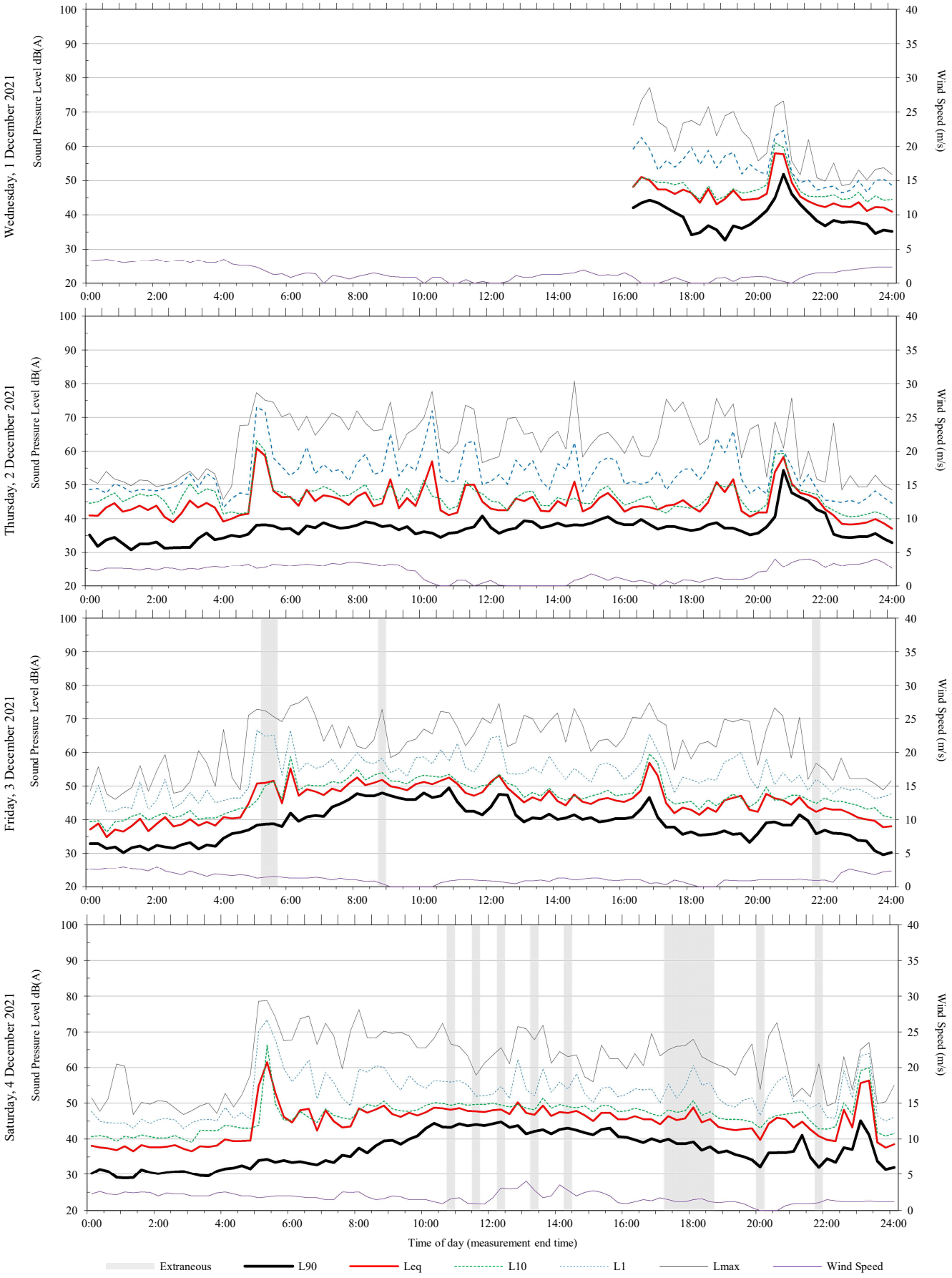
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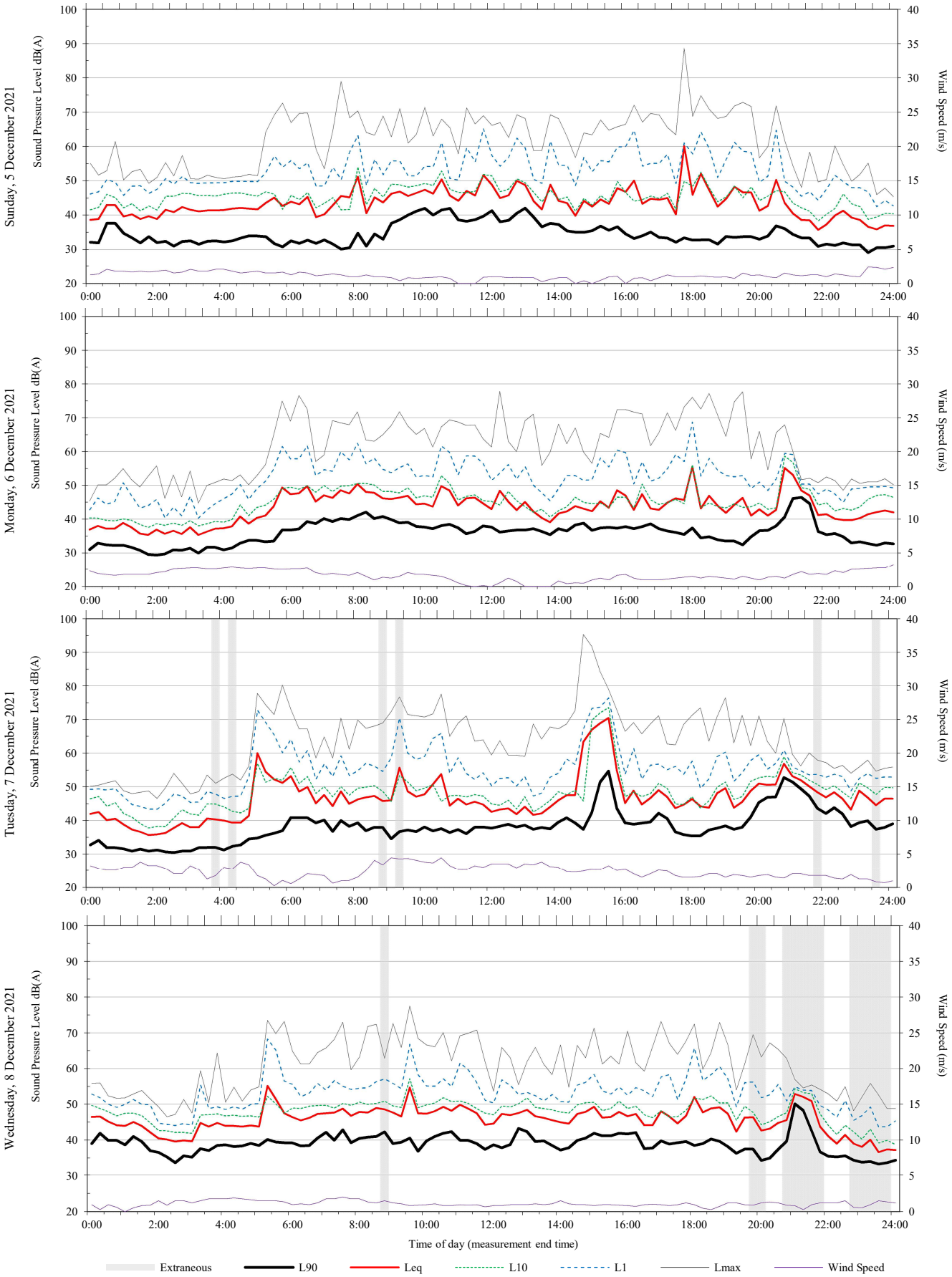
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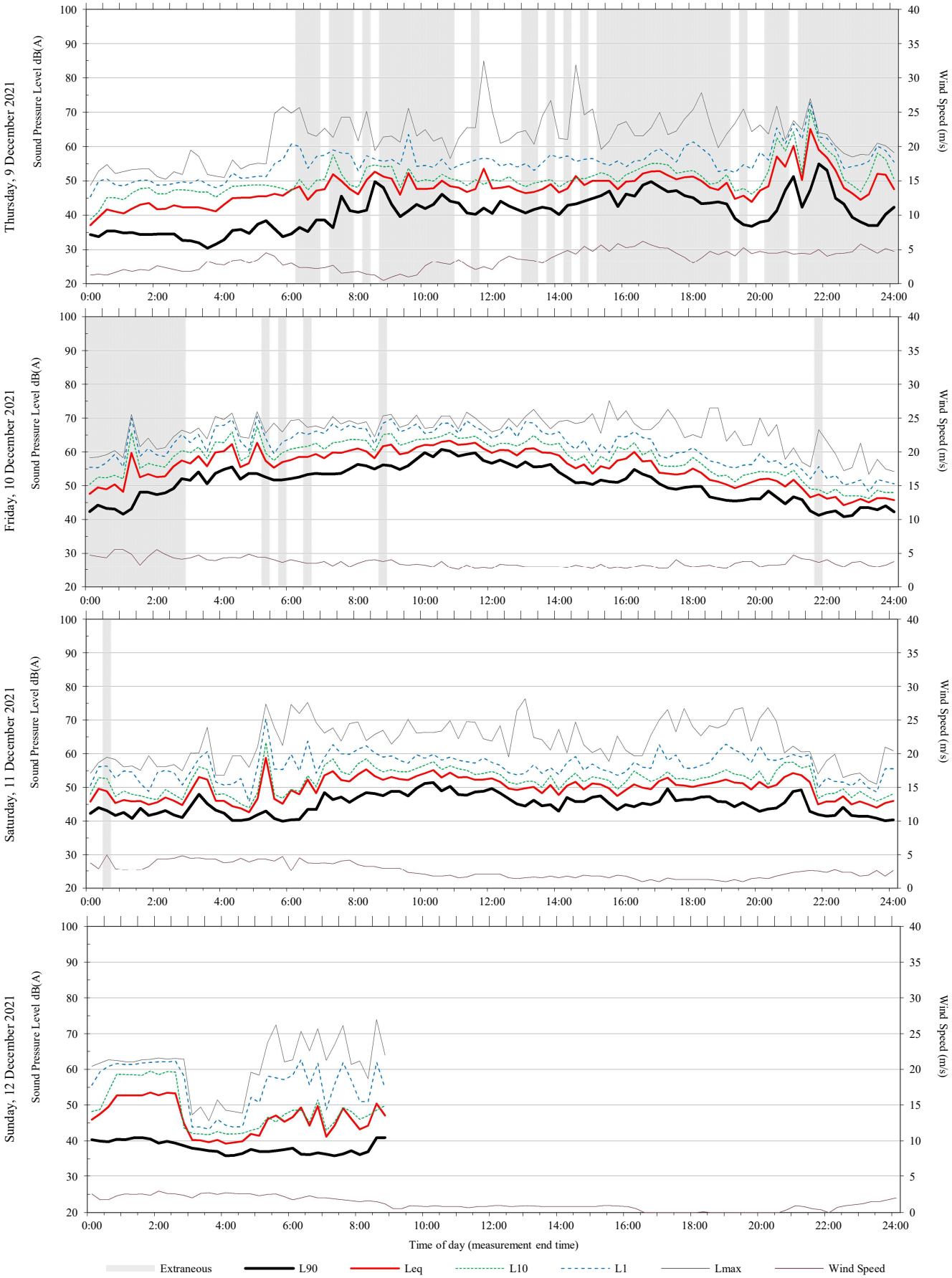
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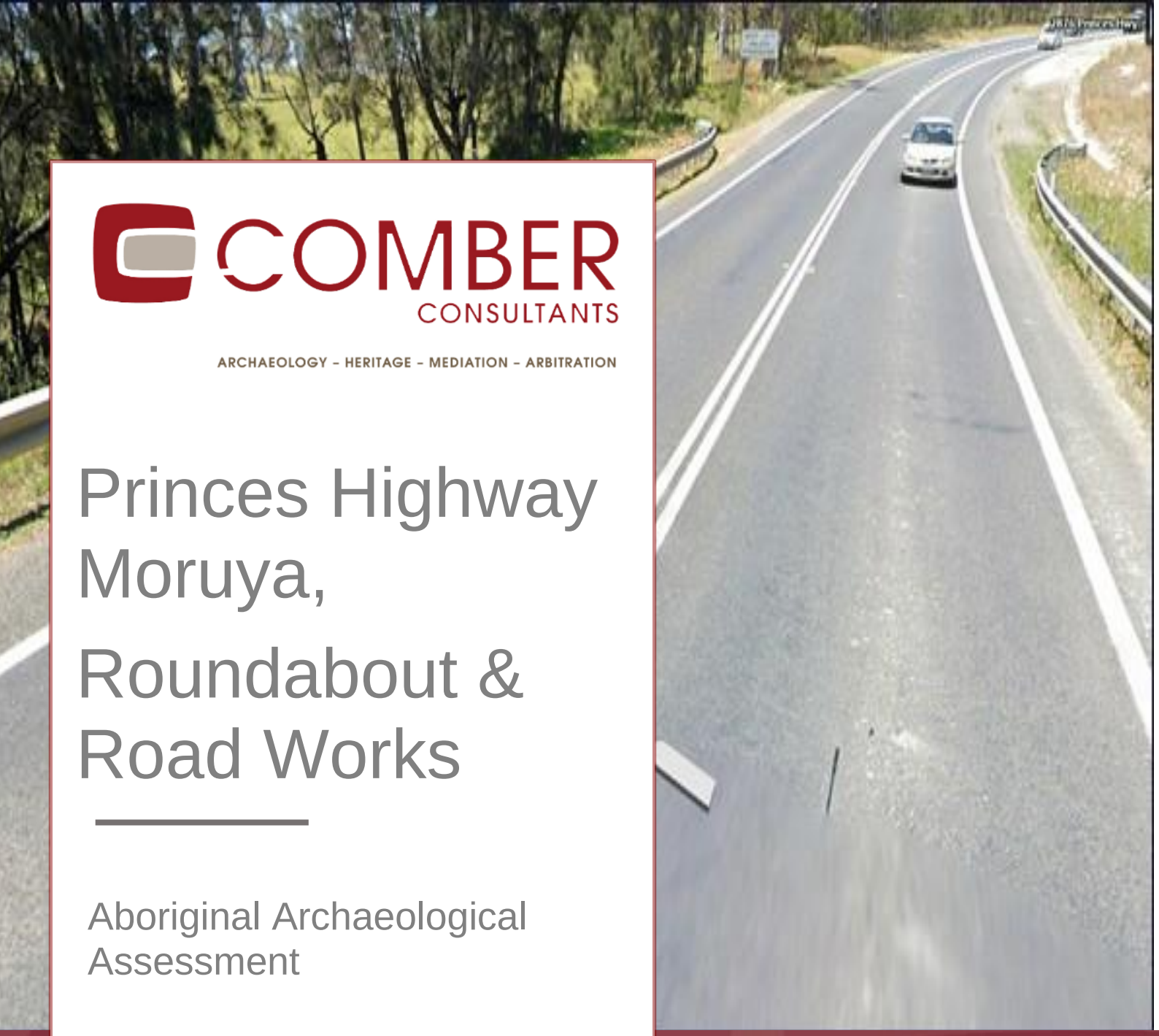
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Unattended monitoring: (Free Field)

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COMBER CONSULTANTS

ARCHAEOLOGY – HERITAGE – MEDIATION – ARBITRATION

Princes Highway Moruya, Roundabout & Road Works

Aboriginal Archaeological Assessment

12th MAY 2022

Report to: Health Infrastructure NSW

LGA: Eurobodalla Shire

Version: C.2022

ABN 96 109 670 573 | 76 EDWIN STREET NORTH | CROYDON, NSW, 2132 | T 02 9799 6000 | F 02 9799 6011 www.comber.net.au

DOCUMENT CONTROL

PROJECT NO: NH407 **STATUS:** FINAL

REV	DATE	PREPARED	EDITED	APPROVED
A	14/04/2022	Dr Jillian Comber	David Nutley	Dr Jillian Comber
B	18/04/2022	Dr Jillian Comber	David Nutley	Dr Jillian Comber
C	12/05/2022	Dr Jillian Comber	David Nutley	Dr Jillian Comber

ACKNOWLEDGEMENTS

Comber Consultants would like to thank:

- Lee-Anne Parsons, Michelle Davis, Ellis Davis and Christopher Brierley from the Cobowra Local Aboriginal Land Council for their assistance and generosity in sharing information about the site and the Moruya area.
- Also, Ash McGowan, Project Manager, Root Partnership for her assistance in providing maps, explaining the project and general support.

INTEGRATED MANAGEMENT SYSTEM

Comber Consultants has a certified integrated management system to the requirements of ISO 9001 (quality), ISO 14001 (environmental) and ISO 45001 (health and safety). This is your assurance that Comber Consultants is committed to excellence, quality, and best practice and that we are regularly subjected to rigorous, independent assessments to ensure that we comply with stringent Management System Standards.

EXECUTIVE SUMMARY

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

To ensure that the Aboriginal archaeological significance of the project area is not adversely impacted upon by this proposal and to meet planning requirements, Comber Consultants have been commissioned to undertake this Aboriginal Archaeological Assessment in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2010).

This report has determined that the area of the proposed works does not include any Aboriginal archaeological or cultural significance. It does not contain any Aboriginal objects and is not an Aboriginal place. Therefore, there are no constraints upon construction of the roundabout and associated works in respect of Aboriginal heritage. However, please refer to the following recommendations:

Recommendation 1: Induction
An Aboriginal heritage induction should be provided to all employees, contractors and subcontractors engaged in the road construction on the significance of the Aboriginal heritage, that it an offence to harm Aboriginal objects and be advised of their responsibilities under the *National Parks and Wildlife Act 1974* in respect of Aboriginal heritage.

Recommendation 2: Unexpected Finds and Human Remains Procedure
If any Aboriginal objects are unexpectedly uncovered during the redevelopment of the site, all work must cease in the vicinity of the object and an area of at least one metre around the Aboriginal objectsecured and cordoned off using fencing and/or appropriate barriers. The archaeological consultant must be immediately contacted for further advice. The consultant will assess the object and provide further advice. In addition, the consultant will liaise with the Registered Aboriginal Parties. No-one should enter the secured area and work can only recommence when advised by the consultant.

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1 INTRODUCTION

1.1. Background

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

To ensure that the Aboriginal archaeological significance of the project area is not adversely impacted upon by this proposal and to meet planning requirements, Comber Consultants have been commissioned to undertake this Aboriginal Archaeological Assessment in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2010).

1.2. Location and description

The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot **2**, DP1281576 , a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north is a small residential subdivision called Mynora Estate.

The location of Moruya is shown in Figure 1 and the approximate location of the roundabout is shown in Figure 2 below.



Figure 1: Location map

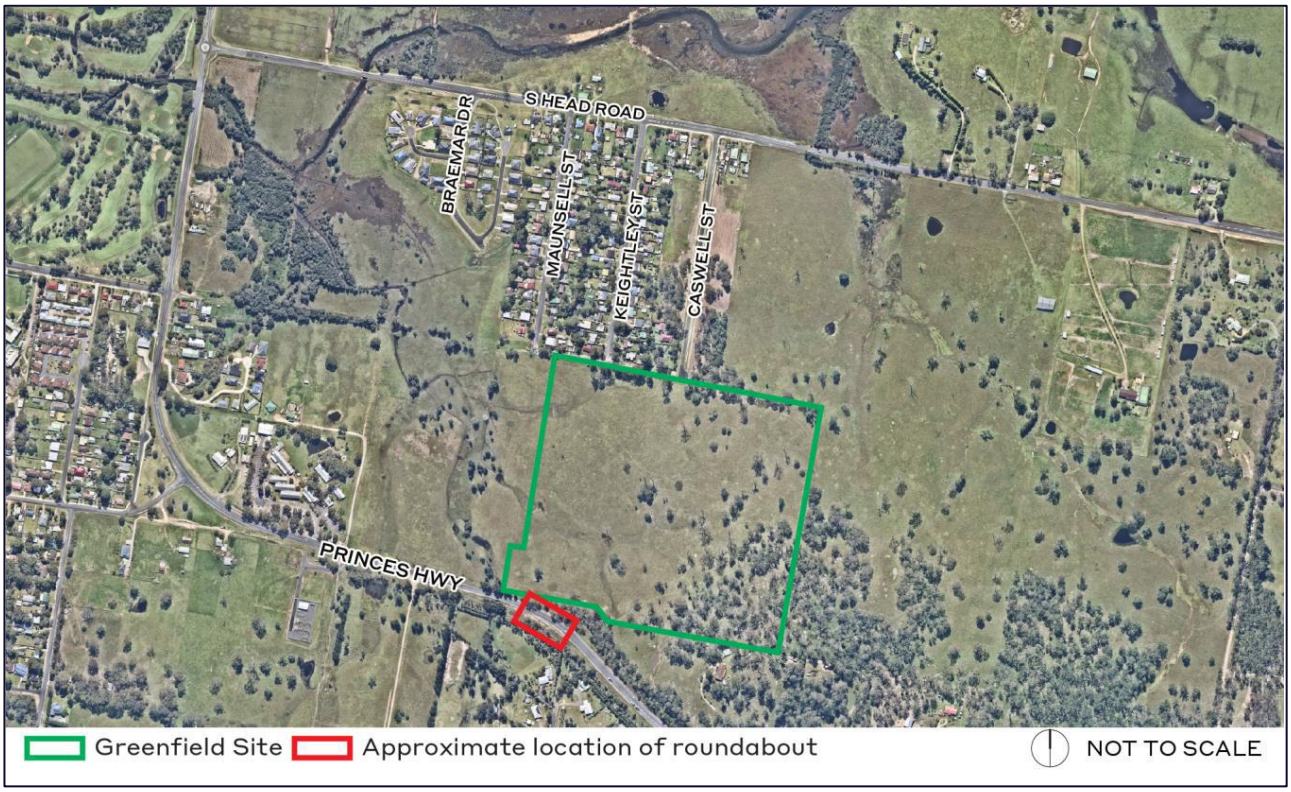


Figure 2: Approximate location of proposed works

1.3. Proposed Works

The works proposed under the REF include the following:

- Construction of a new roundabout located on the Princes Highway.
- Ancillary road and public domain works.
- Ancillary electricity reticulation and street lighting.

A further detailed description of the proposed works is contained in the Review of Environmental Factors report prepared by Ethos Urban.

2 METHODOLOGY

This project was conducted in three stages, being background research, field survey and report preparation, as detailed below.

Stage 1: Background Research

Prior to the field component of this project, the Aboriginal Heritage Information Management System (AHIMS) of the Department of Planning and Environment (Heritage NSW) was searched on 17/05/2021. A copy is attached at Appendix A. Site data, associated documents and archaeological reports held by AHIMS were reviewed. Environmental information relating to Aboriginal land use was also researched. Such research facilitated an understanding of the potential nature of sites and site patterning in the region, which enabled a predictive statement to be made. It also provided an archaeological and environmental context within which a significance assessment could be made, if any Aboriginal sites were located during the field survey.

Stage 2: Site Inspection

The archaeological site inspection was undertaken on 3-4 June 2021. The site inspection was undertaken by the following:

Comber Consultants:

- Dr Jillian Comber
- David Nutley
- Glenn Suey
- Chris Jones

Cobowra Local Aboriginal Land Council:

- Michelle Davis
- Ellis Davis
- Christopher Brierley

Stage 3: Report Preparation

Further archaeological research was conducted, where necessary, to clarify the results of the survey. This report was then prepared and provided to Root Partnership, Health Infrastructure NSW and the Cobowra Local Aboriginal Land Council.

3 LEGISLATION

3.1. National Parks & Wildlife Act 1974

The National Parks & Wildlife Act 1974 (NPW Act) provides statutory protection to all Aboriginal sites within New South Wales. Heritage NSW is the State Government agency responsible for the implementation and management of this Act.

Part 6 of the National Parks & Wildlife Act states that it is an offence to harm or desecrate an Aboriginal object or Aboriginal place, without an Aboriginal Heritage Impact Permit (AHIP). An Aboriginal object is defined as:

"Any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction and includes Aboriginal remains".

An Aboriginal Place is defined as*:*

"A place that, in the opinion of the Minister, is or was of special significance with respect to Aboriginal culture, to be an Aboriginal place for the purposes of this Act".

As the study area does not contain Aboriginal objects or archaeological significance and is not an Aboriginal Place an AHIP will not be required.

4 ABORIGINAL CONSULTATION

Aboriginal culture is dynamic and continuous. It includes the tangible and intangible and links people over time to their community and land. It is important to recognise that Aboriginal people have the right to protect, preserve and promote their cultural heritage. In recognition of that right, the Cobowra Local Aboriginal Land Council were invited to participate fully in the assessment.

The study area falls within Walbunga country and is within the boundaries of the Cobowra Local Aboriginal Land Council (CLALC). Prior to the site inspection Jillian Comber discussed the project with Lee-Anne Parsons of the CLALC and plans and maps were sent to the CLALC. The following representatives of the CLALC attended the site inspection and provide invaluable advice and information:

- Michelle Davis
- Ellis Davis
- Christopher Brierley

The Cobowra Local Aboriginal Land Council advised that they have no objections to the proposed roundabout and road works.

5 ENVIRONMENTAL CONTEXT

5.1. Topography

The study area is located 1.6 km east of Moruya's town centre and 1.3 km south of the Moruya River. The location for the proposed roundabout is within an existing road reserve. To the north of the study area, a seasonal creek leads into a swamp along the right bank of Racecourse Creek, which is a major tributary of the Moruya River.

5.1. Geology and soils

The local lithology is characterised by Devonian granite, exposed in valleys incised through Permian siltstone and silty sandstone, elevation about 170m (Mitchell 2002: 116). The study area is located within a coastal lowlands system developing along the right bank of the Moruya River. This system is characterised by rolling to undulating terrain described as the Moruya Channels and Floodplains Landscape (MCF) (Mitchell 2002:126). According to Mitchell (2002:126), the MCF landscape is defined by:

Channel, floodplain, and terraces of the deep, narrow valley of Quaternary alluvium of the Moruya and Deua Rivers from the coast to the base of the Great Escarpment. Uniform sands and loamy sands on the active floodplain, gradational loams, and sandy loams on the first terrace and brown texture-contrast soils on higher terraces. Limited areas of abandoned channel and swamp.

5.2. Vegetation and wildlife

According to the Mitchell (2002) landscape descriptions, endemic vegetation throughout the study area would have comprised:

Gallery forest of river oak (Casuarina cunninghamiana) along the main channel, tall forest of river peppermint (Eucalyptus elata) on the floodplains with rough-barked apple (Angophora floribunda) and Acacia sp., understorey. … Small patches of temperate rainforest with sassafras (Doryphora sassafras) and lilly pilly (Acmena smithii) in gully heads and as a gallery forest along major streams in sheltered locations.

Such vegetation communities would have provided a variety of edible plant species and plants suitable for artefact manufacture. They would have also sustained a diverse fauna including a variety of marsupials, which would have provided a sustainable food resource. The proximity to fresh water also determines the availability of further food resources such as fish and possibly eels.

5.3. Land use and disturbance

The town of Moruya was gazetted in 1851 and an informal track led south from Moruya along the current route of the Princes Highway. In 1950 it was finally bitumenised and a permanent concrete bridge built across the Moruya River in 1966. The Princes Highway upgrade and construction of the roundabout will be within the existing road reserve first developed in the second half of the 19th century.

6 ARCHAEOLOGICAL BACKGROUND

6.1. Moruya

Archaeological survey, assessment and testing as part of development consulting projects have been undertaken in the Moruya area since the late 1970s with the quantity of works notably increasing in the 1990s and 2000s (for an exhaustive summary of works prior to 2004 see Dibden 2005). The vast majority of Aboriginal sites recorded and studied in the local area reveal broadly similar parameters. The sites are usually represented by artefact scatters and subsurface archaeological deposits of Aboriginal stone tools. Artefact concentrations are of various density determined by microregional specifics such as landform, land use and disturbance. Midden sites are usually located on coastal headlands.

More recently, Williams (2005) undertook subsurface probing at Bangalay Estate, Moruya Heads. This site is located c. 2.5 km east of the study area. It was surveyed in 2003 and test-excavated in 2005. It is located on a similar landform to the general locality of the current study area. Williams excavated 88, 250x250 mm test pits (c. 5.5 m^2) which yielded 590 Aboriginal stone artefacts, indicating concentrations exceeding 93 artefacts per m^2. The highest densities were identified on flat to gently sloping ridge saddles.

In 2006 Dibden undertook an archaeological assessment for a proposed residential subdivision at Lot 69, DP 752151, South Head Road, Moruya. This property is located to the north-east of the current study area. The initial site survey of this property was undertaken by Dr Julie Dibden in October 2006 and revealed a vegetated agricultural land with minimal ground surface visibility. While no Aboriginal artefacts were identified on the ground surface, four areas, were identified as archaeologically sensitive for the likely presence of subsurface archaeological deposits. A program for subsurface archaeological testing was recommended as a result of this assessment.

In 2007 the Lot 69 which had been assessed by Dibden (2006) was test-excavated by AHMS (2007). This was a machine excavation using a mechanical excavator with a 1 m flat bucket. Test pits were laid out in transects across the project area and excavated in 100 mm mechanical layers.

Eighteen test pits were excavated down to basal clay which revealed a heavily disturbed soil profile with evident traces of ploughing down to the basal clay. 293 definite and probable Aboriginal artefacts were recovered comprising items of quartz (34.8%), silcrete (26.3%), tuff (14.3%) and chert (5.8%), plus a mixture of other materials such as volcanic rocks, FGS, qartzite and agate (6.8%). The assemblage was dominated by broken flakes as residue of the stone tool production process (aka 'knapping', or 'debitage'). Nevertheless, some complete flakes and cores were also recovered. Usewear analysis found micro chipping on several of the artefacts. No further archaeological and mitigation works were recommended after the completion of the test excavation.

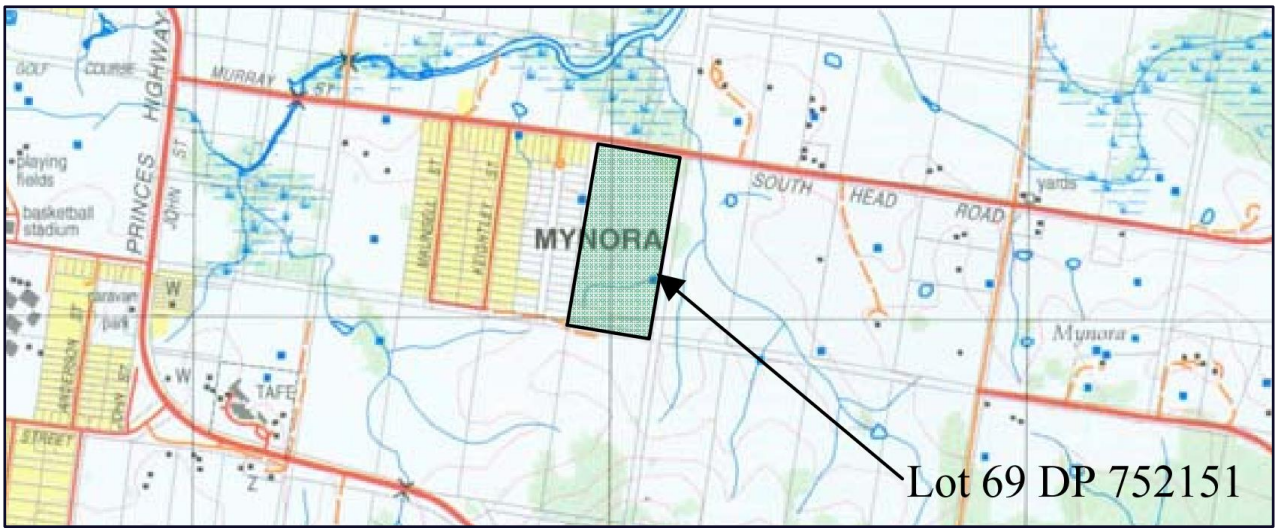


Figure 3: Dibden's 2006 survey area, excavated in 2007 by AHMS (after Dibden 2006, Figure 4)

6.2. AHIMS

An AHIMS search was undertaken on 17 May 2021. This search revealed 18 Aboriginal sites in a 1 km radius around the study area. Nine sites are located immediately to the north of the study area as detailed below in Table 2 and Figure 4.

Site ID	Site name	Grid Reference	Site Type
58-4-1104	Moruya Site 2	238050E 6020945N (GDA)	Open site / Isolated Find
58-4-1317	BF-SU7	237707E 6020702N (GDA)	Open site / Isolated Find
58-4-1318	BF-SU9	238052E 6020911N (GDA)	Open site / Artefact scatter (2 artefacts)
58-4-1319	BF-SU10	237992E 6020828N (GDA)	Open site / Artefact scatter (58 artefacts)
58-4-1320	BF-SU11	237725E 6020841N (GDA)	Open site / Artefact scatter (59 artefacts)
58-4-1321	BF-SU12	237554E 6020868N (GDA)	Open site / Artefact scatter (67 artefacts)
58-4-1466	Moruya Scarred Tree 1	237778E 6020543N (GDA)	Scarred tree
58-4-1467	Moruya Scarred Tree 2	237921E 6020574N (GDA)	Scarred tree
58-4-1468	Moruya Scarred Tree 3	237912E 6060619N (GDA)	Scarred tree

Table 1: AHIMS sites immediately to the north of the study area.



Figure 4: Map of the study area showing the location the sites immediately to the north. Approximate location of the study area edged in red.

6.3. Study area

None of the recorded sites, as detailed above are within the areas proposed for the roundabout and road upgrade (Figure 4). The study area is not an Aboriginal Place.

6.4. Site prediction

On the basis of the environmental and archaeological information the following prediction can be made:

The roundabout and the section of the road to be upgraded are in an area that has been highly disturbed by the construction of the Princes Highway and it is not expected that evidence of occupation will remain within the road reserve.

7 SITE INSPECTION RESULTS

7.1. Results

The site survey was undertaken on 3-4 June 2021 by Dr Jillian Comber, David Nutley, Glenn Suey and Chris Jones of Comber Consultants together with Michelle Davis, Ellis Davis and Christopher Brierley from the Cobowra Local Aboriginal Land Council. The route for the Princes Highway upgrade and roundabout construction was driven along and the road reserve beside the road was walked along. As can be seen from the photograph below, the road is sealed with asphalt whilst the road reserve on either side contains pasture grass, weeds and regrowth. Visibility was nil.

No Aboriginal objects were observed within the study area. However, it was noted that the road and road reserve were highly disturbed. Construction of the road would have removed any evidence of Aboriginal occupation that may once have existed within the study area. As a result, further assessment, testing, monitoring or salvage is not required.

However, if, during the course of the proposed works any Aboriginal objects are unexpectedly uncovered all work must cease in the vicinity of that object and the consultant contacted for further advice.



Photograph 1: Location of the Princes Highway Upgrade and roundabout construction (Google maps).

8 SIGNIFICANCE ASSESSMENT

8.1. Preamble

Significance assessment is the process whereby sites or landscapes are assessed to determine their value or importance to the community. A range of criteria have been developed for assessing the significance which embody the values contained in the Burra Charter. The Burra Charter provides principles and guidelines for the conservation and management of cultural heritage places within Australia.

Following are the criteria which will be used to assess the study area:

Social Value (sometimes termed "Aboriginal" value) which refers to the spiritual, traditional, historical or contemporary associations and attachments which the place or area has for the present-day Aboriginal community.

Historic Value refers to the associations of a place with a person, event, phase, or activity of importance to the history of an Aboriginal community.

Scientific Value refers to the importance of a landscape, area, place, or object because of its archaeological and/or other technical aspects.

Aesthetic Value refers to the sensory, scenic, architectural, and creative aspects of the place.

Representativeness refers to whether the site demonstrates the principal characteristics of that site and is a good representative example of that site type.

Rarity refers to the degree to which such a site is known elsewhere and whether the site is uncommon, rare or endangered.

8.2. Significance Assessment

The site proposed for the roundabout and road upgrade does not contain any cultural significance. The study area is very small and is an existing road and road reserve which does not contain social, historic, scientific, aesthetic, representative or rarity values.

9 SUMMARY AND RECOMMENDATIONS

9.1. Summary

The construction of a new roundabout and associated road works on the Princes Highway, Moruya, has been proposed by Health Infrastructure. This report has determined that the area of the works does not include any Aboriginal archaeological or cultural significance. It does not contain any known Aboriginal objects and is not an Aboriginal place.

Therefore, there are no constraints upon construction of the roundabout and associated works in respect of Aboriginal heritage. However, please refer to the following recommendations.

9.2. Recommendations

The following recommendations are made on the basis of:

- Legal requirements under the terms of the *National Parks & Wildlife Act* 1974 (as amended), which states that it is an offence to harm or desecrate an Aboriginal object without first gaining a permit under Part 6 of the National Parks & Wildlife Act 1974.
- Research into the archaeological record for the region, and the study area.
- Results of the assessment as outlined in this report.

Recommendation 1: Induction
An Aboriginal heritage induction should be provided to all employees, contractors and subcontractors engaged in the road construction on the significance of the Aboriginal heritage, that it an offence to harm Aboriginal objects and be advised of their responsibilities under the *National Parks and Wildlife Act 1974* in respect of Aboriginal heritage.

Recommendation 2: Unexpected Finds and Human Remains Procedure
If any Aboriginal objects are unexpectedly uncovered during the redevelopment of the site, all work must cease in the vicinity of the object and an area of at least one metre around the Aboriginal object secured and cordoned off using fencing and/or appropriate barriers. The archaeological consultant must be immediately contacted for further advice. The consultant will assess the object and provide further advice. In addition, the consultant will liaise with the Registered Aboriginal Parties. No-one should enter the secured area and work can only recommence when advised by the consultant.

REFERENCES

Barry, F and Wheeler, J. 2007. LOT 69 DP752151, South Head Road, Moruya, NSW Aboriginal Archaeological Test Excavation Report, Report by AHMS to Blue Mist Pty. Ltd.

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Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Eurobodalla

Client Service ID : 591283

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
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58-4-1105	Moruya Site 3	GDA	56	237487	6021409	Closed site	Valid	Shell : -		
	Contact: Searle	Recorders: Doctor.Julie Dibden						Permits:	2249,2250,3438	
58-4-1261	Lot 69 South Head Road 1	GDA	56	237922	6020998	Open site	Valid	Artefact : -		103039
	Contact:	Recorders: Jim Wheeler						Permits:		
58-4-1326	BF - SU 17	GDA	56	237410	6021374	Open site	Valid	Artefact : 4		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:		
58-4-1320	BF- SU11	GDA	56	237725	6020841	Open site	Valid	Artefact : 59		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:		
58-4-1321	BF- SU12	GDA	56	237554	6020868	Open site	Valid	Artefact : 67		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:		
58-4-1322	BF- SU14	GDA	56	237295	6021175	Open site	Valid	Artefact : 1		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:	3438	
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	Contact:	Recorders: Doctor.Julie Dibden						Permits:	3438	
58-4-1324	BF- SU18	GDA	56	237419	6021453	Open site	Valid	Artefact : 3		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:	3438	
58-4-1315	BF- SU2	GDA	56	237358	6020793	Open site	Valid	Artefact : 28		
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58-4-1319	BF- SU10	GDA	56	237992	6020828	Open site	Valid	Artefact : 58		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:		
58-4-1325	BF- SU19	GDA	56	237279	6021453	Open site	Valid	Artefact : 22		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:		
58-4-1331	BF-SU4	GDA	56	237504	6020744	Open site	Valid	Artefact : 43		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:		

Report generated by AHIMS Web Service on 17/05/2021 for Dragomir Garbov for the following area at Lat, Long From : -35.9234, 150.0804 - Lat, Long To : -35.9121, 150.0986 with a Buffer of 0 meters. Additional Info : Assessment. Number of Aboriginal sites and Aboriginal objects found is 16

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Abel Bushfire

5 May 2022 2210065

Introduction

This report supports a Review of Environmental Factors (REF) prepared for Health Infrastructure NSW pursuant to part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a new roundabout and associated road works on the Princes Highway, Moruya.

Site Description

The site of the new roundabout is located on the Princes Highway in the NSW south coast town of Moruya. The site is located to the south of Lot 2, DP 1281576, a large vacant greenfield site. The roundabout will provide access into this greenfield lot to allow for its future development. To the west of the site is Moruya TAFE, and to the north is a small residential subdivision called Mynora Estate.

The approximate location of the roundabout is shown in **Figure 1** below. It is noted that ancillary inground works may extend beyond this location.

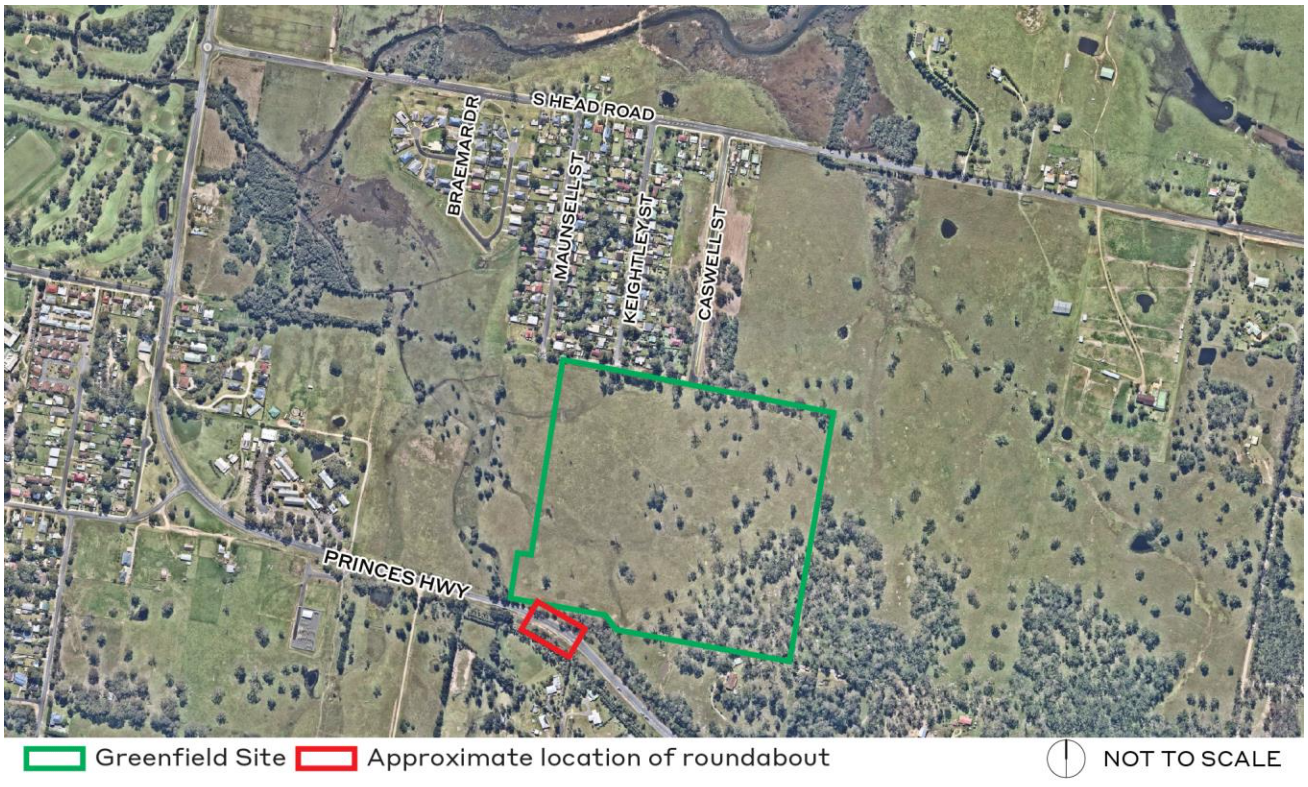


Figure 1 Approximate location of the proposed works. Proposed Works

The works proposed under this REF include the following:

- Construction of a new roundabout located on Princes Highway.
- Ancillary road and public domain works.
- Ancillary electricity reticulation and street lighting.

A further detailed description of the proposed works is contained in the Review of Environmental Factors report prepared by Ethos Urban.

BAM Ecology Pty Ltd (T/A Abel Bushfire)
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Abel Bushfire

Document No: 2454-LET-ISS 2
12 May 2022

Root Partnerships
Level 19/9 Hunter Street,
Sydney NSW 2000

On behalf of – NSW Health Infrastructure

RE: Proposed new roundabout and associated road works,
Princes Highway, Moruya NSW 2537, Adjacent Lot 2, DP 1281576.

Attention: Ash McGowan, Root Partnerships

Dear Ash,

Abel Bushfire was engaged by NSW Health Infrastructure to make an assessment of compliance for the proposed roundabout and associated road infrastructure against the requirements of the NSW RFS document 'Planning for Bushfire Protection 2019' (PBP). The site of proposed works is the Princes Highway, Moruya NSW, located south and adjacent to Lot 2, DP 1281576, approximately 2.3 km SE of Moruya CBD (Figure 1 and Figure 2). The site is identified as Bush Fire Prone Land under section 10.3 of the *Environmental Planning and Assessment Act 1979* (*EP & A Act*) and is therefore required to comply with PBP under section 4.14 of that *Act*. Compliance with PBP relies upon the proposal meeting the general aim and objectives of PBP Chapter 1 and the specific objectives for Special Fire Protection Purpose) SFPP) development of PBP Chapter 6.

Abel Bushfire has relied upon the following references from the client:

1. Plans by PTC Consultants, numbered 21-3123, revision P8, dated 05/04/2022 (Figure 3),
2. Plans by Conrad Gargett, numbered 20157, revision C, dated 06 April 2022.

The Chapter 1 aim of PBP is to:

"provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment."

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The general Chapter 1 objectives of PBP are to:

1. afford buildings and their occupants protection from exposure to a bush fire;
2. provide for a defendable space to be located around buildings;
3. provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;
4. ensure that appropriate operational access and egress for emergency service personnel and occupants is available;
5. provide for ongoing management and maintenance of Bushfire Protection Measures; and
6. ensure that utility services are adequate to meet the needs of firefighters.

With respect to roads and other access infrastructure, PBP Objectives 1, 2, 3, and 5 are not applicable, as these relate specifically to buildings that give shelter to people. In this case, Objective 4 and Objective 6 are applicable to the proposed road work. The proposed works do meet the aim and objectives of PBP 2019 where the access infrastructure complies with the PBP performance criteria for SFPP developments.

The specific objectives and performance criteria for SFPP developments are specified in PBP Chapter 6. SFPP developments often provide for occupants that are more vulnerable than the general population. Consequently, there is more reliance upon provision of relatively wide and unrestricted access and emergency management arrangements for proposed roads. Note additional Bushfire Protection Measures (BMPs) not mentioned apply to other building types under SFPP developments.

PBP section 6.2 outlines the specific objectives for SFPP developments, being:

a) minimise levels of radiant heat, localised smoke and ember attack through increased APZ, building design and siting;

b) provide an appropriate operational environment for emergency service personnel during firefighting and emergency management;

c) ensure the capacity of existing infrastructure (such as roads and utilities) can accommodate the increase in demand during emergencies as a result of the development;

d) ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.

Whilst Specific Objectives (a) and (d) are not directly applicable to road infrastructure, objectives (b) and (c) are relevant. Meeting these objectives is contingent upon compliance with the relevant performance criteria and acceptable solutions for 'Access' detailed in PBP Tables 6.8b. The proposal meets these requirements (see below).

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Table 1. Relevant performance criteria and acceptable solutions of PBP Table 6.8b for SFPP development. *(Adapted from PBP 2019)*

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIANCE of proposed roundabout and associated road infrastructure
The intent may be achieved for access requirements where:		
firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	▪ SFPP access roads are two-wheel drive, all-weather roads	Complies. The roads are two-wheel drive, all weather roads;
	▪ access is provided to all structures	N/A to roundabout road work.
	▪ traffic management devices are constructed not to prohibit access by emergency services vehicles	Can comply.
	▪ access roads must provide suitable turning areas in accordance with PBP Appendix 3	Complies. The proposed roundabout has a minimum turning radius of 20m, exceeding the 12m radius required by PBP Appendix 3.
	▪ one way public access roads are no less than 3 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression	N/A to roundabout road work.
the capacity of access roads is adequate for firefighting vehicles	▪ the capacity of road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes), bridges/causeways are to clearly indicate load rating	Can comply. It is assumed that all new roadways are sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes) Any bridges or causeways will clearly indicate load rating.
there is appropriate access to water supply.	▪ Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression	N/A to roundabout road work.
	▪ Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005	N/A to roundabout road work
	▪ there is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	N/A to roundabout road work.
Perimeter Roads	▪ are two-way sealed roads;	Complies
	▪ minimum 8m carriageway width kerb to kerb;	Complies. The minimum proposed width of the roundabout road is 8m.

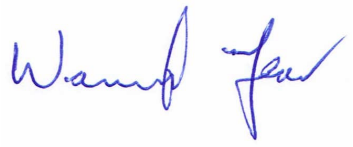
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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIANCE of proposed roundabout and associated road infrastructure
access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	▪ parking is provided outside of the carriageway width;	N/A to roundabout road work.
	▪ hydrants are located clear of parking areas;	N/A to roundabout road work.
	▪ are through roads, and these are linked to the internal road system at an interval of no greater than 500m;	Complies. The roundabout is linked to the Princes Highway.
	▪ curves of roads have a minimum inner radius of 6m;	Complies. The proposed roundabout road has a minimum inner radius of 20m.
	▪ the maximum grade road is 15 degrees and average grade of not more than 10 degrees;	Can comply. The land on which the roundabout is to be constructed has slope of no more than 5 degrees.
	▪ the road crossfall does not exceed 3 degrees;	Can comply. The crossfall is not to exceed 3 degrees.
	▪ a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided	Can comply. Proposal plans indicate that vegetation adjacent to the roundabout within the site footprint is to be removed.
Non-perimeter Roads access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.	▪ minimum 5.5m carriageway width kerb to kerb;	Complies. The roundabout proposal will meet the more stringent requirements for perimeter roads (above).
	▪ parking is provided outside of the carriageway width;	
	▪ hydrants are located clear of parking areas;	
	▪ roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m;	
	▪ curves of roads have a minimum inner radius of 6m; the road crossfall does not exceed 3 degrees;	
	▪ minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	

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In conclusion, the proposed roundabout and associated road infrastructure can meet the aim and relevant objectives of PBP Chapter 1 and the specific access performance criteria and acceptable solutions of PBP Table 6.8b for SFPP developments. Abel Bushfire certifies the proposal plans provided and referenced here are compliant with all relevant performance criteria of PBP 2019, and recommends consent be given for the construction of proposed works assessed here.

Yours faithfully,



Warwick Fear
Bushfire Scientist
B. App. Sci (Hons), PhD, Grad. Dip. Bushfire Protection
BPAD Bushfire Planning & Design Accredited Practitioner Level 2



Mark Mackinnon
Senior Bushfire Scientist
B. Env. Sci (Hons), Grad. Dip. Bushfire Protection
BPAD Bushfire Planning & Design Accredited Practitioner Level 3

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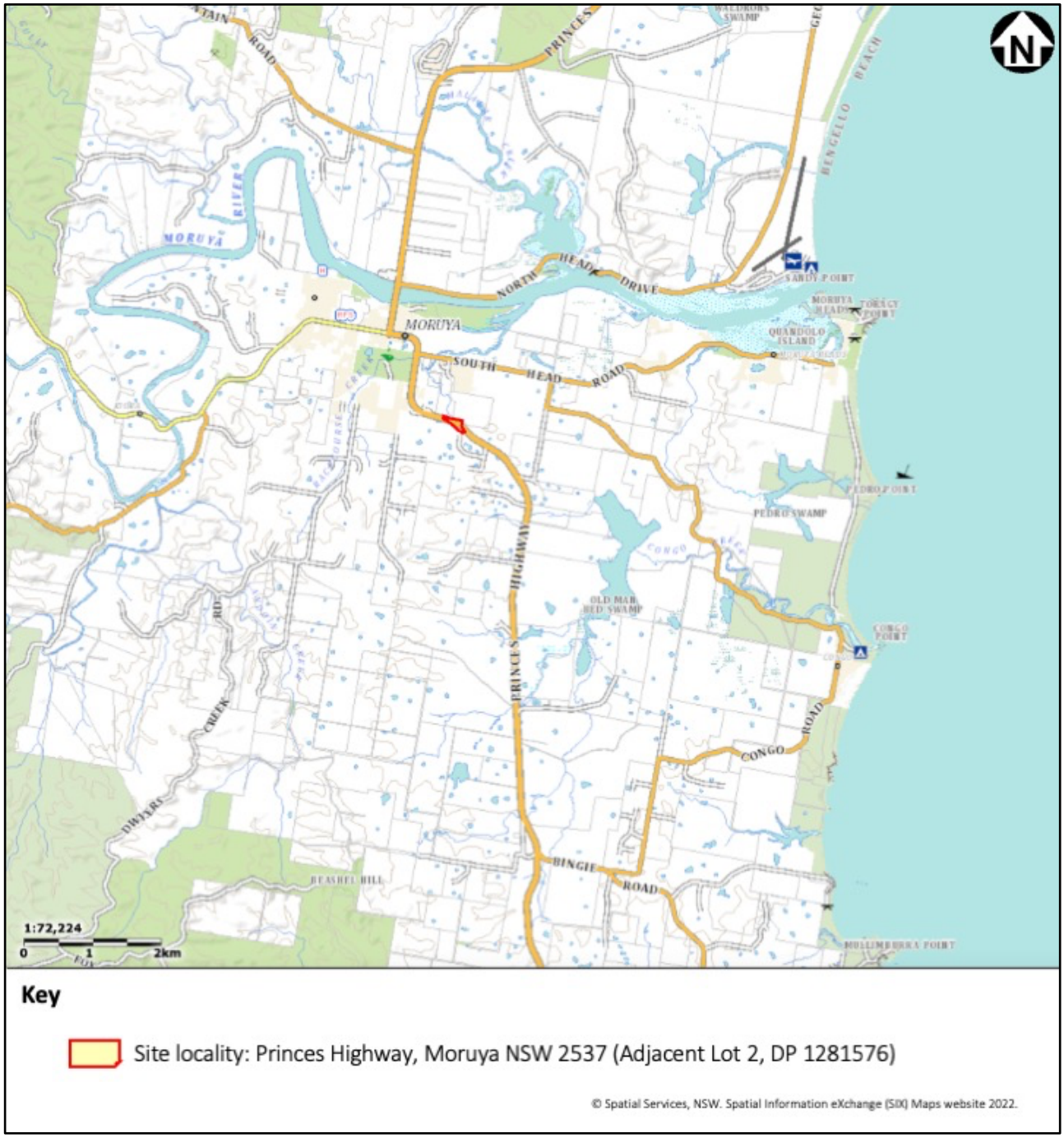


Figure 1. Site locality map.

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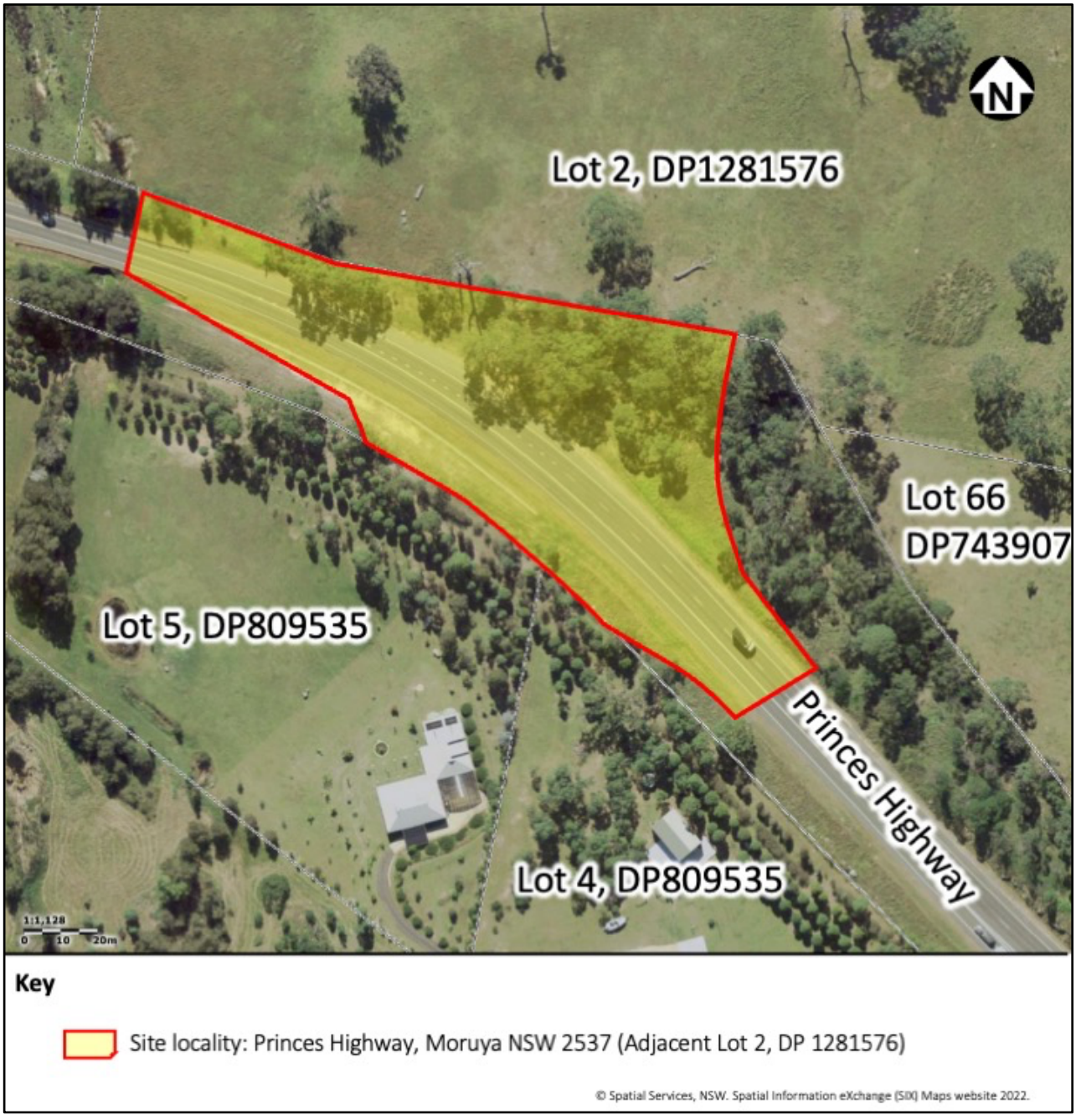


Figure 2. Locality map for proposed roundabout and road work affected area.

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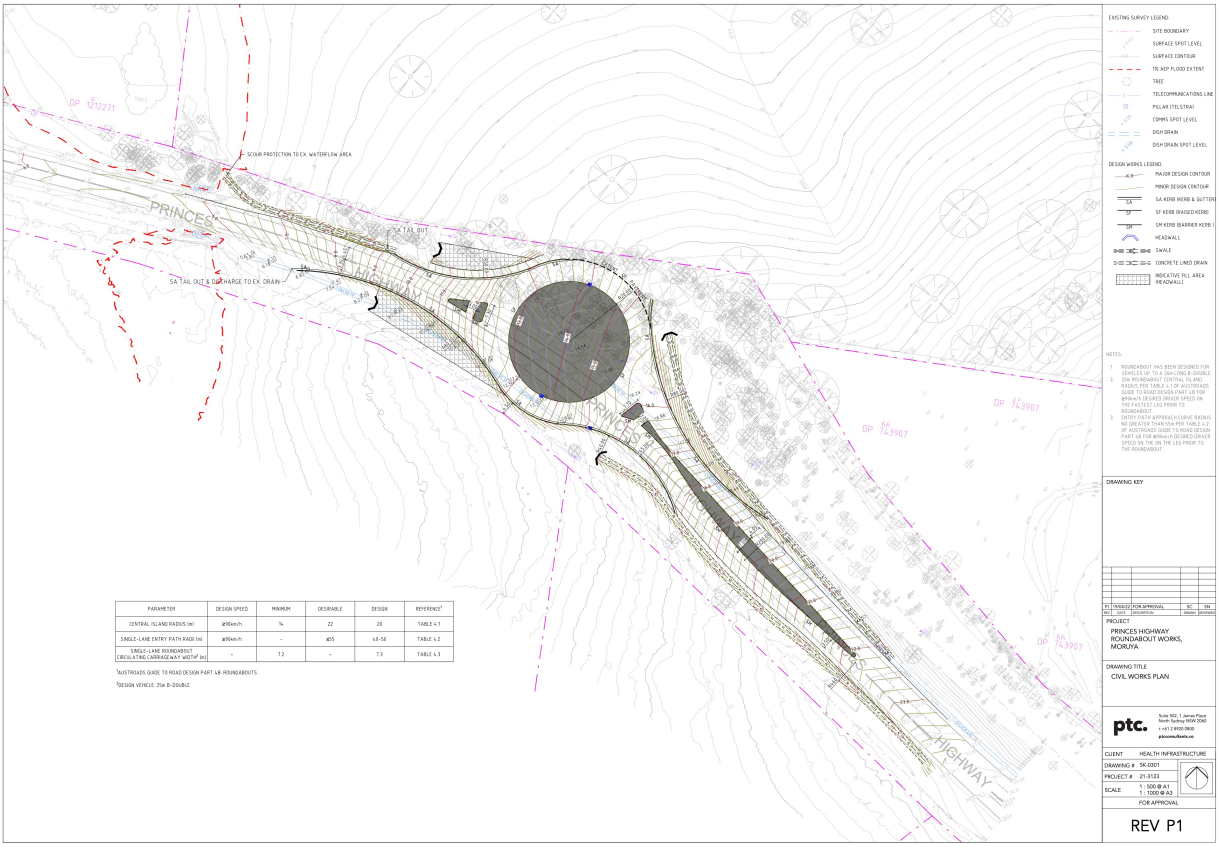


Figure 3. Proposal diagram for proposed roundabout and road work.

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21 April 2022

Our Ref: STH21/00065/11

Ash McGowan
Root Partnerships
BY EMAIL: mcgowan.a@rootpartnerships.com.au

PROPOSED ROUNDABOUT, PRINCES HIGHWAY, MORUYA

Transport for NSW (TfNSW) refers to the updated strategic designs, dated 5 April 2022, for the proposed roundabout associated with the Eurobodalla Health Service (EHS) on the Princes Highway, Moruya.

TfNSW has reviewed the information submitted and provides in-principle acceptance to the proposed roundabout, as generally shown in **Attachment 1**, noting that the northeastern leg (i.e. hospital entrance road) will be constructed as part of the future EHS works. This in-principle acceptance is subject to the process and requirements outlined in **Attachment 2**.

TfNSW acknowledges that the roundabout forms part of the Early Works package for the EHS and as such, a Review of Environmental Factors (REF) has not been completed. TfNSW references its previous comments for detailed design (**Attachment 3**), as well as the geotechnical advice provided (**Attachment 4**) and ongoing discussions between the applicant and the Lighting for TfNSW team.

TfNSW highlights that Health Infrastructure (HI) will be acting as the determining authority for the proposed works, and will therefore be responsible for considering and addressing any environmental impacts of the roundabout via a Part 5 assessment under the *Environmental Planning and Assessment Act, 1979*. This includes consideration and mitigation of issues such as noise, biodiversity, heritage, parking accessibility, etc. both during construction and post construction.

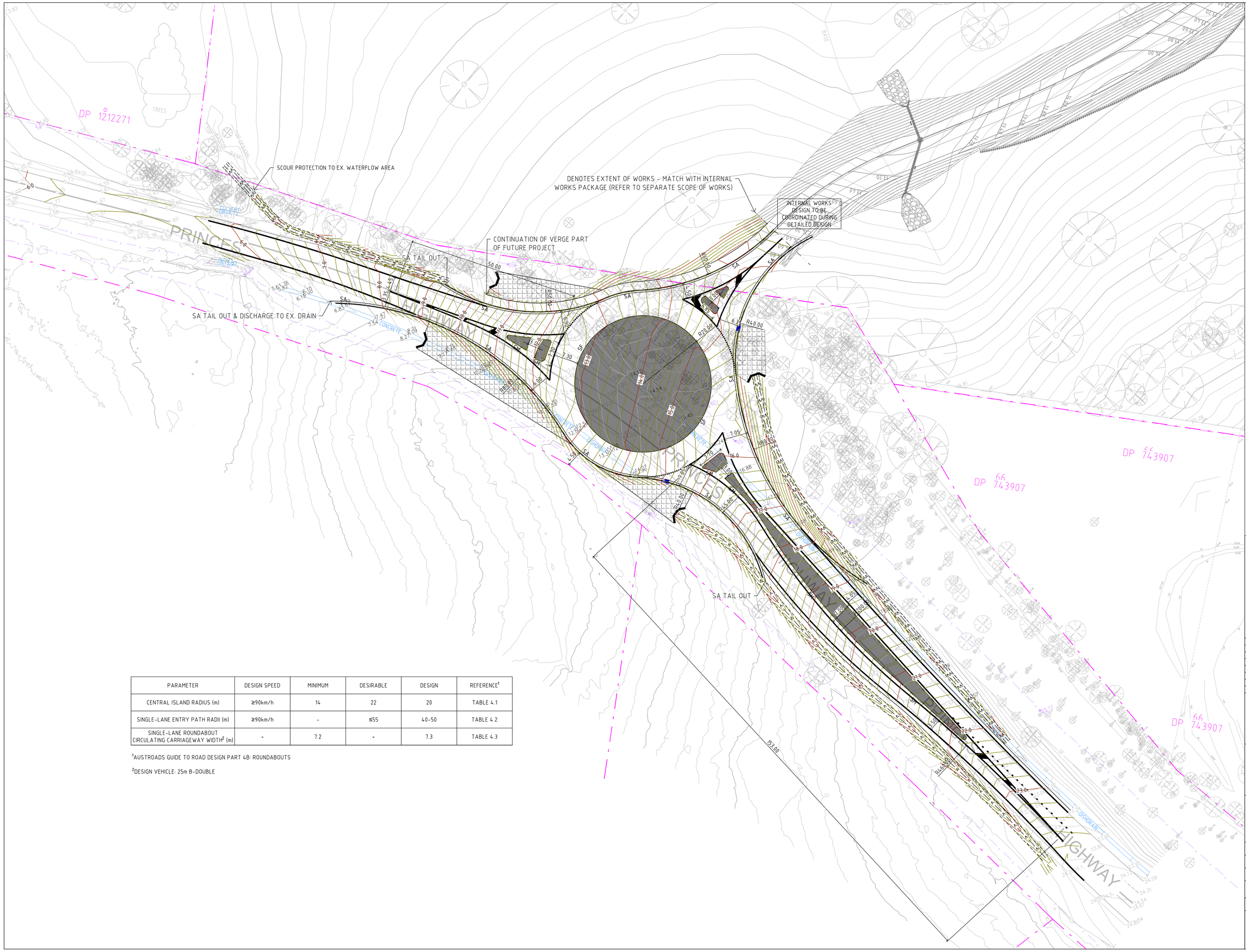
Should you require further information please contact Elira Reynolds, Development Services Case Officer on 02 9549 9397 or by emailing development.south@transport.nsw.gov.au.

Yours sincerely

Chris Millet
Manager, Development Services

Attachment 1

See attached concept design titled Attachment 1



PARAMETER	DESIGN SPEED	MINIMUM	DESIRABLE	DESIGN	REFERENCE[1]
CENTRAL ISLAND RADIUS (m)	≥90km/h	14	22	20	TABLE 4.1
SINGLE-LANE ENTRY PATH RADII (m)	≥90km/h	-	≤55	40-50	TABLE 4.2
SINGLE-LANE ROUNDABOUT CIRCULATING CARRIAGEWAY WIDTH[2] (m)	-	7.2	-	7.3	TABLE 4.3

[1]AUSTROADS GUIDE TO ROAD DESIGN PART 4B: ROUNDABOUTS

[2]DESIGN VEHICLE: 25m B-DOUBLE

SURVEY LEGEND:

- EXISTING CONTOUR
- BOUNDARY LINE
- EX STORMWATER
- EX COMMUNICATIONS

DESIGN WORKS LEGEND:

- X.X MAJOR DESIGN CONTOUR
- MINOR DESIGN CONTOUR
- SA KERB (KERB & GUTTER)
- SF KERB (RAISED KERB)
- SM KERB (BARRIER KERB)
- 375ø STORMWATER PIPE
- HEADWALL
- SWALE
- CONCRETE LINED DRAIN
- INDICATIVE FILL AREA (HEADWALL)

NOTES:

1. ROUNDABOUT HAS BEEN DESIGNED FOR VEHICLES UP TO A 26m LONG B-DOUBLE (REFER DRAWINGS 01C-0311 & 01C-0312)
2. 22m (DESIRABLE) ROUNDABOUT CENTRAL ISLAND RADIUS PER TABLE 4.1 OF AUSTROADS GUIDE TO ROAD DESIGN PART 4B FOR ≥90km/h DESIRED DRIVER SPEED ON THE FASTEST LEG PRIOR TO ROUNDABOUT.
3. ENTRY PATH APPROACH CURVE RADIUS NO GREATER THAN 55m PER TABLE 4.2 OF AUSTROADS GUIDE TO ROAD DESIGN PART 4B FOR ≥90km/h DESIRED DRIVER SPEED ON THE ON THE LEG PRIOR TO THE ROUNDABOUT.
4. REFER TO DRAWING # 01C-0343 FOR VERTICAL SIGHT DISTANCE

DRAWING KEY

REV	DATE	DESCRIPTION	DRAWN	REVIEWED
P8	05/04/22	FOR APPROVAL	SC	SN
P7	29/03/22	FOR APPROVAL	SC	SN
P6	09/03/22	FOR APPROVAL	SC	SN
P5	25/01/22	PRELIMINARY	SC	SN
P4	23/12/21	REVISED LAYOUT	SC	SN
P3	10/12/21	REVISED LAYOUT	SC	SN
P2	24/11/21	REVISED LAYOUT	SC	SN

PROJECT

EUROBODALLA HEALTH SERVICES (MORUYA HOSPITAL)

DRAWING TITLE

ROUNDABOUT CONCEPT DESIGN LAYOUT

ptc.
Suite 502, 1 James Place
North Sydney NSW 2060
t +61 2 8920 0800
ptcconsultants.co

CLIENT	HEALTH INFRASTRUCTURE
DRAWING #	01C-0301
PROJECT #	21-3123
SCALE	1 : 500 @ A1 1 : 1000 @ A3

CONCEPT DESIGN

REV P8

Prior to TfNSW reviewing the detailed design for works, the applicant must:

1. Update the concept design (Attachment 1) to ensure they address the comments detailed in Attachment 3.
2. Enter into a Works Authorisation Deed (WAD) with the TfNSW, or other suitable arrangement as agreed to by TfNSW, to progress the delivery of the works.

   Notes:

   - *To initiate this process, the applicant is to email development.south@transport.nsw.gov.au requesting to commence the detailed design and delivery. Please include a copy of this letter.*
   - *TfNSW will then appoint a project manager who will coordinate TfNSW's involvement in the detailed design and delivery of the works.*
   - *A WAD is a legally binding contract between TfNSW and the applicant, authorising the applicant to undertake works on a state road.*
   - *Any civil works on a State road or at an intersection with a State road need to be undertaken by a pre-qualified contractor. A copy of pre-qualified contractors can be found on the RMS website at: http://www.rms.nsw.gov.au/doingbusinesswithus/tenderscontracts/prequalifiedcontractors.htm*
   - *More information on WADs can be found at:*

     www.rms.nsw.gov.au/documents/projects/factsheet-development-process.pdf
3. Pay TfNSW's costs involved with the delivery of the works, including costs associated with the roundabout itself as wells as project management and surveillance.

Prior to the commencing works within the Princes Highway road reserve, the applicant must:

1. Obtain TfNSW acceptance to the detailed design and TfNSW concurrence and consent to the works under Section 138 of the Roads Act, 1993.

   Notes:

   - *TfNSW will be exercising its powers under Section 64 of the Roads Act, 1993 to become the roads authority.*
   - *Preliminary comments to be addressed as part of the detailed design are contained in Attachment 3.*
   - *TfNSW's acceptance of the detailed design will also represent its concurrence and consent under Section 138 of the Roads Act, 1993.*
2. Provide a copy of the HI determination under Part 5 of the Environmental Planning & Assessment Act, 1979 (i.e. a copy of the determined review of environmental factors, REF) to TfNSW.

   Notes:
   - *The determination under Part 5 of the Environmental Planning and Assessment Act, 1979 must be reflective of the design that TfNSW has provided its acceptance to as required in 1. above.*
3. Develop and implement a community information strategy in relation to the works, in consultation with, and to the satisfaction of, TfNSW.
4. Apply for, and obtain a Road Occupancy Licence (ROL) from the TfNSW Traffic Operations Unit (TOU) prior to commencing roadworks on a State road or any other

works that impact a travel lane of a State road or impact the operation of traffic signals on any road.

Notes:

- *The application will require a Traffic Management Plan (TMP) to be prepared by a person who is certified to prepare Traffic Control Plans. Should the TMP require a reduction of the speed limit, a Speed Zone Authorisation will also be required from the TOU.*
- *The developer must submit the ROL application 10 business days prior to commencing work. It should be noted that receiving an approval for the ROL within this 10 business day period is dependent upon TfNSW receiving an accurate and compliant TMP.*
- *An approved ROL does not constitute an approval to commence works until an authorisation letter for the works has been issued by TfNSW Project Manager.*

Prior to the operation of the roundabout, the applicant must:

1. Complete all works to the satisfaction of TfNSW or as otherwise agreed to by TfNSW.

TfNSW provides the following comments to be considered during detailed design:

1. The designs for the works within the Princes Highway road reserve are to demonstrate compliance with the applicable requirements in *Austroads Guide to Road Design*.
2. Details of pavement design, including any subsurface drainage, are required and must be in accordance with Austroads standards.
    a) TfNSW has previously provided details on the geotechnical testing requirements for test pits (Attachment 4).
    b) A verge (minimum 1.0m) is to be provided between all kerbs for support.
    c) A table drain will be required on the Princes Highway LHS between Ch. 260.00 to Ch. 300.00 at the edge of the shoulder.
    d) The invert level of the drain is to be below the level of the edge of the shoulder on the Princes Highway cross sections 90 to 130 LHS.
3. Lighting provided must demonstrate compliance with the Australian Standard (AS) 1158.2005-2015 and ensure required clearances as per *Austroads Guide to Road Design* are provided.
4. A detailed signs and lines plan is required. This must ensure all pavement markings and signage is in compliance with TfNSW delineation guidelines, AS1742.2 and other relevant standards.

See attached Geotechnical Requirements titled Attachment 4

Geotechnical Requirements for Pavement Investigation – Princes Highway roundabout. Moruya hospital.

Test pits:

For the pavement, a minimum of three test pits will be required. One on either side of the Princes Highway in the area where the pavement will be constructed and one on the Princes Highway, middle of a lane, to provide information on the existing highway pavement.

For each pit, Log existing pavement materials. DCP test the subgrade and collect sufficient subgrade sample for testing as prescribed below.

Test Type	Pavement
Field Moisture Content and Bulk Density	X
Particle Size Distribution and hydrometer	X
Atterberg Limits	X
MDD and CBR	X
In-situ Density of Existing Subgrade.	X
Hand Dynamic Cone Penetration	X

Geotechnical Report.

The pavement investigations report should include:

(i) Test hole logs.

(ii) Photographs (colour) of test holes and other relevant detail.

(iii) All laboratory test reports.

(iv) Survey location of all investigation sites.

(v) Discussion of all results.

(vi) All other relevant detail required by the pavement designer.

Proposed Pavement Report.

The design report must include geotechnical advice with respect to the following:

(i) Consultation with the pavements designer to assess and define all requirements.

(ii) Design subgrade CBR values for all pavements.

(iii) Advice on specific issues relevant to pavement design including drainage requirements, subgrade support, need for bridging layers, specific requirements for fill material (including upper zone of formation), and swell/shrink characteristics of underlying materials.

(iv) Assessment on the residual and differential settlements of all supporting foundations and their corresponding effect on the pavement choice, design and timing of construction.

(v) Advice on alternatives, including stabilisation and the effect of high moisture content on the performance of flexible pavements including temporary pavements, tie-in areas etc.