Gunnedah Shire Council

Application for Development Consent

Made under the Environmental Planning & Assessment Act.1979

LAST UPDATED 07 JUNE 2019

Date: 08/02/21

DEVELOPMENT APPLICATION NUMBER

Development Application Number: 2021.00000016.001

APPLICANT DETAILS

Name(s): MR DANIEL NOBLE

Address: 63 ELGIN STREET

Town/Suburb: GUNNEDAH State: NSW Postcode: 2380

Telephone: (02) 6740 2100 Mobile:

Email: council@infogunnedah.com.au

LAND OWNER DETAILS

Name(s): GUNNEDAH SHIRE COUNCIL c/o MR ERIC GROTH

Address: 63 ELGIN STREET

Town/Suburb: GUNNEDAH State: NSW Postcode: 2380

Telephone: (02) 6740 2100 Mobile:

Email: council@infogunnedah.com.au

LAND TO BE DEVELOPED

Address: 3130 Oxley Highway, Gunnedah

Lot Number: 328 & 329 DP Number: 755503 Parish:

Site Area: 35.27 ha

Latitude of Development: -30.978333456

Longitude of Development: 150.2285076

TYPE OF DEVELOPMENT APPROVAL BEING SOUGHT

- ☑ Erecting, altering or adding to a building
- ☐ Subdivision of Land
- ☐ Subdivision of a building into Strata Units
- ☑ Change of use of land or building
- ☐ Demolition
- ☑ Other work

PO Box 63 (63 Elgin Street) Gunnedah NSW 2380
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www.gunnedah.nsw.gov.au

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FULL DESCRIPTION AND USE OF PROPOSED DEVELOPMENT

Construction and use of a Koala Sanctuary and associated facilities and services (refer to Statement of Environmental Effects).

PROPOSED DEVELOPMENT DETAILS

☐ Local Development

☑ Integrated Development (requires approval under another Act)

☐ Designated Development (requires an EIS to be submitted)

Total Project Value: $ 8,993,364 Existing Use of the Land: Previously used as a quarry & is currently used as a motorcycle track & a go-kart track.

Proposed Hours of Operation: Core hours 7am – 8pm Number of Car Parking Spaces Proposed: 50

Does the development involve the removal of trees? If yes, how many?: .....

INTEGRATED DEVELOPMENT – Requires approval under one or more of the following

Coal Mine Subsidence Compensation Act 2017 - ☐ s.22

Environmental Planning and Assessment Act, 1979 - ☐ s.91

Fisheries Management Act 1994 - ☐ s.144 ☐ s.201 ☐ s.205 ☐ s.219

Heritage Act 1977 - ☐ s.58

Mining Act 1992 - ☐ ss.63 & 64

National Parks and Wildlife Act 1974 - ☒ s.90

Petroleum (onshore) Act 1991 - ☐ s.16

Protection of the Environment Operations Act 1997 - ☐ ss.43(a), 47 & 55
☐ ss.43(b), 48 & 55
☐ ss.43(d), 55 & 122

Roads Act 1993 - ☐ s.138

Rural Fires Act 1997 - ☒ s.100B

Water Management Act 2000 - ☒ ss.89, 90 & 91

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CERTIFYING AUTHORITY

Do you wish to appoint Gunnedah Shire Council as the Principal Certifying Authority for the purposes of undertaking the required inspections and issuing the Compliance and Occupation Certificate(s)?

☐ Yes
☐ No

Note: If 'Yes' is ticked, this application will be deemed to also be an application for Final Occupation Certificate. The date of the application will be taken to be the date that a final inspection is requested. If an Interim Occupation Certificate is required, a separate application must be lodged at that time.

ENVIRONMENTAL IMPACTS

☑ A Statement of Environmental Effects is attached

☐ The development will have a negligible effect on the Environment (eg. minor interior alterations)

Will the proposal impact the environment of Threatened Species?

☐ Yes - Species Impact Statement to be attached
☐ No

Is the land subject to a private land conservation agreement under the Biodiversity Conservation Act 2016?

☐ Yes – Provide details of the type of agreement
☑ No

For Designated Development Only

☐ An Environmental Impact Statement is attached

BUILDER'S DETAILS

☐ Owner Builder Permit Number: .....

☐ Licensed Builder Number: .....

Builder's Name: .....

Builder's Address: .....

Telephone: ..... Fax: .....

DETAILS OF PROPOSED STRUCTURE

☐ New ☐ Alterations ☐ Additions

Colour of Walls: .....

Colour of Roof: .....

Floor Area (Square Metres): .....

☐ Separate House ☐ Kit House ☐ Transportable House

Number of Storeys: ..... Number of new or additional dwellings/units: .....

☐ Attached Dwelling ☐ Detached Dwelling

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Gunnedah Shire Council

Materials

Please indicate the materials to be used in the construction of the new building(s):

Walls	Code	Roof	Code	Floor	Code	Frame	Code
Brick (double)	☐ 11	Tiles	☐ 10	Concrete or slate	☐ 20	Timber	☐ 40
Brick (veneer)	☐ 12	Concrete or slate	☐ 20	Timber	☐ 40	Steel	☐ 60
Concrete or stone	☐ 20	Fibre Cement	☐ 30	Other	☐ 80	Aluminium	☐ 70
Fibre cement	☐ 30	Steel	☐ 60	Not Specified	☐ 90	Other	☐ 80
Timber	☐ 40	Aluminium	☐ 70			Not Specified	☐ 90
Curtain Glass	☐ 50	Other	☐ 80				
Steel	☐ 60	Not Specified	☐ 90				
Aluminium	☐ 70						
Other	☐ 80						
Not Specified	☐ 90						

APPLICANT'S DECLARATION

I/We the undersigned hereby apply for development consent and a construction certificate in relation to the development proposal described hereon and in the plans, specifications and documents accompanying the application.

I/We undertake to develop in accordance with the development consent approval granted by Council and conform with the provisions of the relevant Acts, Regulations, Codes and Local Environmental Plan.

I/We further undertake to indemnify against all claims arising from negligence (or otherwise) resulting from work carried out in connection with the development within the road reserve.

Name(s) ..: MR DANIEL NOBLE

Office (e.g. Director): ... CHIEF ENGINEER

Signature: ... Date: 08/02/2021

OWNER'S DECLARATION

I/We the undersigned are the owner(s) of the property described in this application and consent to its lodgement.

I/We hereby permit and duly authorise officers of the Gunnedah Shire Council to enter the land or premises to carry out inspections and surveys or take measurements or photographs as required for the administration of the Act(s), Regulations or Planning Instrument.

Name(s) MR ERIC GROTH

Office (e.g. Director): GENERAL MANAGER

Signature: ... Date: 8/2/2021

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Quote Number: 2615 Account Number: 2021.00000016.001

Type	Description	GST	Fee
81	Development Application Fees	No	$14,125.44
82	Plan First Levee	No	$5,756.00
83	Construction Certificate Fees	Yes	$
84	Inspection Fees	Yes	$
85	Long Service Levy Payment	No	$
88	Sewerage Management System Fee	No	$
89	Notification Fees	Yes	$49.50
89	Local Advertisement Fee	Yes	$245.00
106	Modification of Consent	No	$
109	Complying Development Certificate	Yes	$
111	Amend Construction Certificate	Yes	$
115	Section 68 Approvals	Yes	$
	Section 94A Contribution	No	$
	Other: Intagrated Dev. Fee	Yes/No	$140.00
		Total	$20,315.94

Date: 9/3/2021 Cashier: JP R/N: 667307.

Zone:	Parcel ID:	Assessment Number:
RU1	17720/17721	13305696

Documentation Approved for Receipting: Date: 9/03/2021

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Shire Council

DISCLOSURE OF POLITICAL DONATIONS AND GIFTS

Amendments made to the Local Government Act 1993 and Environmental Planning & Assessment Act 1979 in relation to political donations and gifts will become effective from 1 October 2008.

These introduce obligations on applicants, those making submissions and decision makers in relation to the disclosure of information relating to political donations and gifts during the plan making or development assessment process.

When must an applicant/proponent make a disclosure?

A disclosure must be made by any person who has a financial interest in a planning application and who has made a reportable political donation in the 2 years before a planning application is made and/or determined.

When must a person making a submission make a disclosure?

Any submissions must include disclosure of any reportable political contribution or gift made in the previous two years, and up to the time the application is determined, by you or your associate to anyone including:

(i) all reportable political donation made to any local councillor of the council
(ii) all gifts made to any local councillor or employee of that council.

A reportable political donation made to a local councillor of any local council includes any donation made at the time the person was a candidate for election to the council.

You are advised that a person is guilty of an offence under s9.37 of the Environmental Planning & Assessment Act 1979 if the person fails to make a disclosure of a reportable political donation or gift if it is reasonable for that person to know such a reportable donation or gift should have been disclosed. It is also an offence to make a false statement. Currently, the maximum penalty is $22,000 or imprisonment for 12 months, or both.

A blank disclosure statement which meets the requirements of the legislation is provided on the backside of this information. If you require any further information as to the definition of terms used, or clarification of your obligations, the Guideline produced by the Department of Planning may be obtained from their web-site – www.planning.nsw.gov.au, or a printed copy obtained from Council's Customer Services Centre.

Gunnedah Shire Council

Application No: ..... Date Disclosure Made: .....

DISCLOSURE STATEMENT OF POLITICAL DONATIONS AND GIFTS

A disclosure statement of a reportable political donation or gift must accompany a planning application or submission if the reportable donation or gift is made within 2 years before the application or submission is made. If the donation or gift is made after the lodgement of the application, a disclosure statement must be sent to the relevant consent or approval authority within 7 days after the donation or gift is made.

Name of the person making donation or gift: .....

Residential address or Registered/official office: .....

ABN if not an individual: .....

Name/address of development application or planning matter: .....

.....

Date application lodged: .....

Consent or approval authority: **Gunnedah Shire Council**

Person's interest in application: .....

Applicant: .....

Person with *financial interest (explain):* .....

Person making submission in opposition: .....

Person making submission in support: .....

Name of the person to benefit from the donation	**Date donation made**	**Amount of the donation***
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Name of the person to whom gift is made	**Date gift made**	**Amount or value of the gift***
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

*Note: *A reportable political donation of:*

- $1,000 or more made to or for the benefit of the party, elected member, group or candidate; or
- $1,000 or more made by a major political donor to or for the benefit of a party, elected member, group or candidate; or
- Less than $1,000 if the aggregated total of the donation made by the entity or person to the same party, elected member, group, candidate or person within the same financial year (ending 30 June) is $1,000 or more.

The Gunnedah Koala Park - Development Application

3130 Oxley Highway, Gunnedah - Lot 328 DP 755503, Lot 329 DP 755503 - 35.27ha
Gunnedah Shire Council - Gunnedah Local Environmental Plan 2012 - Northern Region Planning Panel

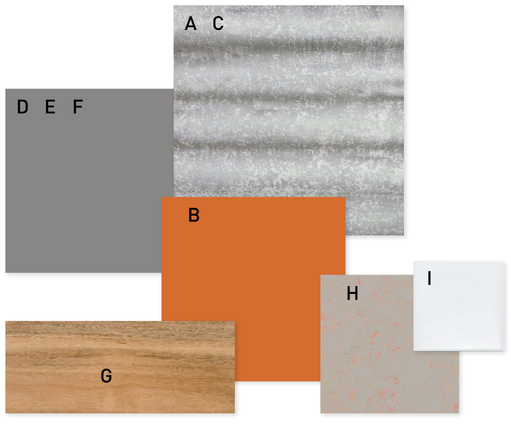
Location Plan, sourced from SixMaps - NTS

Architectural Drawing List

Drawing No.	Drawing Title	Current Revision	Date
DA01-00	Cover Sheet	B	Fri, 4 Dec 2020
DA01-01	Not Included	A	Thu, 12 Nov 2020
DA01-02	Site Plans	C	Fri, 4 Dec 2020
DA01-03	Wildlife Centre & Hospital	B	Fri, 4 Dec 2020
DA01-04	Petting Zoo & Animal Enclosures	B	Fri, 4 Dec 2020
DA01-05	Volunteer Accommodation & Caretaker's Residence	C	Fri, 4 Dec 2020
DA01-06	Caretaker's Residence	C	Fri, 4 Dec 2020
DA01-07	Maintenance Shed & Amenities Building	B	Fri, 4 Dec 2020

Supporting Documentation

Document No.	Document Title	Current Revision	Date
	Statement of Environmental Effects - SJB Planning		
	Bushfire Assessment Report - Intergrated Consulting		
	Biodiversity Assessment Report - AREA Environmental Consultants & Communication		
QU-0245	Cultural Heritage Assessment - AREA Environmental Consultants & Communication		
5284	Survey - Stewart Surveys Pty Ltd		
5284	Lanadscape Design - Stewart Surveys Pty Ltd		
5284	Stormwater Management Plan - Stewart Surveys Pty Ltd		
	BCA Report - Design Confidence		
	DDA Report - Lindsay Perry		
10401	Traffic Impact Assessment - Ardill Payne & Partners		
10401	Water & Sewer Design Report - Ardill Payne & Partners		
19501	Noise Impact Assessment - Wilkinson Murray		
27780	Cost Estimate Report - Mitchell Brandtman		



Finishes Schedule

Code	Location	Type	Substrate	Colour
A	Roof	Profiled metal	R3 insulation	Zincalume
B	Structural framing	Resene Metalics	External and internal steel, primer and undercoat.	Resene Gold Drop
C	Walls	Profiled metal	Plantation grown timber frame	Zincalume
D	Walls	Profiled metal	Plantation grown timber frame	Colorbond Wallaby
E	Fences	Profiled metal		Colorbond Wallaby
F	Doors & Windows	Annodised aluminium		Colorbond Wallaby
G	Floors	Timber	Plantation grown timber frame	Natural
H	Floors	Resilient flooring	Plantation grown timber frame	Orange Shimmer
I	Floors	Ceramic tiles	Plantation grown timber frame	Matt White

3130 Oxley Highway Gunnedah

SUMMARY OF BASIX COMMITMENTS FOR EACH UNIT

This is a summary of the BASIX Commitments as detailed in the BASIX Certificate.
Refer to the CURRENT BASIX Certificate for Complete details.
For definitions refer to basix.nsw.gov.au

WATER COMMITMENTS				
Fixtures				
3 Star Shower Heads	Yes			
3 Star Kitchen / Basin Taps	Yes	3 Star Toilet	Yes	
Alternative Water				
Minimum Tank Size (L)	6000	Collected from Roof Area (m2)	100	
Tank Connected To:				
All Toilets	Yes	Laundry W/M Cold Tap	Yes	
One Outdoor Tap	Yes			
THERMAL COMFORT COMMITMENTS - Refer to TPA Specification on plans				
ENERGY COMMITMENTS				
Hot Water	Solar (Electric Boost) 21 to 25 STCs			
Cooling System	Living	1 Phase A/C Zoned	EER 3.0 - 3.5	
	Bedrooms	1 Phase A/C Zoned	EER 3.0 - 3.5	
Heating System	Living	1 Phase A/C Zoned	EER 3.0 - 3.5	
	Bedrooms	1 Phase A/C Zoned	EER 3.0 - 3.5	
Ventilation	1 x Bathroom	Fan ducted to exterior	Manual on/off	
	Kitchen	Fan ducted to exterior	Manual on/off	
	Laundry	Natural ventilation	N/A	
Natural Lighting	Window/Skylight in Kitchen		No	
	Window/Skylight in Bathrooms/Toilets		Yes to	2
Artificial Lighting (rooms to be primarily lit by fluorescent or LED lights)	Number of bedrooms	All	Dedicated	Yes
	Number of Living/Dining rooms	All	Dedicated	Yes
	Kitchen	Yes	Dedicated	Yes
	All Bathrms/Toilets	Yes	Dedicated	Yes
	Laundry	Yes	Dedicated	Yes
	All Hallways	Yes	Dedicated	Yes
OTHER COMMITMENTS				
Outdoor clothes line	Yes	Ventilated refrigerator space	Yes	
Stove/Oven	Gas cooktop & electric oven			
Alternative Energy	Photovoltaic System: 0.5kW to Caretaker Residence only			

December 2020 — BSA Reference: 16482

Building Sustainability Assessments — Ph: (02) 4962 3439
enquiries@buildingsustainability.net.au — www. buildingsustainability.net.au

Important Note

The following specification was used to achieve the thermal performance values indicated on the Assessor Certificate and takes precedence over any other specification.
If different construction elements are applied then the Assessor Certificate is no longer valid.

Thermal Performance Specifications (does not apply to garage)

External Wall Construction		*Added Insulation*
Lightweight		R2.0
Internal Wall Construction		*Added Insulation*
Plasterboard on studs		None
Ceiling Construction		*Added Insulation*
Plasterboard		R3.5 to ceilings adjacent to roof space
Roof Construction	*Colour*	*Added Insulation*
Metal	Any	Foil + R1.0 blanket
Floor Construction	*Covering*	*Added Insulation*
Timber	As drawn	R1.0

Windows	*Glass and frame type*	*U Value*	*SHGC Range*	*Area sq m*
Performance glazing Type A		*4.80*	*0.46 - 0.56*	Caretaker Res
Performance glazing Type B		*4.80*	*0.53 - 0.65*	Caretaker Res
ALM-001-01 A	Aluminium Type A Single clear	*6.70*	*0.51 - 0.63*	Volunteer Res
ALM-002-01 A	Aluminium Type B Single clear	*6.70*	*0.63 - 0.77*	Volunteer Res

Type A windows are awning windows, bifolds, casements, tilt 'n turn' windows, entry doors, french doors
Type B windows are double hung windows, sliding windows & doors, fixed windows, stacker doors, louvres

Skylights	*Glass and frame type*	*U Value*	*SHGC*	*Area sq m*

U and SHGC values are according to AFRC. Alternate products may be used if the U value is lower and the SHGC is within the range specified

External Window Shading *(eaves, verandahs, pergolas, awnings etc)*
All shade elements modelled as drawn
Ceiling Penetrations *(downlights, exhaust fans, flues etc)*
No adjustment has been made for losses to insulation arising from ceiling penetrations.

0005521260 17 Dec 2020
Assessor — Gavin Chambers
Accreditation No. — DMN13/1491
Address — 3130 Oxley Highway , Gunnedah , NSW, 2380
hstar.com.au

Rev	Date	By	Notes
B	13/11/20	SF	Preliminary DA issue to consultants
A	12/11/20	SF	Preliminary DA drawings for client approval

notes
1. all dimensions in mm.
2. do not scale from drawing.
3. this drawing has been prepared for Development Approval purposes only and is not to be used for tender or construction.
4. clarification to be sought from the architect in the event of any discrepancies in the documentation or if further information is required.

Consultants

Surveyor -
contact ph:

Structural Engineer -
contact ph:

Civil Engineer -
contact ph:

Quantity Surveyor -
contact ph:

Builder - TBA
contact ph:

DUNN & HILLAM ARCHITECTS

Workshop 1 Pty Ltd
t/a Dunn & Hillam Architects
ACN 098 309 196 ABN 17 098 309 196

33 Salisbury St, Botany NSW 2019
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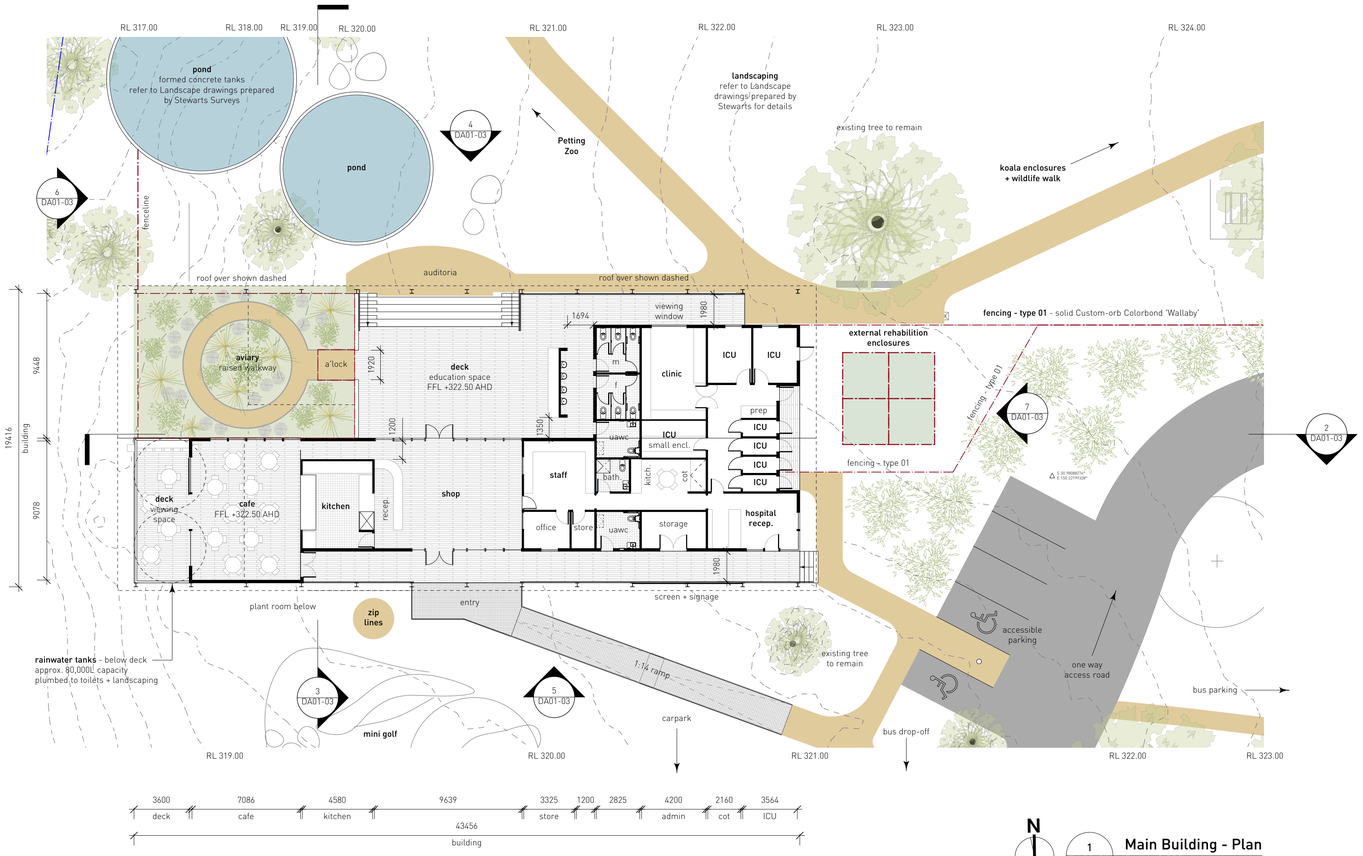
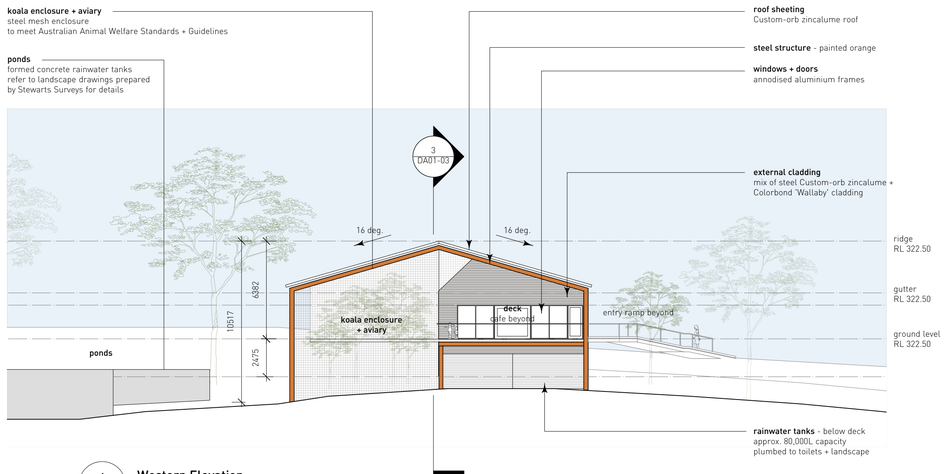
F +61 2 9316 7725
E studio@dunnhillam.com.au
Nominated architect Ashley Dunn NSW ARB No. 7547

Client	Gunnedah Shire Council
Project	**Gunnedah Koala Sanctuary** **3130 Oxley Highway, Gunnedah**
Issue	**Development Approval**
Date	Wed, 16 Dec 2020
Scale	@A1
Drawing	Cover Sheet
Drw No.	DA01-00 **Rev** B
Job No.	20_301

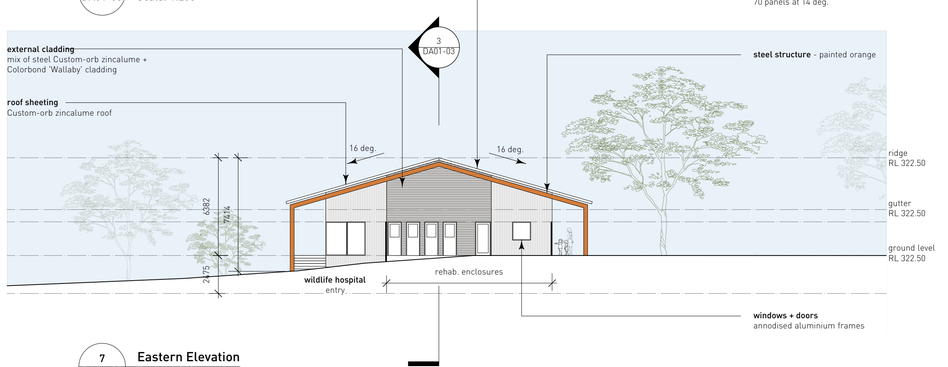
PRELIMINARY



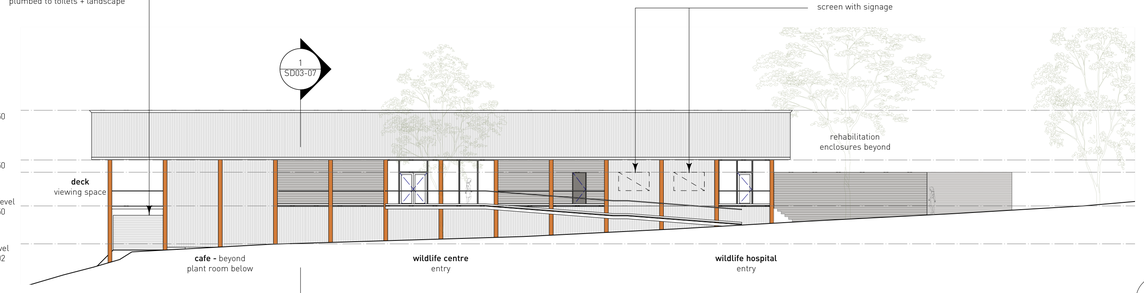
1 DA01-03 **Main Building - Plan** Scale: 1:200



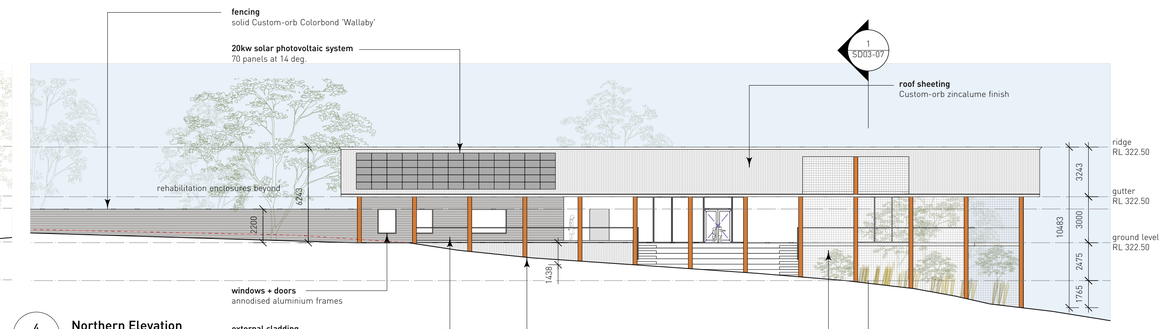
6 DA01-03 **Western Elevation** Scale: 1:200



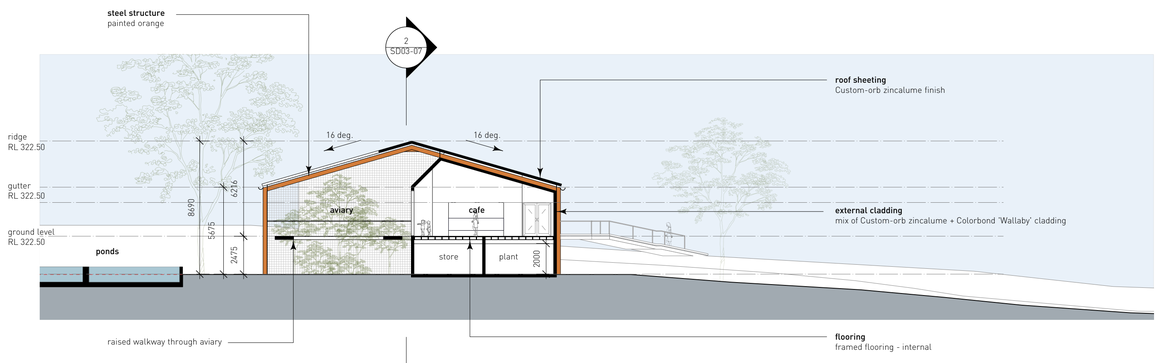
7 DA01-03 **Eastern Elevation** Scale: 1:200



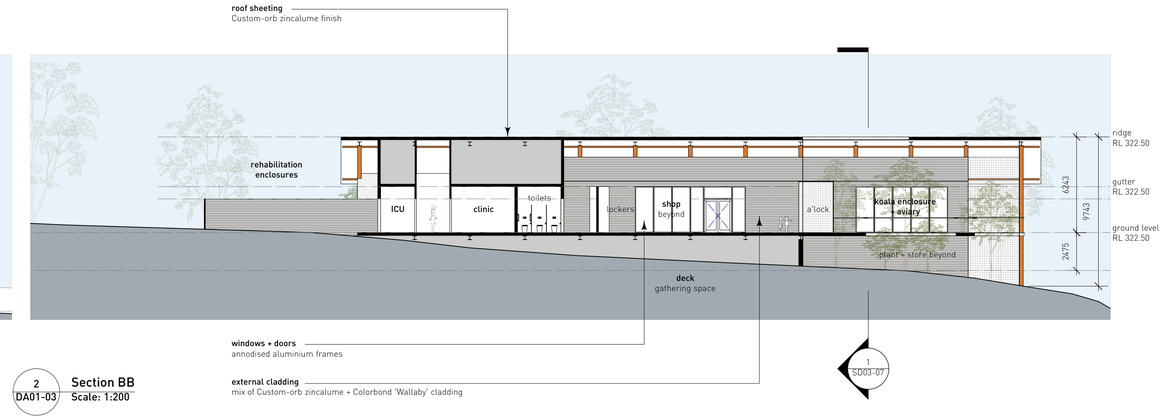
5 DA01-03 **Southern Elevation** Scale: 1:200



4 DA01-03 **Northern Elevation** Scale: 1:200



3 DA01-03 **Section AA** Scale: 1:200



2 DA01-03 **Section BB** Scale: 1:200

PRELIMINARY

Rev	Date	By	Notes
B	13/11/20	SF	Preliminary DA issue to consultants
A	12/11/20	SF	Preliminary DA drawings for client approval

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Consultants

Surveyor - contact ph:

Structural Engineer - contact ph:

Civil Engineer - contact ph:

Quantity Surveyor - contact ph:

Builder - TBA contact ph:

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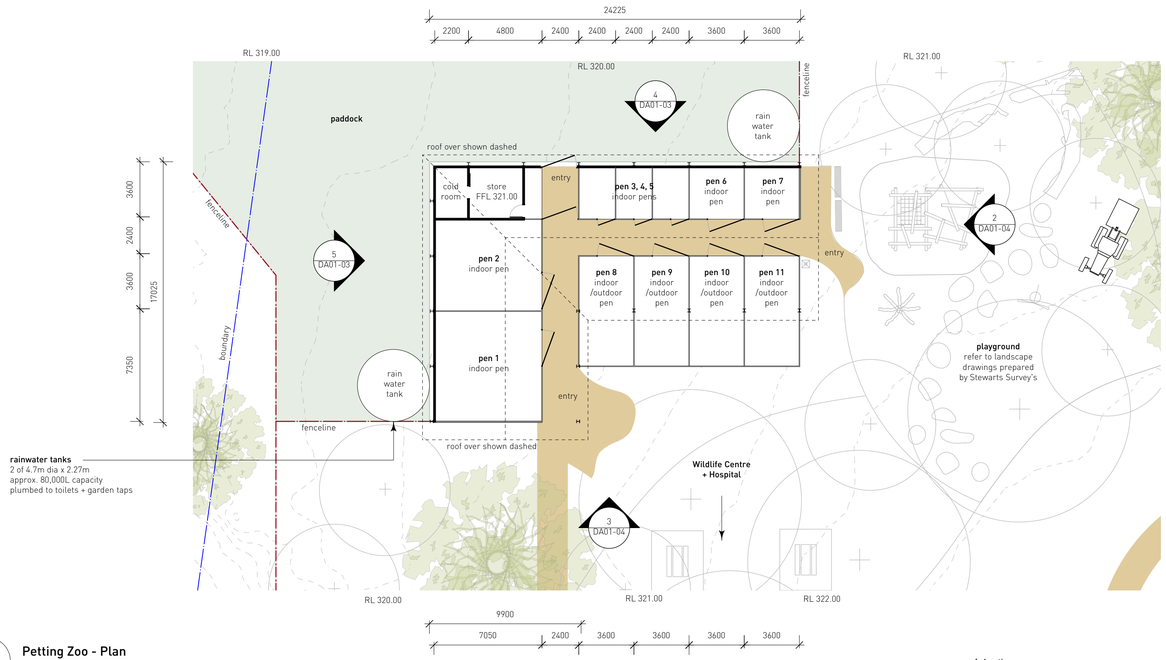
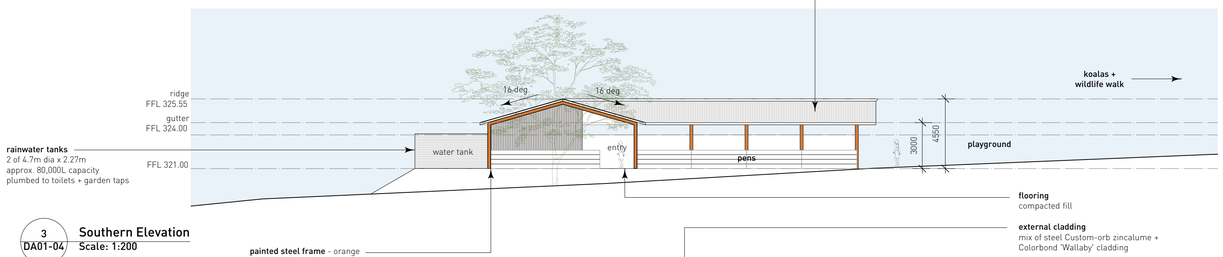
Nominated architect Ashley Dunn NSW ARB No. 7547

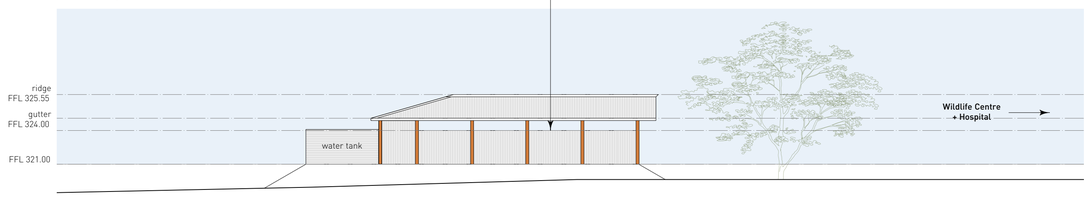
Client	Gunnedah Shire Council
Project	**Gunnedah Koala Sanctuary** **3130 Oxley Highway, Gunnedah**
Issue	**Development Approval**
Date	Fri, 18 Dec 2020
Scale	1:200 @A1
Drawing	Wildlife Centre & Hospital
Drw No.	DA01-03 **Rev** B
Job No.	20_301
Drawn:	SF **Check:** LH



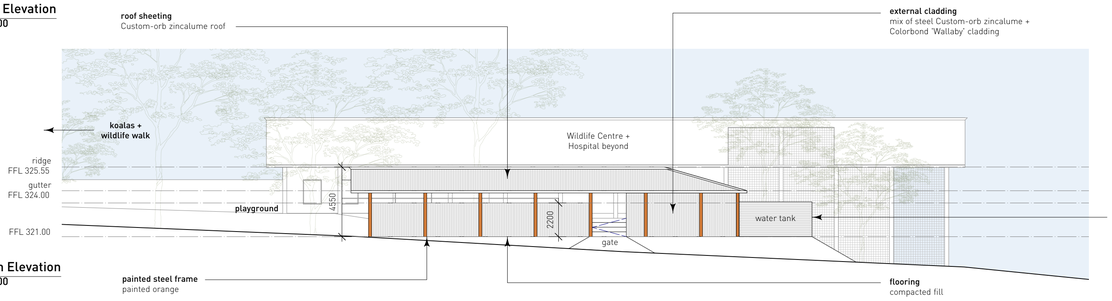
1 DA01-04 **Petting Zoo - Plan**
Scale: 1:200



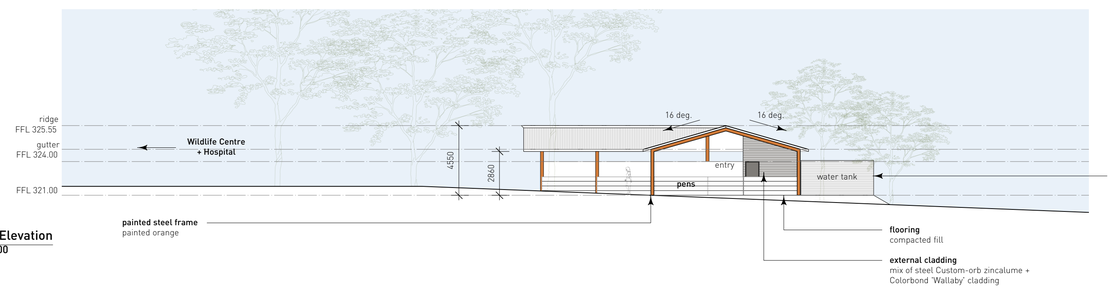
3 DA01-04 **Southern Elevation**
Scale: 1:200



5 DA01-04 **Western Elevation**
Scale: 1:200



4 DA01-04 **Northern Elevation**
Scale: 1:200



2 DA01-04 **Eastern Elevation**
Scale: 1:200

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A	12/11/20	SF	Preliminary DA drawings for client approval

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F +61 2 9316 7725
E studio@dunnhillam.com.au
Nominated architect Ashley Dunn NSW ARB No. 7547

Client	Gunnedah Shire Council
Project	**Gunnedah Koala Sanctuary** **3130 Oxley Highway, Gunnedah**
Issue	**Development Approval**
Date	Fri, 18 Dec 2020
Scale	1:200 @A1
Drawing	Petting Zoo & Animal Enclosures
Drw No.	DA01-04 **Rev** B
Job No.	20_301
Drawn:	SF **Check:** LH

PRELIMINARY

Finishes Schedule

	Structure	Cladding	Colour
Roof	Plantation grown timber frame	Custom-orb roof sheeting with R3 insulation	zincalume
Walls	Plantation grown timber frame	Mix of Custom-orb zincalume and Colorbond cladding	Colorbond 'Wallaby' and zincalume
Doors & Windows	Plantation grown timber frame	Annodised aluminium	'Wallaby'
Floor	Plantation grown timber frame	carpet and tile	Natural

Schedule of Areas

	Existing Area	Proposed Area
Site Area	355535 sq m	
Built Area	0.00 sq m	207.30 sq m
Area To Be Demolished	-	0.00 sq m
New Build		207.30 sq m
Roof Area	0.00 sq m	266.68 sq m
Decks	0.00 sq m	25.85 sq m
Landscaped Area	0.00 sq m	0.00 sq m
Porous Paving	0.00 sq m	0.00 sq m
Gross Floor Area (by DCP)	0.00 sq m	181.00 sq m
Floor Space Ratio	0.00	0.0005

Door + Window Schedule

WINDOWS

ID	Location	Description	Material	Height	Width
W01	Lounge	Fixed glass with louvred windows	Aluminium frame	2100	3600
W02	Dining / Kitchen	Fixed glass with louvred windows	Aluminium frame	2100	3600
W03	Bed 5	Louvred window	Aluminium frame	2100	970
W04	Corridor	Louvred window	Aluminium frame	2100	970
W05	Bed 4	Louvred window	Aluminium frame	2100	970
W06	Bed 3	Louvred window	Aluminium frame	2100	970
W07	Male bathroom	Louvred window	Aluminium frame	2100	970
W08	Female bathroom	Louvred window	Aluminium frame	2100	970
W09	Bed 2	Louvred window	Aluminium frame	2100	970
W10	Bed 1	Louvred window	Aluminium frame	2100	970
W11	Bed 1	Louvred window	Aluminium frame	2100	970

DOORS

ID	Location	Description	Material	Height	Width
D01	Kitchen / dining	Fixed glass hinged door	Aluminium frame	2100	900
D02	Lounge	Face sliding fixed glass doors	Aluminium frame	2100	2400

December 2020 — BSA Reference: 16482

Building Sustainability Assessments — Ph: (02) 4962 3439
enquiries@buildingsustainability.net.au — www. buildingsustainability.net.au

Important Note

The following specification was used to achieve the thermal performance values indicated on the Assessor Certificate and takes precedence over any other specification.
If different construction elements are applied then the Assessor Certificate is no longer valid.

Thermal Performance Specifications (does not apply to garage)

External Wall Construction			*Added Insulation*
Lightweight			R2.0
Internal Wall Construction			*Added Insulation*
Plasterboard on studs			None
Ceiling Construction			*Added Insulation*
Plasterboard			R3.5 to ceilings adjacent to roof space
Roof Construction	*Colour*		*Added Insulation*
Metal	Any		Foil + R1.0 blanket
Floor Construction	*Covering*		*Added Insulation*
Timber	As drawn		R1.0

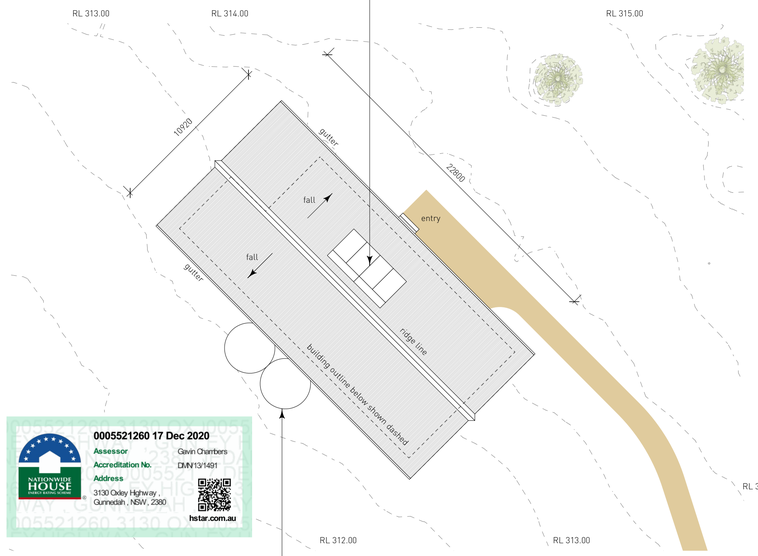
Windows	*Glass and frame type*	*U Value*	*SHGC Range*	*Area sq m*
Performance glazing Type A		*4.80*	*0.46 - 0.56*	Caretaker Res
Performance glazing Type B		*4.80*	*0.53 - 0.65*	Caretaker Res
ALM-001-01 A	Aluminium Type A Single clear	*6.70*	*0.51 - 0.63*	Volunteer Res
ALM-002-01 A	Aluminium Type B Single clear	*6.70*	*0.63 - 0.77*	Volunteer Res

Type A windows are awning windows, bifolds, casements, tilt 'n 'turn' windows, entry doors, french doors
Type B windows are double hung windows, sliding windows & doors, fixed windows, stacker doors, louvres

Skylights	*Glass and frame type*	*U Value*	*SHGC*	*Area sq m*

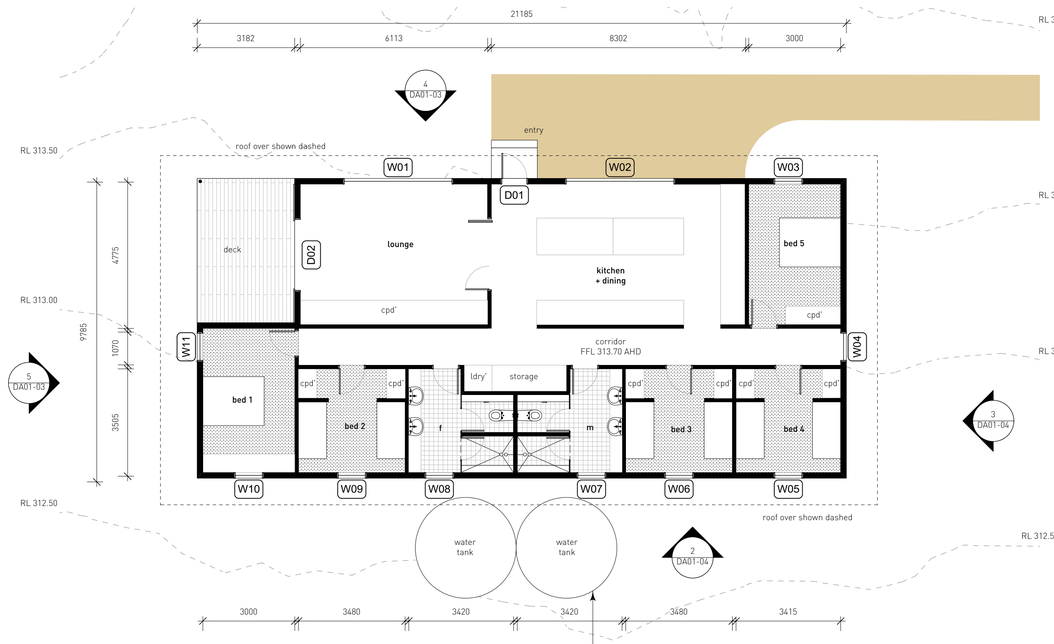
U and SHGC values are according to AFRC. Alternate products may be used if the U value is lower and the SHGC is within the range specified

External Window Shading *(eaves, verandahs, pergolas, awnings etc)*
All shade elements modelled as drawn
Ceiling Penetrations *(downlights, exhaust fans, flues etc)*
No adjustment has been made for losses to insulation arising from ceiling penetrations.



0005521260 17 Dec 2020
Assessor Gavin Chambers
Accreditation No. DMN13/1491
Address 3130 Oxley Highway , Gunnedah , NSW, 2380
hstar.com.au

6 DA01-05 **Volunteer Accommodation - Roof Plan**
Scale: 1:200



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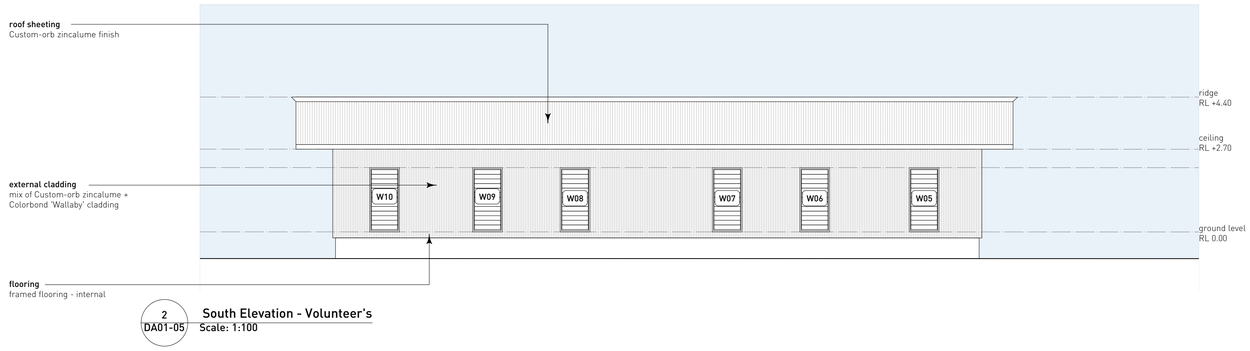

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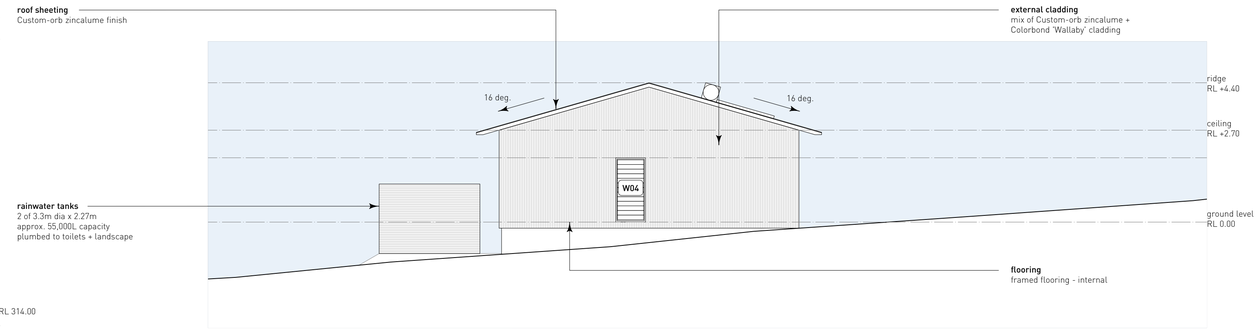
Scale: 1:100



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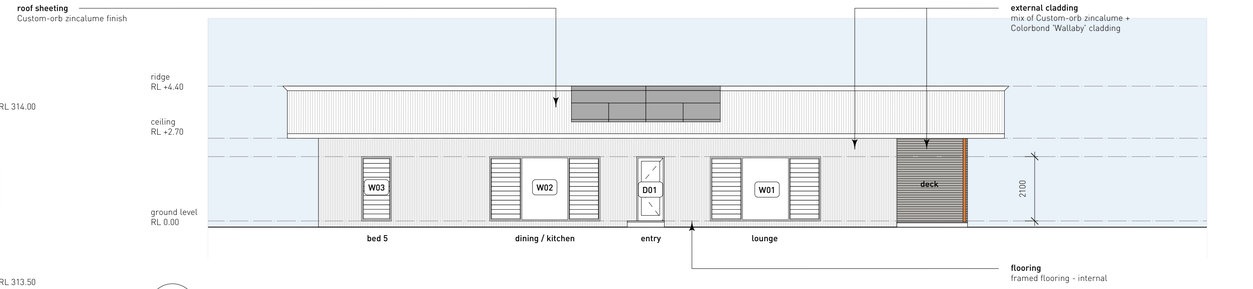

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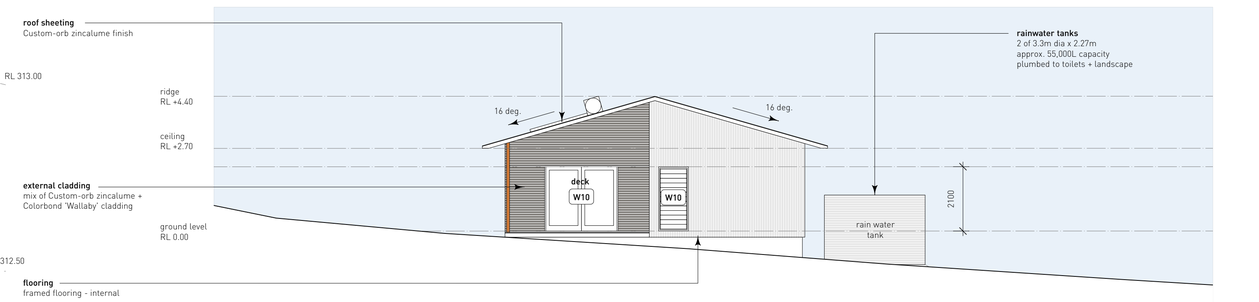

5 DA01-05 **West Elevation - Volunteer's**
Scale: 1:100

Rev	Date	By	Notes
C	27/11/20	SF	Issue for BASIX
B	13/11/20	SF	Preliminary DA issue to consultants
A	12/11/20	SF	Preliminary DA drawings for client approval

notes
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contact ph:

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E studio@dunnhillam.com.au
Nominated architect Ashley Dunn NSW ARB No. 7547

Client	Gunnedah Shire Council
Project	**Gunnedah Koala Sanctuary** **3130 Oxley Highway, Gunnedah**
Issue	**Development Approval**
Date	Wed, 16 Dec 2020
Scale	@A1
Drawing	Volunteer Accommodation & Caretaker Residence
Drw No.	DA01-05 **Rev** C
Job No.	20_301
Drawn:	SF **Check:** LH

PRELIMINARY

Finishes Schedule

	Structure	Cladding	Colour
Roof	Plantation grown timber frame	Custom-orb roof sheeting with R3 insulation	zincalume
Walls	Plantation grown timber frame	Mix of Custom-orb zincalume and Colorbond cladding	Colorbond 'Wallaby' and zincalume
Doors & Windows	Plantation grown timber frame	Annodised aluminium	'Wallaby'
Floor	Plantation grown timber frame	carpet and tile	Natural

Schedule of Areas

	Existing Area	Proposed Area
Site Area	355535 sq m	355535 sq m
Built Area	0.00 sq m	170.73 sq m
Area To Be Demolished	-	0.00 sq m
New Build	-	170.73 sq m
Roof Area	0.00 sq m	218.88 sq m
Decks	0.00 sq m	17.62 sq m
Landscaped Area	0.00 sq m	0.00 sq m
Porous Paving	0.00 sq m	0.00 sq m
Gross Floor Area (by DCP)	0.00 sq m	142.88 sq m
Floor Space Ratio	0.00	0.0004

December 2020 — BSA Reference: 16482

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Plasterboard on studs		None
Ceiling Construction		*Added Insulation*
Plasterboard		R3.5 to ceilings adjacent to roof space
Roof Construction	*Colour*	*Added Insulation*
Metal	Any	Foil + R1.0 blanket
Floor Construction	*Covering*	*Added Insulation*
Timber	As drawn	R1.0

Windows	*Glass and frame type*	*U Value*	*SHGC Range*	*Area sq m*
Performance glazing Type A		*4.80*	*0.46 - 0.56*	Caretaker Res
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Skylights	*Glass and frame type*	*U Value*	*SHGC*	*Area sq m*

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External Window Shading *(eaves, verandahs, pergolas, awnings etc)*
All shade elements modelled as drawn
Ceiling Penetrations *(downlights, exhaust fans, flues etc)*
No adjustment has been made for losses to insulation arising from ceiling penetrations.

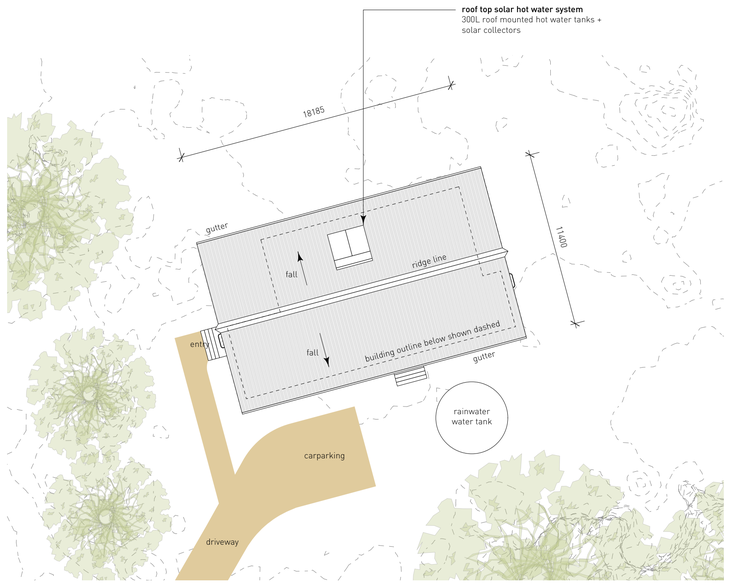
Door + Window Schedule

WINDOWS

ID	Location	Description	Material	Height	Width
W01	Dining / kitchen	Fixed glass with louvered window	Aluminium Frame	2100	3600
W02	Ensuite	Obscured fixed glass with louvered window	Aluminium Frame	1200	1500
W03	Bed 1	Louvered window	Aluminium Frame	2100	970
W04	Bed 1	Louvered window	Aluminium Frame	2100	970
W05	Bed 2	Louvered window	Aluminium Frame	2100	970
W06	Bed 2	Louvered window	Aluminium Frame	2100	970
W07	Bed 3	Louvered window	Aluminium Frame	2100	970
W08	Bathroom	Obscured fixed glass with louvered window	Aluminium Frame	1200	1500
W09	Living	Louver Window	Aluminium Frame	2100	970
W10	Living	Louver Window	Aluminium Frame	2100	970
W11	Living	Fixed and Louver Window	Aluminium Frame	2100	2300

DOORS

ID	Location	Description	Material	Height	Width
D01	Dining	Fixed glass bi-folding door	Aluminium Frame	2100	4630
D02	Corridor	Fixed glass hinged door	Aluminium Frame	2100	900
D03	Laundry	Fixed glass hinged door	Aluminium Frame	2100	900
D04	Living	Fixed glass hinged door Solid hinged d	Aluminium Frame	2100	1210



6 DA01-06 — **Roof Plan - Caretaker's**
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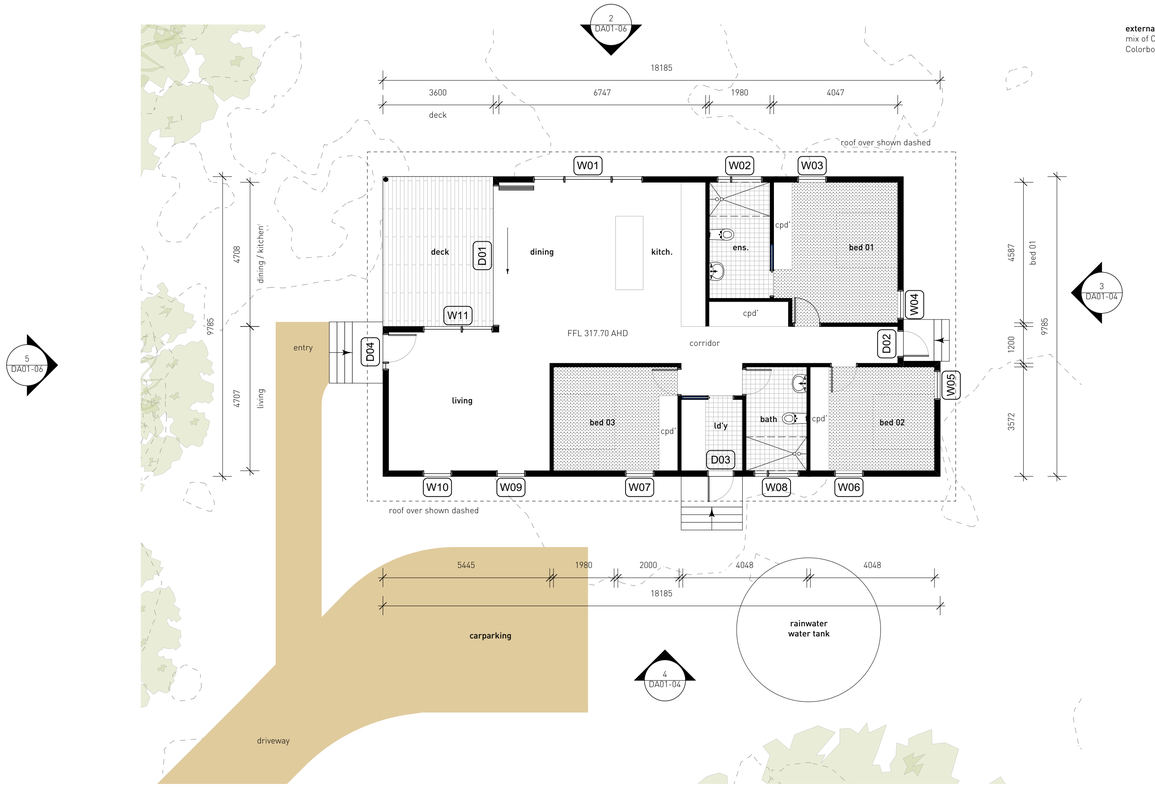

1 DA01-06 — **Floor Plan - Caretaker's**
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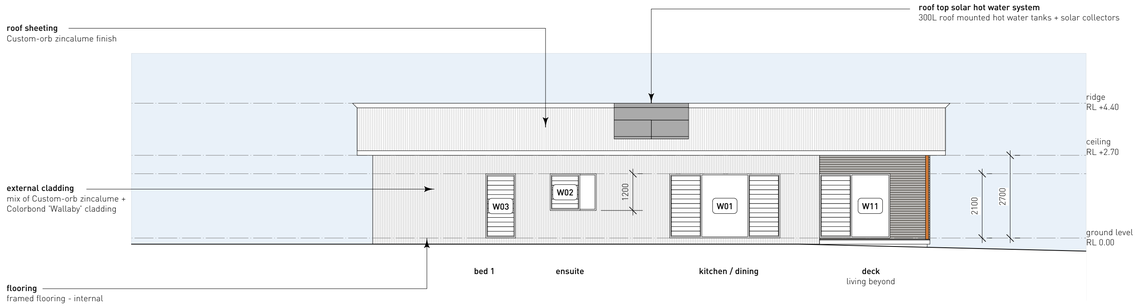

2 DA01-06 — **North Elevation - Caretaker's**
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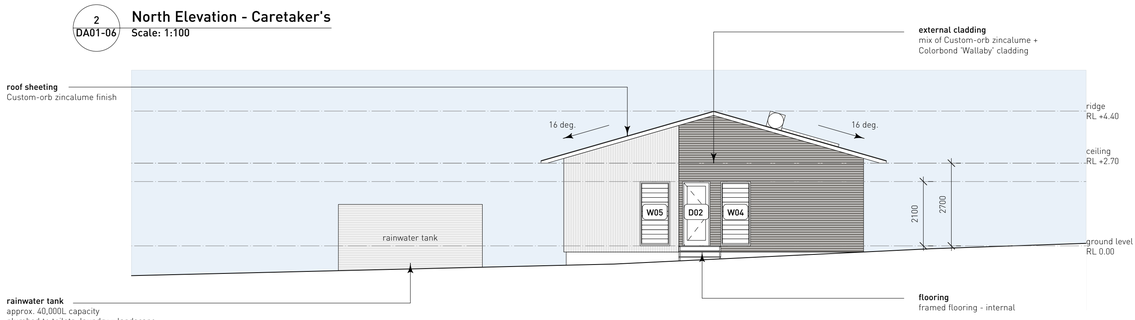

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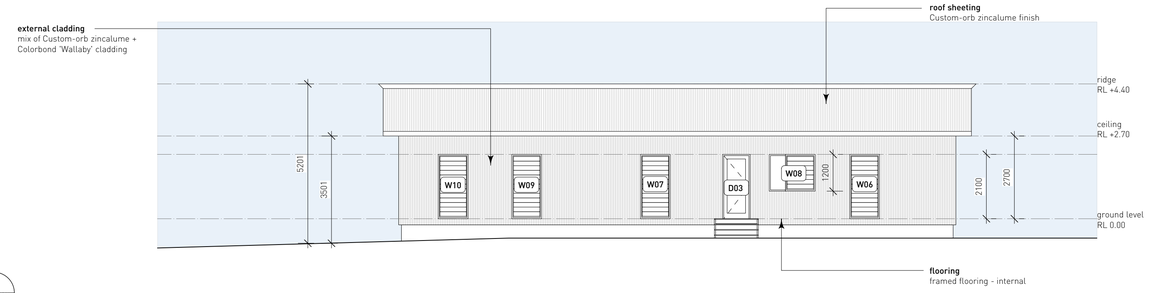

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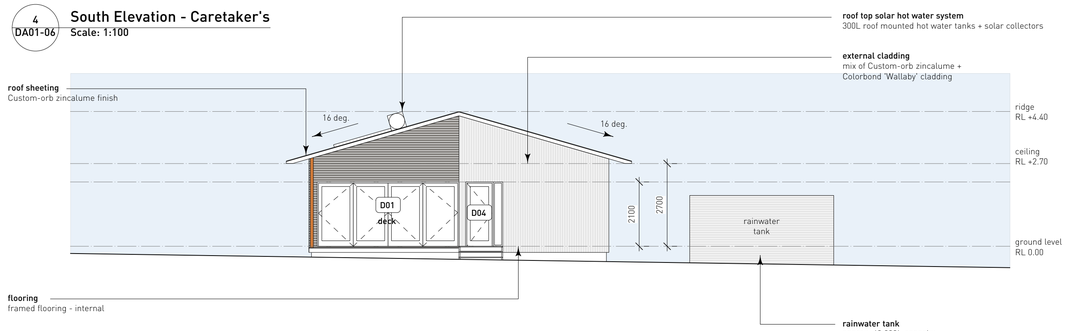

5 DA01-06 — **West Elevation - Caretaker's**
Scale: 1:100

0005521260 17 Dec 2020
Assessor Gavin Chambers
Accreditation No. DMN13/1491
Address 3130 Oxley Highway , Gunnedah , NSW, 2380
hstar.com.au

PRELIMINARY

Rev	Date	By	Notes
C	27/11/20	SF	Issue for BASIX
B	13/11/20	SF	Preliminary DA issue to consultants
A	12/11/20	SF	Preliminary DA drawings for client approval

notes
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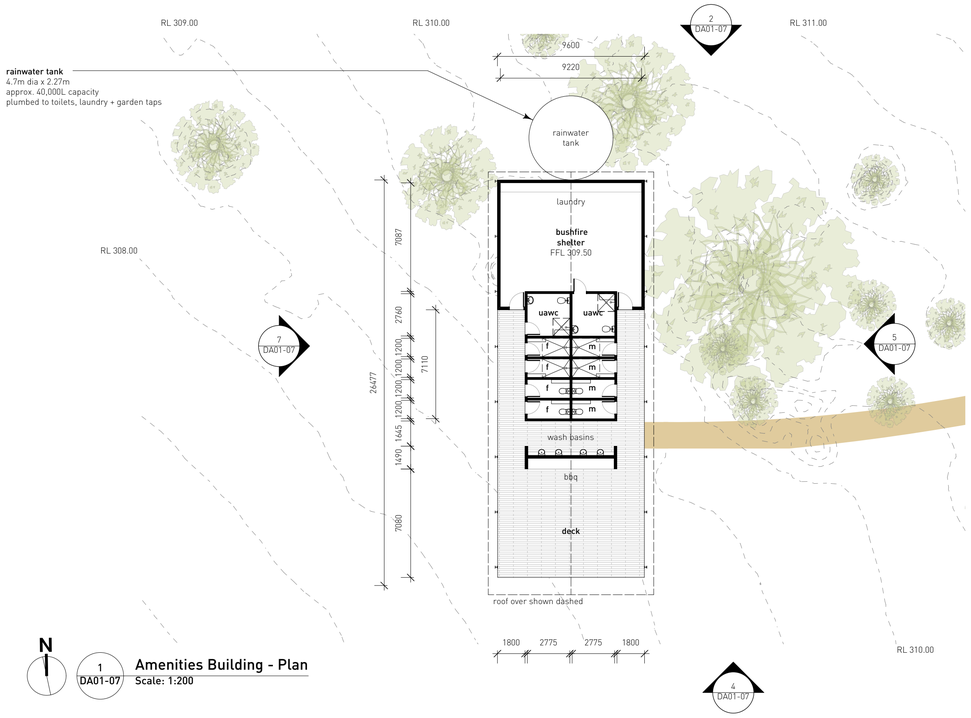
Client	Gunnedah Shire Council
Project	**Gunnedah Koala Sanctuary 3130 Oxley Highway, Gunnedah**
Issue	**Development Approval**
Date	Wed, 16 Dec 2020
Scale	1:100 @A1
Drawing	Caretaker's Residence
Drw No.	DA01-06 **Rev** C
Job No.	20_301
Drawn:	SF **Check:** LH



1 DA01-07 **Amenities Building - Plan**
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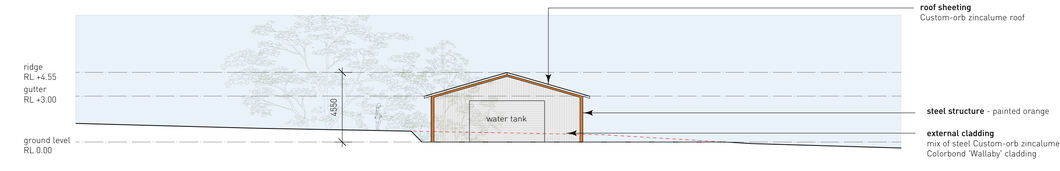

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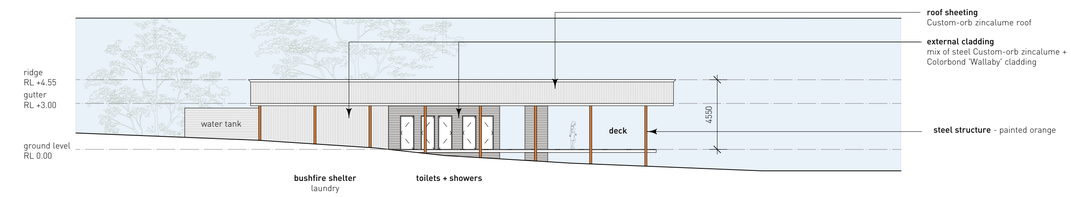

3 DA01-07 **Amenities Building - West Elevation**
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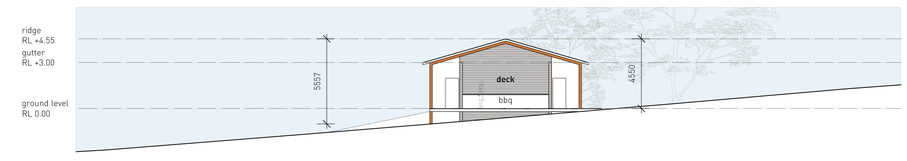

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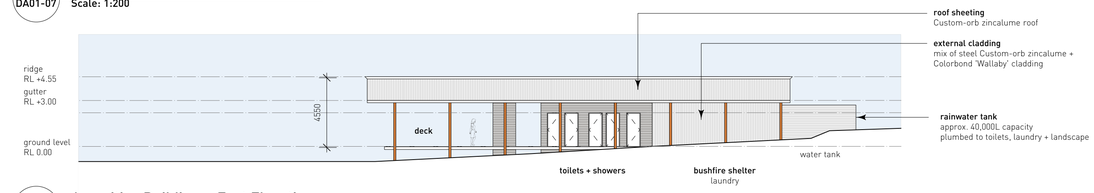

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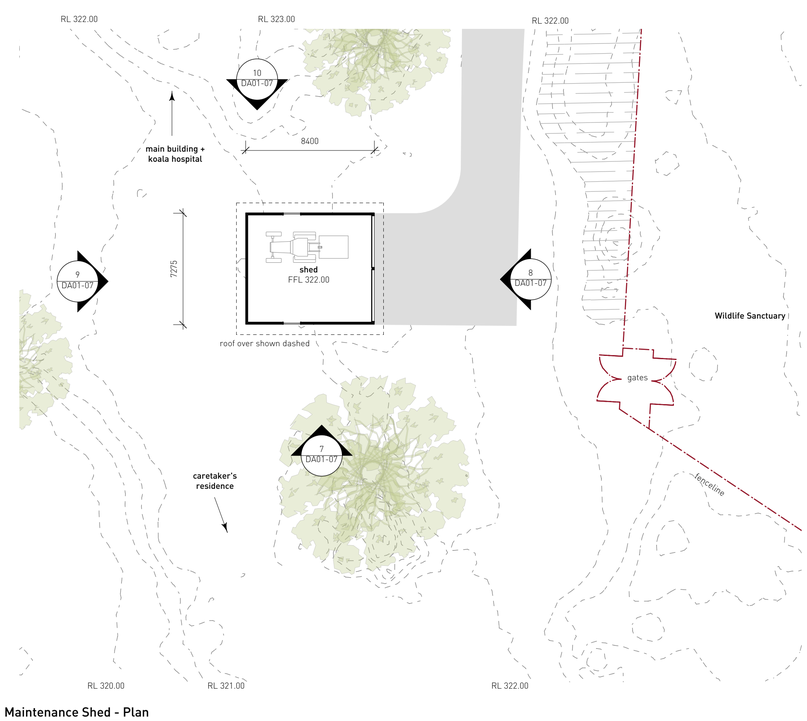

6 DA01-07 **Maintenance Shed - Plan**
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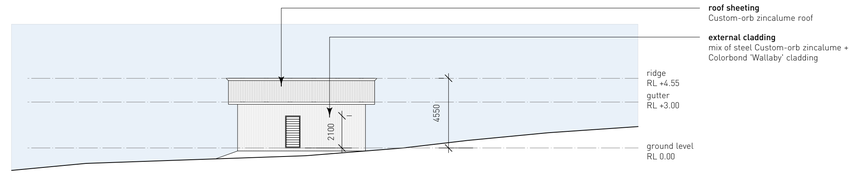

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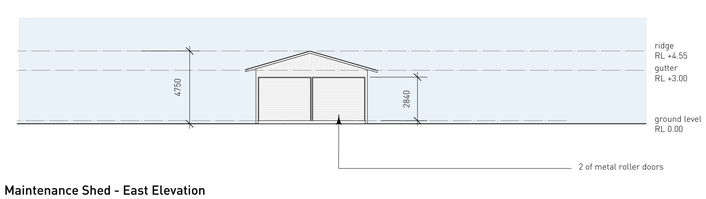

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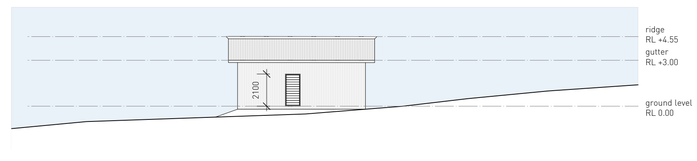
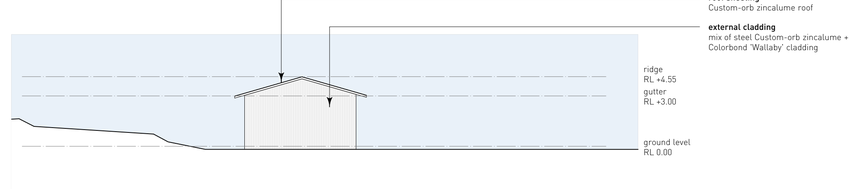
Scale: 1:200



10 DA01-07 **Maintenance Shed - North Elevation**
Scale: 1:200



9 DA01-07 **Maintenance Shed - West Elevation**
Scale: 1:200

PRELIMINARY

Rev	Date	By	Notes
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A	12/11/20	SF	Preliminary DA drawings for client approval

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Nominated architect Ashley Dunn NSW ARB No. 7547

Client	Gunnedah Shire Council
Project	**Gunnedah Koala Sanctuary** **3130 Oxley Highway, Gunnedah**
Issue	**Development Approval**
Date	Fri, 18 Dec 2020
Scale	1:200 @A1
Drawing	Maintenance Shed & Amenities Buildin
Drw No.	DA01-07 **Rev** B
Job No.	20_301
Drawn:	SF **Check:** LH

Ardill Payne & PARTNERS

ENGINEERS PLANNERS SURVEYORS ENVIRONMENTAL PROJECT MANAGEMENT

WATER AND SEWER DESIGN REPORT

Submission to Gunnedah Shire Council

GUNNEDAH KOALA SANCTUARY

3130 Oxley Highway, Gunnedah
Lot 328 and Lot 329 DP 755503

For:

Gunnedah Shire Council

December 2020

BALLINA
45 River Street
PO Box 20
BALLINA NSW 2478
02 6686 3280

GUNNEDAH
Germane House
285 Conadilly Street
GUNNEDAH NSW 2380
02 6742 9955

Document Control Sheet

Filename:	10401 Gunnedah Koala Sanctuary Water and Sewer Design Report V2.docx				
Job No.:	10401				
Job Captain:	Tony Cromack				
Author:	Parham Ghasemzadeh				
Client:	Gunnedah Shire Council				
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Revision No.	Date	Checked By		Issued By	
		Name	Signed	Name	Signed
0	18.08.20			P. Ghasemzadeh	
1	13.10.20	T. Cromack		P. Ghasemzadeh	
2	2.12.20			P. Ghasemzadeh	

Revision No:	Description
0	First issue
1	Updated based on revised development plan and additional scope of study
2	**Updated based on revised site visitors numbers, development scheme and received review comments**

Table of Contents

Abbreviations

This report may have used the following abbreviations.

Abbreviation	Abbreviated Term
APP	Ardill Payne & Partners
AS	Australian Standards
AWTS	Aerated Wastewater Treatment System
BCA	Building Code of Australia
BPS	Booster Pump Station
DA	Development Application
DCP	Development Control Plan
DDS	Development Design Specification
DEM	Digital Elevation Model
DSP	Development Servicing Plan
ET	Equivalent Tenement
ETA	Evapotranspiration Absorption
FH	Fire Hydrant
FHR	Fire Hose Reel
GSC	Gunnedah Shire Council
HT	Hydropneumatic tank
LAA	Land Application Area
LDR	Design Loading Rate
DIR	Design Irrigation Rate
OSM	Onsite Sewer Management
PID	Peak Instantaneous Demand
RT	Rainwater Tank
S94	Section 94 of the NSW Environmental Planning and Assessment Act 1979
SPS	Sewer Pump Station
WSA	Water Services Association

1. Introduction

Ardill Payne and Partners has been commissioned by Gunnedah Shire Council to provide necessary water and sewer designs to support the DA for the proposed Koala Sanctuary at 3130 Oxley Highway, Gunnedah. The development includes a koala and wildlife hospital, wildlife sanctuary and touristic attractions on a Council owned site located approximately 2km to the west of Gunnedah. Development details are shown in the site layout plan provided in **Attachment 1**. The site locality is shown in **Figure 1.1**.

Figure 1.1: Site locality

The following report discusses the water and sewer provisions for the proposed Koala Sanctuary and does not include any assessment or recommendation regarding the water and sewer systems of the existing Motorcycle Track and Kart Track on Lot 328. The report has been prepared in collaboration with the project architect and GSC and based on the development details provided to us.

This study has been undertaken with consideration of GSC Engineering Guidelines and DCP in addition to State and National guidelines and standards.

2. Site and Proposed Development

2.1. Site Conditions

The site has 35.54 ha total area and includes two large rural lots. Established gravel roads and access to Oxley Highway and Hunts Road are existing at the site. The western lot (328) with 17.60ha area contains an existing motorcycle track located to the north and an existing kart track located to the south of the lot. The majority of the proposed development is located on Lot 329 with an area of 17.94ha. The site aerial view is shown in **Figure 2.1**.

The site slopes from the middle toward the southwest and northwest corners with 6% to 8% grades. The site highest elevation is approx. 340m AHD and lowest elevation approx. 300m AHD. The site elevations are shown in **Figure 1, Attachment 2**.

Figure 2.1: Site Locality Plan

2.2. Proposed Development

The development layout plan and details regarding the allocated development areas are provided in **Attachment 1**. The main development components include:

- Administration Building (Reception/Gift Shop/General Store/Ticket Sales/Offices/Public Bathrooms)
- Koala and Wildlife Hospital
- Wildlife Park (Exhibition)
- Wildlife Sanctuary
- Petting Zoo
- Restaurant
- Visitor Accommodation (Eco-Tourism tents)
- Volunteer Accommodation (dorm style)
- Manager/Caretaker Accommodation
- Eucalypt Plantation
- Indigenous Cultural Education Centre
- Mini Golf Course/Adventure Climbing/Zip Lines
- Camp Ground (Caravans/RVs)

For Water and Sewer services design this report considers that:

- The proposed development will enable accommodating 75 people for overnight stay in addition to 135 daily visitors. In functions expected to happen once or twice a year the number of visitors may increase to up to 200 people.

- The overnight visitors will mainly reside at Visitor Accommodation and Volunteer Accommodation.

- The daily visitors primarily use the sanitary services provided at the shops and restaurant in Koala and Wildlife Hospital.

- The Aboriginal cultural centre will not require water or sewer connection.

3. Water Supply

3.1. Water Demands

GSC Engineering Guidelines recommend that the water demands are defined in accordance with New South Wales Public Works Department Standards. However, in this project using a more recent guideline, *2017 Water Directorate Publication 'Section 64 - Determinations of Equivalent Tenement Guidelines'* (ET Guideline), was preferred. The ET Guideline defines the water consumption rates for a wide range of residential, commercial and industrial developments and allows a more accurate estimation of the site water demands. The water demands have been estimated from the two approaches below:

- Approach 1: Based on the number of site visitors
- Approach 2: Based on the unit rates provided in ET guideline for each development component

The results are provided in **Table 3.1** and **Table 3.2**.

Table 3.1: Estimated post development water demands based on the total expected site visitors and residents – Approach 1

Category	Standard Unit	Water Demand ET per Unit	Development	Estimated ET for development
Daily Visitors	Person	0.1	135 - 200	13.5 - 20
Overnight Visitors	Person	0.3	75	22.5
Total				**36 - 42.5**

Notes:

- 1 ET equals to 630 L/day

- Unit ETs per person are not directly available in the equivalent tenement guideline

It can be seen that the estimated ETs from both approach are in the same range. Numbers in **Table 3.2** has been used for distributing the water demands between the demand points across the site water network. In the table a provisional demand of 7 ET has been allocated to the main building (Wildlife Hospital) for the functions days. Sensitivity assessment shows that the proposed water network will be able to cope with additional ETs and changes in the site water demand distribution.

Table 3.2: Estimated post development water demands based on the development details – Approach 2

Category	Standard Unit	Water Demand ET per Unit	Development	Estimated ET for Development	Comment
Wildlife Hospital					
-Vet	m^2	0.01	292	2.92	Vet data used
- Cafe	m^2	0.02	120 (30 x 4m^2)	2.4	Unit rates for fast foods
- Shop	m^2	0.01	34	0.34	
- Toilet	Unit	0.4	10	4.0	
Additional ET on Function days with 200 visitor				7	Provisional
Wildlife Park (Exhibition)				1	Provisional
Wildlife Sanctuary				4	Provisional considered at site amenities
Petting Zoo				4	Provisional
Volunteer Accommodation					
-Dormitories	Bed	0.15	16	2.4	
- Bathrooms	Unit	0.4	2	0.8	
Tourist Accommodation					
- Eco-tourism tents - Couples (inc. bathroom)	Site	0.4	2	0.8	1 bedroom
- Eco-tourism tents - Family (unserviced)	Unit	0.6	3	1.8	2 bedroom
- Caravan (powered) camping	Site	0.4	12	4.8	Temporary camping site
Manager/Caretaker Accommodation	Unit	0.8	1	0.8	3 bedroom unit
Indigenous Cultural Education Centre				1	Provisional considered at site amenities
Mini Golf				1	Provisional considered at site amenities
Ablutions Building					
- Toilet	Unit	0.4	4	1.6	
- Shower	Unit	0.4	4	1.6	
Total				**35.26 – 42.26**	

Notes:

- 1 ET equals to 630 L/day

- Development details and assigned provisional ETs are based on the Gunnedah Koala Sanctuary master plan provided in Attachment 1 and other received information

3.2. Design Flows and Pressures

The site design instantaneous flows are quantified based on the following assumptions:

- Peak Instantaneous Demand: 0.15 L/s per ET
- Maximum Allowable Pressure: 780kPa at no discharge
- Minimum Acceptable Pressure: 200 kPa at PID
- Fire Flows: 10 L/s at a minimum pressure of 150 kPa with two third of PID assigned to demand nodes

The above assumptions comply with relevant local, state and national standards and guidelines. The design flows are shown in **Table 3.3**.

Table 3.3: The site minimum design flows and pressure requirement

Case	Instantaneous Demand per ET (L/s)	Site Demand (L/s)	Firefighting (L/s)	Requirement
Normal Operation	0.15	6.4	N/A	6.4 L/s at 200 kPa
Firefighting	0.1	3.6	10	13.6 L/s at 150 kPa

Notes:

- *The PID in normal operation is based on 42.5 ET*
- *The site water demand in firefighting condition is based on 36.0 ET*

3.3. Site Water Source

The site can be connected to the existing 200mm water main located at Hunts Road along the site western boundary. After consultation with GSC it is considered that this water main can provide a reliable source of water for both the site regular use and firefighting.

The location of the existing water main, proposed point of connection, and site water network is shown in **Figure 3, Attachment 2**.

The pressure test results of the water main is shown in **Figure 3.1**. The design flows based on **Table 3.3** and the residual pressures at these design flows are marked in the figure.

As shown, the residual pressure at the PID flow is 33m and at the firefighting flow 27m. The connection point to the water main is at 30m AHD. The majority of the proposed buildings are located at or above 310m AHD. Hydraulic modelling shows that with consideration of the friction losses and increase of elevations, the minimum pressure requirements as defined in **Table 3.3** cannot be met at many locations. As a result a boosted system is proposed for the site. The boosted system requirements are discussed in **Section 3.6**.

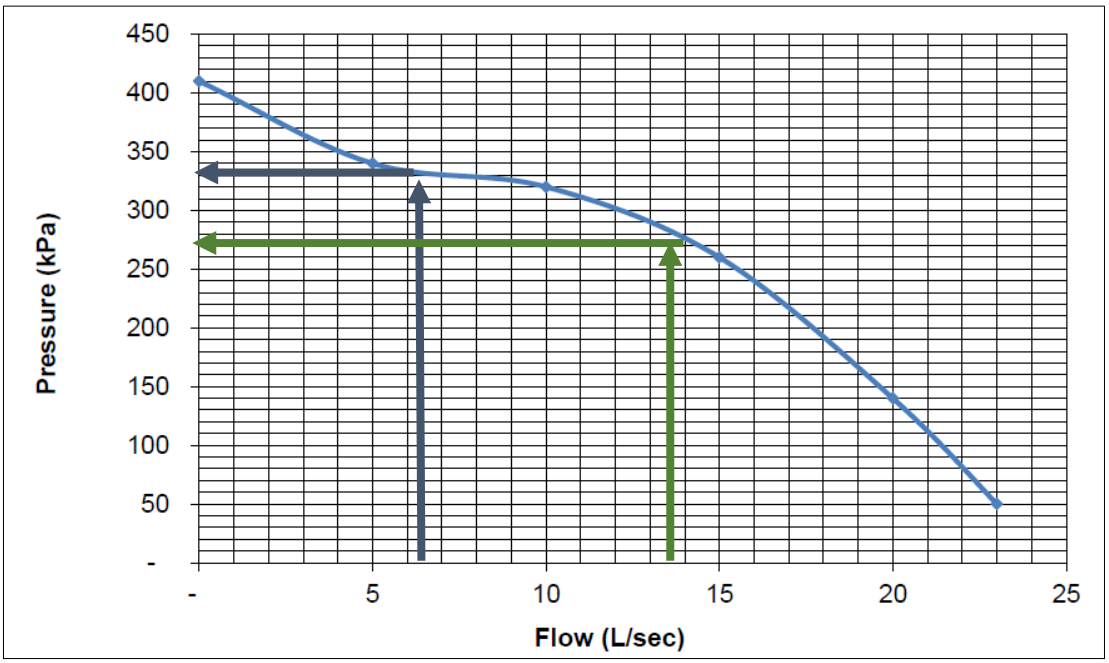

Figure 3.1: Pressure test results of Hunts Road 200mm water main

3.4. Site Water Network

The proposed site water network is shown in **Figure 3, Attachment 2**. Regarding the proposed network:

- The water network must be constructed with minimum DN100 diameter to enable supply to the fire hydrants.
- Connections to each building can be provided by metered or non-metered 20mm or 25mm pipes. Based on the defined use none of the proposed buildings will require FHRs. If required, 32mm connections would have been needed.
- Based on the received advice the Aboriginal Cultural Centre will not require water connection. However, extending the water network to this area for firefighting purposes may be required. GSC recommends that in rural areas FHs are located every 250m and also in presence of people risk of fire will be existing. Necessity of extending the pipeline to this building to be confirmed prior to the site detailed designs.

3.1. Fire Hydrants

The existing hydrants along the water main at Hunts Road do not provide enough coverage for the site.

GSC Engineering Guidelines call for a maximum distance of 75m between hydrants in urban residential areas and 250m in rural areas. AS 2419 defines a maximum distance of 70m between the hydrants and the furthest location of the building being serviced.

For the site designs the hydrants are located with a maximum distance of 70m from the furthest part of the buildings and 250m from each other.

The fire hydrants shall be located in a place with no obstructions and with a minimum distance of 10m from the buildings. The hydrants need to be accessible with a maximum distance of 20m from hardstand areas.

The location of the existing and proposed fire hydrants and their approximate coverage are shown in **Figure 3, Attachment 2.** As shown part of the Caretaker House in its current location is not covered. The building can be moved slightly closer to the road or extending a 100mm water branch along the building driveway will be required.

3.2. Boosted System Components

Hydraulic modelling shows that with consideration of the elevation of the proposed buildings, their distance from the connection point to the water main, and pressure at the water main, provision of a boosted water system for the site will be necessary.

The boosted system will consist of three parallel pumps located as shown in **Figure 3**, **Attachment 2** close to the connection point and a hydropneumatic tank located in proximity to the boosting pumps. The HT will be installed on a tee junction as schematically shown in **Figure 3.2**. The pumps will be automatically controlled by pressure in the HT.

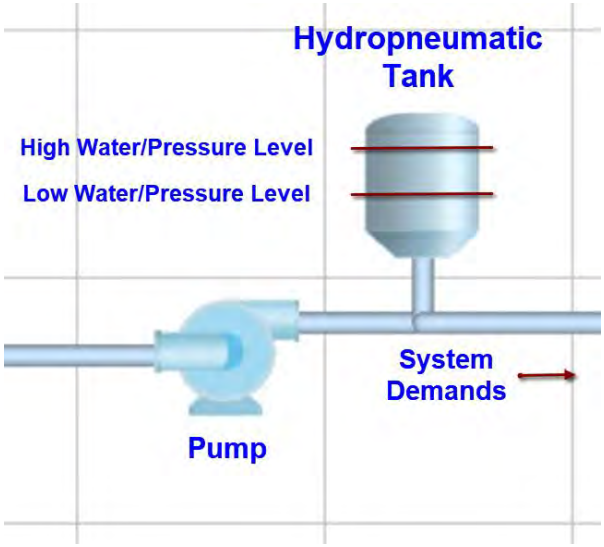

Figure 3.2: Pump and Hydropneumatic tank setup schematic

The aspects of the system are described in detail below:

Booster Pumps: As shown in **Table 3.3** the site will have a PID of 6.38 L/s and firefighting need of 13.6 L/s. As such the best arrangement will be to have a triplex booster pump with 2 duty/1 standby setup. Hydraulic modelling shows that each pump should be able to discharge 7.0 L/s at 35m head. The pumps will be automatically controlled by pressure in the HT. The following rule based controls are included in the hydraulic model for the pumps operation.

'Rule 1:

If Tank HT Level < 55 Then Pump Booster1 status is Open

Rule 2:

If Tank HT Level >= 64 Then Pump Booster1 status is Closed

Rule 3:

If Tank HT Level < 54 Then Pump Booster2 status is Open

Rule 4:

If Tank HT Level >= 63 Then Pump Booster2 status is Closed'

Hydropneumatic Tank: In a booster pump application, HTs provide water to the system during periods of low flows to reduce the number of pump starts. A hydropneumatic tank contains pressurized air and water. The compressed air acts as a cushion exerting or absorbing pressure. HTs serve with three main functions:

- Delivers water within a selected pressure range so the pump is not continuously running.
- Prevents a pump from starting up every time there is a minor call for water from the distribution system.
- Minimizes pressure surges (water hammer).

The site HT is sized based on the method explained by US Army Corp of Engineers in *'AED Design Requirements: Hydropneumatic Tanks'* dated Sep 2009. The assumptions and calculations are as follows:

Tank Drawdown $D = t * (Q * 60) / 4$

The acceptance factor $F = 1 - [(P_f + \text{atmospheric pressure}) / (P_o + \text{atmospheric pressure})]$

Tank size $V = D / F$

Flow (Q) = 36ET x 630L/day = 0.26 L/s (average site demand)

(t) = 10 min pump start cycle

P_f = 550 kPa P_o = 640 kPa

Atm = 101 kPa

D = 10 min ((0.26 l/s)(60sec/min)) / 4 = 39 litres

F = 1 - [(550+101) / (640+101) = 0.121

V = 39.0 litres / 0.121 = 322 litres Use one 350 litre hydropneumatic tank or larger

3.3. Hydraulic Modelling

3.3.1. Approach

Computer modelling has been utilised to assess the site water supply requirements and the performance of the boosted system. Modelling has been completed in EPANET 2 software which allows extended period time step analysis of pressurised water systems. Hydraulic modelling was performed in four condition below:

- PID flow of 0.15 L/s/ET - Not boosted
- PID flow - boosted
- Average flow of 0.008 L/s/ET (630 L/day/ET) with diurnal pattern - boosted
- 2/3 PID plus firefighting - boosted

3.3.2. Model Setup

The model layout is shown in **Attachment 3** of the report. In the model setup:

- The water demand at each demand point is according to the ETs in **Table 3.2** with 42.5ETs assigned for Peak instantaneous demand simulation and 36ETs assigned for firefighting simulation.
- The booster pump curve is based on equation 'H = 46.67 - $0.2381Q^2$ with a pumping rate of 7L/s @ 35m head.
- When simulating varied flows (flow with diurnal pattern) The pressure at the connection point is modelled by including a pump with a curve simulating the pressure test results. When simulating constant PID flow the connection point is simulated as a reservoir with 33m head. When simulating constant 2/3 PID+FH flow the connection point is simulated as a reservoir with 27m head.
- The HT operation is simulated using a tank node with 500L storage capacity between 55m to 64m head (tank diameter 0.27m).
- All pipes in the model are DN 100mm which is the minimum allowable size for the pipes feeding FHs.
- The diurnal demand is based on the figure shown in **Figure 3.3**.

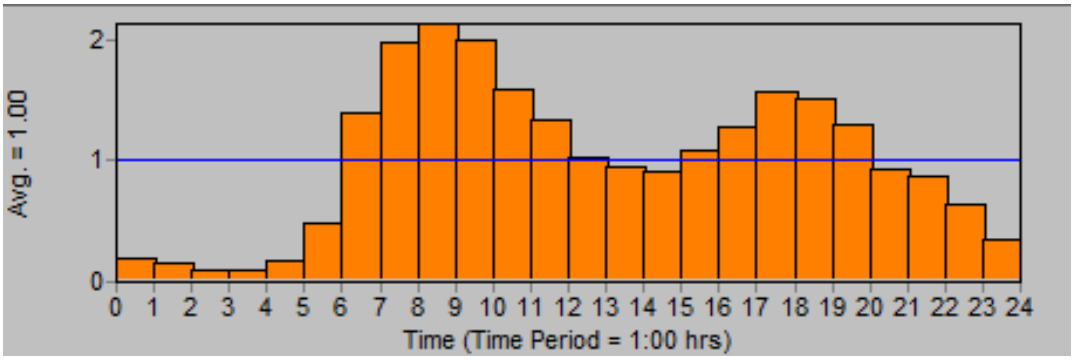

Figure 3.3: Diurnal pattern used in hydraulic modelling

3.3.3. Modelling Results

Modelling results are shown and explained in **Attachment 3**.

4. Sewer

In this section the site sewer loads are calculated and the two options of onsite sewer management and connection to the offsite GSC network have been compared.

4.1. Site Sewer Loads

The ET sewer loads are estimated from the Equivalent Tenement Guidelines. Similar to the approach for water demands, the sewer loads have been estimated from the two approaches below:

- Approach 1: Based on the number of site visitors
- Approach 2: Based on the unit rates provided in ET guideline for each development component

The results are provided in **Table 4.1** and **Table 4.2**.

Table 4.1: Estimated post development sewer loads based on the total expected site visitors and residents – Approach 1

Category	Standard Unit	Sewer Load ET per Unit	Development	Estimated ET for development
Daily Visitors	Person	0.12	135 - 200	16.2 - 24
Overnight Visitors	Person	0.35	75	26.3
Total				**42.5 – 50.3**

Notes:

- 1 ET equals to 385 L/day

- Unit ETs per person are not directly available in the equivalent tenement guideline

It can be seen that the total ETs calculated from the both approach is close. **Table 4.2,** prepared from Approach 2, provides more details regarding the sewer loads at each part of the development. In this study, the additional 8ET sewer load on functions days have been included in the ETs allocated to the main building (Wildlife Hospital). The system will be able to cope with realistic increase or change of the site sewer loads distribution.

Table 4.2: Estimated post development sewer loads based on the development details – Approach 2

Category	Standard Unit	Water Demand ET per Unit	Development	Estimated ET for Development	Comment
Wildlife Hospital					
-Vet	m^2	0.01	292	2.92	Vet data used
- Cafe	m^2	0.02	120 (30 x 4m^2)	2.4	Unit rates for fast foods
- Shop	m^2	0.01	34	0.34	
- Toilet	Unit	0.63	10	6.3	
Additional ET on Function days with 200 visitor				8	Provisional
Wildlife Park (Exhibition)				1	Provisional
Wildlife Sanctuary				4	Provisional considered at site amenities
Petting Zoo				4	Provisional
Volunteer Accommodation					
-Dormitories	Bed	0.15	16	2.4	
- Bathrooms	Unit	0.63	2	1.26	
Tourist Accommodation					
- Eco-tourism tents - Couples (inc. bathroom)	Site	0.5	2	1.0	1 bedroom
- Eco-tourism tents - Family (unserviced)	Unit	0.75	3	2.25	2 bedroom
- Caravan (powered) camping	Site	0.5	12	6.0	Temporary camping site
Manager/Caretaker Accommodation	Unit	0.8	1	0.8	3 bedroom unit
Indigenous Cultural Education Centre				1	Provisional considered at site amenities
Mini Golf				1	Provisional considered at site amenities
Ablutions Building					
- Toilet	Unit	0.63	4	2.52	
- Shower	Unit	0.63	4	2.52	
Total				**41.7-49.7**	

Notes:

- 1 ET equals to 385 L/day

- Development details are based on the Gunnedah Koala Sanctuary master plan provided in Attachment 1

The design sewer loads based on the estimated total 50.0 ETs for the site are calculated in **Table 4.3**.

Table 4.3: Site design sewer loads

Category	Design ADWF (ET)	Design ADWF (L/day)	Design ADWF (L/S)	Design PWWF (L/S)
Site	50	19250	0.22	1.0

Note:

- *PWWF is calculated as 4.5 x ADWF*

4.2. Onsite Sewer Management

4.2.1. Site Attributes and Constraints for OSM

The main considerations for the design of the site for a future OSM system are as follows:

- The site is not located within a flood prone area and is not in proximity of a major overland flow path.
- The site slope is less than 10%. Therefore, the buffer distance between the land application area (LAA) and different on-site and off-site features to be in accordance with **Table 4.4**.

Table 4.4: Buffer distance required between the LAA and on-site and off-site features

Feature	Buffer Distance Requirement - ETA Bed	Buffer Distance - Other Disposal Methods
River or waterway	100m	100m
Water course	40m	40m
Down slope property boundary	12m	6m
Up slope property boundary	6m	3m
Swimming pools, driveway, building boundary	6m	6m

4.2.2. Site Soil Characteristics

Soil texture and structure determines the soil ability to accept effluent, which in turn determines the appropriate effluent loading rate. At this stage the soil data is extracted from eSPADE v2.1. eSPADE is a Google Maps based information system that allows free, easy access to a wealth of soil and land information across NSW. eSPADE assigns the highest degree of confidence to their available information for the site area.

Based on data extracted from eSPADE shown in **Figure 4.4** the site soil texture can be classified as 'Sandy Clay'. Hydrological information layers in eSPADE not shown in this report categorise the site soil as 'Slow Infiltration'.

While this information should suffice at the DA stage, the soil characteristics must be confirmed with soil infiltration tests at the proposed LAA locations to confirm the DLR assumption made in this report and to confirm that the soil depth to the bed rock at the LAA is more than 2m.

The soil test can be performed by the OSM system provider prior at the detailed design stage.

4.2.3. Treatment System

The site is spread across a large area. To minimise the piping and also to enable construction of the OSM system in different stages, instead of developing a centralised system, the site sewer treatment can be undertaken by installing 2 AWTS units at the approximate locations shown in **Figure 6, Attachment 2**. The size of the AWTS units are provided in **Table 4.5**. AWTS is an advanced treatment system providing additional treatment through aerating the sewage and controlled release of the treated effluent. The treatment capacity of the selected future treatment units must not be less that the numbers specified below.

- At least 50% treatment of Total Nitrogen
- At least 80% treatment of Total Phosphorous

4.2.4. Effluent Disposal

Land Application Method

The land application method is selected with consideration of the site specification. Absorption trenches do not provide significant absorption opportunities through the surface plants and are not supported by Council. Sub-surface drip irrigation allows more flexibility in shaping the application area but is not the proposed method in this report as in general this method is not considered suitable for clay base soils. Mounds are a very reliable disposal method and ideal for installing on steep slopes but would also be the most costly.

With consideration of the above notes, an Evapotranspiration-Absorption (ETA) system has been selected as the preferred land application option. ETA systems are not suitable in steep areas with more than 10% grade. This limitation has been considered in locating the LAA.

The total size of the LAA has been defined by hydraulic calculation in compliance with AS 1547. The details are provided in the rest of this section.

Hydraulic Calculations

The size of the land application area (LAA) can be calculated from the equation below provided in AS 1547 for domestic developments.

$A = Q \div DIR$
A = Area of land application required in m^2
Q = Daily Design Flow Rate in litres/day
DLR = Design Loading Rate in mm/day

For the subject site:

A = 19,135 ÷ 12 (DLR for the site category 4 soil, 0.12m<Ksat<0.5m from AS 1547 Table 5.2)
A = 1594 m²

Soil tests for confirmation of the above DLR is necessary.

LAA Location and Size

The preliminary OSM plan is shown in **Figure 6, Attachment 1**. As shown with consideration of the development stages and limited suitable land, four LAA locations with an additional reserve LAA have been proposed. The location of the LAA complies with the buffer requirements in **Table 4.4**. The total dedicated land for effluent disposal is more than 5000m^2 which in addition to the necessary DLR area covers the TN and TP absorption requirement.

If required, additional on-site reserve application fields are available within the site boundary to be used in an unlikely event of long term deficiency of the proposed LAAs.

4.2.5. Cost Estimate of Onsite Sewer Management

A cost estimate for the sewer management options is provided in **Table 4.5**. The costs are based on the information from the most recent construction works managed by APP.

In this cost estimate:

- No fee is included for detailed designs and contract management
- No allowance has been made for inflation, currency and commodity fluctuations and other factors unknown at this time
- Does not include sanitary drainage lines from buildings to OSM systems.
- Does not include the long term operation and maintenance costs

Table 4.5: Estimated cost of onsite sewer management

Item	Description	$ Cost
LAA 1	15kL AWTS , Disposal Area, Supply, Installation and Piping	$100,000
LAA 2	15kL AWTS , Disposal Area, Supply, Installation and Piping	$135,000
Total		**$235,000**

The estimated costs should be considered preliminary.

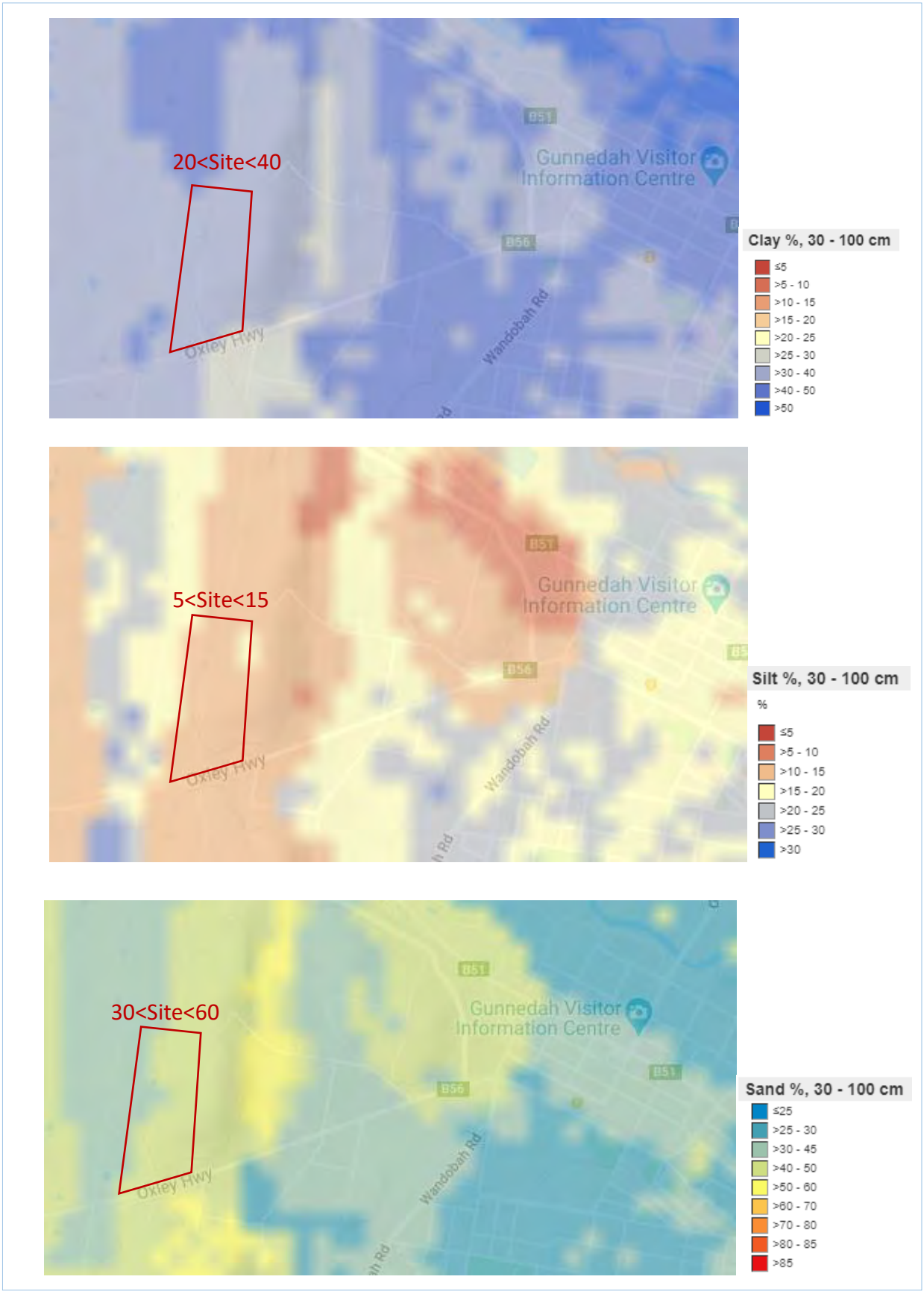

Figure 4.4: Soil grading properties to 1m depth – Based on eSPADE 2.1 data

4.3. Connection to Gunnedah Sewer Network – Offsite Management

4.3.1. Connection Point

The existing Gunnedah sewer network and the location of the site are shown in **Figure 4.1**. The network information is based on data received from GSC. As shown, gravity sewer pipes are existing at both sides of the Oxley Highway. The 150mm gravity main located at the northern side of the highway is closer with 800m distance from the site eastern boundary.

The sewer gravity main located at the southern side of the highway upsizes to 225mm at the Bennett Road intersection 960m from the site eastern boundary. The subject 225mm pipe connects to the town main gravity sewer line at the southern end of Farrar Road. The main sewer line traverses along Farrar Road and discharges to the town WWTP at the location shown in **Figure 4.1**. The GSC sewer network is shown in details in **Figure 4, Attachment 2**.

Figure 4.1: Gunnedah sewer network

The slope of the existing gravity mains either side of Oxley Highway are not available. However, based on the surface grades the pipes should have at least 1% slope. Table 5.6 of WSA 02 defines the following maximum ET capacities for 150mm and 225mm gravity pipes with 1% slope in an area with 2 year ARI rainfall intensity of 21mm/hr:

- 225mm Diameter: 730 ET
- 150mm Diameter: 200 ET

The site post development total sewer load is estimated at 50 ET. With consideration of the current customers connected to the 150mm main to the north of the highway, connection of the site sewer to this pipe could be possible but increases the pipe load to its limit. Though further from our site boundary, the 225mm pipe located to the south of the highway would be a more suitable connection point.

The site connection point to GSC network is shown in **Figure 4.1**. The surface level at the connection point is 275m AHD, 41m lower than the eastern corner of the site allowing connection through a 150mm gravity main. Contour lines at the location of connection are shown in **Figure 4, Attachment 2**.

4.3.2. Site Sewer Network

The site collecting pipe will be a 150mm gravity sewer main which is the minimum allowable pipe size for gravity sewer systems. The gravity main route is shown in **Figure 4.2**. Where possible the main is located within the road reserve. At some segments this will not be possible or may not be the preferred option. This is explained in Figure 4.2. Further investigation will be undertaken at the detailed design stage to ensure the impact of the pipework to the site native vegetation will be minimal.

Wastewater generated at most of the proposed buildings can fall to the site collecting pipe by gravity means. Part of the development including the Volunteer Accommodation and the amenities block servicing the Eco-tourism tents are located at elevations lower than the proposed gravity sewer main. Wastewater generated from these buildings will need to be directed to a proposed SPS and pumped to the sewer main through a short length of 50mm pressure main. The catchment that will be connected to the proposed SPS is shown in **Figure 4.2**.

The capacity of the proposed SPS is calculated in **Table 4.6**. This calculation show that the pumping capacity can be provided through a small packaged SPS.

Table 4.6: Site pump station capacity calculation

SPS ET Load	Design ADWF (L/day)	Design ADWF (L/S)	Design PWWF (L/S)	SPS Pumping Capacity	Emergency Storage (m^3)
17.95	6911	0.08	0.34	0.4@20m	2500

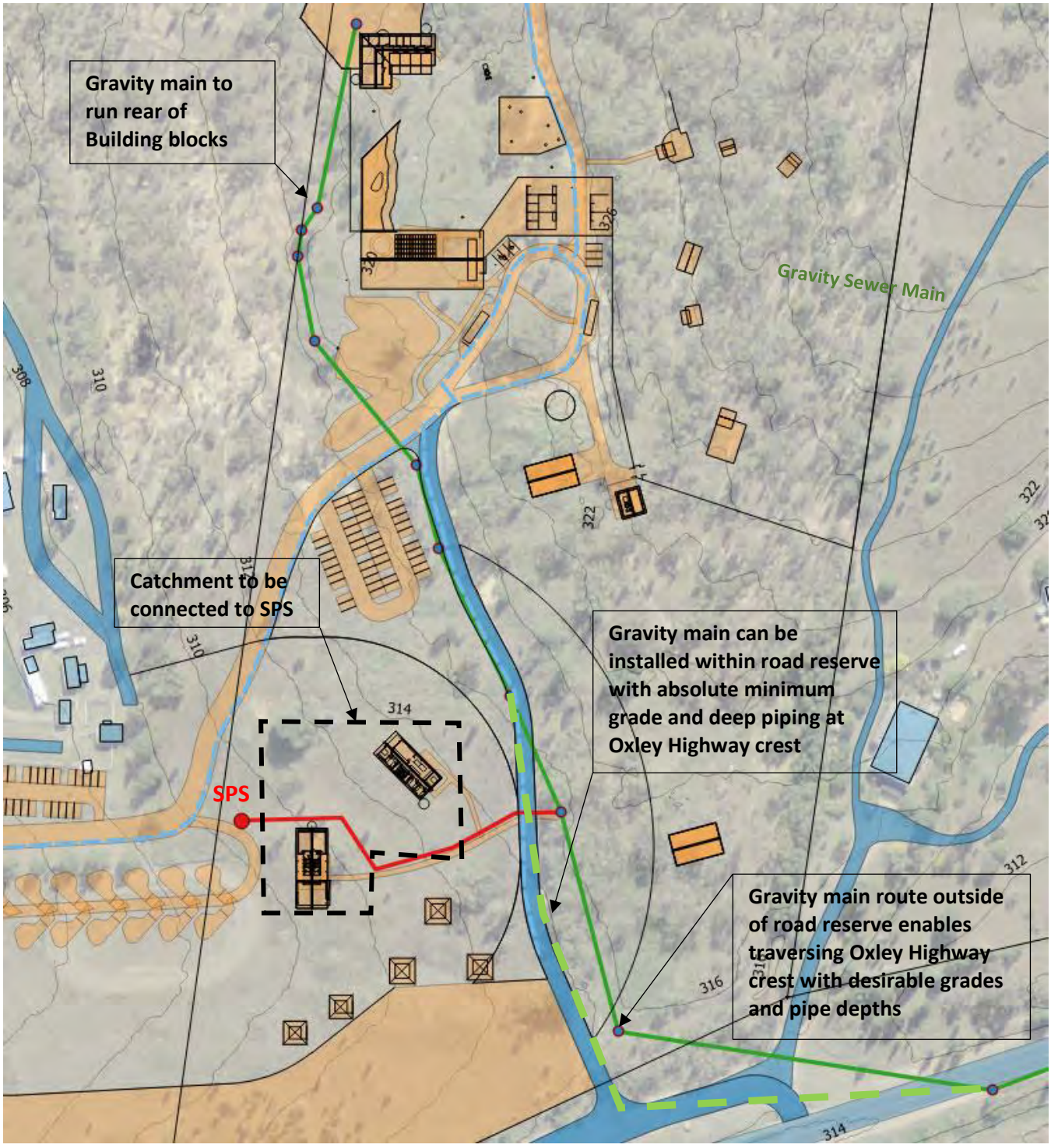

Figure 4.2: Part of development to be connected to SPS

In summary the site sewer system will include the infrastructure below:

- 1668m of 150mm gravity main
- 13 sewer manholes

- 123m of 50mm sewer pressure main
- One Duplex packaged SPS with standby/duty setup, each pump 0.4L/s @ 20m head and with 2.5m^3 emergency storage (EOne Grinder 1HP ESD-0022 or similar)
- 100mm sanitary drainage lines from the buildings to the sewer main

4.3.3. Cost Estimation of Gravity Sewer System

A cost estimate for connecting the site gravity sewer to Councils network is provided in **Table 4.6** below. The unit prices are based on information from the most recent construction works managed by APP.

In this cost estimate:

- No fee is included for detailed designs and contract management
- No allowance has been made for inflation, currency and commodity fluctuations and other factors unknown at this time
- Does not include sanitary drainage lines from buildings to the gravity main.
- Does not include right of way, easement acquisition, connection and other legal fees
- Does not include the long term operation and maintenance costs

Item	Unit	$ Unit Cost	Quantity	$ Cost
Site setup, set out survey and traffic control	Item	$25,000	1	$25,000
150mm gravity main	Lm	$90	1668	$169,290
Manholes	No.	$4,000	13	$64,000
50mm sewer pressure main	Lm	$50	123	$8,450
Duplex 1 L/s SPS @ 20m head with emergency storage	No.	$20,000	1	$25,000
Underbore across Oxley Highway	Item	$8,000	1	$8,000
Total				**$266,270**

4.4. Considerations Regarding Selecting Site Sewer System

The two options of 'onsite management' and 'offsite disposal' were discussed earlier in this section. Offsite sewer management minimises the maintenance of the site sewer system but requires more capital spending mainly for installing the 150mm gravity sewer line along Oxley Highway.

Onsite treatment requires confirmation of the site soil parameters prior detail design of the OSM system.

5. Scope of Engagement

This Water and Sewer Design Report has been prepared by Ardill Payne & Partners (APP) at the request of Gunnedah Shire Council to support an application for development of the Gunnedah Koala Sanctuary at 3130 Oxley Highway, Gunnedah and is not to be used for any other purpose or by any other person or corporation.

This report has been prepared from the information provided to us and from other information obtained as a result of enquiries made by us. APP accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

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APP declares that it does not have, nor expects to have, a beneficial interest in the subject project.

To avoid this advice being used inappropriately, it is recommended that you consult with APP before conveying the information to another who may not fully understand the objectives of the report. This report is meant only for the subject site/project and should not be applied to any other.

6. Attachments

Attachment 1	Site Architectural Information
Attachment 2	Figures and Preliminary Designs
Attachment 3	EPANET 2 Hydraulic Modelling

ATTACHMENT 1

Attachment 1: Site Architectural Information

ATTACHMENT 2

Attachment 2: Figures and Preliminary Designs

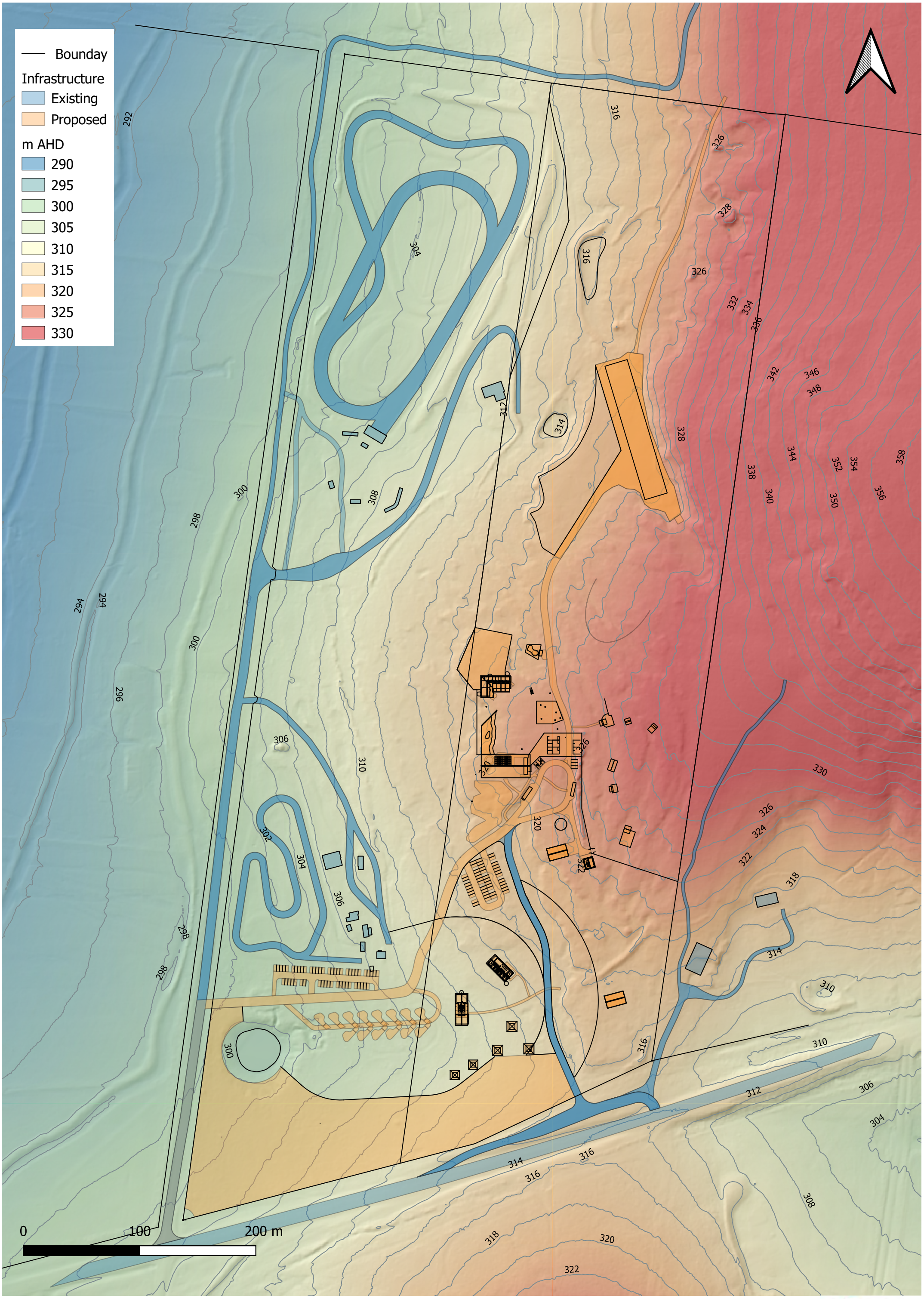


Figure 1: Site Topography and Development Plan

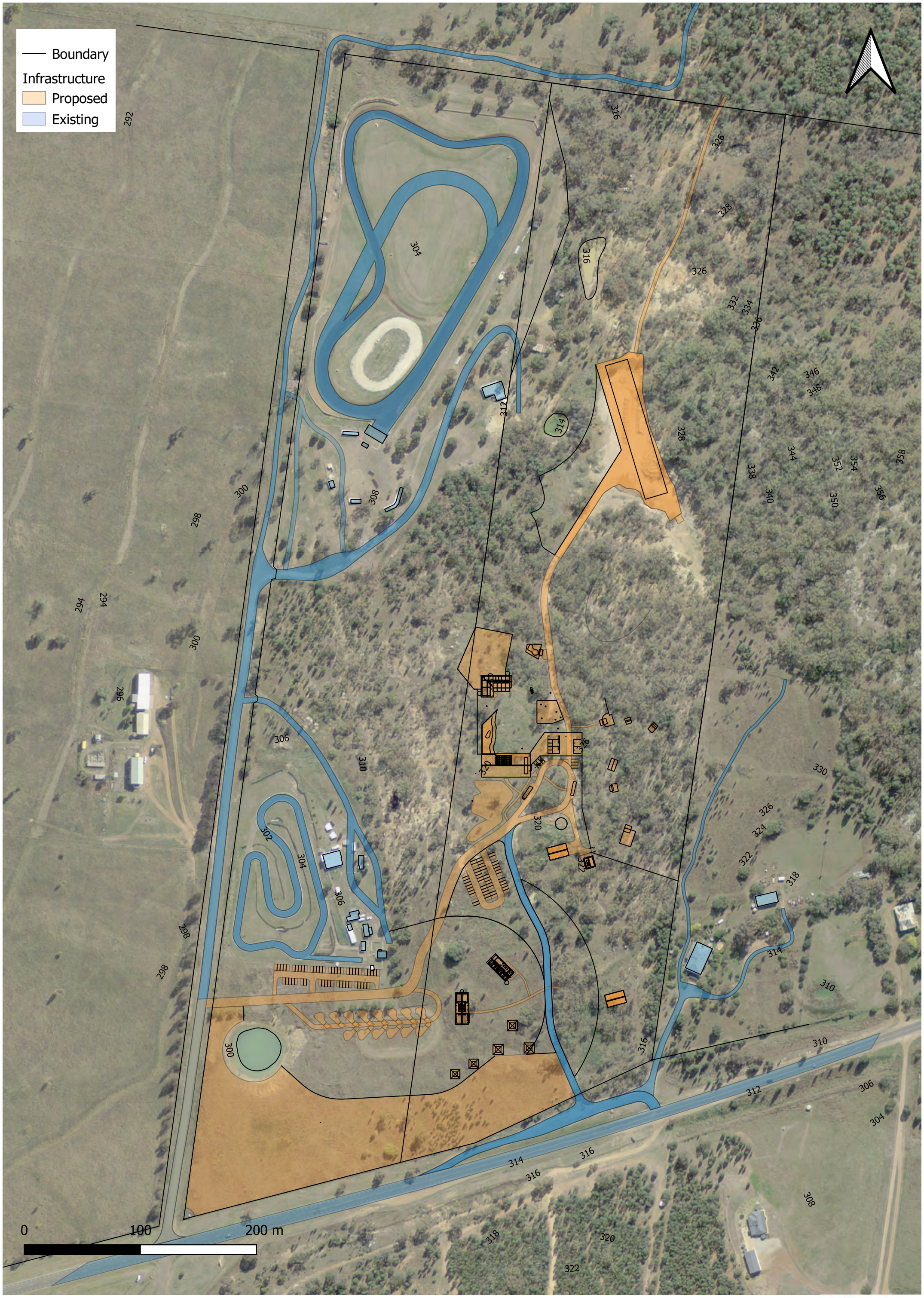


Figure 2: Site Aerial and Development Plan

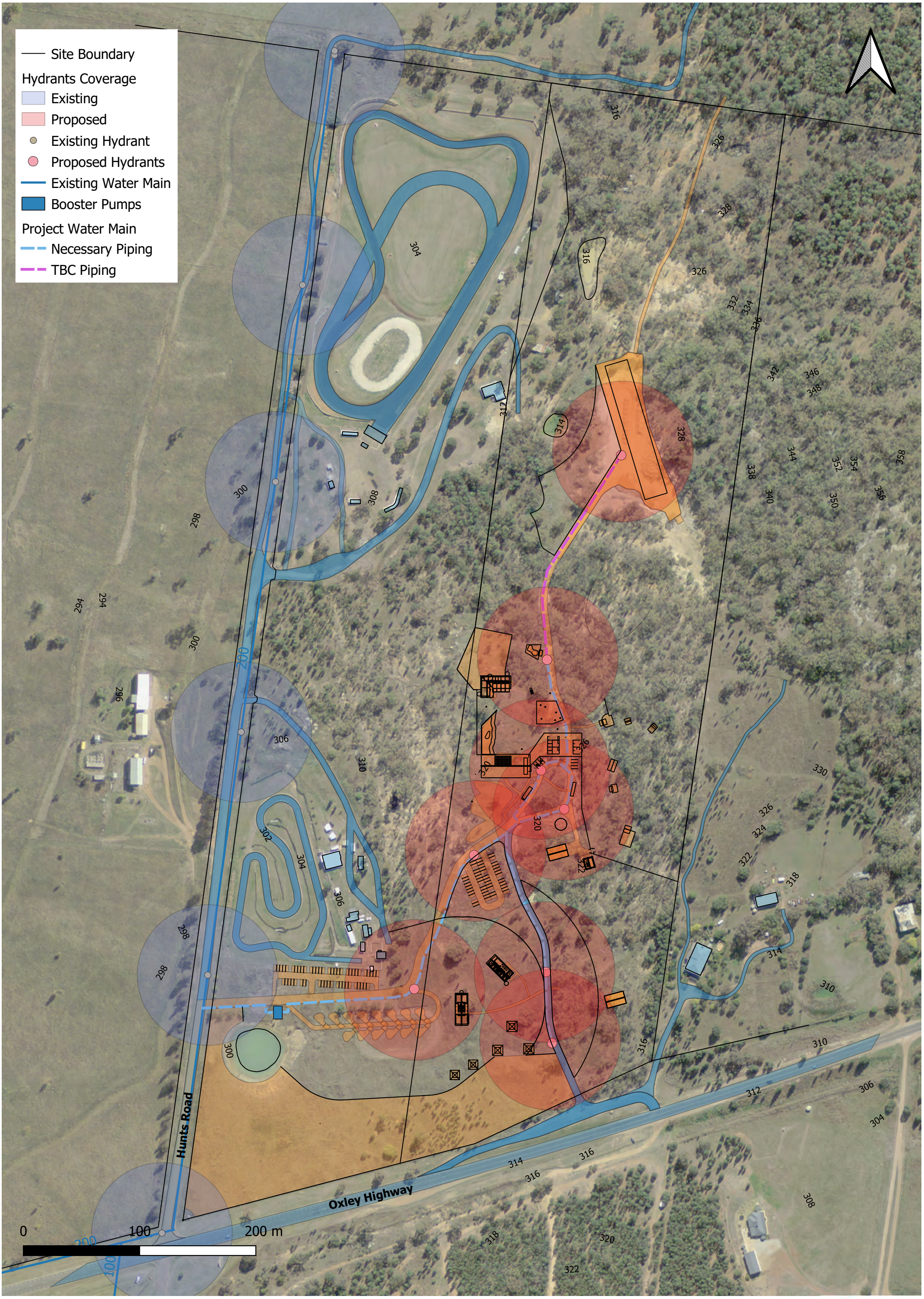


Figure 3: Site Proposed Water Network

Ardill Payne & Partners

Figure 4: Site Sewer Connection to Public Network

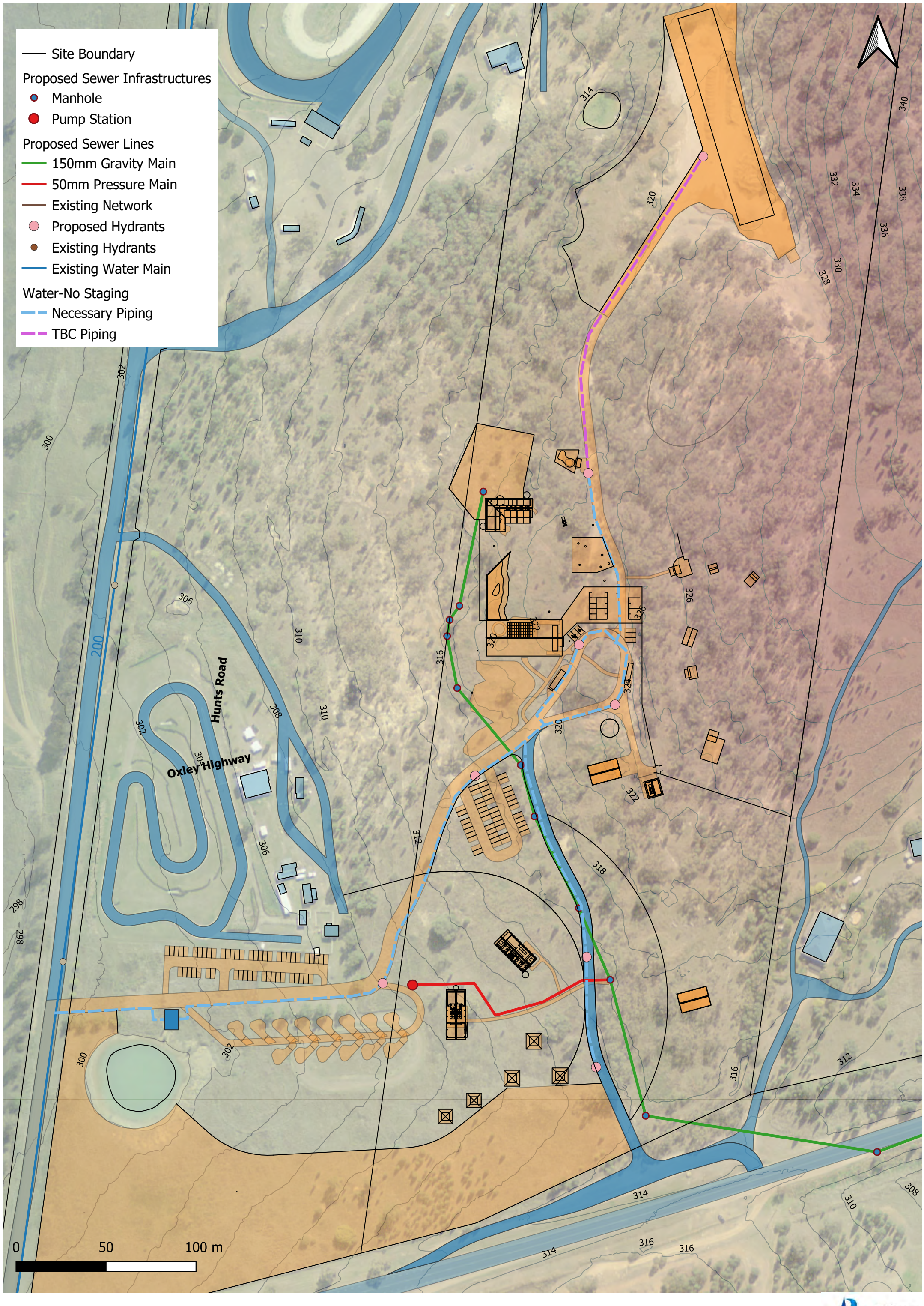


Figure 5: Combined Water and Sewer Network

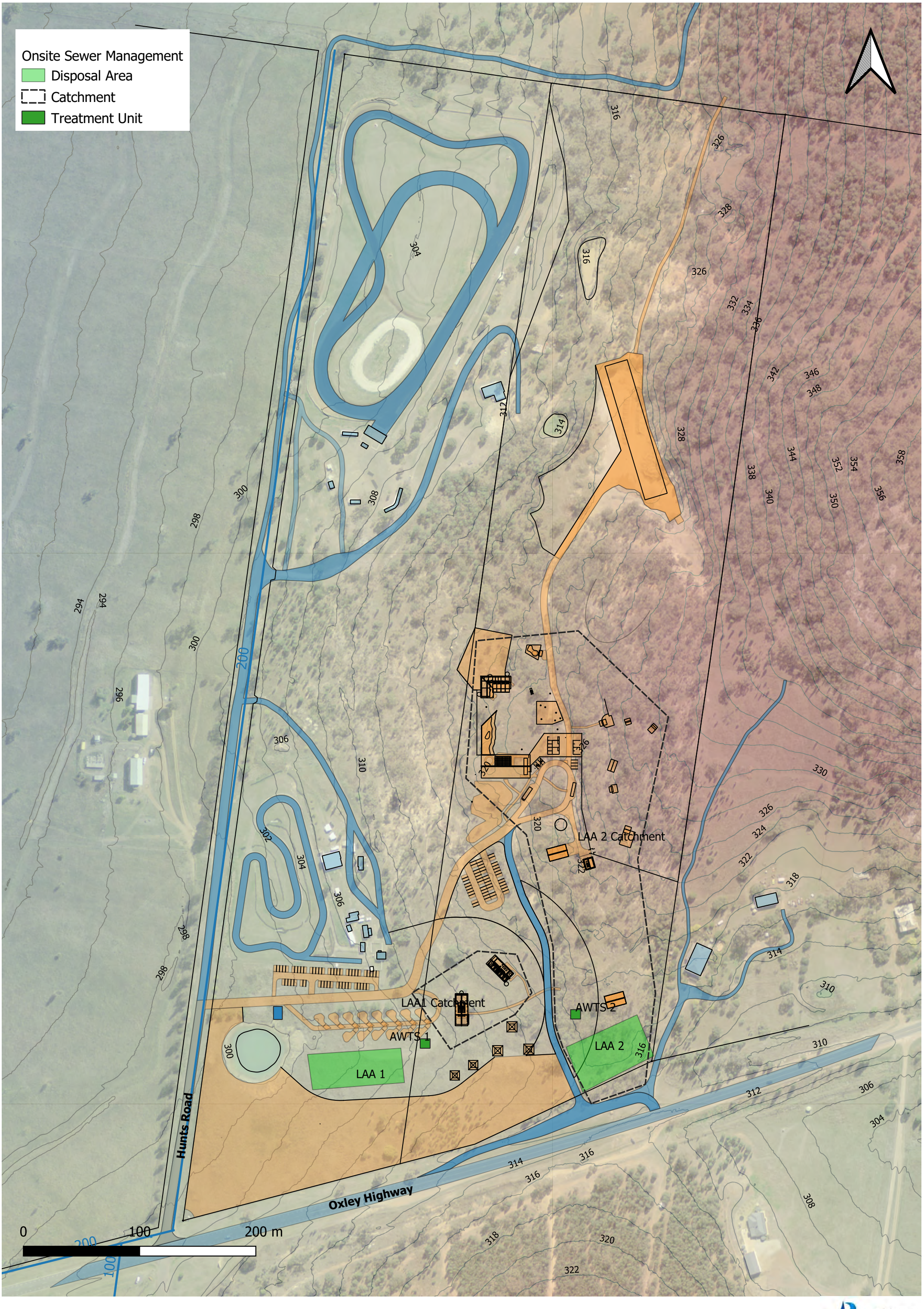


Figure 6: Possible location of Land Application Areas and Treatment Units for Onsite Sewer Management

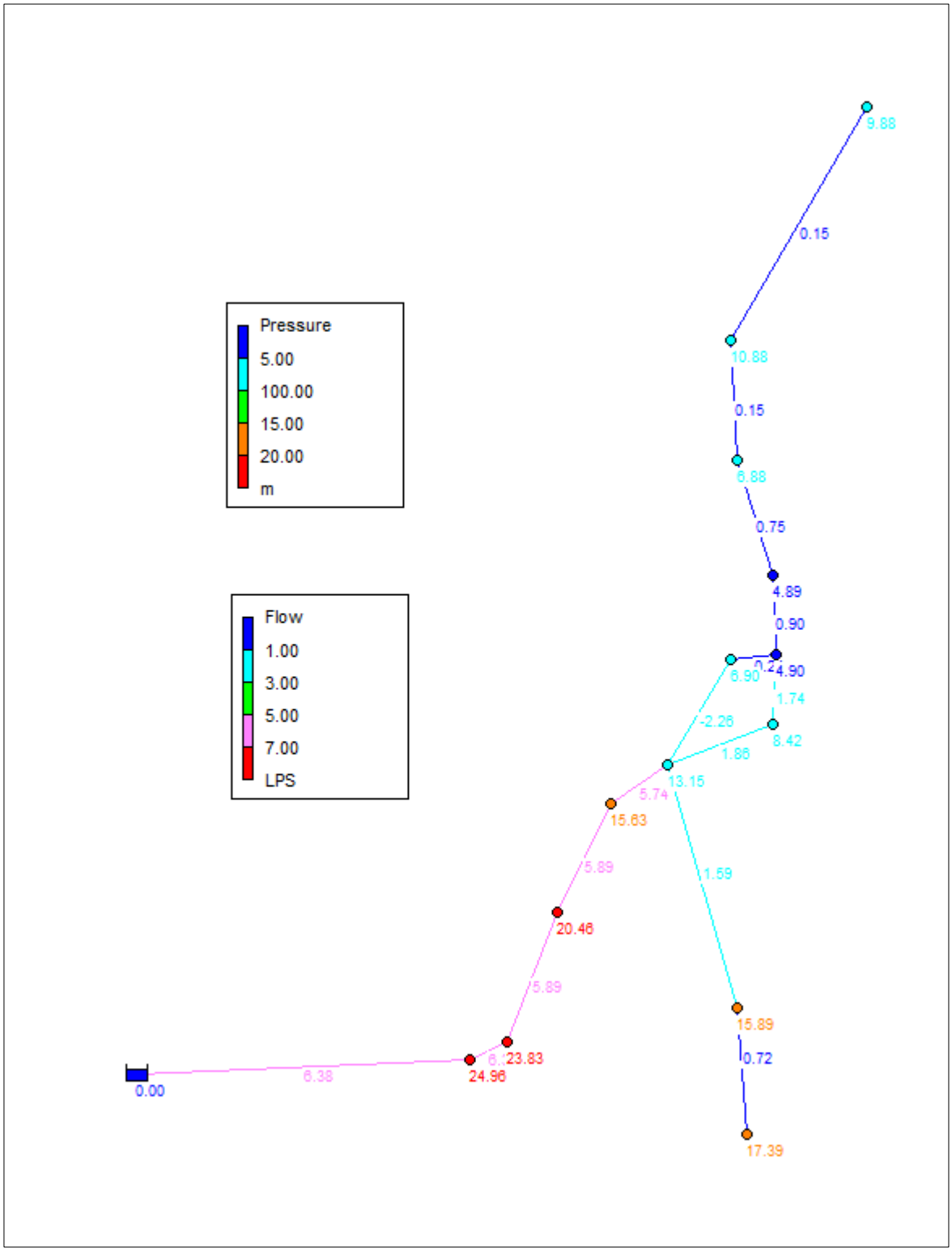
ATTACHMENT 3

Attachment 3: EPANET 2 Hydraulic Modelling

Model layout and pipe and junction IDs

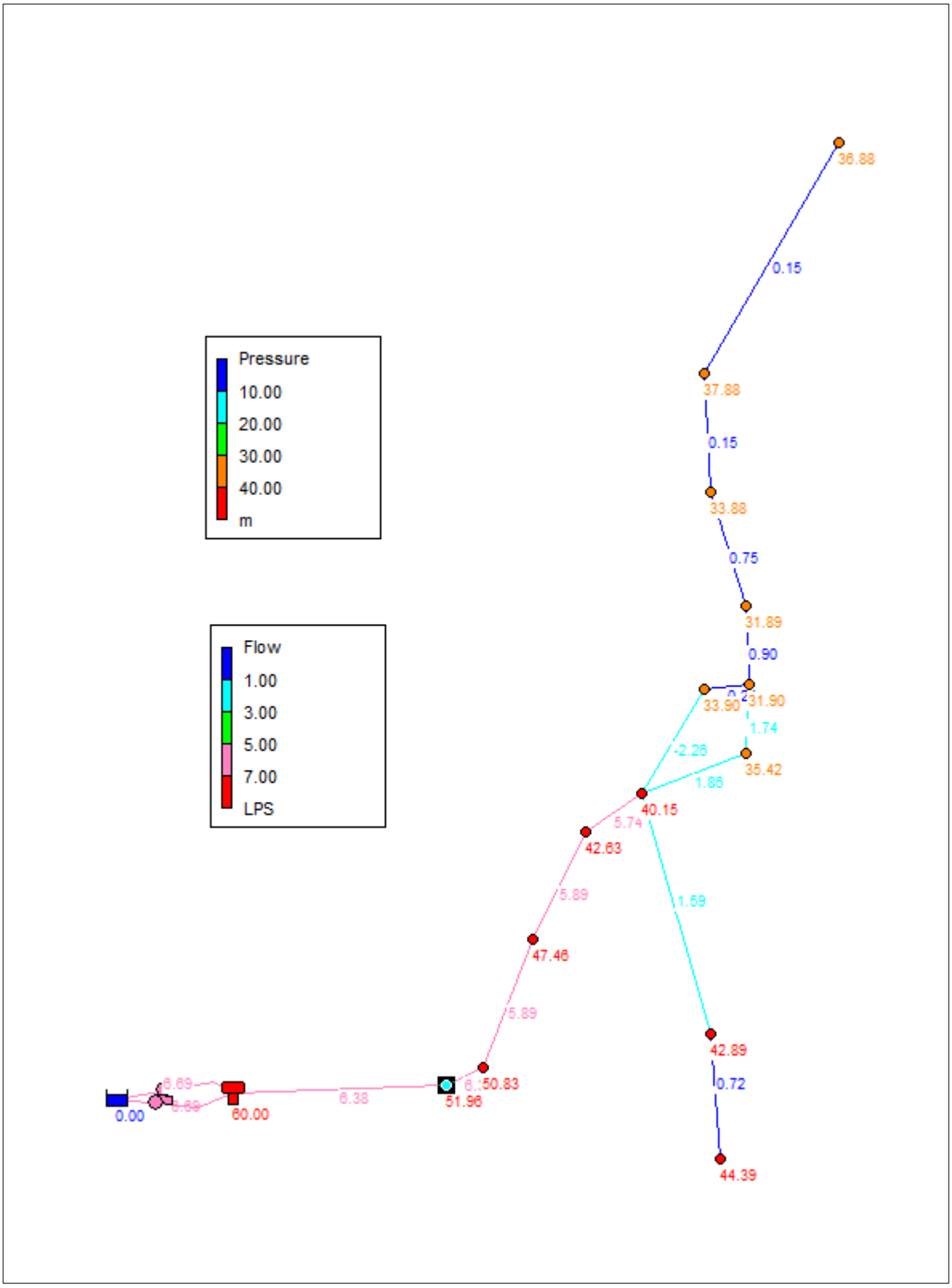
Model layout with pipe lengths (m) and junction elevations (m AHD)

Model layout with pipe diameters (mm) and demands at junctions (ET)



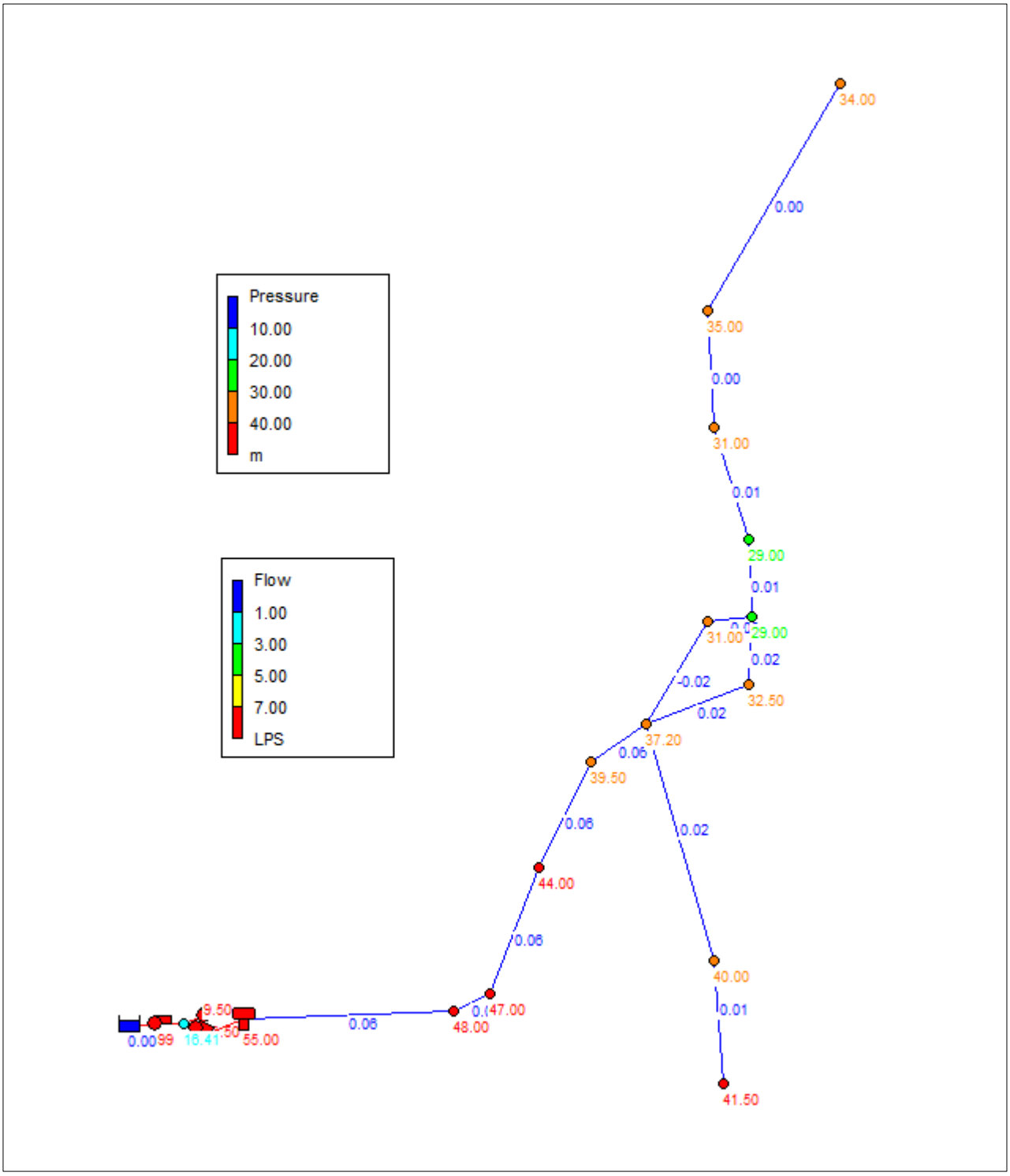
Modelling Results – Node Pressure and Pipe Flows in PID flow of 0.15 L/s/ET - <u>Not boosted</u>

As shown except for those areas close to the connection point to the water main in other more disadvantaged demand points the node pressures are lower than the minimum acceptable 20m.



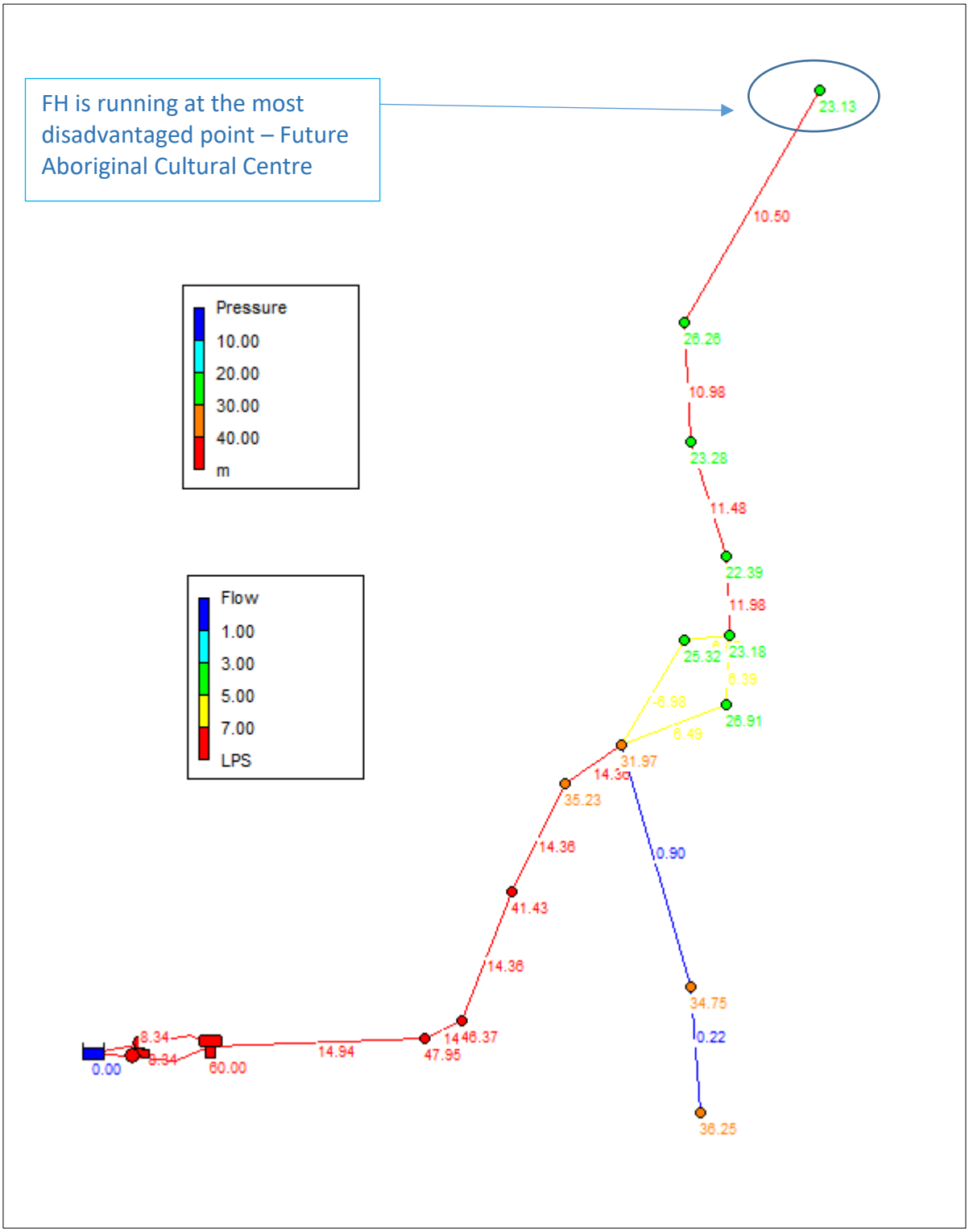
Modelling Results – Node Pressure and Pipe Flows in PID flow of 0.15 L/s/ET - <u>Boosted</u>

As shown desirable pressure provided at all demand nodes.



Modelling Results – Node Pressure and Pipe Flows at 12:00pm with 0.0079 L/s/ET and diurnal pattern - <u>Boosted</u>

As shown desirable pressure provided at all demand nodes.



Modelling Results – Node Pressure and Pipe Flows in 2/3 PID plus firefighting - <u>Boosted</u>

Pressures are above minimum at all points when the most disadvantaged fire hydrant is running at 10L/s.

Ardill Payne & PARTNERS

ENGINEERS PLANNERS SURVEYORS ENVIRONMENTAL PROJECT MANAGEMENT

TRAFFIC IMPACT ASSESSMENT

Gunnedah Koala Sanctuary

3130 Oxley Highway, Gunnedah
Lot 328 and Lot 329 DP 755503

for:

Gunnedah Shire Council

November 2020

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1. Introduction

Ardill Payne & Partners (APP) has been engaged by Dunn & Hillam Architects (DHA), on behalf of Gunnedah Shire Council (Council), to prepare a Traffic Impact Assessment for the proposed Gunnedah Koala Sanctuary at 3130 Oxley Highway, Gunnedah, to accompany the lodgement of a Development Application (DA) with Joint Regional Planning Panel (JRPP).

Council has obtained grant funding from the Federal Government to develop a koala and wildlife hospital and wildlife sanctuary on a Council owned site to the west of Gunnedah township. DHA is preparing a Masterplan for the site, which will include schematic designs for the buildings and infrastructure.

The Masterplan provides facilities for the care and rehabilitation of injured koalas and other wildlife, the display of captive animals for education and protection, a wildlife sanctuary for native animals of the area, accommodation for wildlife volunteers, and supporting facilities such as cafe, campgrounds, ticketing and gift store, picnic areas, bushwalking trails, an indigenous plant nursery, and maintenance/storage spaces.

This report provides details regarding the current traffic situation and the level of service provided by both the Oxley Highway and Hunts Road, and the impact the proposed development will have on these roads.

2. Proposed Development

2.1 Background Development

The site is approximately 50 hectares and has a past use as a quarry. On the lower part of the site a motor cycle club and go kart club have facilities, including race tracks, sheds, shelters and clubhouses.

The site sits on the western side of a ridge facing away from town, and is adjacent to the Oxley Highway.

Some remnant bushland and revegetated areas exist, along with the cleared and damaged areas associated with the past quarry use.

2.2 Description of Proposed Development

The primary purpose of the development will be to provide for a Koala Hospital with ancillary supporting activities and attractions. The current funding will likely be inadequate to complete the Masterplan in one construction phase; works will be staged using separate Construction Certificates, with the aim to complete as much of the Masterplan as possible within the available funding.

The Masterplan includes:

- Site Entry and Carpark
- Wildlife Centre and Hospital (reception, gift shop, café and kitchen, administration, toilets, education deck and auditoria, wildlife hospital)
- Pond and Picnic Zone
- Petting Zoo
- Wildlife Park Walk
- Wildlife Sanctuary
- Volunteer Accommodation (dorm style)
- Maintenance Shed
- Eucalypt Plantation
- Caravan Sites
- Eco-Tourism Tents
- Amenities Block (for camp sites)
- Mini Golf Course/Zip Lines
- Indigenous Cultural Education Centre
- Caretakers House

The park will be publicly owned and leased to a not-for-profit charity that will operate the facility under the management of an established wildlife park operator.

Projected visitor and staff numbers are:

- Daily visitors – regular weekdays (outside of school holidays) 35-50 per day; peak days (school holidays, or a busy Saturday or Sunday) may attract up to 135 per day; event days (once or twice per year) maximum 200 per day.
- Overnight stays – 14 caravan sites and 5 tent sites, and 5 permanent tent sites (2 couples and 3 family/group tents); regular weekdays (outside of school holidays) 24 per night; peak days (school holidays, or a busy Saturday or Sunday) up to 60 per night – limited by number of sites.
- Staff – 4-6 on regular days; up to 10 on busy days (includes 1 permanent on-site caretaker).
- Volunteers – accommodation for up to 16. They will typically stay around 6 weeks or longer. There may be 2-3 additional local volunteers that come and go.

The current Masterplan layout is provided in **Attachment 1**.

2.2.1 Phasing and Timing

The current funding will likely be inadequate to complete the Masterplan in one construction phase; works will be staged using separate Construction Certificates, with the aim to complete as much of the Masterplan as possible within the available funding.

2.2.2 Location and Site Plan

The land is situated within the Gunnedah Shire Council Local Government Area. The land is described in real property terms as Lot 328 and Lot 329 DP 755503.

The site is on the north-east corner of the intersection of Hunts Road and the Oxley Highway, and is located approx. 3.8km west of the Gunnedah CBD.

The site location is shown in **Figure 1**. An aerial plan is shown in **Figure 2**.

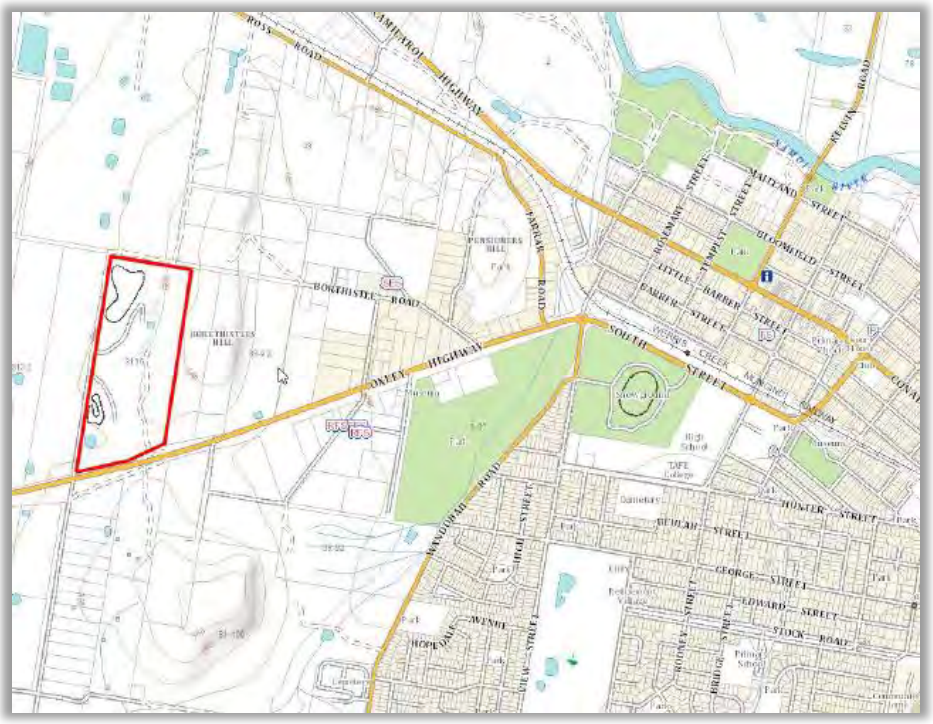


Figure 1: Site Location

Figure 2: Site Aerial Plan

3. Existing Area Conditions

3.1 Study Area

3.1.1 Area of Influence

The area of influence for this study includes Hunts Road and the Oxley Highway. The site access road comes off Hunts Road.

3.2 Study Area Land Use

3.2.1 Existing Land Uses

The site is approximately 50ha in size and has a past use as a quarry. On the lower part of the site a motor cycle club and go kart club have facilities, including race tracks, sheds, shelters and clubhouses.

The site sits on the western side of a ridge facing away from town, is adjacent to the Oxley highway and has significant views from the south, to the west and around to the north.

Some remnant bushland and revegetated areas exist, along with the cleared and damaged areas associated with the quarry. The past uses provide an opportunity for construction of the facility without further damaging the site and will facilitate the necessary clean-up of the site.

3.2.2 Adjoining Land Use

The surrounding land uses are mainly unimproved pastures, agricultural such as hobby farms, and stands of native timber.

3.2.3 Existing Zoning

The subject site is primarily zoned RU1 – Primary Production under the Gunnedah Shire Council Local Environmental Plan 2012. There is a small area zoned E3 – Environmental Management in the north-east corner of Lot 329.

3.2.4 Anticipated Future Development

There are no known other planned developments in the area.

3.3 Site Accessibility

Access to the site will be from an existing road along the western boundary (Hunts Road). A new access will be constructed approx. 200m from the Oxley Highway intersection. Car parking for day visitors will be kept to the south of the site to minimise traffic. One directional roads will be provided through the camp grounds and carpark areas.

An existing access onto the Oxley Highway (the old quarry access) will be used only as an emergency fire exit.

3.3.1 Existing Roads and Intersections

Current descriptions and conditions for the roads and intersections fronting the site are provided below:

Hunts Road

Hunts Road is a local rural unsealed road (Crown Road) along the site's western frontage, from the Oxley Highway to the entry to the Motorcycle Track. North of the Motorcycle Track entry the road reduces to a gravel track. The road is mostly level, with the entry to the Motorcycle Track on a gentle crest. The road has a 5.0m wide gravel formation; roadside drainage is generally along the edge of the gravel formation. The speed zoning is not posted but would be the default rural speed limit (100km/h). At the time of inspection, the pavement of Hunts Road was in good condition.

Photo 1: Hunts Road (looking North)

Oxley Highway

The Oxley Highway is a Transport for NSW, Roads & Maritime Services (RMS) classified State Road (Route B56), with its primary function to connect the mid north coast of NSW (Port Macquarie, Wauchope) to the New England area (Walcha, Tamworth, Gunnedah) and the Central West of NSW (Coonabarabran, Gilgandra and Warren).

At the site, the road is an undivided two-lane two-way sealed rural road with an 8m wide sealed carriageway (2 x 3.5m travel lanes and min. 0.5m wide sealed shoulders), edge and centre line marked. The speed zoning is 100km/h at the site. At the time of inspection, the Oxley Highway was in good condition.

The Oxley Highway past the site is an approved 26m B-double route. Regional and interstate bus services run along the highway, along with school buses to and from Gunnedah.

Photo 2: Oxley Highway (looking West)

Hunts Road/Oxley Highway Intersection

Sealed lanes on Oxley Highway; unsealed lanes on Hunts Road. No turn lanes, no intersection line marking. Give way signs on Hunts Road, but no hold lines due to gravel formation.

Sight distance is at least 300m in both directions.

Photo 3: Hunts Road/Oxley Highway Intersection (looking North along Hunts Road)

3.3.2 Future Roadway Systems

There are no known plans for future roadway systems near the subject site.

3.3.3 Existing Traffic Volumes and Conditions

Current traffic volumes for the Oxley Highway were obtained from various sources, and are shown in **Table 1**.

Current traffic volumes for Hunts Road have been estimated based on advice provided by Council. There appears to be only one rural property accessing the road. The Go-Kart track is used intermittently and on an ad-hoc basis. Council's local knowledge suggests it is used 2-3 times a year by 5-10 users. With respect to the Motorcycle track, again anecdotally it is used once a month by an average 50 users and support vehicles. Go-Kart events and Motorcycle events do not coincide.

On this basis, the current average daily traffic volume on Hunts Road is in the order of approx. 12vpd (approx. 1vph). Peak daily traffic volumes would occur on days when the Motorcycle track is open, with volumes in the order of 80vpd, with a peak hourly volume of approx. 40vph. It should be noted that this peak hourly rate will only occur once a month.

Table 1: Available Traffic Volume Data

Year	Road	Location	Direction	Type	Volume	HV%
* 2015	Oxley Highway	Gunnedah to Coonabarabran	Two Way	Daily	1378	-
** 2020	Oxley Highway	At Black Jack Road intersection	Two Way	Daily	1560	-
*** 2011	Oxley Highway	80m W of Beeson Road	Two Way	Daily	1052	16

** Oxley Highway Route Safety Review, Transport for NSW, July 2015*
*** 'Traffic Impact Assessment, Solar Farm, 262 Hunts Road, Gunnedah', Intersect Traffic, April 2020*
**** Transport for NSW, Traffic Volume Viewer*

The adopted pre-development traffic volumes are summarised in **Table 2**.

Table 2: Adopted Pre-Development Traffic Volumes 2020

Year	Road	Location	Direction	Type	Volume	HV%
2020	Oxley Highway	At Black Jack Road intersection	Two Way	Daily	1560	16
2020	Hunts Road	Between Motorcycle track and Oxley Highway	Two Way	Daily	12 *	5

** includes Go-Kart and Motorcycle Club traffic*

3.3.4 Public Transport Systems

Regional and interstate bus services operate along the Oxley Highway. School buses also operate on designated routes within and near each urban centre as well as offering connections between regions.

3.3.5 Pedestrians and Cyclists

As the site is on the rural fringe of Gunnedah, there are no formal pedestrian footpaths or cycleways. Near the site, pedestrians and cyclists will generally use the grass verges and/or road shoulders.

3.3.6 Accident History

In the 5-year period 2015-2019, there have been no recorded crashes at the site frontage or at the Hunts Road intersection. There have been 4 recorded crashes on the Oxley Highway west of the site (source: *Transport for NSW, Centre for Road Safety website*):

- 1 crash (a rear end crash at a driveway) resulted in serious injuries to 3 vehicle occupants.
- There were 2 crashes at the Black Jack Road intersection; 1 resulted in a moderate injury, the other resulted in a minor injury.
- In the crash closest to the site (approx. 70m west of Hunts Road), a vehicle struck an animal (at night); no casualties.

4. Projected Traffic

4.1 Site Traffic

4.1.1 Trip Generation

The RMS '*Guide to Traffic Generating Developments, Version 2.2*' provides trip rates for a number of different land uses. Where the RMS Guide does not provide trip rates for the specific land uses in relation to the development, trip generation is derived from first principles.

Projected visitor and staff numbers are:

- Daily visitors – regular weekdays (outside of school holidays) 35-50 per day; peak days (school holidays, or a busy Saturday or Sunday) may attract up to 135 per day; event days (once or twice per year) maximum 200 per day.
- Overnight stays – 14 caravan sites and 5 tent sites, and 5 permanent tent sites (2 couples and 3 family/group tents); regular weekdays (outside of school holidays) 24 per night; peak days (school holidays, or a busy Saturday or Sunday) up to 60 per night – limited by number of sites.
- Staff – 4-6 on regular days; up to 10 on busy days (includes 1 permanent on-site caretaker).
- Volunteers – accommodation for up to 16. They will typically stay around 6 weeks or longer. There may be 2-3 additional local volunteers that come and go.

The maximum visitor numbers may only occur when an event is held on site. These event days may only occur once or twice per year.

Based on the projected peak (not event) visitor numbers above, the proposed traffic generation and parking demand is calculated in **Tables 3 and 4**.

Table 3: Proposed Traffic Generation – Peak Days

Traffic Generation Unit	Number	Calculation	Daily Vehicle Trips (vpd)
Day Visitors	135	2.2 persons/veh.	124
Overnight Stays	60	24 sites. Would likely arrive after 2pm, depart before 10am	48
Day Staff	10	Arrive and depart outside of visiting times	20
Long Term Volunteers	16	Arrive by bus and stay on site for 6 weeks	<1
Day Volunteers	2-3	Arrive and depart outside of visiting times	4
Deliveries	3-4	Arrive and depart outside of visiting times	8
TOTAL			**205**

Table 4: Estimated Traffic Movements and Parking Demand – Peak Days

Time	Day Visitors (veh.)		Overnight Stays (veh.)		Staff, Volunteers, Deliveries, etc. (veh.)		Hourly Vehicle Movements (vph)	Day Visitor Parking Demand
	In	Out	In	Out	In	Out		
9:00				12	14		26	
10:00	10			12	2	4	28	10
11:00	12						12	22
12:00	15	10					25	27
13:00	14	12					26	29
14:00	7	15	6				28	21
15:00	4	14	7				25	11
16:00		11	8			2	21	0
17:00			3			10	13	
TOTAL	**62**	**62**	**24**	**24**	**16**	**16**	**28 max.**	**29 max.**

Based on the projected regular visitor numbers above, the proposed traffic generation and parking demand is calculated in **Tables 5 and 6**.

Table 5: Proposed Traffic Generation – Regular Days

Traffic Generation Unit	Number	Calculation	Daily Vehicle Trips (vpd)
Day Visitors	50	2.2 persons/veh.	45
Overnight Stays	24	24 sites, 40% occupancy Would likely arrive after 2pm, depart before 10am	19
Day Staff	6	Arrive and depart outside of visiting times	12
Long Term Volunteers	8	Arrive by bus and stay on site for 6 weeks	<1
Day Volunteers	1-2	Arrive and depart outside of visiting times	2
Deliveries	2-3	Arrive and depart outside of visiting times	6
TOTAL			**85**

Table 6: Estimated Traffic Movements and Parking Demand – Regular Days

Time	Day Visitors (veh.)		Overnight Stays (veh.)		Staff, Volunteers, etc. (veh.)		Hourly Vehicle Movements (vph)	Day Visitor Parking Demand
	In	Out	In	Out	In	Out		
9:00				5	9		14	
10:00	4			5	1	3	13	4
11:00	5						5	9
12:00	5	4					9	10
13:00	5	5					10	10
14:00	3	5	2				10	8
15:00	1	5	3				9	4
16:00		4	4			1	9	0
17:00			1			6	7	
TOTAL	**23**	**23**	**10**	**10**	**10**	**10**	**14 max.**	**10 max.**

4.1.2 Trip Distribution

It is estimated that 75% of visitors and 100% of the staff will come from the east (from Gunnedah). The remaining 25% of visitors will come from the west via the Oxley Highway.

4.1.3 Modal Split

It is estimated that most visitors and overnight stays will arrive by private vehicle (including caravans and RVs). There will be some arrivals by bus (school groups, volunteer groups, coach tours, etc.) but these are expected to be minimal and irregular.

Deliveries and service will be mainly by small and medium rigid heavy vehicles.

4.2 Through Traffic

The traffic volumes at the 10-year horizon have been obtained using a growth rate of 1% per year over a 10-year period (*'Oxley Highway Draft Corridor Strategy'*, NSW Government, March 2016).

Table 7: Projected Through Traffic Volumes 2030

Year	Road	Location	Direction	Type	Volume *	HV%
2030	Oxley Highway	At Black Jack Road intersection	Two Way	Daily	1723	16
2030	Hunts Road	Between Motorcycle track and Oxley Highway	Two Way	Daily	13	5

** not including projected development traffic*

4.3 Total Estimated Traffic

Combining the existing and projected through traffic with the additional site traffic for both the current year and 10-year development horizon allows for the determination of traffic flows in the following four cases:

- Case 1 - Undeveloped traffic flow 2020
- Case 2 - Developed traffic flow 2020
- Case 3 - Undeveloped traffic flow 2030
- Case 4 - Developed traffic flow 2030

Summaries of peak hour traffic on peak days (not event days) are provided in **Table 8** below.

Table 8: Peak Hour Total Traffic Volumes – Peak Days (2020 and 2030)

Road	Case 1	Case 2	Case 3	Case 4
Oxley Highway	156	184	172	200
Hunts Road	1	29	1	29

It should be noted that peak hour traffic volumes on event days can potentially generate an additional 60 vehicle trips per day (approx. 13vph), but these event days may only occur once or twice per year. Motorcycle events at the adjoining track occur about once a month, and can potentially generate an additional 40vph.

Summaries of peak hour traffic on regular days are provided in **Table 9** below.

Table 9: Peak Hour Total Traffic Volumes – Regular Days (2020 and 2030)

Road	Case 1	Case 2	Case 3	Case 4
Oxley Highway	156	170	172	186
Hunts Road	1	15	1	15

5. Traffic Analysis

5.1 Site Access

Access to the site will be from an existing road along the western boundary (Hunts Road). A new site access will be constructed approx. 200m from the Oxley Highway intersection. The assessment of the capacity of Hunts Road to cater for the expected traffic volumes is in Section 5.4.

A layout of the proposed site access is included in the Masterplan drawings in **Attachment 1**.

5.2 Road Capacities and Level of Service

To aid interpretation of the impacts of the proposed development on traffic flows, the RMS *'Guide to Traffic Generating Developments'*, Version 2.2 (2002), provides acceptable ranges of peak vehicle flows for various Levels of Service (LOS) experienced on rural roads. The intention is to at least maintain the existing Level of Service for the streets adjacent to the site.

Road capacity 'levels of service' are defined by the RMS for rural roads as shown in **Table 10**, with the highest level of service being Level A (free flow), with service deteriorating to Level F (forced flow).

Table 10: Two Way Peak Hour Flows on Two Lane Rural Roads

Terrain	Level of Service	10% Heavy Vehicles (veh/hr) – 100km/h [1]	15% Heavy Vehicles (veh/hr) – 100km/h
Level	B	560	530
	C	920	870
	D	1480	1410
	E	2390	2290

The following performance standards are recommended:

Weekday Peak Hour Flows

Major Roads: Level of service C

Minor Roads: Level of service C (desirable)

Recreational Peak Hours (weekends)

Major Roads: Level of service D

Minor Roads: Level of service D (desirable)

The 'level of service' on Hunts Road and the Oxley Highway is currently Level B or better (<530 veh/hr). If the site remained undeveloped, they will continue to be Level B or better to year 2030 (**Table 8**).

The estimated traffic movements generated by the proposed development (up to 28 vehicle movements per hour on peak days) will not alter the 'level of service' experienced on Hunts Road or the Oxley Highway to year 2030 (**Table 8**).

5.3 Intersections

5.3.1 Intersection Capacity

The Hunts Road/Oxley Highway intersection has been modelled in SIDRA (for the existing configuration) for the 4 cases listed in Section 4.3 and the peak day traffic volumes in **Table 8** to obtain the LOS and Average Delay (secs/veh) outputs listed in **Table 11**. The existing configuration has no provision for basic left or right turns, however, passing movements are possible on the partially sealed shoulders.

Table 4.2 of the RMS *'Guide to Traffic Generating Developments'*, Version 2.2 (2002), sets out average delays for levels of service, and provides the baseline for this assessment.

SIDRA model layouts for the modelled intersection are provided in **Attachment 2**, in addition to movement summaries for Cases 1 - 4. The SIDRA models have made no provision for the passing of turning vehicles. Movement summaries contain traffic flows in each lane in addition to the LOS and Average Delay for each modelled case.

Table 11: Overview of SIDRA Outputs – Existing Layout – Peak Days

Location	Case 1		Case 2		Case 3		Case 4	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Hunts Road	A	7.6	A	7.8	A	7.7	A	7.9
Oxley Highway	A	8.1	A	8.2	A	8.2	A	8.3

LOS and DOS are for the worst case movements

Based on the results shown in **Table 11**, the introduction of peak day development traffic in both the current year and the 10-year horizon will not change the LOS, and results in only very minor increases in Average Delay, at the Hunts Road/Oxley Highway intersection. **Table 11** demonstrates that the existing intersection will operate at a satisfactory level both in the current year and the 10-year horizon, with the current configuration, and with the addition of peak day development traffic. Average delays are acceptable and spare capacity is available (refer RMS Guide, Table 4.2).

5.3.2 Turn Lane Warrants

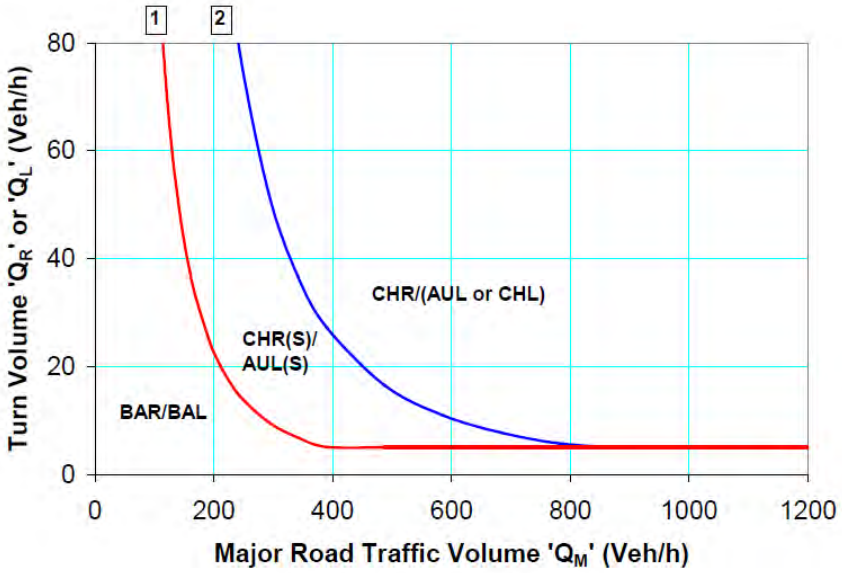
Turn lane warrants have been checked using developed case 2030 traffic volumes.

For peak days, apply the peak hour through volumes for the Oxley Highway (200vph) and the estimated turn volumes into Hunts Road (20vph) to the figure below (reproduced from Figure A10, Austroads AGRD04-17).

For regular days, apply the peak hour through volumes for the Oxley Highway (186vph) and the estimated turn volumes into Hunts Road (10vph) to the figure below (reproduced from Figure A10, Austroads AGRD04-17)

In both cases, according to the Austroads figure, basic left and right turn treatments may be warranted. However, it was demonstrated in Section 5.3.1 that the intersection operates

satisfactorily under all modelled cases in the existing configuration. Safety issues will be discussed in Section 5.5.



(a) Design speed ≥ 100 km/h

5.3.3 Intersection Sight Distances

Observed and required Safe Intersection Sight Distances (SISD) and Approach Sight Distances (ASD) are as shown in **Table 12**. Compliance has been assessed against Austroads *'Guide to Road Design Part 4A 'Unsignalised and Signalised Intersections'* (2017).

Table 12: Intersection Sight Distances

Intersection	Sight Distance Actual (Left)	Sight Distance Actual (Right)	SISD Required	ASD Required	Intersection Suitability
Site Access onto Hunts Road	200m	250m	181m(1)	114m(1)	Compliant
Hunts Road/Oxley Highway	300m	>300m	248m(2)	165m(2)	Compliant

1) *Assumes a design speed of 80km/h on Hunts Road, reaction time 2.0sec.*
2) *Assumes a design speed of 100km/h on the Oxley Highway at the intersection, reaction time 2.0sec.*

Based on the above, both intersections satisfy Austroads sight distance requirements.

5.4 Impact on Amenity

Amenity is primarily the concern of minor roads. The amenity of an area can be impacted by increase in traffic volume, proportion of heavy vehicles, increases in speed, road widths and surface condition.

There will be an increase in traffic on the local roads due to the new development.

Hunts Road

Hunts Road is an existing gravel road. Post development the projected traffic volume is approx. 200vpd.

Austroads *'Guide to Road Design Part 3: Geometric Design'* (2016) specifies minimum design standards for rural roads. From Austroads Table 4.5, for a road with an AADT of 150-500, the minimum standard is a 6.2m seal with 1.5m shoulders. It is recommended that Hunts Road be upgraded (widen and bitumen seal) from the highway to the site entrance (approx. 200m) to meet the minimum Austroads design standard.

5.4.1 Noise Impacts

There are three adjacent uses which generate unwelcome noise. The Oxley Highway, the Go-Kart track and the Motorcycle track all generate noise. The Go-Kart and Motorcycle tracks create noise only on set days and so, to a certain extent, can be planned for. The highway is a relatively constant noise source.

This application to increase vehicle movements will have a minimal impact on the environmental road traffic noise.

5.4.2 Dust Impacts

This application to increase vehicle movements may increase the environmental impacts of dust. The roads that service the caravan sites, the overflow parking area, and the emergency egress road will have a gravel surface. It is noted that Hunts Road (currently gravel) will be sealed which will reduce dust impacts associated with that road.

Water from the dam could be used for dust suppression if required. This would involve water spraying of the gravel roads in the event that vehicle movements cause excessive generation of dust.

If necessary, mitigation measures can include:

- Water spraying of internal gravel roads.
- Dirt that has been tracked onto sealed roads should be cleaned as soon as practicable.
- All vehicles on-site should be confined to designated routes with a 20km/h speed limit.

5.5 Traffic Safety

The current operations on the site (Go-Kart and Motorcycle tracks) have operated without any known traffic related impacts or incidents.

At present, there are no auxiliary turn lanes provided at the Hunts Road/Oxley Highway intersection, which is in a 100km/h speed zone. It was demonstrated in Section 5.3.1 that the intersection operates satisfactorily under all modelled cases with no auxiliary turn lanes. However, from Figure A10, Austroads AGRD04-17, basic left and right turn treatments may be warranted (refer Section 5.3.2.). Sight distances are satisfactory (refer Section 5.3.3.).

The following recommendations are made to improve safety at the intersection:

- Investigate whether the 80km/h speed zone on the Oxley Highway can be extended to west of the Hunts Road intersection. This may require a safety evaluation of this stretch of road, and an application to Transport for NSW (TfNSW) for a speed zone review.
- If the speed zone cannot be extended, widen the road shoulders to provide basic left and right turn treatments. Concept plans are included in **Attachment 3**.

There is no advance warning sign ('Crossroad') on the highway westbound for the Hunts Road intersection. It is recommended that this sign be provided. Consider also providing advance guide signs in both directions for the tourist venue. These signs will improve the advance warning for motorists of the change in normal traffic conditions on the road ahead – the intersection. Advance warning and guide signs also help provide a safe and efficient traffic flow.

Pedestrian and cyclist numbers are low in the vicinity of the site. Where using main roads and highways, pedestrians and cyclists currently share these roads with other heavy vehicles, with little known problems.

Peak traffic generation from the proposed development of up to 205 additional vehicle movements per day is unlikely to raise any significant adverse safety issues for local transport and users of the local and regional road network.

5.6 Impacts on Public Transport

The proposal raises no demand for the provision of public transport. A maximum of 10 employees will be engaged at the site (including 1 on-site caretaker). Private transport will be used for all personal and most visitor access. Some visitor access (school groups, volunteer groups, coach tours, etc.) will be by bus.

5.7 Impacts on Pedestrians and Cyclists

The proposed development is not expected to create a significant increased risk to pedestrians or cyclists.

5.8 Circulation and Parking

New internal roads will provide provides access from the site entrance to the parking areas, the main building entrance, and the camp ground.

The new internal road will be purpose built to suit the anticipated design vehicles (delivery trucks and car/caravan combinations). A swept path analysis has confirmed suitable site circulation is available. Plans are included in **Attachment 4**.

A layout of the proposed internal roads and car parks is included in the Masterplan drawings in **Attachment 1**.

Parking requirements for specific land uses are provided in the *'Gunnedah Development Control Plan 2012'*, Appendix 1, and the RMS *'Guide to Traffic Generating Developments'*, Version 2.2, October 2002. However, there are no rates relevant to this development as a whole. Therefore, parking demand is assessed and calculated in this report.

Parking demand is as follows:

- Parking demand for day visitors is summarised in **Tables 4 and 6**. On peak days, it was estimated that a minimum of 29 parking spaces would be required. Allowing time for parking turnover, provision of approx. 40 spaces is recommended.
- Parking for overnight stays will be next to the caravan/tent site.
- Parking for staff and volunteers:
    - Parking required – approx. 6 spaces (at a rate of 1/2 employees).
    - Parking for long term volunteers will be next to the dormitories.
- Deliveries will occur infrequently, mainly during off-peak times. There is ample space on site for loading and unloading of vehicles. No parking is required.

Parking is provided as follows:

- 45 spaces in the main (sealed) car park, plus 5 spaces near the main building entrance, which includes 2 accessible spaces – total of 50 (sealed) spaces provided
- 1 bus/coach parking space is provided on the eastern side of the ring road.
- A bus drop-off space is provided near the main building entrance.
- On event days (once or twice per year), up to an additional 30 parking spaces could be required. An overflow area (unsealed) with space for approx. 50 cars will be provided near the site entrance.

The total maximum parking demand (for day visitors, staff, and volunteers) is estimated to be 46. The total of sealed on-site parking spaces provided is 50 (not including the approx. 50 overflow car spaces near the site entrance).

Therefore, adequate parking is provided on site for visitors, staff, and volunteers.

6. Improvement Analysis

6.1 Recommended Improvements to Accommodate Increased Site Traffic

Recommended improvements to accommodate the increase in site traffic essentially relate to safety and amenity improvements:

- Upgrade and widen Hunts Road to provide a 6.2m seal with 1.5m shoulders.
- Investigate whether the 80km/h speed zone on the Oxley Highway can be extended to west of the Hunts Road intersection. This may require a safety evaluation of this stretch of road, and an application to TfNSW for a speed zone review.
- If the speed zone cannot be extended, widen the road shoulders to provide basic left and right turn treatments.

Warrants for and analysis of these recommended improvements has been provided in earlier sections of this report.

7. Findings

An assessment of potential traffic issues associated with the proposed development was undertaken by Ardill Payne & Partners. This assessment examines what impact the increased traffic movements will have on the local traffic flows and road network.

The issues addressed in this report and the associated findings and recommendations are summarised below:

7.1 Roads and Intersections

- **Traffic Efficiency** – traffic movements will increase due to the proposed development. However, the 'level of service' currently experienced on local roads and intersections will generally not be reduced.
- **Traffic Amenity** – it is proposed to upgrade (widen and bitumen seal) Hunts Road from the highway to the site entrance to meet minimum Austroads design standards.

  Road traffic noise and dust impacts associated with the development will be minimal. Dust emissions will be reduced by the sealing of Hunts Road.
- **Traffic Safety** – the current operations have operated at the site without any known traffic related impacts or issues.

  To improve safety at the Oxley Highway/Hunts Road intersection:

  - Investigate whether the 80km/h speed zone on the Oxley Highway can be extended to west of the Hunts Road intersection. This may require a safety evaluation of this stretch of road, and an application to TfNSW for a speed zone review.
  - If the speed zone cannot be extended, widen the road shoulders to provide basic left and right turn treatments.

  It is recommended that additional advance warning and guide signs be installed on the Oxley Highway in the approaches to the site.

7.2 Site Access and Circulation

The site access location is suitable for the intended range of vehicle movements (including bus/coaches, and car/caravan combinations), and intersection sight distance is adequate.

The internal access road shall be designed for the relevant road users. From the site entrance to the caravan sites, the road should accommodate 12.5m maximum car/caravan combinations (minimum 6.0m bitumen seal on 8m gravel formation). From the caravan sites to the main building, the road should accommodate the largest service vehicle (HRV – garbage and fire trucks). The loop road can be designed for one-way movements, and therefore a narrower width (minimum 4.0m bitumen seal on 5m gravel formation).

The main internal road with loop at top, and the main car park, will all be sealed. The roads in the caravan area, the emergency egress road, and the overflow car park will all have a gravel surface.

All vehicles will enter and leave site in a forward direction.

7.3 Parking

Adequate spaces are provided onsite for visitor, staff, and volunteer parking.

7.4 Pedestrians and Cyclists

The proposed development is not expected to create a significant increased risk to pedestrians or cyclists.

7.5 Compliance with Local Codes

All planned and recommended works shall be constructed in accordance with Austroads and NRLG standards, and any other relevant local codes and regulations.

7.6 Public Transport

The proposal raises no demand for the provision of public transport as a maximum of only 8 employees will be engaged at the site.

In view of the above it is assessed that if the planned and recommended improvements are implemented, the safety and efficiency of the local road network will not be unduly affected by the increase in the number of vehicle movements that will be generated by the proposal.

8. Recommendations

It is recommended that the proponent implement the following as their contribution to improve amenity and safety in relation to the traffic impacts of the application.

1. Upgrade and widen Hunts Road to a provide a 6.2m seal with 1.5m shoulders.
2. Provide an advance warning sign ('Crossroad') on the highway westbound for the Hunts Road intersection. Consider also providing advance guide signs in both directions for the tourist venue.

The following recommendations are made to improve safety at the Oxley Highway/Hunts Road intersection:

3. Investigate whether the 80km/h speed zone on the Oxley Highway can be extended to west of the Hunts Road intersection. This may require a safety evaluation of this stretch of road, and an application to TfNSW for a speed zone review.
4. If the speed zone cannot be extended, widen the road shoulders to provide basic left and right turn treatments.

9. Conclusion

It is concluded that the proposed development will impose an increase in the number of daily and peak hourly trips on the local roads.

The implementation of recommended improvements will improve amenity and safety in relation to the traffic impacts of the application.

As such it is concluded that upon implementation of the recommendations contained in this report, the impacts on the capacity, safety, and amenity of the surrounding road network and intersections due to the proposed development can be successfully managed.

10. Scope of Engagement

This report has been prepared by Ardill Payne & Partners (APP) at the request of Dunn & Hillam Architects, on behalf of Gunnedah Shire Council, for the purpose of a Traffic Impact Assessment for the proposed Gunnedah Koala Sanctuary at 3130 Oxley Highway, Gunnedah, and is not to be used for any other purpose or by any other person or corporation.

This report has been prepared from the information provided to us and from other information obtained as a result of enquiries made by us. APP accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

To avoid this advice being used inappropriately it is recommended that you consult with APP before conveying the information to another who may not fully understand the objectives of the report. This report is meant only for the subject site/project and should not be applied to any other.

11. Attachments

Attachment 1	Masterplan
Attachment 2	SIDRA Model Layout and Outputs (Cases 1 to 4)
Attachment 3	Oxley Highway/Hunts Road Intersection Upgrade Concept
Attachment 4	Vehicle Movement Plans

ATTACHMENT 1

Attachment 1: Masterplan

Key

A - Site Entry
Enter at a point approximately 200m from the intersetion of Hunts Rd and Oxley Highway
lockable gate, welcome and orientation signage

B - Carpark - 800m2 approx.
45 car parking spaces with interspersed landscaping and vegetation buffer. Central road to be sealed, car parking spaces to be compacted gravel. Clearly marked path towards Main building

C - Hospital Drop-off & Bus setdown
Parking for site vehicles, accessible, and injured animal drop off parking. Bus drop off zone and parking on a one-way loop road.
2 accessible, 2 injured animal drop off, 1 bus drop off and 1 bus parking. All surfaces sealed

D - Wildlife Centre + Hospital
Wildlife Centre - 344m2 internally, 294m2 externally, 31 lm fencing (rehabilitation area).
The main entry to ticketed areas. This building contains the, reception desk, shop, cafe and kitchen, administration offices, storage, public toilets, education deck and auditoria, large aviary/ animal enclosure and viewing deck, and wildlife hospital.
Amenities have been provided for a capacity of up to 200 people at a time in the Park, including 10 M,F, UA toilets.
Cafe; 20-30 people. Education deck and auditoria; 70 people.
The building will be a large portal frame structure with a framed floor, zincalume or eco-ply cladding, and hardwood decking. The viewing deck and aviary will be screened.
Wildlife hospital and rehabilitation facility with 4 small animal Intensive Care Units (ICU), 2 large ICU's and up to 12 small animal enclosures, a large clinic, office, and staff room. Externally 2 stage 1 and 8 stage 2 rehabilitation enclosure are provided.
A viewing deck accessible from the picnic area will allow views into the clinic and the two large ICU's.
All ICU's to able to be cleaned with a pressure hose. Specific requirements of wildlife guidelines must be met incl. gunyahs, natural light and air, the ability to isolate infectious disease.

E - Pond & Picnic Zone - 6000m2
Large grassed area with minimal picnic seating, an agricultural themed playground and a large constructed pond. Kangaroos and emus will roam freely in this area. A koala enclosure will be built within the picnic area, around a cluster of existing trees.
Dry river bed landscaped edge to pond to allow pond levels to vary. New trees and planting throughout.

F - Petting Zoo - 320m2 + 1.6ha paddock
Large L-shaped zincalume shed with pens for domestic animals. Walls only to north and western elevations, and partially to south adjacent to pen 1
Insulated roof, rough sawn timber internal lining up to 1800mm. Cattle yard style pens. Compacted dirt floor. Water supply to each pen. Large store/ work room including cool room for animal food storage.

G - Wildlife Sanctuary walk
An accessible path through the bushland with roaming wallabies, kangaroos and emus. Smaller enclosures hold other native animals.
Each enclosure has a shade shelter at the viewing point.
Water supply at each enclosure and a semi-natural pond/ dam for water for free-roaming animals.
External fence to be predator-proof. 2 metres high with 45 degree top and submerged based to prevent fox and dog entry. Smaller enclosures to have fencing appropriate to each animal.

H - Wildlife Sanctuary - 2.8ha, 688 lm fencing
A large area of bushland fenced with predator-proof fencing to allow animals to live 'in the wild'.
External fence to be predator-proof, 2m metres high with 45 degree top and submerged based to prevent fox and dog entry.

I- Volunteers Accommodation - 180m2
Backpackers style house accommodating up to 16 singles in 5 bed dorms, with a large common lounge room and kitchen/ dining.
Could be pre-fabricated house. Will require a BAL rating and Asset Protection zone for bushfire protection

J - Maintenance Shed - 57m2
zincalume shed on slab. An area associated with this shed should be enclosed for propagating native plants and areas provided for storage of landscape materials such as gravel and mulch.
Can be 'off-the-shelf' farm shed with roller doors and workbench

K - Asset Protection Zones (APZ)
These areas will need to be maintained, and possibly have some vegetation removed in order to maintain a zone around the buildings for bushfire protection.
The area within these zones will incur some biodiversity offsetting costs

L - Eucalyptus Plantation - 2.8ha
an area of degraded land that will be planted with species of trees particular to the feeding requirements of koalas.
(These trees should also be interspersed through all parts of the site).
Trees kept reasonably small and harvested regularly for the feeding of koalas.

M - Signage
12-15m high, up to 1200mm wide koala (pillar) sign to be read from both directions. Power supply for lighting at night.

N - Caravan sites - 65m2 each
14 caravan sites with gravel connecting road.
Includeding power, common soil waste dump pit.
Will require an Asset Protection Zone.

O- Eco-tourism tents - 35m2 incl. decks
2 couples tents with ensuites and 3 family or school group tents accessed by pedestrian pathways. New planting in and around tents (subject to APZ requirements)
At least one tent will need to be accessible.

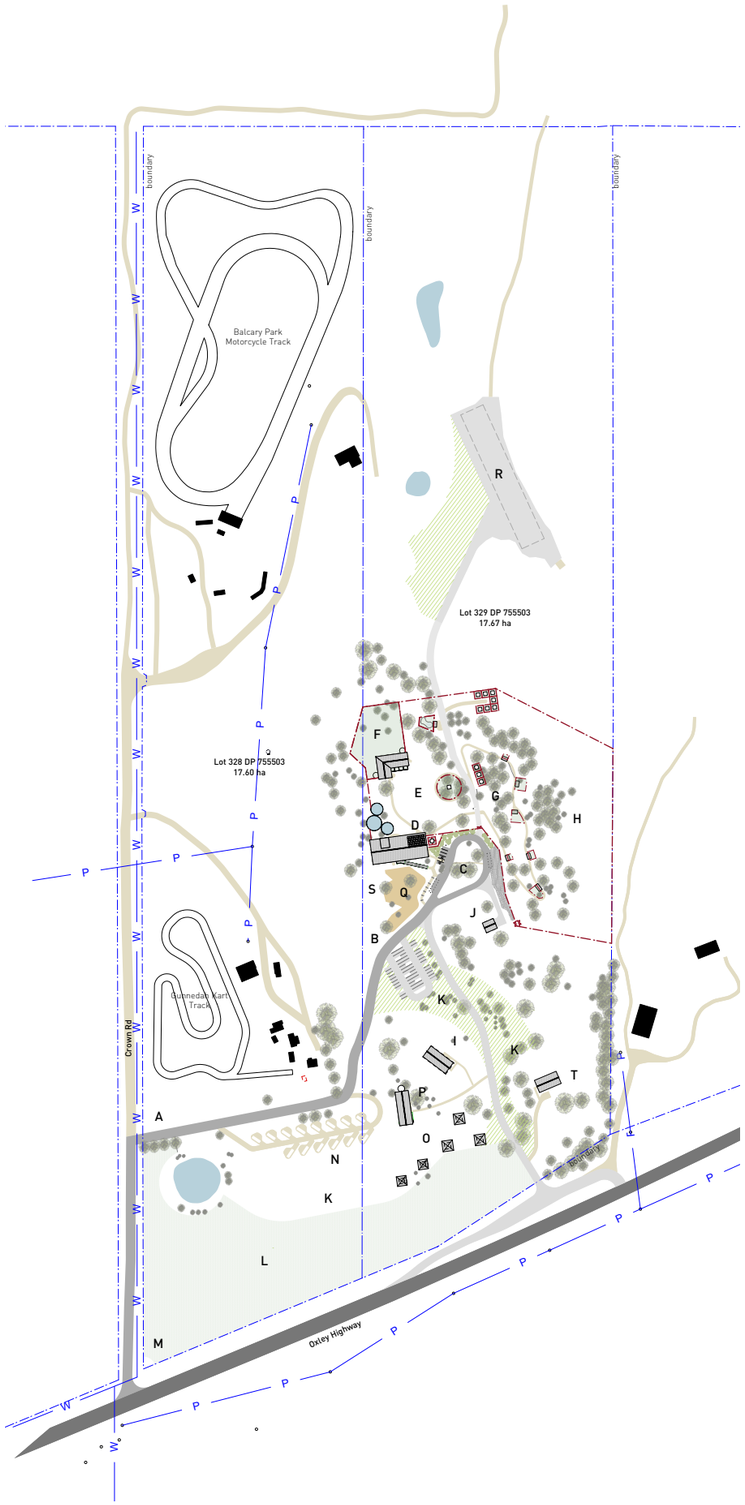
P - Amenities Block - 115m2 internally, 80m2 externally
Toilets, showers and laundry to support tents. Large bbq deck with picnic tables. Laundry oversized to also act as bushfire refuge as required by eco-tourism bushfire protection

Q - Mini Golf - 1800m2
A bush-themed mini-golf course
specific design by others

R- Indigenous Cultural Centre - 5800m2
A large open area with a sheltered display area for the demonstration of cultural knowledge and skills in the repatriated quarry area.
Associated with the indigenous food bush regeneration area.
Some fencing may be required around the area to restrict animals into the area if spear throwing demonstrations are underway.
A bushwalking path should be marked through the sanctuary with some interpretive signage. Bush regeneration area will focus on indigenous food plants. Formalise existing dams to ensure constant water source.

S- Zip-lines, Rope Courses, and Adventure Activities -
A platform can be built near the entry to the main building to launch twin zip lines going over the mini-gold course
specific design by others

T - Caretakers House - 170sqm
Small family sized house including 3 bedrooms, kitchen, dining, living and laundry



1 DA01-02 **Master Plan**
Scale: 1:2500

fencing - type 01
solid colorbond 'Wallaby' fencing

fencing - type 02
steel mesh, black PVC coated

fencing - type 03
typical agricultural paddock fencing

crocodile pool/enclosure (exhibit)
with shade structure
solid Colorbond 'Wallaby' fencing enclosure to meet Australian Animal Welfare Standards + Guidelines

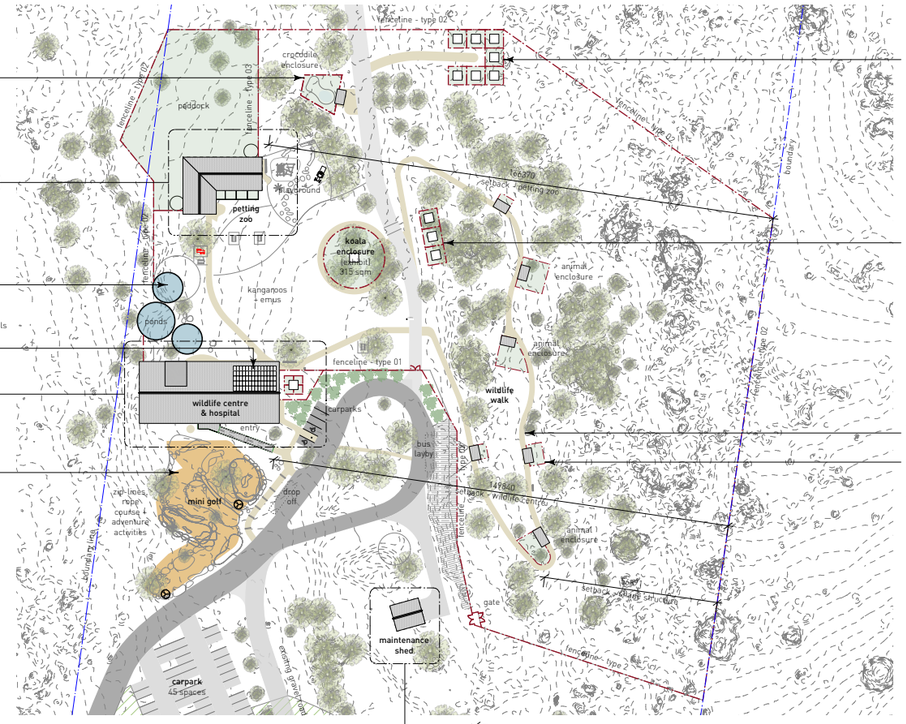
1 DA01-04

ponds
concrete formed water tanks
1 of 100kl, 12m dia.
2 of 65kl, 9m dia.
refer to Landscape drawings for details

20kw solar photovoltaic system
70 panels at 14 deg.

1 DA01-03

mini golf
refer to Landscape drawings prepared by Stewarts Surveys



2 DA01-02 **Site Plan - Wildlife Sanctuary**
Scale: 1:1000

fencing - type 01
solid colorbond 'Wallaby' fencing

fencing - type 02
steel mesh, black PVC coated

fencing - type 03
typical agricultural paddock fencing

Rev	Date	By	Notes
B	13/11/20	SF	Preliminary DA issue to consultants
A	12/11/20	SF	Preliminary DA drawings for client approval

notes
1. all dimensions in mm.
2. do not scale from drawing.
3. this drawing has been prepared for Feasibility purposes only and is not to be used for development approval purposes or construction.
4. clarification to be sought from the architect in the event of any discrepancies in the documentation or if further information is required.

Consultants

Surveyor -
contact ph:

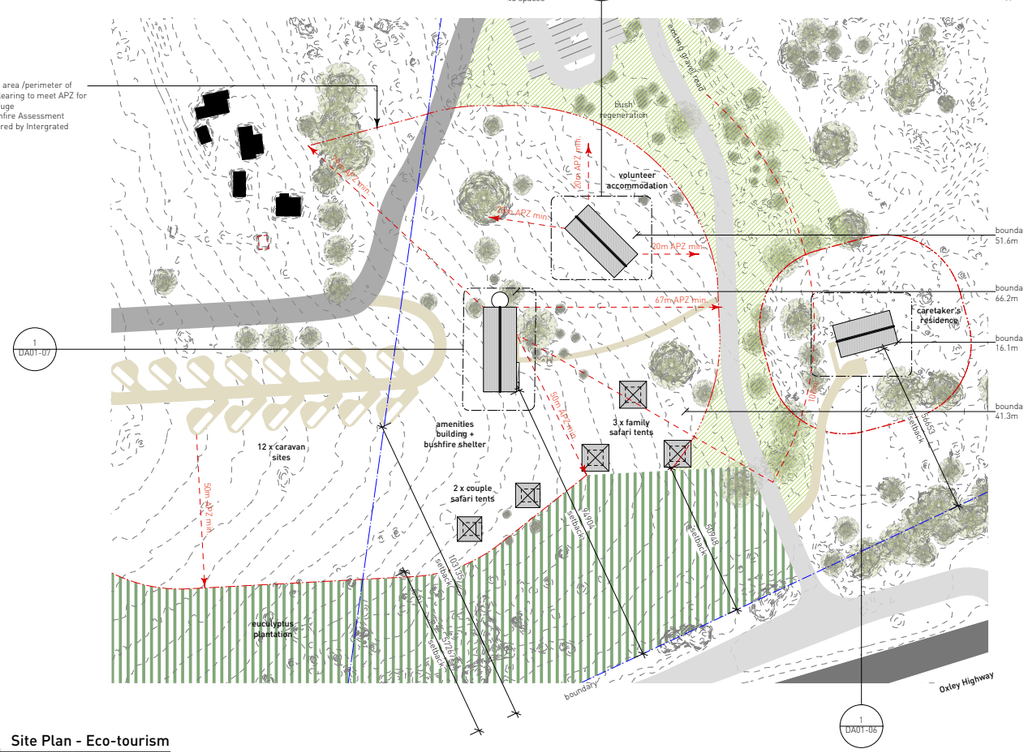
Structural Engineer -
contact ph:

Civil Engineer -
contact ph:

Quantity Surveyor -
contact ph:

Builder - TBA
contact ph:

approximate area /perimeter of vegetation clearing to meet APZ for Bushfire Refuge
refer to Bushfire Assessment report prepared by Intergrated Consulting



3 DA01-02 **Site Plan - Eco-tourism**
Scale: 1:1000

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t/a Dunn & Hillam Architects
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E studio@dunnhillam.com.au
Nominated architect Ashley Dunn NSW ARB No. 7547

Client	Gunnedah Shire Council
Project	**Gunnedah Koala Sanctuary 3130 Oxley Highway, Gunnedah**
Issue	**Feasibility**
Date	Fri, 13 Nov 2020
Scale	@A1
Drawing	Site Plans
Drw No.	DA01-02 **Rev** B
Job No.	20_301
Drawn:	SF **Check:** LH

PRELIMINARY

ATTACHMENT 2

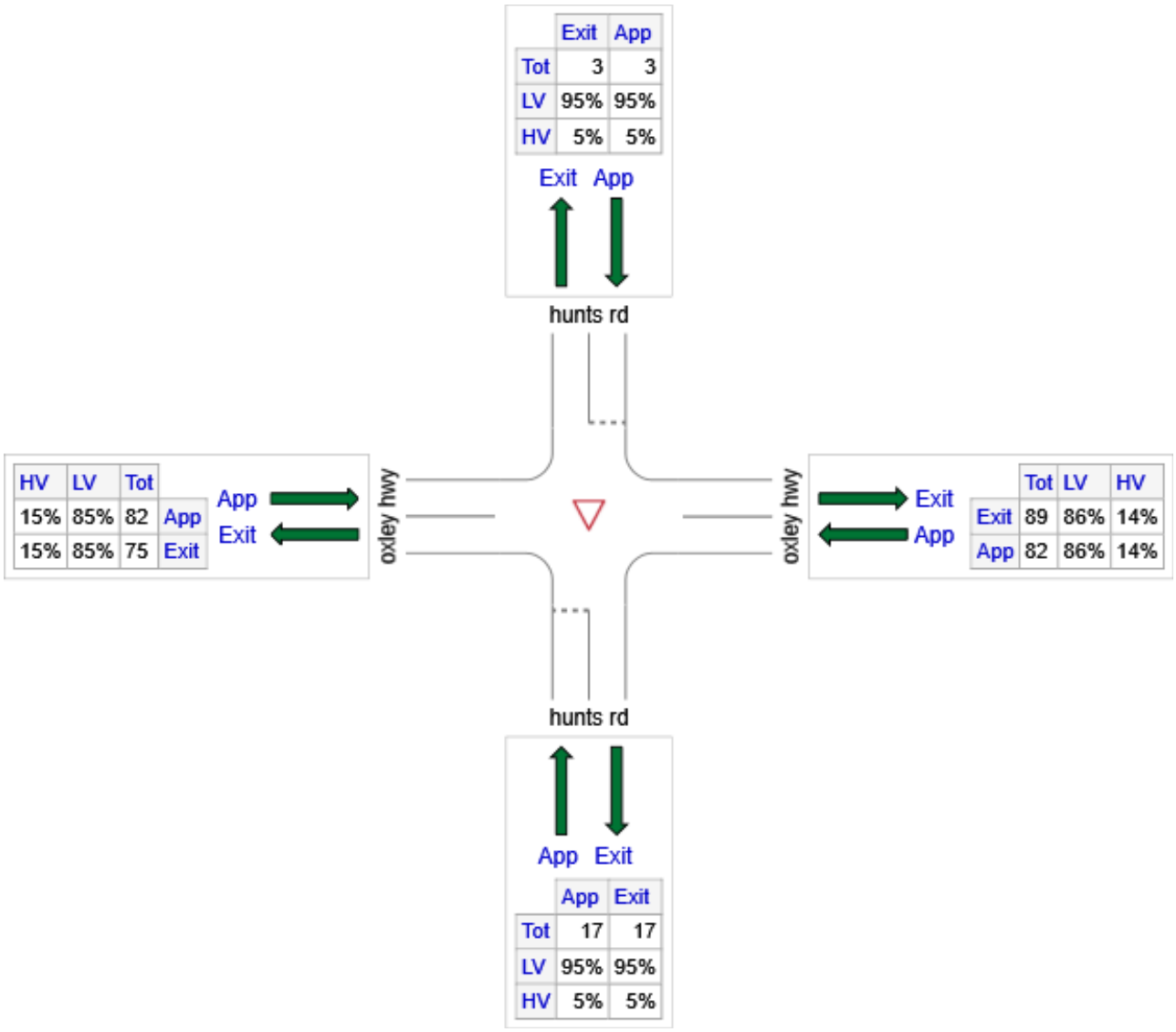
Attachment 2: SIDRA Model Layout and Outputs (Cases 1 to 4)

APPROACH AND EXIT FLOWS

Total Values for All Movement Classes Based on Site Demand Flow Rates (veh/h)

Site: 101 [GKS 2020 undev C1 (Site Folder: General)]

New Site
Site Category: Existing Design
Give-Way (Two-Way)



MOVEMENT SUMMARY

Site: 101 [GKS 2020 undev C1 (Site Folder: General)]

New Site
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: hunts rd														
1	L2	4	5.0	4	5.0	0.016	7.2	LOS A	0.1	0.4	0.21	0.60	0.21	66.0
2	T1	1	5.0	1	5.0	0.016	6.6	LOS A	0.1	0.4	0.21	0.60	0.21	58.6
3	R2	11	5.0	12	5.0	0.016	7.6	LOS A	0.1	0.4	0.21	0.60	0.21	67.1
Approach		16	5.0	17	5.0	0.016	7.5	LOS A	0.1	0.4	0.21	0.60	0.21	66.2
East: oxley hwy														
4	L2	11	5.0	12	5.0	0.045	8.0	LOS A	0.0	0.1	0.01	0.10	0.01	77.4
5	T1	66	16.0	69	16.0	0.045	0.0	LOS A	0.0	0.1	0.01	0.10	0.01	96.4
6	R2	1	5.0	1	5.0	0.045	7.9	LOS A	0.0	0.1	0.01	0.10	0.01	69.6
Approach		78	14.3	82	14.3	0.045	1.2	NA	0.0	0.1	0.01	0.10	0.01	92.7
North: hunts rd														
7	L2	1	5.0	1	5.0	0.003	5.8	LOS A	0.0	0.1	0.21	0.53	0.21	60.6
8	T1	1	5.0	1	5.0	0.003	4.9	LOS A	0.0	0.1	0.21	0.53	0.21	57.3
9	R2	1	5.0	1	5.0	0.003	6.3	LOS A	0.0	0.1	0.21	0.53	0.21	59.3
Approach		3	5.0	3	5.0	0.003	5.7	LOS A	0.0	0.1	0.21	0.53	0.21	59.0
West: oxley hwy														
10	L2	1	5.0	1	5.0	0.046	8.1	LOS A	0.0	0.2	0.02	0.04	0.02	71.3
11	T1	73	16.0	77	16.0	0.046	0.0	LOS A	0.0	0.2	0.02	0.04	0.02	98.2
12	R2	4	5.0	4	5.0	0.046	7.9	LOS A	0.0	0.2	0.02	0.04	0.02	78.0
Approach		78	15.3	82	15.3	0.046	0.5	NA	0.0	0.2	0.02	0.04	0.02	96.4
All Vehicles		175	13.7	184	13.7	0.046	1.6	NA	0.1	0.4	0.04	0.13	0.04	90.1

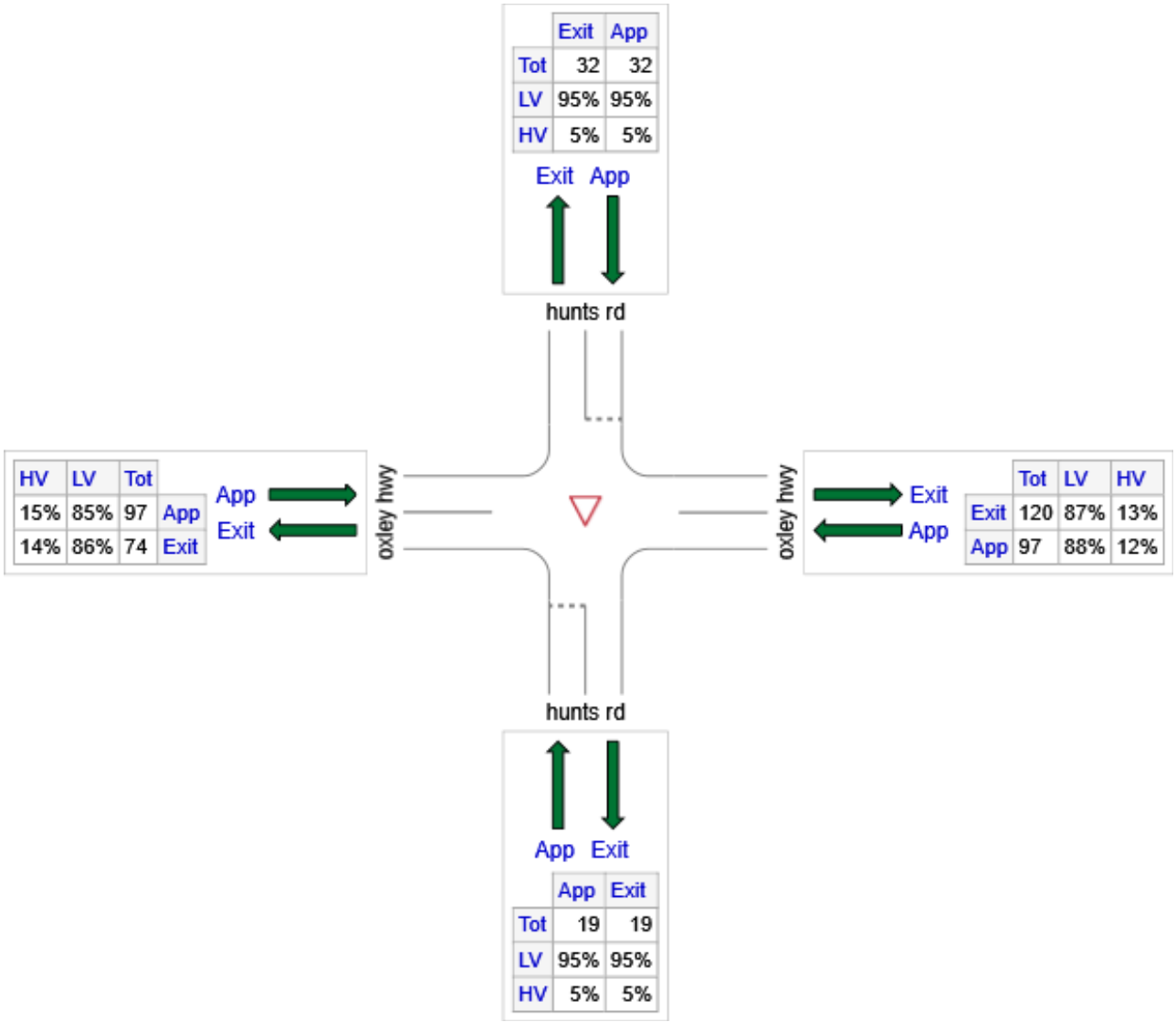
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPROACH AND EXIT FLOWS

Total Values for All Movement Classes Based on Site Demand Flow Rates (veh/h)

Site: 101 [GKS 2020 dev C2 (Site Folder: General)]

New Site
Site Category: Existing Design
Give-Way (Two-Way)



MOVEMENT SUMMARY

Site: 101 [GKS 2020 dev C2 (Site Folder: General)]

New Site
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: hunts rd														
1	L2	4	5.0	4	5.0	0.019	7.2	LOS A	0.1	0.5	0.22	0.61	0.22	65.9
2	T1	1	5.0	1	5.0	0.019	6.7	LOS A	0.1	0.5	0.22	0.61	0.22	58.5
3	R2	13	5.0	14	5.0	0.019	7.8	LOS A	0.1	0.5	0.22	0.61	0.22	67.0
Approach		18	5.0	19	5.0	0.019	7.6	LOS A	0.1	0.5	0.22	0.61	0.22	66.2
East: oxley hwy														
4	L2	13	5.0	14	5.0	0.054	8.2	LOS A	0.2	1.2	0.12	0.23	0.12	74.0
5	T1	58	16.0	61	16.0	0.054	0.1	LOS A	0.2	1.2	0.12	0.23	0.12	91.0
6	R2	21	5.0	22	5.0	0.054	8.0	LOS A	0.2	1.2	0.12	0.23	0.12	66.8
Approach		92	11.9	97	11.9	0.054	3.1	NA	0.2	1.2	0.12	0.23	0.12	81.6
North: hunts rd														
7	L2	21	5.0	22	5.0	0.025	5.9	LOS A	0.1	0.7	0.19	0.55	0.19	60.3
8	T1	1	5.0	1	5.0	0.025	5.1	LOS A	0.1	0.7	0.19	0.55	0.19	57.0
9	R2	8	5.0	8	5.0	0.025	6.5	LOS A	0.1	0.7	0.19	0.55	0.19	58.9
Approach		30	5.0	32	5.0	0.025	6.0	LOS A	0.1	0.7	0.19	0.55	0.19	59.8
West: oxley hwy														
10	L2	8	5.0	8	5.0	0.054	8.0	LOS A	0.0	0.3	0.02	0.09	0.02	70.5
11	T1	80	16.0	84	16.0	0.054	0.0	LOS A	0.0	0.3	0.02	0.09	0.02	96.7
12	R2	4	5.0	4	5.0	0.054	7.9	LOS A	0.0	0.3	0.02	0.09	0.02	77.1
Approach		92	14.6	97	14.6	0.054	1.1	NA	0.0	0.3	0.02	0.09	0.02	92.7
All Vehicles		232	11.5	244	11.5	0.054	3.0	NA	0.2	1.2	0.10	0.25	0.10	80.2

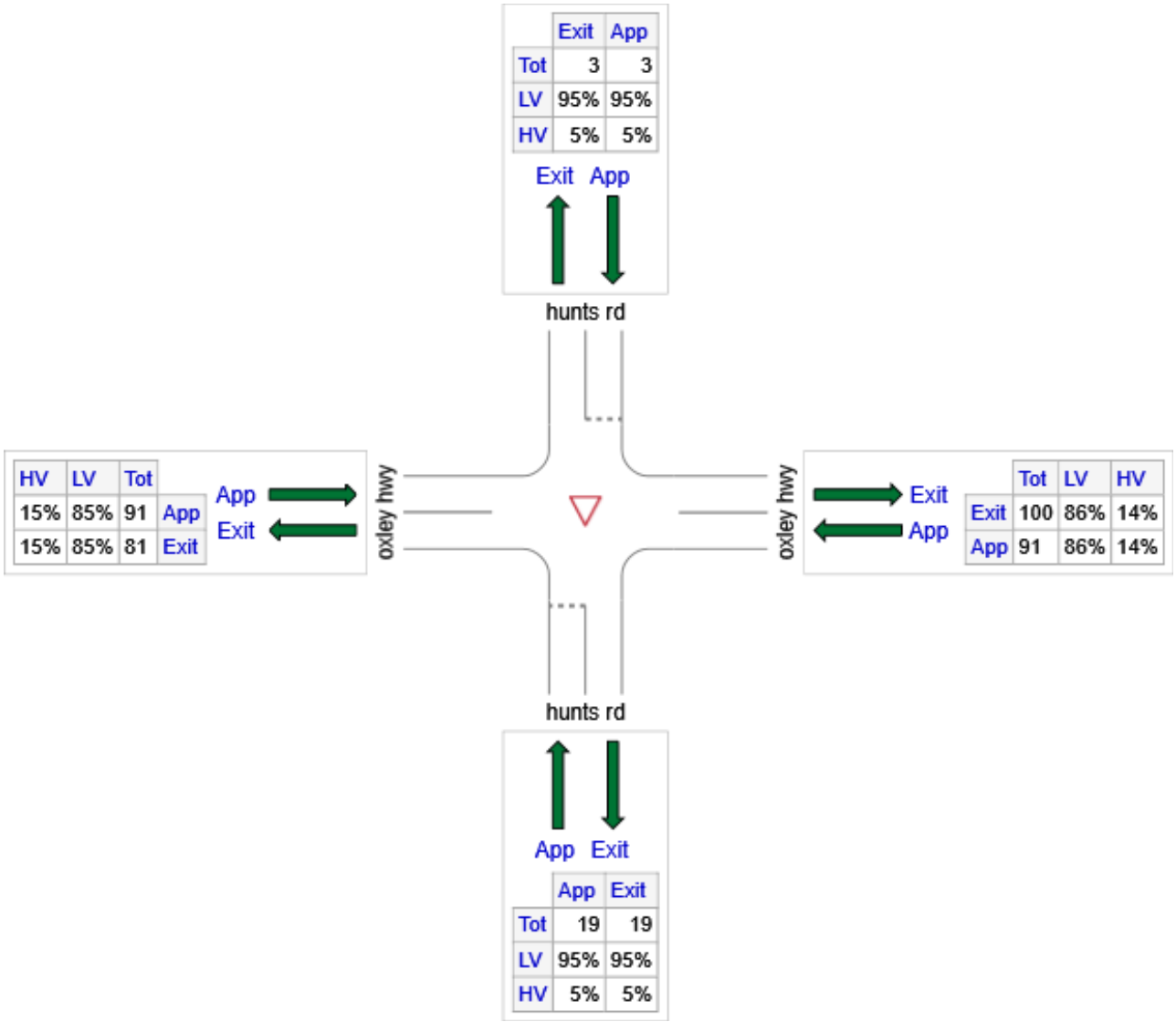
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPROACH AND EXIT FLOWS

Total Values for All Movement Classes Based on Site Demand Flow Rates (veh/h)

Site: 101 [GKS 2030 undev C3 (Site Folder: General)]

New Site
Site Category: Existing Design
Give-Way (Two-Way)



MOVEMENT SUMMARY

Site: 101 [GKS 2030 undev C3 (Site Folder: General)]

New Site
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: hunts rd														
1	L2	4	5.0	4	5.0	0.019	7.3	LOS A	0.1	0.5	0.23	0.60	0.23	65.9
2	T1	1	5.0	1	5.0	0.019	6.6	LOS A	0.1	0.5	0.23	0.60	0.23	58.5
3	R2	13	5.0	14	5.0	0.019	7.7	LOS A	0.1	0.5	0.23	0.60	0.23	67.0
Approach		18	5.0	19	5.0	0.019	7.5	LOS A	0.1	0.5	0.23	0.60	0.23	66.2
East: oxley hwy														
4	L2	13	5.0	14	5.0	0.049	8.0	LOS A	0.0	0.1	0.01	0.11	0.01	77.3
5	T1	72	16.0	76	16.0	0.049	0.0	LOS A	0.0	0.1	0.01	0.11	0.01	96.2
6	R2	1	5.0	1	5.0	0.049	7.9	LOS A	0.0	0.1	0.01	0.11	0.01	69.5
Approach		86	14.2	91	14.2	0.049	1.3	NA	0.0	0.1	0.01	0.11	0.01	92.4
North: hunts rd														
7	L2	1	5.0	1	5.0	0.003	5.8	LOS A	0.0	0.1	0.22	0.53	0.22	60.6
8	T1	1	5.0	1	5.0	0.003	5.0	LOS A	0.0	0.1	0.22	0.53	0.22	57.2
9	R2	1	5.0	1	5.0	0.003	6.4	LOS A	0.0	0.1	0.22	0.53	0.22	59.2
Approach		3	5.0	3	5.0	0.003	5.7	LOS A	0.0	0.1	0.22	0.53	0.22	59.0
West: oxley hwy														
10	L2	1	5.0	1	5.0	0.050	8.2	LOS A	0.0	0.2	0.02	0.04	0.02	71.4
11	T1	81	16.0	85	16.0	0.050	0.0	LOS A	0.0	0.2	0.02	0.04	0.02	98.3
12	R2	4	5.0	4	5.0	0.050	7.9	LOS A	0.0	0.2	0.02	0.04	0.02	78.1
Approach		86	15.4	91	15.4	0.050	0.5	NA	0.0	0.2	0.02	0.04	0.02	96.7
All Vehicles		193	13.7	203	13.7	0.050	1.6	NA	0.1	0.5	0.04	0.13	0.04	90.1

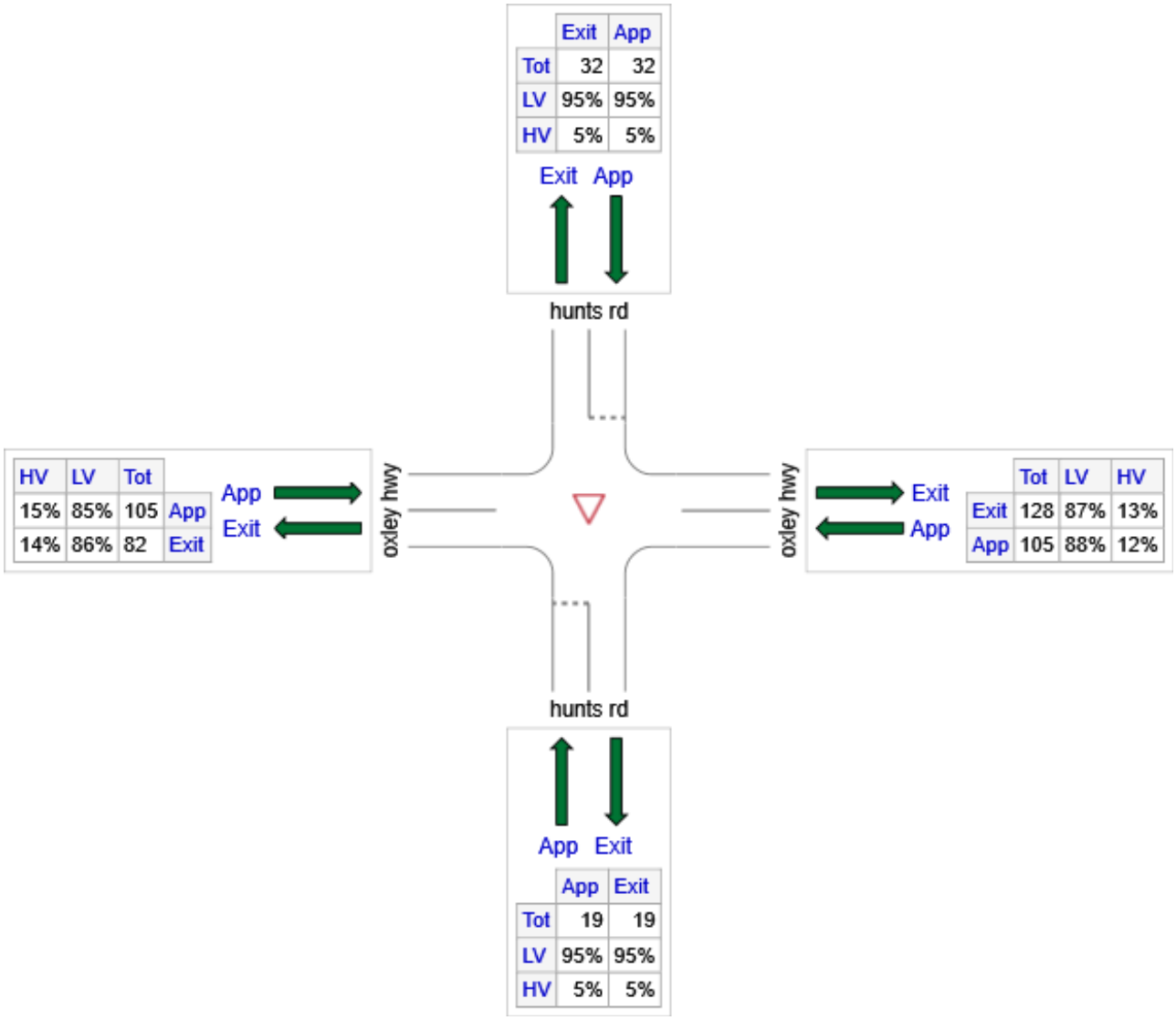
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPROACH AND EXIT FLOWS

Total Values for All Movement Classes Based on Site Demand Flow Rates (veh/h)

Site: 101 [GKS 2030 dev C4 (Site Folder: General)]

New Site
Site Category: Existing Design
Give-Way (Two-Way)



MOVEMENT SUMMARY

Site: 101 [GKS 2030 dev C4 (Site Folder: General)]

New Site
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: hunts rd														
1	L2	4	5.0	4	5.0	0.020	7.2	LOS A	0.1	0.5	0.24	0.61	0.24	65.9
2	T1	1	5.0	1	5.0	0.020	6.8	LOS A	0.1	0.5	0.24	0.61	0.24	58.5
3	R2	13	5.0	14	5.0	0.020	7.9	LOS A	0.1	0.5	0.24	0.61	0.24	66.9
Approach		18	5.0	19	5.0	0.020	7.7	LOS A	0.1	0.5	0.24	0.61	0.24	66.2
East: oxley hwy														
4	L2	13	5.0	14	5.0	0.059	8.3	LOS A	0.2	1.2	0.12	0.22	0.12	74.3
5	T1	66	16.0	69	16.0	0.059	0.1	LOS A	0.2	1.2	0.12	0.22	0.12	91.6
6	R2	21	5.0	22	5.0	0.059	8.0	LOS A	0.2	1.2	0.12	0.22	0.12	67.0
Approach		100	12.3	105	12.3	0.059	2.8	NA	0.2	1.2	0.12	0.22	0.12	82.7
North: hunts rd														
7	L2	21	5.0	22	5.0	0.026	5.9	LOS A	0.1	0.7	0.20	0.55	0.20	60.2
8	T1	1	5.0	1	5.0	0.026	5.2	LOS A	0.1	0.7	0.20	0.55	0.20	56.9
9	R2	8	5.0	8	5.0	0.026	6.6	LOS A	0.1	0.7	0.20	0.55	0.20	58.9
Approach		30	5.0	32	5.0	0.026	6.0	LOS A	0.1	0.7	0.20	0.55	0.20	59.8
West: oxley hwy														
10	L2	8	5.0	8	5.0	0.059	8.0	LOS A	0.0	0.3	0.02	0.08	0.02	70.6
11	T1	88	16.0	93	16.0	0.059	0.0	LOS A	0.0	0.3	0.02	0.08	0.02	96.9
12	R2	4	5.0	4	5.0	0.059	7.9	LOS A	0.0	0.3	0.02	0.08	0.02	77.2
Approach		100	14.7	105	14.7	0.059	1.0	NA	0.0	0.3	0.02	0.08	0.02	93.2
All Vehicles		248	11.8	261	11.8	0.059	2.8	NA	0.2	1.2	0.10	0.23	0.10	81.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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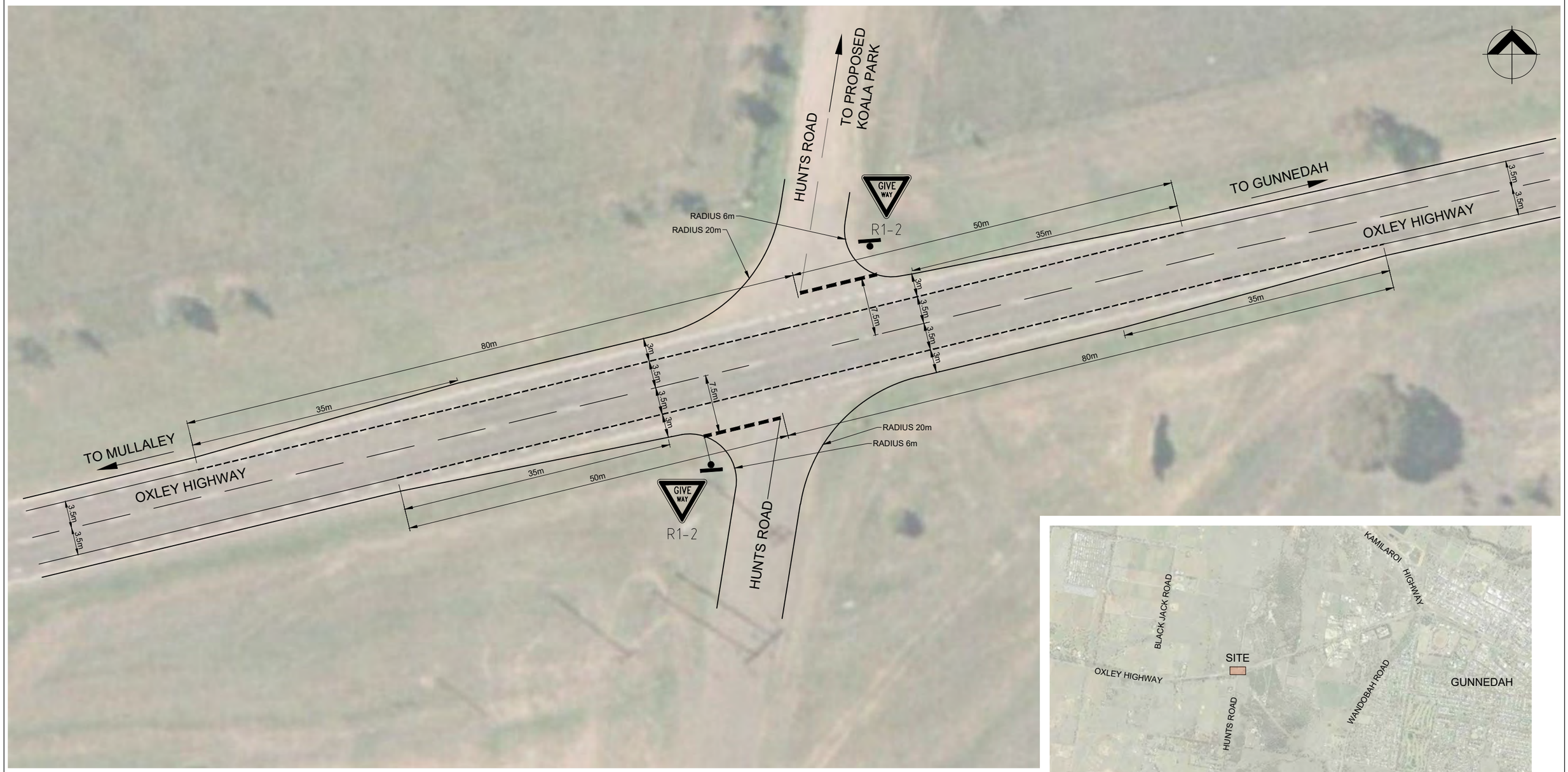
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

ATTACHMENT 3

Attachment 3: Oxley Highway/Hunts Road Intersection Upgrade Concept



SITE LOCALITY
1:25000 @ A1

CONCEPT ONLY

This plan is NOT to be used for construction purposes unless it carries the approval stamp of the local authority.

Issue	Date	Description	App'd
A	10/11/2020	ORIGINAL ISSUE	TC

Client: GUNNEDAH SHIRE COUNCIL

Project: GUNNEDAH KOALA SANCTUARY
GUNNEDAH, NSW

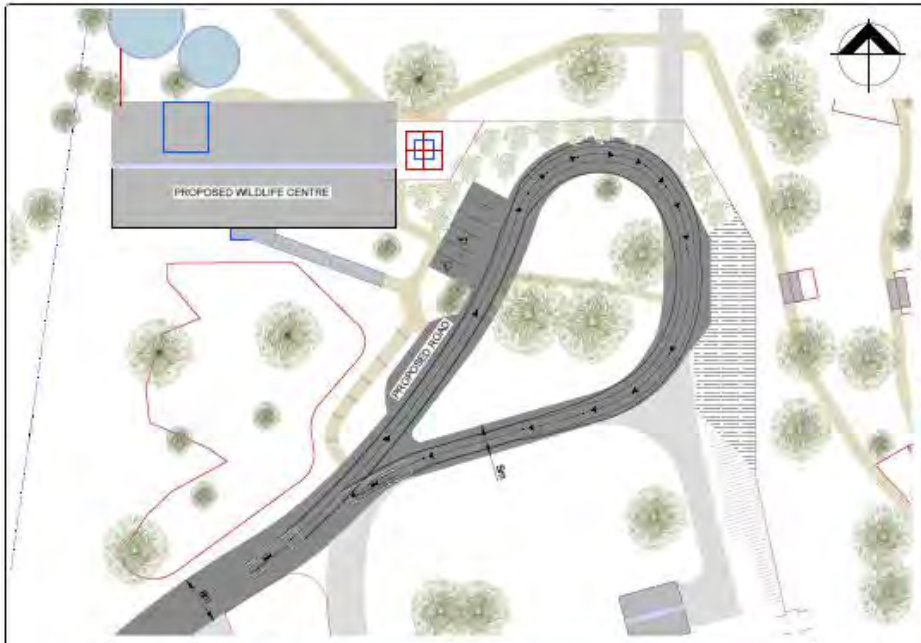
Title: OXLEY HWY & HUNTS RD INTERSECTION LAYOUT

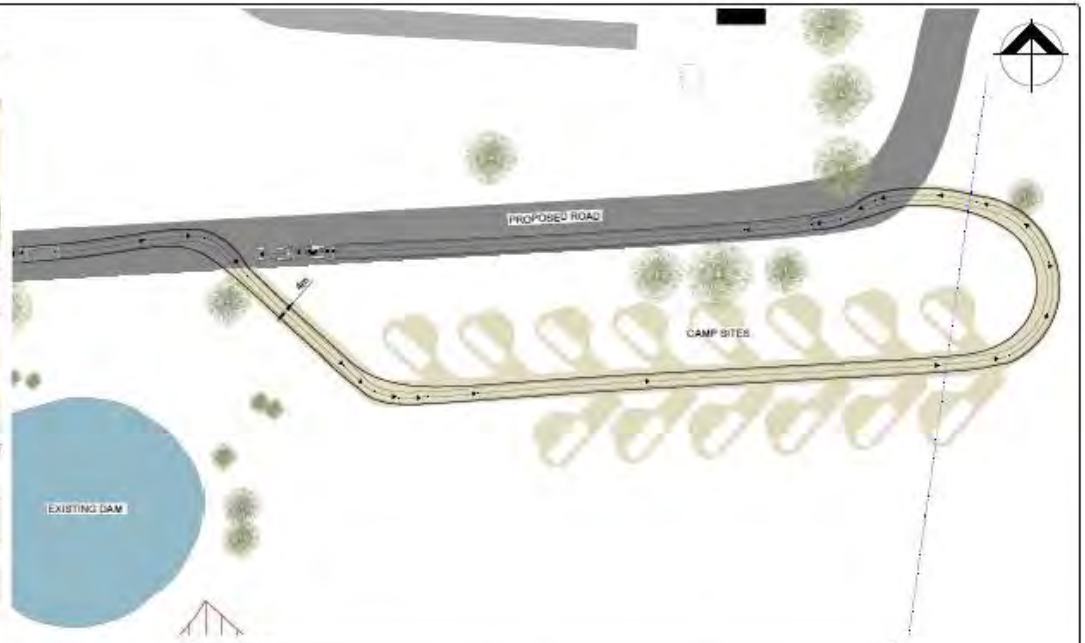
ARDILL PAYNE
& Partners
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT
BALLINA 45 River Street Ph. 02 6686 3280
GUNNEDAH 285 Conadilly Street Ph. 02 6742 9955
A.B.N. 51 808 558 977 e-mail: info@ardillpayne.com.au

Design	TC	Scale	1:250 @ A1, 1:500 @ A3
Drawn	EMR		0 2.5 5 7.5 10 12.5
Checked	TC	Datum	
Approved	TC	Drafting File	10401_DA_Intersection_Layout.dwg
Date	10/11/2020	Design File	
Job No.	10401	Dwg No.	SK01
		Issue	A

ATTACHMENT 4

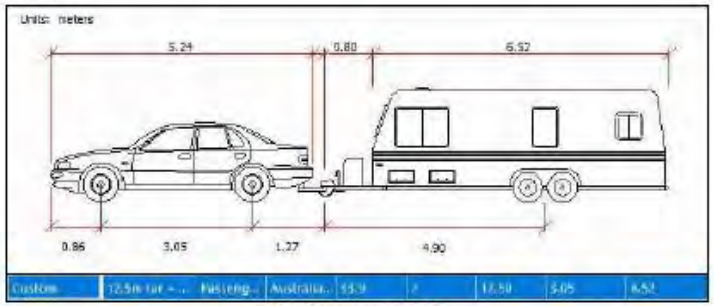
Attachment 4: Vehicle Movement Plans





STANDARDS ...	HRV	Commer...	Australia...	36.7	t	12.50	6.85	N/A

HRV (GARBAGE TRUCK) - 12.5m



Custom	12.5m tur + ...	Passeng...	Australia...	55.9	t	12.50	3.05	6.52

CAR/CARAVAN COMBINATION - 12.5m

This plan is NOT to be used for construction purposes unless it carries the approval stamp of the local authority.

Issue	Date	Description	Appd
A	24/11/2020	ORIGINAL ISSUE	TC

Client: GUNNEDAH SHIRE COUNCIL

Project: GUNNEDAH KOALA SANCTUARY
3130 OXLEY HIGHWAY, GUNNEDAH, NSW

Title: VEHICLE MOVEMENT PLAN

ARDILL PAYNE
& PARTNERS
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT
NAL1304 65 Rival Street Ph: 02 6868 3200
GUN0572AH 380 Conadilly Street Ph: 02 6742 3900
A.B.N. 51 650 656 877 e-mail: info@ardillpayne.com.au

Design	TC
Drawn	EMR
Checked	TC
Approved	TC
Date	24/11/2020
Job No.	10401
Scale	1:400 @ A1, 1:800 @ A3
Drawing No.	VMP1
Issue	A

NOTES:
1. NO BOUNDARY SURVEYS HAVE BEEN CARRIED OUT.
2. OUTLINE IS SITE FENCE INTERPOLATED FROM PHOTOGRAPHY.
3. SURVEY DTM IN DIGITAL MODEL IS ONLY ACCURATE IN NON-VEGETATED AREAS

STEWART SURVEYS
Pty Ltd Inc in NSW ABN 65 002 886 508
109 Conadilly Street
P.O. Box 592
GUNNEDAH NSW 2380
T 02 67422966 F 02 67420684
E office@stewartsurveys.com
Surveying, Environmental & Landscape Architecture

CLIENT: GUNNEDAH SHIRE COUNCIL			TITLE: UNMANNED AERIAL SURVEY (UAS) 3130 OXLEY HIGHWAY, GUNNEDAH LOT 328 & 329 IN DP755503
PROJECT: 3130 OXLEY HIGHWAY, GUNNEDAH			
DRAWN BY: KY	OUR REFERENCE: 5284	DATE: 16 JANUARY 2020	REDUCTION RATIO: 1:1,500 @ A1 / DRAWING: Sheet 2 of 2

NOTES:
1. NO BOUNDARY SURVEYS HAVE BEEN CARRIED OUT.
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CLIENT: GUNNEDAH SHIRE COUNCIL			TITLE: UNMANNED AERIAL SURVEY (UAS) 3130 OXLEY HIGHWAY, GUNNEDAH LOT 328 & 329 IN DP755503
PROJECT: 3130 OXLEY HIGHWAY, GUNNEDAH			
DRAWN BY: KY	OUR REFERENCE: 5284	DATE: 16 JANUARY 2020	REDUCTION RATIO: 1:1,500 @ A1
			DRAWING: Sheet 1 of 2

DEVELOPMENT APPLICATION
3130 OXLEY HIGHWAY GUNNEDAH
LOT 328 & 329 IN DP755503

STORMWATER MANAGEMENT PLAN
PROPOSED KOALA SANCTUARY

DATE: 7 DECEMBER 2020

PREPARED FOR:
Dunn + Hillam Architects
on behalf of
Gunnedah Shire Council

PREPARED BY:
Stewart Surveys Pty Ltd
107-109 Conadilly Street,
PO Box 592
GUNNEDAH NSW 2380
office@stewartsurveys.com

Stewart Surveys Reference 5284

REPORT PREPARATION

Name: **Daniel Stewart**

Qualifications: Bachelor of Engineering (UNSW)
Bachelor of Arts (UNSW)
MIEAust CPEng NPER Chartered Professional Engineer

Name: **Kathryn Yigman**

Qualifications: Bachelor of Landscape Architecture (UNSW)
Masters of Environmental Management (UNSW)
Registered Landscape Architect (#001493)

Company: **Stewart Surveys Pty Ltd**
ABN: 65 002 886 508
PO Box 592, Gunnedah NSW 2380
(02) 6742 2966
office@stewartsurveys.com

This Stormwater Management Plan and report has been prepared by our office to accompany a council development application. To the best of our knowledge, the content of this statement is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

INTRODUCTION

Stewart Surveys has been commissioned by Dunn & Hilliam Architects on behalf of Gunnedah Shire Council to prepare a stormwater management strategy for the proposed Koala Sanctuary at 3130 Oxley Highway Gunnedah being Lots 328 and 329 in DP755503. This report has been prepared to satisfy the requirements of the Gunnedah Shire Council Engineering Guidelines for Subdivision and Developments V2.0 dated August 2013. This document is hereby referred to as the guideline. Section 3.5.2 of this guideline outlines that a stormwater servicing strategy shall be submitted with a development application.

SITE

The subject site is Lots 328 and 329 in DP755503 located at 3130 Oxley Highway Gunnedah on the western slopes of Borethistles Hill just west of the town of Gunnedah. The site has an overall area of 35.5 hectare and contains an established motorcycle and go cart track in the western section near Hunts Road. It is proposed to construct a new Koala Sanctuary, Hospital and Wildlife Park on the eastern side of the site. Ancillary to this development will be camping and caravan sites. Both holdings are owned by Gunnedah Shire Council. Lot 329 is heavily timbered and was previously utilised as a gravel quarry. The quarried area and hard sandstone floor remain on the site today. The new buildings associated with this development are located on Lot 329 above the existing motorcycle and go-cart tracks. Access to the site will be from Hunts Road with the intersection at the Oxley Highway upgraded and the road bitumen sealed for approximately 210 meters to the site entry. A new bitumen road access will be constructed from Hunts Road to access the development and native vegetation will be retained and enhanced as part of this project. The site is zoned RU1 Primary Production and E3 Environmental Management under the Gunnedah Local Environmental Plan 2012 and has a varying minimum lot size of 40 hectares and 200 hectares. The site and surrounding properties would be considered to have a rural land use. **Figure 1** shows the site in context with the town of Gunnedah. **Figure 2** is an aerial photo of the site showing the character and **Figure 3** is the proposed architectural layout.

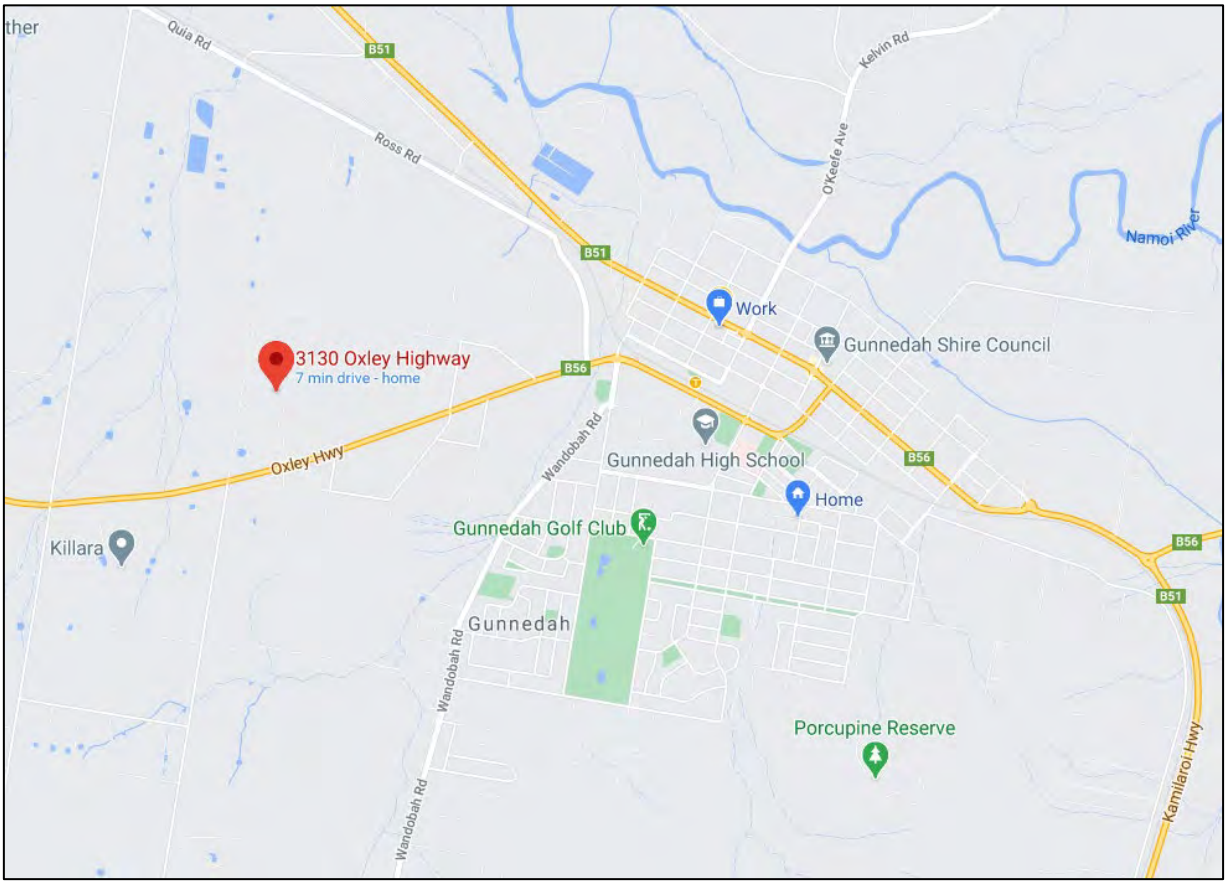

Figure 1: Site Context

Figure 2: Aerial Photo (Stewart Surveys January 2020)

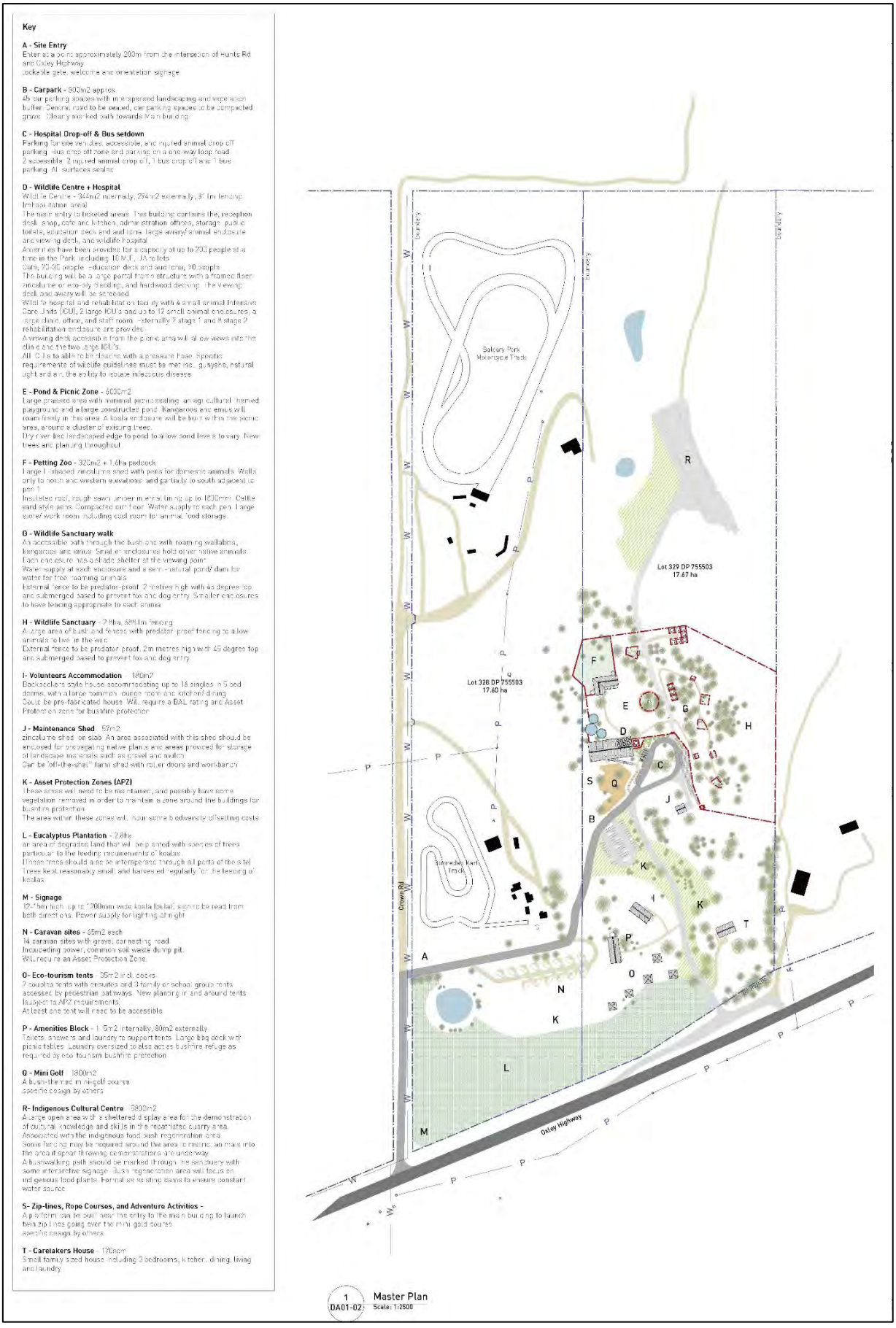

Figure 3: Architectural Site Plan (Dunn & Hilliam Architects)

OBJECTIVES

The principle objectives of the development's stormwater and drainage design are;

- To meet best practice engineering standards
- To safely and efficiently collect and control stormwater runoff generated within the subdivision in the full development of the site
- To provide an efficient outlet for collected stormwater from the development site.
- Design and construction of a stormwater network that is both feasible to construct and economical to maintain in the long term
- Design and construction of a stormwater network that does not place an unnecessary burden on Councils maintenance and operations resources.
- To achieve these objectives without detrimentally effecting the environment, surface or subsurface water quality or the groundwater infiltration characteristics of the site.

STORMWATER MANAGEMENT STRATEGY

The subject site contains three dams, one near the south western corner of the property and two smaller dams on Lot 329 in DP755503 near the western boundary of this lot. The site soil is mapped by the Office of Environment and Heritage (espade) as the Porcupine Soil Landscape. This landscape is described as undulating hills on Permian sandstone plateaux. The qualities and limitations of this soil include widespread shallow soil, poor moisture availability, widespread rock outcrops, localised gully erosion and widespread sheet erosion hazard.

To manage the stormwater flows that occur due to the increased impervious areas within the new development it is proposed to construct table drains along the proposed new access road within the site which direct water into the existing site dam near the south western corner of the site. The geometry of the table drains have been designed to reduce velocities to minimise the risk of erosion and to be traversable to allow easy maintenance.

A new retention pond is proposed as a landscape feature in the wildlife sanctuary. This pond will be constructed from three interconnected concrete tanks to capture overland runoff from and take the overflow from the water storage tanks on the wildlife sanctuary, hospital building and petting zoo. The size of the basin has been determined to balance the footprint of the pond with a suitable depth of standing water.

Table 1 is a summary of the approximate built areas as part of this development.

Table 1: Summary of built areas (Dunn & Hillam & Stewart Survey measurement)

PROPOSED STRUCTURE	Building Roof Area
BUILDINGS	
Wildlife Centre and Hospital building	873m²
Petting Zoo	377m²
Maintenance Shed	83m²
Volunteer Accommodation	272m²
Ablutions Block	310m²
Caretakers house	222m²
Ancillary Structure (animal shelters)	230m²
TOTAL ESTIAMATED BUILDING AREA	**2,367m²**

LANDSCAPE HARDSCAPES	
New Pathways	1511m²
Koala Hospital Park (semi-impervious)	360m²
Animal Enclosures (semi-impervious)	429.5m²
Mini Golf	1120m²
Carparking Area	1366m²
Playground	340m²
New access road	6183m²
Caravan sites and road	1369m²
Tents	**272m²**
New Pond	256m²
TOTAL ESTIMATED HARDSCAPE AREA	**13,206.5m²**

The proposed new built structures total an estimated 1.57 hectares. The site has an area of 35.5 hectares which corresponds to an impervious area of less than 5% of the site. This is considered to be low intensity development with the preferred treatment of stormwater runoff to prevent nuisance flows through the site. These two drainage systems proposed will manage the increased stormwater flows as a result of this development.

As part of the proposed development the following tanks will be installed at each building:

PROPOSED STRUCTURE	Updated Area
BUILDINGS	
Wildlife Centre and Hospital building	80,000L (2 tanks)
Petting Zoo	80,000L (2 tanks)
Volunteer Accommodation	55,000L (2 tanks)
Ablutions Block	40,000L
Caretakers house	40,000L
TOTAL	**295,000L (8 tanks)**

This installation of eight tanks to told up to 295,000 litres of potable water at the site will provide potable water supply for the facility and mitigate the impacts of water runoff from the built structure. Overflow from the Wildlife Centre and Hospital building will flow into the proposed landscape ponds. Overflow from other buildings will be directed to the proposed drainage system with scour protection measures in place to prevent erosion.

Analysis of topography, including natural drainage paths and watercourses

The site is located on the side of a hill landscape and the topography is undulating. The slope of the natural surface on the site range from 27% in the eastern section to 5% in the western section of the site. As outlined previously in this report the site was formally utilised as a gravel quarry and the quarry scar remains in the landscape with a rock wall on the eastern side. The natural drainage of the site is in a westerly direction, along natural drainage lines topsoil had washed and the rock shelf has been exposed. There are no watercourses mapped on topographic maps identified within this site.

In the northern section of the site natural drainage paths will remain unchanged.

In the other sections of the site where built works are proposed, table drains will be constructed to convey upstream flows around the site to the existing dam. The Motorcycle and Go Cart tracks below the site have had their topography manipulated and concrete block retaining walls direct water away from the tracks. The proposed development is not expected to concentrate water at these facilities.

Type of minor system proposed

The development is considered to fit the description *overland minor drainage system* in the Gunnedah Shire Council Subdivision Code. This system is defined as typically consisting of open table drains designed parallel to roadways to convey flows generated by average recurrence intervals (ARI) to a natural watercourse.

There are two catchments within the footprint of the development, catchment 1 and 2 see **Figure 4**. Catchment 1 relies on table drains to intercept the upstream surface runoff and convey them around the development. Catchment 2 relies on sheet flow through the site to a proposed retention pond to manage the minor system flows.

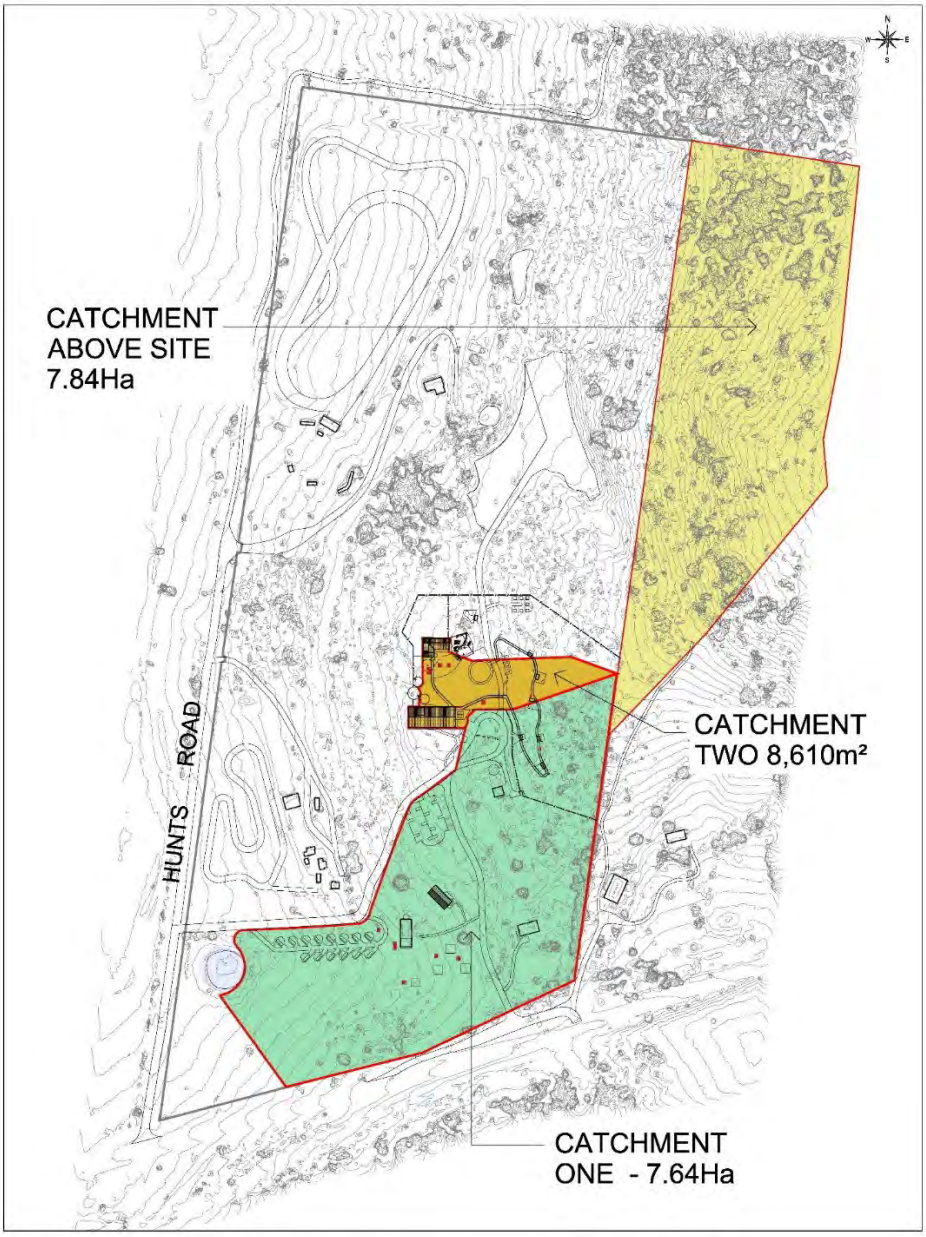

Figure 4: Catchment diagram

Surface runoff not intercepted by the table drains are minimal and the catchment is limited to a small section of the development within catchment 1. These flows are conveyed via sheet flow across the road (one way crossfall from east to the west) and towards the natural watercourse west of the site.

The table drains for this development have been designed for the 10 year Average Recurrence Interval.

The retention pond within catchment 2 has been sized for the 20 year Average Recurrence Interval.

Location of major system overflow path

It is proposed to maintain the existing overland paths for stormwater from the site. The water from the site is collected within the proposed retention pond and existing dam and once full, overtops these structures and is conveyed across Hunts Road, through adjoining rural properties into an unnamed watercourse which is part of the Namoi River catchment. As demonstrated above, the development only represents an increase in impervious area of less than 5% which is considered negligeable for the size of the site. Although the retention pond within Catchment 2 is not provided for this purpose, it will nonetheless reduce the magnitude of the post developed flows leaving the site. This major overflow path is shown in **Figure 5**.

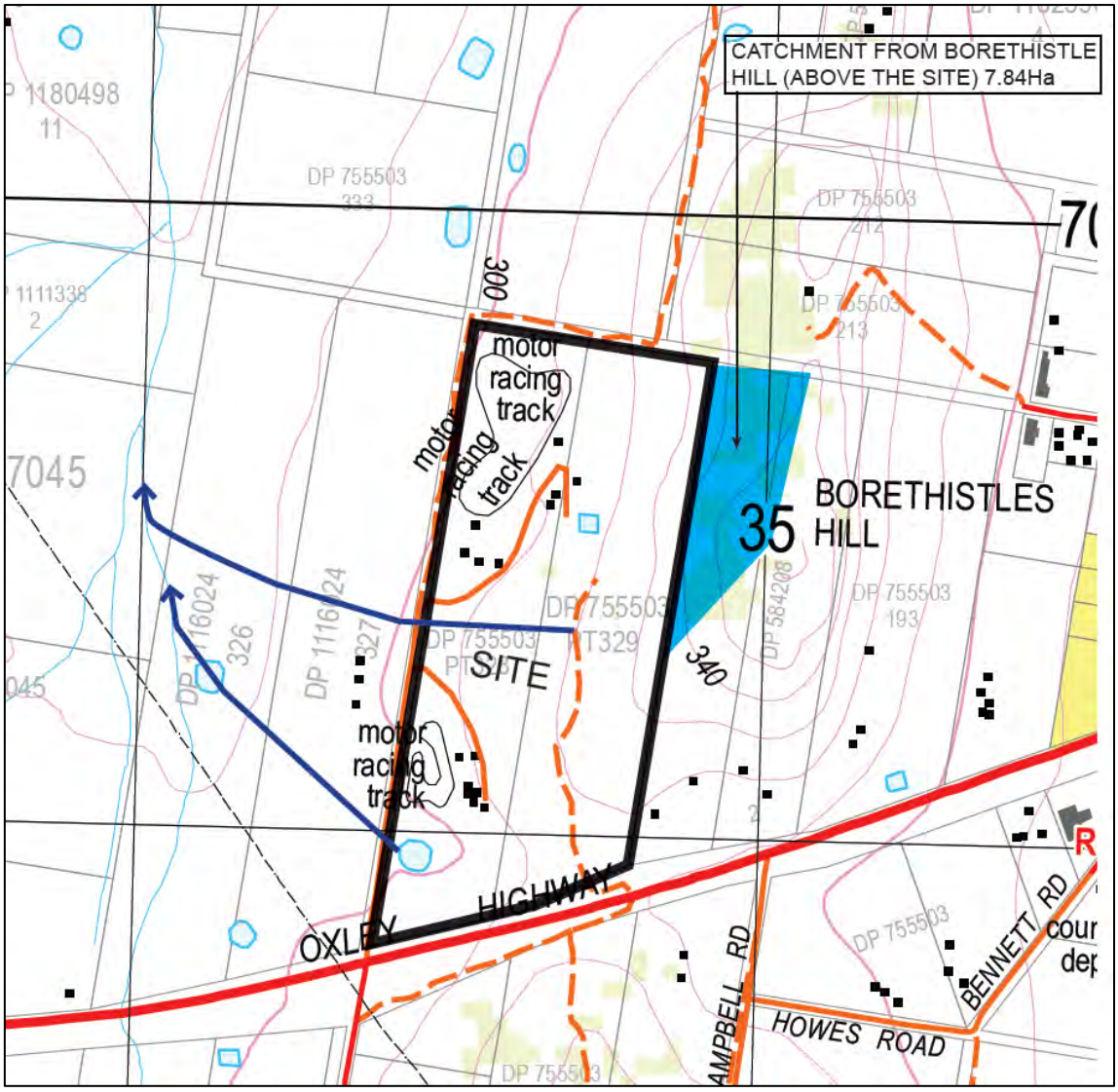

Figure 5 Site Overflow path and upstream catchment

Location of any Trunk drainage system

There are no trunk drainage systems identified on the subject site.

Catchment and sub-catchment boundaries, areas and land use types

Catchment Area 1

Catchment 1 has an area of 8,610m2 and surface runoff from this catchment is conveyed via overland sheetflow to a new retention pond that has been sized for the approximate 1 in 20 year event with this recurrence interval solely chosen to provide sufficient volume to ensure a suitable volume of water will be retained as a landscaping feature. It is proposed that the pond has a depth of 600 to 800 millimetres to ensure retaining walls are less than 900 millimetres and does not require a balustrade.

Catchment Area 2

Catchment 2 has an area of 7.64ha and consists of table drains that intercept the upstream surface runoff before it enters the developed area. These flows are conveyed via table drains to the existing dam at the south western side of the site. The table drains have been sized for the 1 in 10 year event.

Consideration of flows from upstream development and catchments

The upstream catchment is relatively small being 2,156 square metres on the western slopes of Borethistles Hill. Upstream development is a rural property with a single dwelling. The topography of the property to the east of the site is expected to preclude development area with water flowing into the area of the site which north of the development area in which natural flows are being maintained. Thus the upstream flows that enter the site are not expected to increase. **Figure 4** show the catchment above the site.

Consideration of the impact of the development on downstream development and catchments

The overall catchment in which the site is situated covers a large area, with water flowing into the Namoi River approximately 3 kilometres north of the site. The overland flow in this catchment passes through natural waterway structures and manmade waterways between Quia Road and the Kamilaroi Highway. Overflow from the onsite storage sheets across Hunts Road where a contour bank is located in the adjoining property parallel to the boundary, this contains and directs water towards the natural waterway. **Figure 6** shows the major overland flow path from the site to the Namoi River. It is proposed to construct a concrete edge beam to the Hunts Road at the causeway to protect the road integrity.

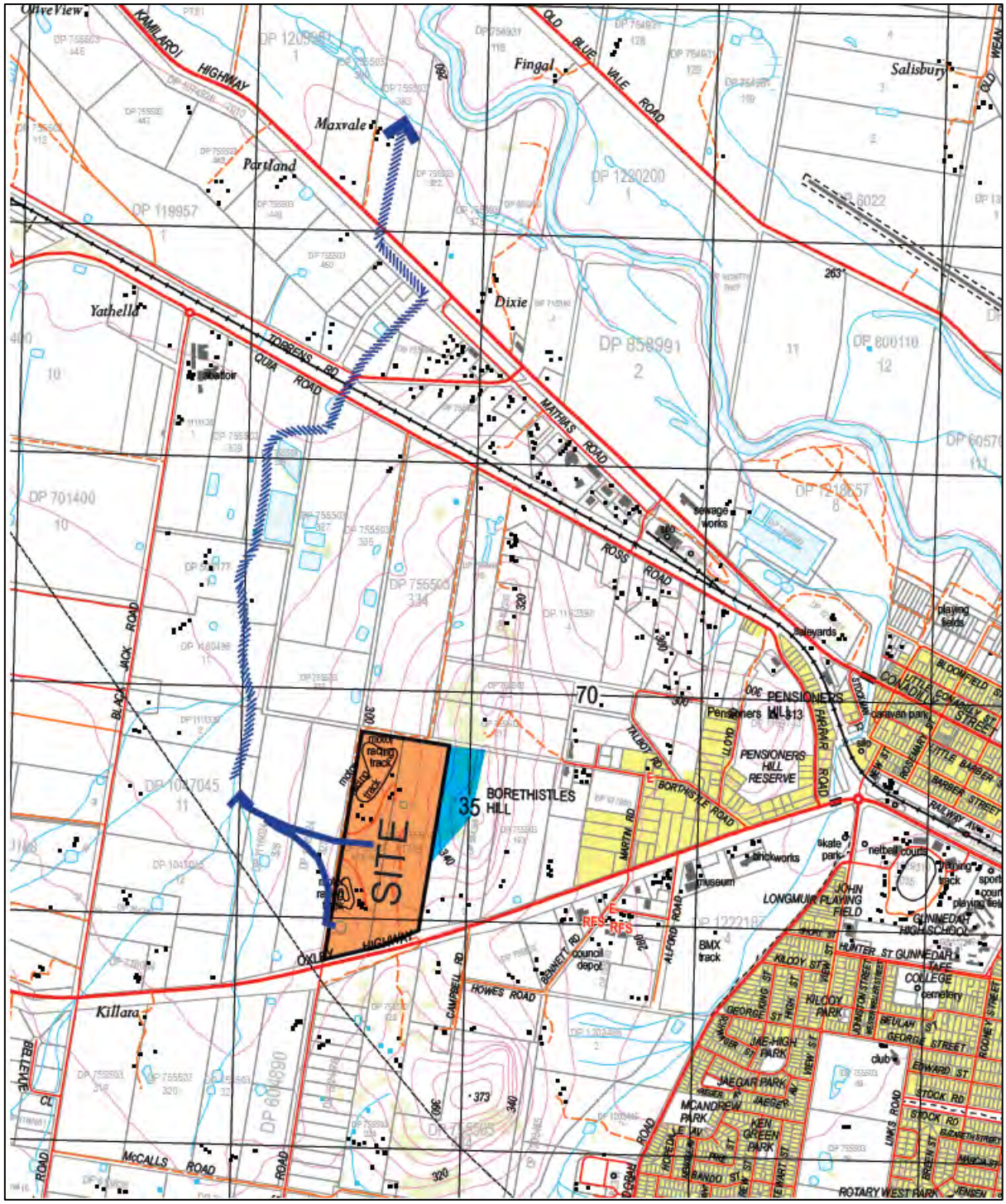

Figure 6: Overall catchment in which the site is located.

As demonstrated above, the increase in impervious area on the site represents less than 5% of the overall site catchment area. As such, it is not expected that the development will have an adverse impact on the downstream properties

Location and type of drainage retention or detention structures

The existing and proposed dams will act as retention basins. The location of these features is shown on the enclosed site plans.

Figure 7 is a photo of the on site storage in catchment 1. **Figure 8** is a photo of a storage in the northern section of the site outside the development area.

Figure 7: Existing dam at the bottom of Catchment 1

Figure 8: Existing dam above the motorcycle track to be retained on the site.

Location and type of any water quality devices

There are no water quality devices proposed as part of this development.

The placement of native grasses within the table drains and settlement of water in on site dam storage will allow for sediment to settle and result in improved was quality.

CONCLUSION

Appended to this report are the engineering stormwater calculations and a stormwater management plan for this project. The measures outlined in this report will control the stormwater at the site up to a 1 in 10 year event. In larger events water will flow across Hunts Road and into an unnamed intermittent watercourse which flows from the southern side of the Oxley Highway across Quia Road, Mathias Road, the Kamilaroi Highway and into the Namoi River. As part of the Hunts Road upgrade council may wish to install a concrete causeway in the Hunts Road formation to prevent erosion.

The development is considered to be low intensity development and within the handling capacity of the surrounding environment. The installation of table drains and new water storage pond will mitigate impacts of the development during storm events. There are no major alterations or redirections proposed to the natural drainage of the site. This reports is consistent with the Gunnedah Shire Council Engineering Guidelines for Subdivision and Developments V2.0 dated August 2013 and is submitted at the development application stage for the project. Detailed design will of the structures identified in this report will be required once development consent is received.

APPENDIX A

STORMWATER MANAGEMENT PLAN GUNNEDAH KOALA SANCTUARY, 3130 OXLEY HIGHWAY, GUNNEDAH, PREPARED BY STEWART SURVEYS, DATED 9 NOVEMBER 2020

Stewart Surveys Pty Ltd
ABN 65 002 886 508

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Gunnedah NSW 2380

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MAINTAIN NATURAL DRAINAGE

CATCHMENT ABOVE THE SITE - 7.84Ha

PROPERTY BOUNDARY

CATCHMENT TWO - 8,610m²

CONCRETE DISH ALONG EDGE OF PATH TO DIRECT OVERLAND FLOW BACK TO POND

PROPOSED PONDS INTERCONNECTED CONCRETE TANKS TO BE SIZED TO RETAIN 100m^3 OF WATER (APPROXIMATELY 1 IN 20 YEAR EVENT) WEIR OUTLET TO DISCHARGE BIGGER FLOWS. OUTLET CHANNEL ON DOWNSTREAM SIDE OF POND TO HAVE MIN. DN200 RIP RAP FOR AN EXTENT OF 10m MIN.

STAGE 2 CONSTRUCT CONCRETE DISH TO FORM EDGE OF MINI GOLF AND DIRECT WATER. DN200 RIP RAP AT END FOR 10m MIN.

TABLE DRAIN 2 - 6H:1V BATTERS 1.0m BASE WIDTH 0.3m DEEP. MIN. 0.5%.

ONE WAY CROSS FALL ON ROAD TO DIRECT WATER AWAY FROM CARAVAN SITES

INSTALL CONCRETE EDGE BEAM TO ROAD AT CAUSEWAY

TABLE DRAIN 1 - 6H:1V BATTERS 1.5m BASE WIDTH 0.2m DEEP. MIN. 0.5%.

TABLE DRAIN 2

TABLE DRAIN 3

CATCHMENT ONE - 7.64Ha

DAM

TABLE DRAIN 3 - 6H:1V BATTERS 1.5m BASE WIDTH 0.3m DEEP. MIN. 0.5%.
0.2 TO 0.3m HIGH BUND TO PREVENT SHEET FLOW INTO CARAVAN SITE

PROPERTY BOUNDARY

HUNTS ROAD

OXLEY HIGHWAY

N W E S

1:1000

REDUCTION RATIO METRES

LEGEND

- CATCHMENT BOUNDARY
- FORMED TABLE DRAIN
- OVERLAND FALL DIRECTION

STEWART SURVEYS
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Surveying, Environmental & Landscape Architecture

CLIENT: GUNNEDAH SHIRE COUNCIL			TITLE: STORMWATER STRATEGY MASTERPLAN GUNNEDAH KOALA SANCTUARY 3130 OXLEY HIGHWAY, GUNNEDAH
PROJECT: KOALA SANCTUARY			
DRAWN BY: KJY	OUR REFERENCE: 5284	DATE: 9 NOVEMBER 2020	REDUCTION RATIO: 1:1,000@A1 / DRAWING: Sheet 1 of 1

APPENDIX B

ENGINEERING STORMWATER CALUCLATIONS

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IFD FOR KOALA PARK, GUNNEDAH

RAINFALL INTENSITY IN mm/h FOR VARIOUS DURATIONS AND RETURN PERIODS

	RETURN PERIOD (YEARS)						
DURATION	1	2	5	10	20	50	100
5 mins	67.7	89.2	119.	139.	165.	203.	233.
6 mins	63.1	83.0	111.	129.	154.	189.	218.
10 mins	51.5	67.7	90.1	105.	125.	153.	176.
20 mins	37.6	49.4	65.4	75.9	89.9	110.	126.
30 mins	30.4	40.0	52.8	61.2	72.4	88.3	101.
1 hour	20.3	26.6	35.0	40.6	48.0	58.4	66.9
2 hours	12.9	16.8	22.2	25.7	30.4	37.1	42.4
3 hours	9.71	12.7	16.8	19.4	23.0	28.0	32.1
6 hours	5.96	7.83	10.3	12.0	14.2	17.3	19.9
12 hours	3.67	4.83	6.42	7.47	8.88	10.9	12.5
24 hours	2.25	2.98	4.01	4.70	5.63	6.94	8.02
48 hours	1.34	1.79	2.46	2.91	3.52	4.39	5.11
72 hours	.950	1.28	1.78	2.12	2.58	3.24	3.79

(Raw data: 27.46, 4.95, 1.31, 54.88, 10.09, 2.99,skew= 0.330)

HYDROMETEOROLOGICAL ADVISORY SERVICE

* ENSURE THE COORDINATES ARE THOSE REQUIRED SINCE DATA IS BASED ON THESE AND NOT LOCATION NAME

Project Reference: Catchment 2 - design flows into Retention pond

Time of Concentration

ARI Event	1 in …	**20**	years	
Sub-Catchment Area	A_{sub}	**0.00816**	km^2	
Catchment Area	A	**0.00816**	km^2	
Slope of the land	S	**0.08**	m/m	
Flow length	L	**150**	m	
Trial rainfall Intensity	I	**61**	mm/hr	iterate for kinematic
retardance co-efficient	N*	**0.15**		wave equation
Time of Concentration	Tc			
1. Rational		7.34	mins	
2. Bransby-Williams		5.86	mins	
3. Kinematic Wave		18.52	mins	
Land Use		**rural**		"rural" or "urban"
Adopted Tc	Tc	**7.34**	mins	select method

Pre Developed Flow

ARI Event	1 in …	**20**	years	
Catchment Area	A	0.816	ha	
Time of Concentration	Tc	7.34	mins	rational method
C_{10}		**0.25827**		
FFy (FF20)		1.26		
C10*FFy (C*20)		0.33		
Rainfall Intensity	20 I 7.3	144.3	mm/hr	for the adopted Tc
Pre Developed Flow	Q_{des}	0.106	m^3/sec	

Design Flow

ARI Event	1 in …	**20**	years	
Catchment Area	A	0.816	ha	
Time of Concentration	Tc	7.34		for the adopted Tc
impervious factor	f	**0.4**		
C_{10}		**0.514962**		
FFy (FF20)		1.26		
C10*FFy (C*20)		0.65		
Rainfall Intensity	20 I 7.3	144.3	mm/hr	for the adopted Tc
Design Flow	Q_{des}	0.212	m^3/sec	

Volume of water for 20yr ARI 93.40241 m3

Therefore adopt a min basin capacity of 100m3 to retain the 20 year event

Project Reference: Table Drain 1

Time of Concentration

ARI Event	1 in ...	**10**	years	
Catchment Area	A	**0.006354**	km^2	
Slope of the land	S	**0.1**	m/m	
Flow length	L	**100**	m	
Trial rainfall Intensity	I	**61**	mm/hr	iterate for kinematic
retardance co-efficient	N*	**0.3**		wave equation
Time of Concentration	Tc			
1. Rational		6.67	mins	
2. Bransby-Williams		3.83	mins	
3. Kinematic Wave		20.58	mins	
Land Use		**rural**		"rural" or "urban"
Adopted Tc	Tc	**6.67**	mins	select method

Design Flow

ARI Event	1 in ...	**10**	years	
Catchment Area	A	0.6354	ha	
impervious factor	f	**0**		
C_{10} location		**Tamworth**		
C_{10}		**0.25827**		
FFy (FF10)		1		
C10*FFy (C*10)		0.26		
Rainfall Intensity	10 I 6.7	129	mm/hr	for the adopted Tc
Design Flow	Q_{des}	0.059	m^3/sec	

Channel Geometry and Capacity - Open Channel Flow Claculations

Width of channel at base		**1.500**	m	
Side slope 1 (1V : ...H)		**6.000**		
Side slope 2 (1V : ...H)		**6.000**		
Channel depth	y_o	**0.200**	m	
Slope channel	$S_{channel}$	**0.005**	m/m	
freeboard	$y_{freeboard}$	0.113	m	
depth of water	$y_{depth\ water}$	0.087	m	click to solve
Side slope 1 wetted length	L_{slope}	0.528	m	
Side slope 2 wetted length	L_{slope}	0.528	m	
Flow Area	A_{actual}	0.175	m^2	
Wetted Perimeter	P_{actual}	2.555	m	
Hydraulic Radius	R_{actual}	0.069	m	
type of channel lining		**grass**		
Mannings factor	n	0.035		
Design Flow of Channel	Q_{actual}	0.059	m^3/sec	
Velocity	V_{actual}	0.338	m/sec	OK
Froude Number (actual)	Fr	0.412	Sub	Fr < 0.8

Project Reference: Table Drain 2, adjacent to main access road

Time of Concentration

ARI Event	1 in ...	**10**	years	
Catchment Area	A	**0.0154**	km^2	
Slope of the land	S	**0.05**	m/m	
Flow length	L	**100**	m	
Trial rainfall Intensity	I	**61**	mm/hr	iterate for kinematic
retardance co-efficient	N*	**0.3**		wave equation
Time of Concentration	Tc			
1. Rational		9.34	mins	
2. Bransby-Williams		4.03	mins	
3. Kinematic Wave		25.34	mins	
Land Use		**rural**		"rural" or "urban"
Adopted Tc	Tc	**9.34**	mins	select method

Design Flow

ARI Event	1 in ...	**10**	years	
Catchment Area	A	1.54	ha	
impervious factor	f	**0**		
C_{10} location		**Tamworth**		
C_{10}		**0.25827**		
FFy (FF10)		1		
C10*FFy (C*10)		0.26		
Rainfall Intensity	10 I 9.3	110	mm/hr	for the adopted Tc
Design Flow	Q_{des}	0.122	m^3/sec	

Channel Geometry and Capacity - Open Channel Flow Claculations

Width of channel at base		**1.000**	m	
Side slope 1 (1V : ...H)		**4.000**		
Side slope 2 (1V : ...H)		**4.000**		
Channel depth	y_o	**0.200**	m	
Slope channel	$S_{channel}$	**0.005**	m/m	
freeboard	$y_{freeboard}$	0.042	m	
depth of water	$y_{depth\ water}$	0.158	m	click to solve
Side slope 1 wetted length	L_{slope}	0.653	m	
Side slope 2 wetted length	L_{slope}	0.653	m	
Flow Area	A_{actual}	0.259	m^2	
Wetted Perimeter	P_{actual}	2.307	m	
Hydraulic Radius	R_{actual}	0.112	m	
type of channel lining		**grass**		
Mannings factor	n	0.035		
Design Flow of Channel	Q_{actual}	0.122	m^3/sec	
Velocity	V_{actual}	0.470	m/sec	OK
Froude Number (actual)	Fr	0.444	Sub	Fr < 0.8

Project Reference: Table drain 3 - whole of catchment 1 area

Time of Concentration

ARI Event	1 in ...	**10**	years	
Catchment Area	A	**0.0764**	km^2	
Slope of the land	S	**0.05**	m/m	
Flow length	L	**100**	m	
Trial rainfall Intensity	I	**61**	mm/hr	iterate for kinematic
retardance co-efficient	N*	**0.3**		wave equation
Time of Concentration	Tc			
1. Rational		17.16	mins	
2. Bransby-Williams		3.43	mins	
3. Kinematic Wave		25.34	mins	
Land Use		**rural**		"rural" or "urban"
Adopted Tc	Tc	**17.16**	mins	select method

Design Flow

ARI Event	1 in ...	**10**	years	
Catchment Area	A	7.64	ha	
impervious factor	f	**0**		
C_{10} location		**Tamworth**		
C_{10}		**0.25827**		
FFy (FF10)		1		
C10*FFy (C*10)		0.26		
Rainfall Intensity	10 I 17.2	84	mm/hr	for the adopted Tc
Design Flow	Q_{des}	0.460	m^3/sec	

Channel Geometry and Capacity - Open Channel Flow Claculations

Width of channel at base		**1.500**	m	
Side slope 1 (1V : ...H)		**6.000**		
Side slope 2 (1V : ...H)		**6.000**		
Channel depth	y_o	**0.300**	m	
Slope channel	$S_{channel}$	**0.010**	m/m	
freeboard	$y_{freeboard}$	0.049	m	
depth of water	$y_{depth\ water}$	0.251	m	click to solve
Side slope 1 wetted length	L_{slope}	1.527	m	
Side slope 2 wetted length	L_{slope}	1.527	m	
Flow Area	A_{actual}	0.755	m^2	
Wetted Perimeter	P_{actual}	4.555	m	
Hydraulic Radius	R_{actual}	0.166	m	
type of channel lining		**grass**		
Mannings factor	n	0.035		
Design Flow of Channel	Q_{actual}	0.651	m^3/sec	
Velocity	V_{actual}	0.862	m/sec	OK
Froude Number (actual)	Fr	0.673	Sub	Fr < 0.8

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ACOUSTICS AND AIR

GUNNEDAH KOALA SANCTUARY

NOISE IMPACT ASSESSMENT

REPORT NO. 19501
VERSION A

NOVEMBER 2020

PREPARED FOR

GUNNEDAH SHIRE COUNCIL
63 ELGIN STREET
GUNNEDAH NSW 2380

WILKINSON MURRAY

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	15 October 2020	Ash Stevens	
A	Final	18 November 2020	Ash Stevens	

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Wilkinson Murray is an independent firm established in 1962, originally as Carr & Wilkinson. In 1976 Barry Murray joined founding partner Roger Wilkinson and the firm adopted the name which remains today. From a successful operation in Australia, Wilkinson Murray expanded its reach into Asia by opening a Hong Kong office early in 2006. Today, with offices in Sydney, Newcastle, Wollongong, Orange, Queensland and Hong Kong, Wilkinson Murray services the entire Asia-Pacific region.

TABLE OF CONTENTS

GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

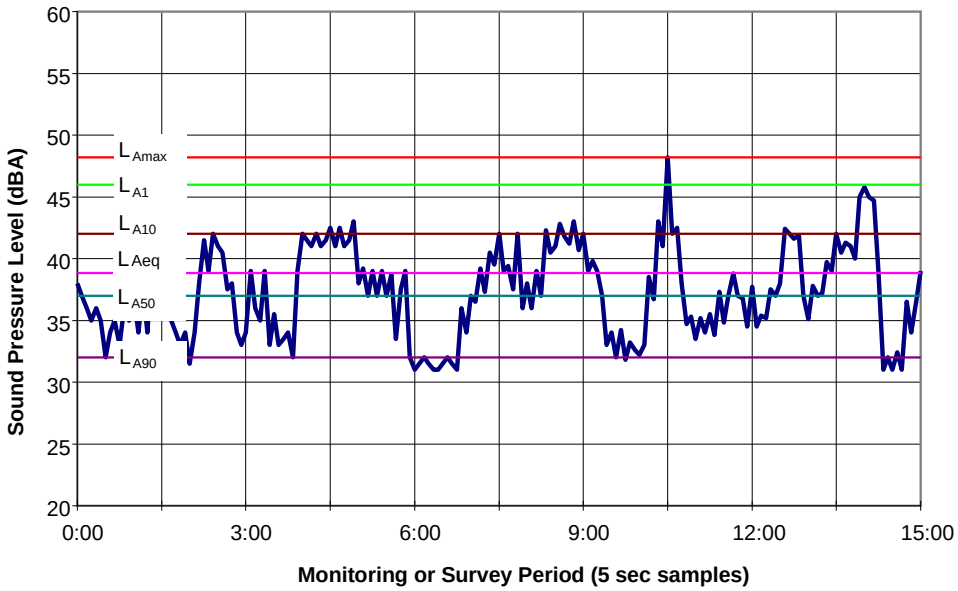
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

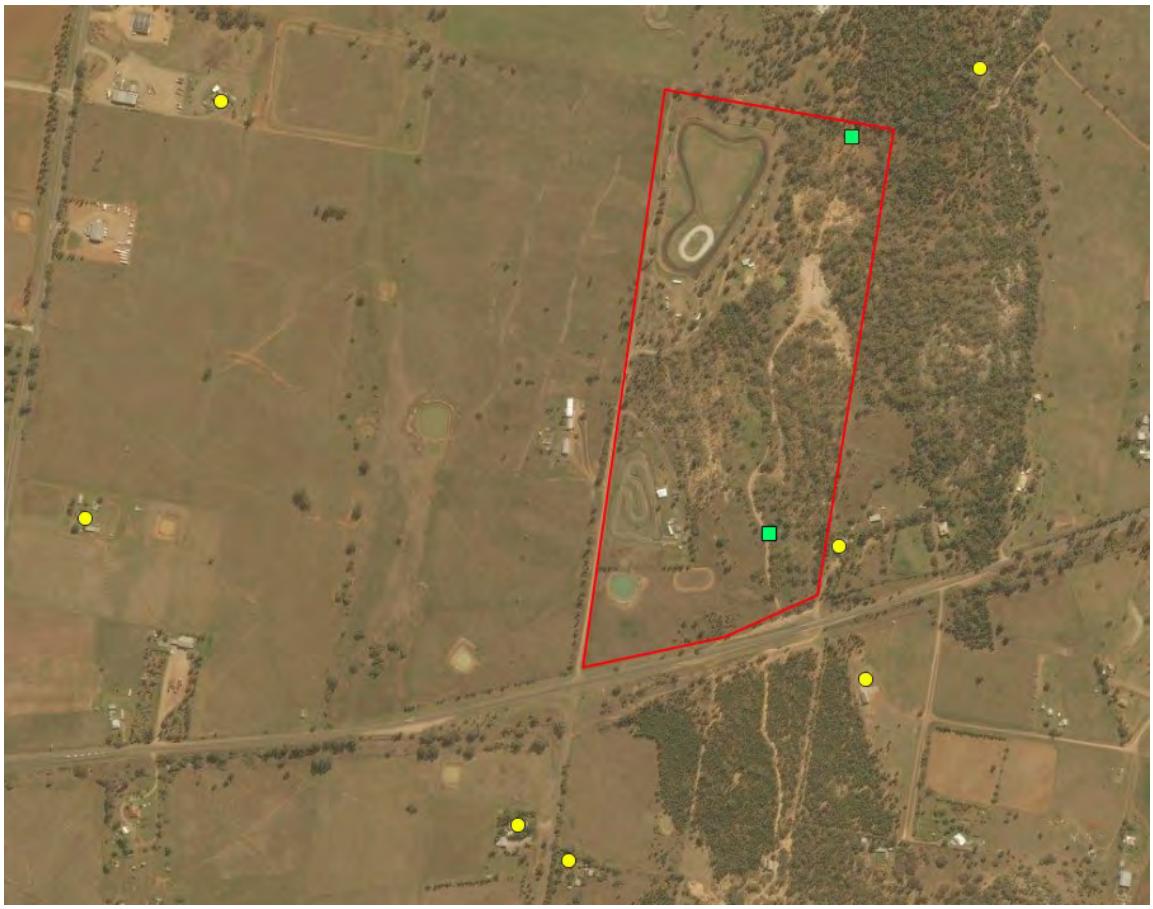
Wilkinson Murray Pty Limited has been engaged by Dunn + Hillam Architects on behalf of Gunnedah Shire Council to prepare a Noise Impact Assessment (NIA) for a proposed koala sanctuary located at 3130 Oxley Highway, Gunnedah. The NIA has been prepared to accompany the lodgement of a development application.

The report will assess noise associated with the operation of the site as well as traffic noise impacts on the surrounding road network. The assessment has been conducted in accordance with the NSW *Noise Policy for Industry (NPfI)* (EPA, 2017) and the NSW *Road Noise Policy (RNP)* (DECCW, 2011).

2 SITE AND OPERATIONS DESCRIPTION

The site is located at Lot 328 and Lot 329 DP 755503, known as 3130 Oxley Highway, Gunnedah. An aerial view of the site as well as the surrounding residential receivers (yellow) is presented in Figure 2-1. The location of the unattended noise monitoring is also shown (green).

Figure 2-1 Aerial overview of the site & surrounding area



To the south and east of the site are rural residential properties. The land to the north and west is rural with some residential properties further away. The nearest and potentially most affected receivers are located directly to the east adjacent to the site and south opposite Oxley Highway. The nearby residential receivers and their approximate distances to the site boundary are presented in Table 2-1 below.

Table 2-1 Closest residential receivers

Receiver ID	Address	Lot Number	Approximate Distance
R1	98-100 Oxley Highway	1 DP 584208	15m
R2	103-107 Oxley Highway	222 DP 755503	160m
R3	31 Hunts Road	24 DP 1224576	330m
R4	24 Hunts Road	21 DP 604890	290m
R5	263 Black Jacks Road	2 DP 261259	890m
R6	179 Black Jacks Road	2 DP 1111338	760m
R7	50-106 Borthistle Road	213 DP 755503	175m

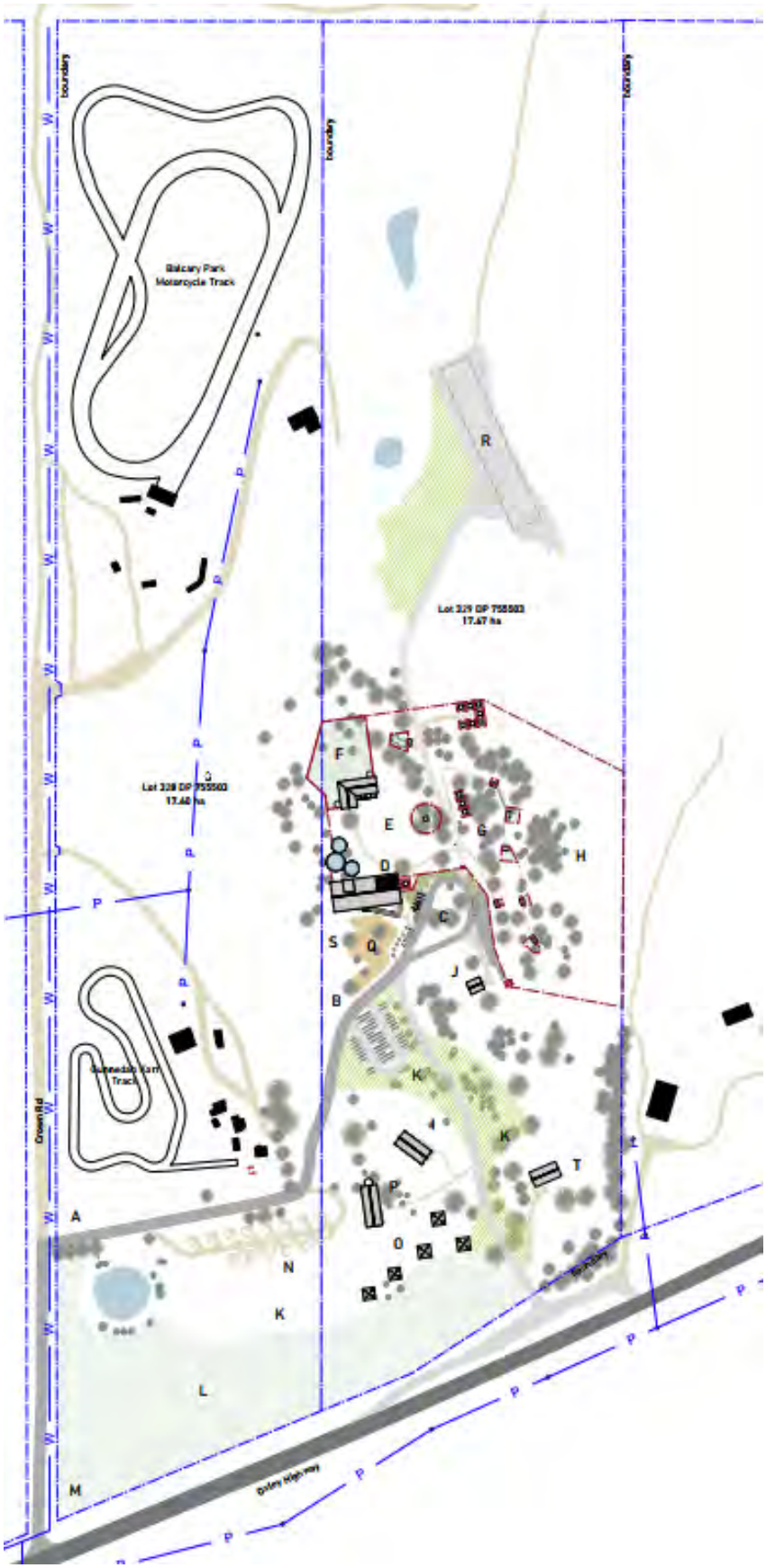
The site currently has a motor cycle track at the north western end and a go cart track at the south western end. The remainder of the site is currently unused and vegetated with cleared area near the eastern boundary.

It is proposed to transform the site into a koala park with a koala hospital (D) and koala sanctuary (H). Associated facilities such as educational walks (G), a petting zoo (F) and mini golf (Q) will also be part of the site. At the southern end of the site will be a caravan park (N) with 14 sites and area for camping (O) for up to 10 sites. Access to the site is via Hunts Road to the west of the site.

It is proposed that the site will be open to the public from 9:00am to 5:00pm. the accommodation facilities will operate outside of these hours. Expected visitor numbers are a maximum 200 per day during an event while typical weekday and weekend visitor numbers are 135 and 20-40 respectively.

The concept plan showing the proposed layout of the site is shown in Figure 2-2.

Figure 2-2 Site layout



3 NOISE CRITERIA

3.1 Existing Noise Environment

To determine the existing noise levels in the surrounding area unattended noise monitoring was conducted. The monitors were located at on the northern and eastern boundaries of the site (as shown in Figure 2-1) and monitored from 29 August 2020 to 11 September 2020. Due to equipment error the northern monitor did not record the entire measurement period. measured levels at the northern monitor were similar or below that of the southern monitor.

The noise monitoring equipment used for this measurement consisted of two ARL NGARA environmental noise loggers set to A-weighted, fast response, continuously monitoring in 15-minute intervals. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The loggers determine L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10} and L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary of Acoustic Terms for definitions). The L_{A90} level is normally taken as the background noise level during the relevant period. From the background noise levels (L_{A90}) the Rating Background Levels (RBLs) were determined using the methodology recommended in the NSW *Noise Policy for Industry* (NPfI).

Table 3-1 Existing ambient noise levels

Monitoring Location	Time of Day	Noise Levels (dBA)	
		RBL	L_{Aeq}
3130 Oxley Highway	Day	32	47
	Evening	27	46
	Night	24	43
	15-hour	-	46
	9-hour	-	43

Day = 7:00am – 6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm – 7:00am.

3.2 Operational Noise Trigger Levels

The *Noise Policy for Industry (NPfI) (EPA, 2017) provides a framework for assessing environmental noise impacts from industrial premises and industrial development proposals in New South Wales.*

The NPfI recommends the development of project noise trigger levels, which provide a benchmark for assessing a proposal or site. The project noise trigger levels should not be interpreted as mandatory noise criteria but, rather, as noise levels that, if exceeded, would indicate a potential noise impact on the community.

The project noise trigger level is the lower value of the project intrusiveness noise level and the project amenity noise level. The project intrusiveness noise level assesses the likelihood of noise being intrusive above the ambient noise level and is applied to residential receivers only. The project amenity noise level ensures the total industrial noise from all sources in the area does not

rise above a maximum acceptable level.

3.2.1 NPfI Project Intrusiveness Noise Levels

The intrusiveness noise level is the noise level 5 dBA above the background noise level (RBL) for each time period (daytime, evening or night time) of interest at a residential receiver. The RBL is derived from the measured L_{A90} noise levels.

The *NPfI* stipulates that project intrusiveness noise levels should not be set below 40 dBA during the daytime and 35 dBA in the evening and night time. Additionally, the *NPfI* recommends that the project intrusiveness noise level for evening is set at no greater than that for the daytime, and that the project intrusiveness level for night time is set at no greater than that for the evening and daytime.

The measured RBLs were below the minimum levels as stipulated in the NPfI. the site. The Project Intrusiveness Noise Levels are presented in Table 3-2.

Table 3-2 Project intrusiveness noise levels

Receiver	Time of Day	RBL	Project Intrusiveness Noise Level ($L_{Aeq,15min}$)
All	Day	32	40
	Evening	27	35
	Night	24	35

Day = 7:00am – 6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm – 7:00am.

3.2.2 NPfI Project Amenity Noise Levels

Project amenity noise levels aim to set a limit on continuing increases in noise levels from all industrial noise sources affecting a variety of receiver types; that is, the ambient noise level in an area from all industrial noise sources remains below recommended amenity noise levels.

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include transportation noise (when on public transport corridors), noise from motor sport, construction noise, community noise, blasting, shooting ranges, occupational workplace noise, wind farms, amplified music/patron noise.

The amenity noise level aims to limit continuing increases in noise levels which may occur if the intrusiveness level alone is applied to successive development within an area.

The recommended amenity noise level represents the objective for total industrial noise at a receiver location. The project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To prevent increases in industrial noise due to the cumulative effect of several developments, the project amenity noise level for each new source of industrial noise is set at 5 dBA below the recommended amenity noise level.

The project amenity noise levels are calculated from the recommended amenity noise levels presented in Table 3-3.

Table 3-3 Recommended amenity noise levels

Receiver	Noise Amenity Area	Time of Day	Recommended Amenity Noise Level (dBA $L_{Aeq,period}$)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45

Day = 7:00am – 6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm – 7:00am.

Recommended amenity noise levels presented in Table 3-3 above represent the objective for total industrial noise at a receiver location. In the case of a single new noise source being proposed, the project amenity noise level represents the objective for noise from a single industrial development at the receiver location. This is calculated as the recommended amenity noise level minus 5 dBA.

Due to different averaging periods for the $L_{Aeq,15min}$ and $L_{Aeq,period}$ noise descriptors, the values of project intrusiveness and amenity noise levels cannot be compared directly when identifying noise trigger levels i.e.; the most stringent values of each category. In order to make a comparison between descriptors, the *NPfI* assumes that the $L_{Aeq,15min}$ equivalent of an $L_{Aeq,period}$ noise level is equal to the $L_{Aeq,15min}$ level plus 3 dB.

Based on the methodology for determining residential receiver category in the *NPfI*, the area surrounding the site can be classified as 'Rural'. These amenity noise levels have been adopted and are presented in Table 3-4.

Table 3-4 Project amenity noise levels

Noise Amenity Area	Time of Day	Recommended Amenity Noise Level ($L_{Aeq,period}$)	Project Amenity Noise Level ($L_{Aeq,15min}$ dBA)
Suburban	Day	50	48
	Evening	45	43
	Night	40	38

Day = 7:00am – 6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm – 7:00am.

3.2.3 NPfI Project Noise Trigger Levels

Table 3-5 below shows the project noise levels for sensitive receivers, with the project noise trigger levels shown in bold.

Table 3-5 Project noise trigger levels

Receiver	Time of Day	Project Intrusiveness Noise Levels ($L_{Aeq,15min}$ dBA)	Project Amenity Noise Levels ($L_{Aeq,15min}$ dBA)
All	Day	40	48
	Evening	35	43
	Night	35	38

Day = 7:00am – 6:00pm; Evening = 6:00pm – 10:00pm; Night = 10:00pm – 7:00am.

3.2.4 NPfI Maximum Noise Trigger Levels

Noise sources at night occurring over a short duration have the potential to cause sleep disturbance despite complying with project noise trigger levels. The site intends to operate within the night period, therefore maximum noise level events need to be considered for potential sleep disturbance.

The *NPfI* recommends that, where the night time L_{Amax} receiver noise levels from a development exceeds 52 dBA or the RBL plus 15 dBA, whichever is the greater, then a more detailed assessment of potential sleep disturbance impacts is warranted. Table 3-6 presents the maximum noise trigger levels for the receivers identified in this assessment. These noise levels are typically addressed at the facade of potentially affected dwellings.

Table 3-6 Maximum noise trigger levels

Receiver	Night RBL (dBA)	RBL + 15 dBA	Maximum Noise Trigger Level (dBA)
All	35	50	52

Additionally, in instances where night time $L_{Aeq,15min}$ noise levels exceed 40 dBA or the prevailing RBL plus 5 dBA, whichever is the greater, then a detailed assessment of potential sleep disturbance impacts is warranted.

3.3 Road Traffic Noise Criteria

The EPA's NSW *Road Noise Policy* (RNP) provides criteria for managing noise levels associated with a development that will increase traffic on a particular road.

The proposed development will result in an increase number of movements on Oxley Highway.

The *RNP* assessment criteria for residential land uses are presented in Table 3-7. Oxley Highway is classified as an arterial or sub-arterial road.

Table 3-7 Road traffic noise assessment criteria for residential receivers

Road Category	Type of Proposal / Land Use	Noise Criteria (dBA)	
		Day (7am-10pm) (dBA)	Night (10pm-7am) (dBA)
Freeway / arterial / sub-arterial roads	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use development	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use development	$L_{Aeq,1hr}$ 55 (external)	$L_{Aeq,1hr}$ 50 (external)

The *RNP* also offers the relative increase criteria to manage the permissible increase in road traffic noise from a land use development. This criteria states that:

> "*For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.*"

4 NOISE ASSESSMENT

4.1 Noise Modelling Methodology

4.1.1 Computer Noise Model

Operational noise emissions associated with the Project were modelled using the CadnaA acoustic noise prediction software. Factors addressed in the noise modelling are:

- Noise level emissions and locations;
- Shielding from ground topography and structures;
- Noise attenuation due to geometric spreading;
- Ground absorption; and,
- Atmospheric absorption.

4.1.2 Ground Topography

Topographical data for the site and nearby surrounding area has been sourced from NSW Spatial Services as 1m contours and has been incorporated in the model.

4.1.3 Ground Absorption

A ground absorption factor of 0.5 has been applied to the entire model. This global ground absorption value conservatively represents the mix of hard ground (absorption = 0) and soft ground (absorption = 1) on and around the site.

4.2 Operational Noise Sources

The proposed site will have a projected maximum number of 200 visitors within a day. This is likely to only occur during an event and not be a typical day however, will be used as a worst case noise scenario. It has been assumed that all 200 visitors are on site at the same time, although this is unlikely. Operating hours of the proposed site are within the day period only.

Information regarding vehicle movements has been obtained from the Traffic Impact Report (TIA) produced by Ardill Payne and Partners (*10401 2020-09 Gunnedah Koala Sanctuary TIA*). This report has determined maximum hourly traffic movements to and from the site where during peak periods up to 40 vehicle movements could occur within an hour. These vehicle movements have been included in the modelling.

The predicted noise levels at the surrounding receivers for this scenario are presented in Table 4-1.

Table 4-1 Predicted noise levels

Receiver ID	Receiver	Predicted level (dBA)	Day period criteria (dBA)	Compliance
R1	98-100 Oxley Highway	34	40	Yes
R2	103-107 Oxley Highway	28	40	Yes
R3	31 Hunts Road	28	40	Yes
R4	24 Hunts Road	27	40	Yes
R5	263 Black Jacks Road	23	40	Yes
R6	179 Black Jacks Road	23	40	Yes
R7	50-106 Borthistle Road	22	40	Yes

The predicted operational noise levels all comply with the relevant noise criteria.

4.3 Mechanical Plant Noise

Mechanical plant requirements have not been considered at this stage of the project. Mechanical plant should be designed to achieve 10dB below the noise criteria to ensure that the operational noise levels are not increased. It is not anticipated that any significant plant is required with small pumps and air conditioner units being the main requirements. These units should be able to comfortably achieve the noise requirements.

4.4 L_{Amax} Operational Noise Levels

Typically, the site will not be in operation throughout the night period, except for use of the camping sites and caravan park. Maximum noise events that could occur include vehicle doors slamming and people shouting. L_{Amax} sound power levels for these events used in the modelling are vehicle (97dBA) and shouting (98dBA).

The predicted maximum noise levels at the surrounding receivers for this scenario are presented in Table 4-2.

Table 4-2 Predicted noise levels

Receiver ID	Receiver	Predicted L_{Amax} level (dBA)	L_{Amax} criteria (dBA)	Compliance
R1	98-100 Oxley Highway	42	50	Yes
R2	103-107 Oxley Highway	34	50	Yes
R3	31 Hunts Road	27	50	Yes
R4	24 Hunts Road	27	50	Yes
R5	263 Black Jacks Road	23	50	Yes
R6	179 Black Jacks Road	23	50	Yes
R7	50-106 Borthistle Road	24	50	Yes

The predicted L_{Amax} noise levels all comply with the relevant noise criteria.

4.5 Road traffic noise assessment

Traffic generation for the proposed site as well as existing traffic volumes on Oxley Highway have been detailed in the Traffic Report. The assessment has used the CORTN calculation method to determine the increase in traffic noise.

Existing traffic flow in Oxley Highway at the Black Jack Road intersection 1560 movements (two way) with a heavy vehicle percentage of 16%. It has been determined that an average daily traffic movement increase as a result of the development is 196 and a peak traffic movement increase of 279 per day.

Using the peak day traffic movements results in a relative increase of up to 0.4dBA on Oxley Highway, which complies with the road traffic noise criteria.

6 CONCLUSION

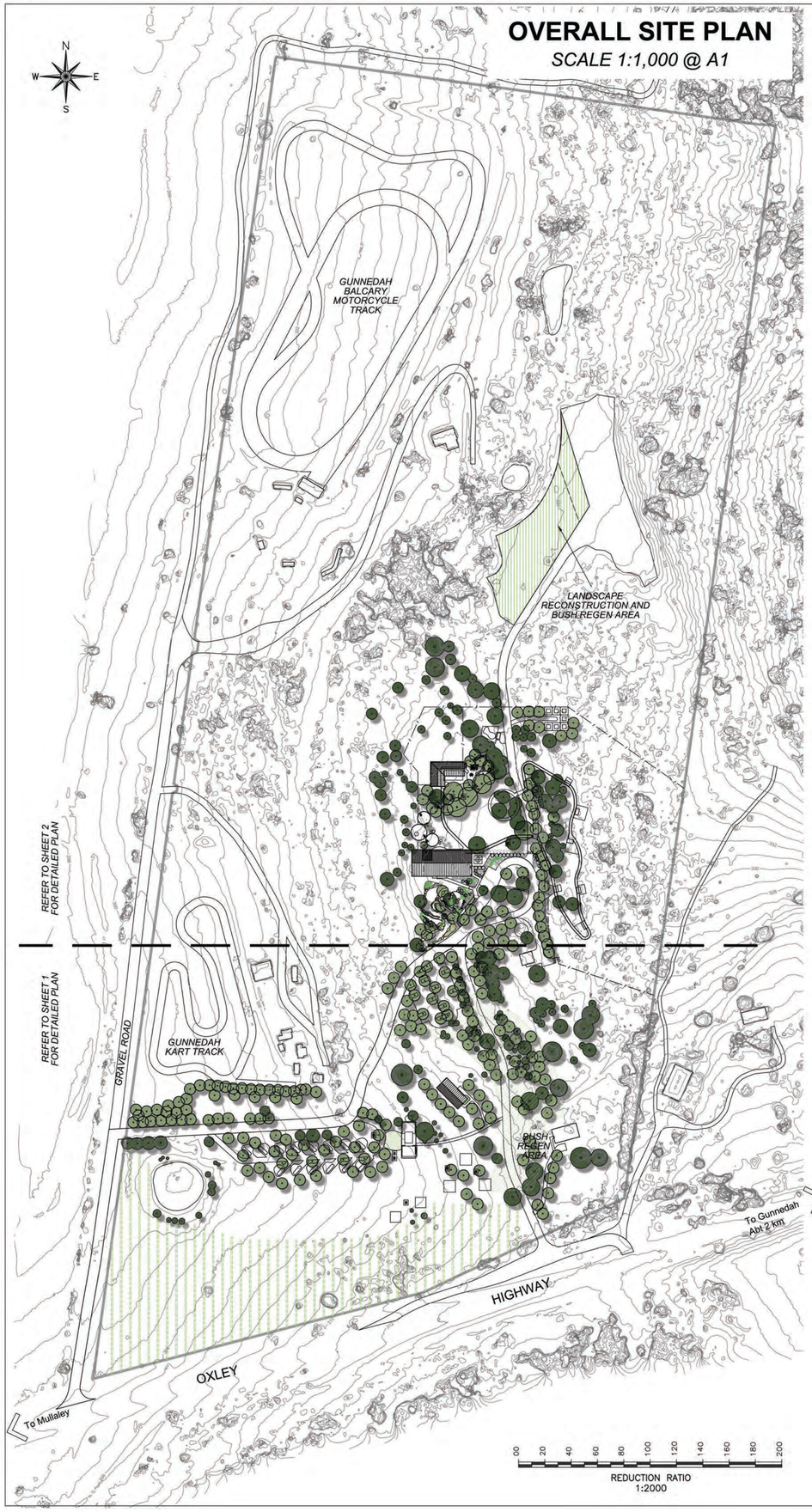
Wilkinson Murray Pty Limited has undertaken an acoustic impact assessment for the proposed Koala Sanctuary located at 3130 Oxley Highway, Gunnedah.

Unattended noise monitoring was conducted to determine the existing ambient noise levels at the most potentially affected residential receivers in the area surrounding the site.

The acoustic assessment has considered noise from operation of the site, vehicles movements on site and traffic noise on generated on Oxley Highway. The assessment has been conducted in accordance with the *Noise Policy for Industry* (NPfI) and *Road Noise Policy (RNP).* The predicted noise levels comply with all relevant criteria and no adverse impact on surrounding residential receivers is expected.

OVERALL SITE PLAN

SCALE 1:1,000 @ A1



DETAILED PLAN 1 SOUTHERN SECTION OF THE SITE

SCALE 1:1,000 @ A1

STAGE ONE

1 NEW ENTRY PLANTING TO SCREEN GOKART TRACK AND MAKE AN ATTRACTIVE ENTRANCE TO THE PARK
2 MAINTAINED VIEW TO EUCALYPTUS PLANTATION
6 MAINTENANCE SHED FOR STORAGE OF PLANT AND EQUIPMENT
7 VOLUNTEERS ACCOMMODATION ENTRANCE GARDEN AND PLANTING TO WESTERN SIDE TO PROVIDE SHADE AND PRIVACY.
8 NEW CAPARK (30 SPACES) TREE PLANTING AND GROUND COVERS TO PROVIDE SHADE AND AESTHETIC SETTING. BUSH ROCK EDGE TO DELININATE EDGES WHERE REQUIRED. SWALE TO WESTERN SIDE IN ACCORDANCE WITH THE STORMWATER MANAGEMENT PLAN
10 LANDSCAPE PLANTING TO SCREEN MAINTENANCE SHED AND WATER STORAGE TANK.

STAGE TWO

3 POWERED CARAVAN SITES (12) PLANTING OF NATIVE TREES TO PROVIDE SHADE AN AMENITY. NO TOUCHING CANOPIES TO COMPLY WITH APZ REQUIREMENTS. BUSH ROCK MARKERS TO DELINEATE SITES
4 MANAGED LAWN COMMON AREA ADJACENT TO AMENITIES BLOCK. PICNIC SETTINGS FOR COMMUNAL EATING.
5 SAFARI TENTS (5) FOR FAMILIES AND COUPLES TREE PLANTINGS FOR SHADE IN ACCORDANCE WITH APZ REQUIREMENTS AND PICNIC SETTINGS.
9 BUSH REGENERATION AREA REFER PLANTING PLAN FOR SPECIES DETAILS

LEGEND

- EXISTING TREE
- EXISTING GRAVEL TRACK
- PROPOSED TREE
- PROPOSED BUILDING
- PROPOSED BITUMEN ROAD/CARPARK
- PROPOSED GARDEN BED
- NATIVE GRASSES AND GROUND COVERS TO BE RETAINED.
- PATH - CONCRETE, STABILISED DECOMPOSED GRANITE OR NPWS BOARDWALK
- PROPOSED PICNIC SETTING
- PROPOSED PARK BENCH
- PROPOSED RUBBISH BIN
- DRY CREEKBED
- POND/DAM
- REVEGETATION AREAS

Issue	Date	Description
	-	-

Architect: DUNN & HILLAM ARCHITECTS

Client: GunnedahShire — Open New Horizons

Project
GUNNEDAH KOALA SANCTUARY
3130 OXLEY HIGHWAY, GUNNEDAH

Title
LANDSCAPE PLAN 1

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Scale
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REDUCTION RATIO 1:1000

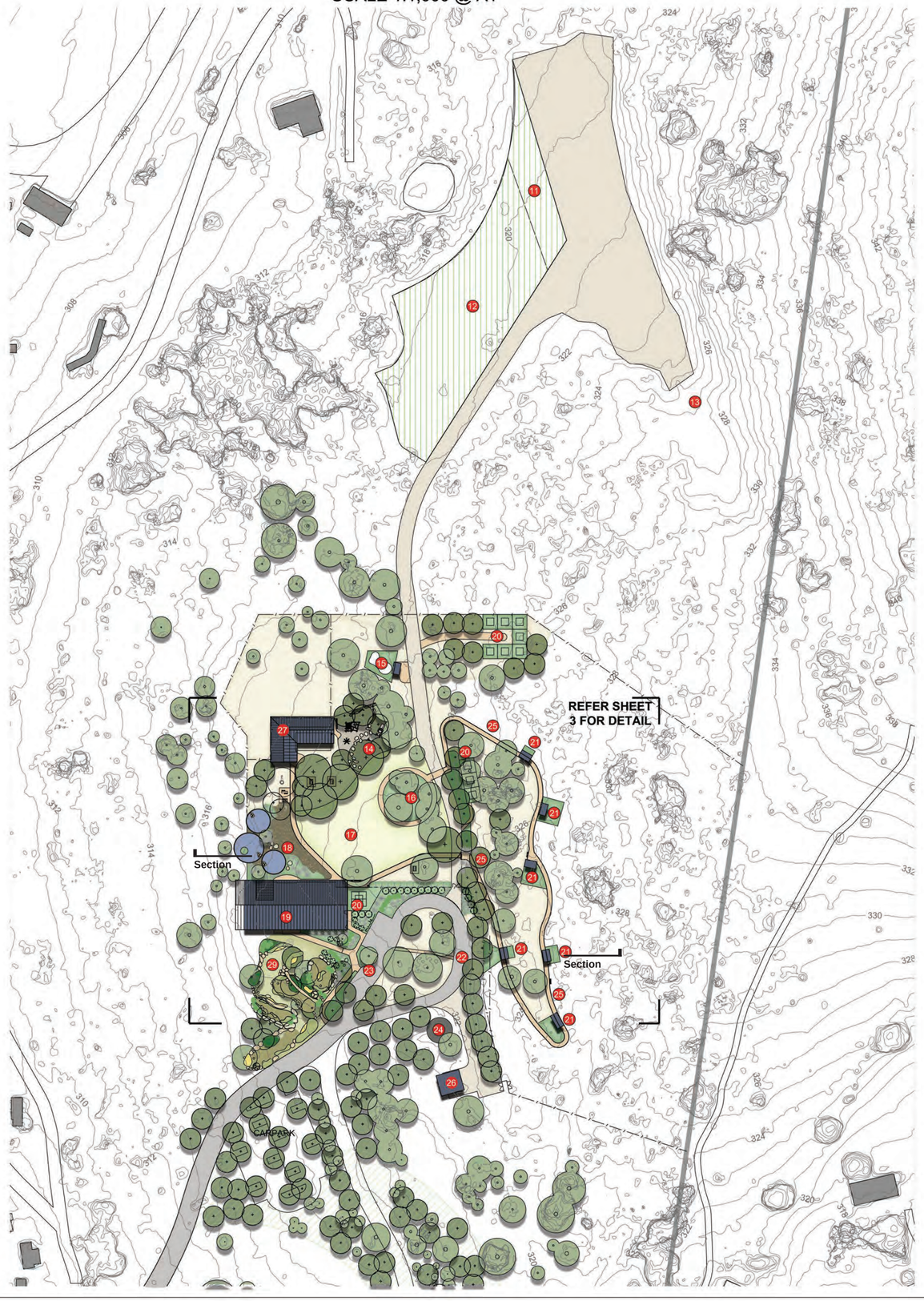
Drawing status
DEVELOPMENT APPLICATION

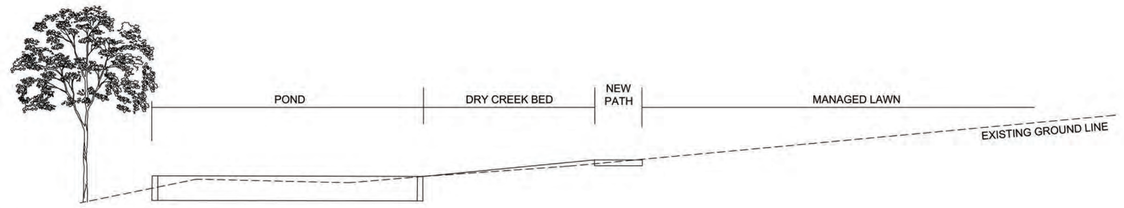
Job Number	Drawing number	Issue
5284	1 of 5	A

Drawing Prepared: KJY

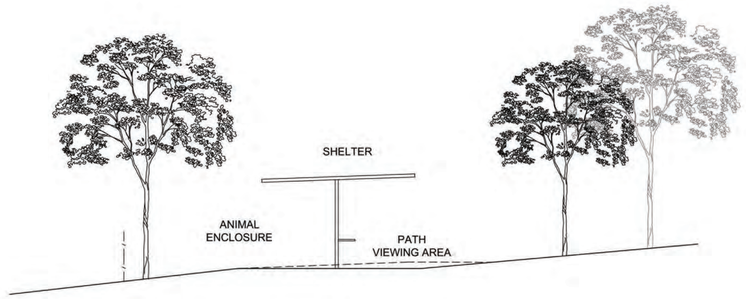
DETAILED PLAN 2 CENTRAL SECTION OF THE SITE

SCALE 1:1,000 @ A1





TYPICAL SECTION THROUGH POND



TYPICAL SECTION WILDLIFE WALK AND ANIMAL ENCLOSURE

LEGEND

- EXISTING TREE
- EXISTING GRAVEL TRACK
- PROPOSED TREE
- PROPOSED BUILDING
- PROPOSED BITUMEN ROAD/CARPARK
- PROPOSED GARDEN BED
- NATIVE GRASSES AND GROUND COVERS TO BE RETAINED.
- PATH - CONCRETE, STABILISED DECOMPOSED GRANITE OR NPWS BOARDWALK
- PROPOSED PICNIC SETTING
- PROPOSED PARK BENCH
- PROPOSED RUBBISH BIN
- DRY CREEKBED
- POND/DAM
- REVEGETATION AREAS

STAGE ONE

14 NEW NATURE PLAYGROUND WITH A COMBINATION OF NATURAL PLAY ELEMENTS AND RURAL THEMED EQUIPMENT.
16 KOALA ENCLOSURE
17 MANAGED LAWN AREA FOR PICNICS AND FUNCTIONS
18 LANDSCAPE POND & WATER SPOUT WITH DRY CREAK BED EDGE AND EPHEMERAL PLANTINGS
19 WILDLIFE CENTER AND HOSPITAL BUILDING WITH CAFE, AMENITIES, GIFT SHOP AND KOALA HOSPITAL FACILITIES, REFER ARCHITECTS PLANS
20 KOALA REHABILITATION ENCLOSURES
21 ANIMAL ENCLOSURE
22 BUS PARKING
23 BUS DROP OFF AREA
24 POTABLE WATER SUPPLY STORAGE TANK
25 UNIVERSALLY ACCESSIBLE WILDLIFE SANCTUARY WALK WITH COMBINATION OF DECOMPOSED GRANITE PATH AND BOARDWALK RAMPS DESIGNED IN ACCORDANCE WITH AS1428.1 DESIGN FOR ACCESS AND MOBILITY
26 MAINTENANCE SHED
27 PETTING ZOO

STAGE TWO

11 RECONSTRUCT LANDSCAPE WITH ROCK EDGE AND IMPORTED SOIL. ESTABLISH BUSH TUCKER GARDEN REFER SHEET 5 FOR SPECIES.
12 RECONSTRUCT LANDSCAPE WITH ROCK EDGE AND IMPORTED SOIL. ESTABLISH NATIVE PLANTINGS REFER SHEET 5 FOR SPECIES LIST.
13 CULTURAL HERITAGE DISPLAY AND DEMONSTRATION AREA
15 CROCODILE ENCLOSURE
29 MINI GOLF AND ZIP LINE TO BE UNDERTAKEN AS A DESIGN AND CONSTRUCT CONTRACT.

Issue	Date	Description
	-	-

Architect: DUNN & HILLAM ARCHITECTS

Client: GunnedahShire — Open New Horizons

Project
GUNNEDAH KOALA SANCTUARY
3130 OXLEY HIGHWAY, GUNNEDAH

Title
LANDSCAPE PLAN 2

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Scale
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REDUCTION RATIO 1:1000

Drawing status
DEVELOPMENT APPLICATION

Job Number	5284	Drawing number	Issue
Drawing Prepared: KJY		2 of 5	A

DETAILED PLAN KOALA SANCTUARY & WILDLIFE PARK

SCALE 1:250 @ A1

Playground
It is proposed to create a playground in a natural bush setting with organic mulch softfall. The playground will feature a series of nature play elements including natural play logs, climbing structure which incorporates rope and natural log elements, a tee-pee and rock steppers. The playground will allow opportunities for creative nature play in a bush setting. It is proposed to modify a tractor to comply with Australian Standards and a pole top windmill will harness natural wind to reference the natural elements. Additional trees will be planted into the playground to enhance the environment and a 100mm wide concrete edge will contain the organic softfall where located adjacent to turf area to allow for easy mowing. Along the bush edge organic softfall will just run into the natural environment.

Koala Sanctuary
New walkways from the carpark, bus drop-off area and disabled parking area lead visitors to the Koala Sanctuary and Hospital building pay office and entrance. Feature native plantings will provide an attractive setting with three natural timber totems and a corten steel Koala silhouette marking the entry path. In other areas surrounding the access road additional Eucalyptus tree planting will be incorporated with natural ground treatments. Within the facility the enclosed picnic area adjacent to the Koala Sanctuary café and hospital will contain a two way accessible path between the main building and the petting zoo with a number of accessible and standard picnic settings providing picnicking opportunities. The open lawn area will be managed as an even slope falling to three feature pond constructed from concrete tanks which catches overland flow and overflow from water storage and roof collection. Surrounding the pond will be a dry creekbed and natural plantings. The evenly graded lawn area provides opportunities for functions. Two Koala Hospital rehab area will be provided, one is close to the hospital with three enclosures and the second is on the outer edge of the wildlife sanctuary to prepare Koala's for release to the wild. These separate enclosures will be constructed from corrugated iron and natural timber materials. Ground treatment will incorporate a combination of natural mulch and synthetic grass for easy maintenance.

Wildlife Sanctuary Walk
The wildlife sanctuary walk will be constructed from a mix of decomposed granite and composite boardwalk materials based on the grades. The walk will incorporate animal exhibits with dual shade structures providing shade to both the animal enclosure and viewing areas on the path. Path grades vary up to 1 in 20 compliant with AS1428.1 design for access and mobility. Shade will incorporate a combination of steel and cargo net materials with natural timber posts.

Mini Golf
A custom designed mini-golf course is proposed which steps down the natural slope. The design will incorporate varying textured synthetic grass, natural rocks, sand bunkers and planting. The design will be similar to the precedent pictures provided but in more natural tones to suit the rural setting. Two zip lines will extend over the mini-golf area and into the landscape beyond. It is proposed that these two elements are undertaken as a design and construct component of the project.

LEGEND

- EXISTING TREE
- EXISTING GRAVEL TRACK
- PROPOSED TREE
- PROPOSED BUILDING
- PROPOSED BITUMEN ROAD/CARPARK
- PROPOSED GARDEN BED
- NATIVE GRASSES AND GROUND COVERS TO BE RETAINED.
- PATH - CONCRETE, STABILISED DECOMPOSED GRANITE OR NPWS BOARDWALK
- PROPOSED PICNIC SETTING
- PROPOSED PARK BENCH
- PROPOSED RUBBISH BIN
- DRY CREEKBED
- POND/DAM
- REVEGETATION AREAS

Issue	Date	Description
	-	-

Architect: DUNN & HILLAM ARCHITECTS

Client: GunnedahShire Open New Horizons

Project
GUNNEDAH KOALA SANCTUARY
3130 OXLEY HIGHWAY, GUNNEDAH

Title
LANDSCAPE PLAN 3

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Scale
5 0 5 10 15 20
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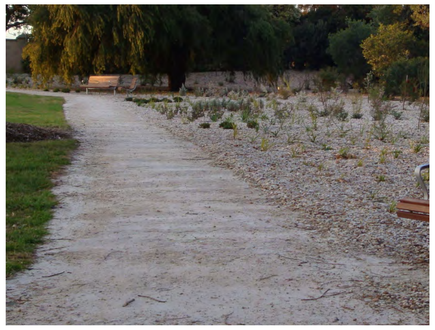
Drawing status
DEVELOPMENT APPLICATION

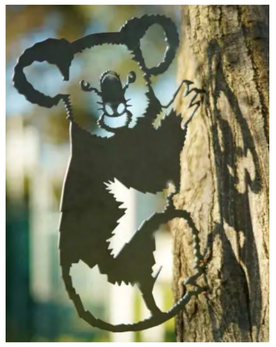
Job Number	5284	Drawing number	Issue
Drawing Prepared: KJY		3 of 5	A

PROPOSED PATH MATERIALS



MINI GOLF PRECEDENT IMAGES, TEXTURES AND COLOURINGS TO BE MORE REFLECTIVE OF THE RURAL SETTING

LANDSCAPE FEATURES



KOALA REHAB ENCLOSURE

SHADE STRUCTURES

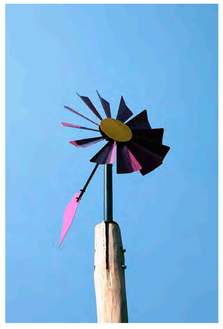
SHADE STRUCTURES TO BE CONSTRUCTED FROM A MIX OF CORRUGATED IRON AND CARGO NET USING RAW TIMBER POSTS.

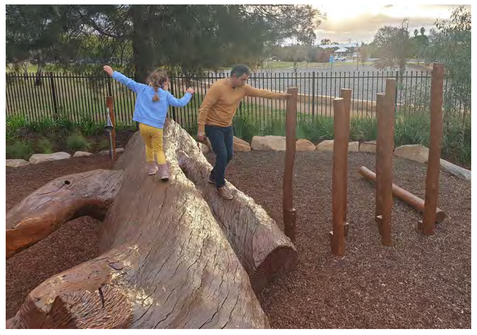
PROPOSED FURNITURE PALETTE

UNISITE RANGE

POND WITH DRYROCK EDGE AND PLANTING

PROPOSED PLAYGROUND PRECEDENT IMAGES TO DEMONSTRATE CHARACTER





	-	-
Issue	Date	Description

Architect: DUNN & HILLAM ARCHITECTS

Client: GunnedahShire — Open New Horizons

Project
GUNNEDAH KOALA SANCTUARY
3130 OXLEY HIGHWAY, GUNNEDAH

Title
LANDSCAPE PRECEDENTS

STEWART SURVEYS
Pty Ltd Inc in NSW ABN 65 002 886 508
109 Conadilly Street
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Scale
0 10 20 30 40 50 60 70 80 90 100
REDUCTION RATIO
1:1000

Drawing status
DEVELOPMENT APPLICATION

Job Number	5284	Drawing number	Issue
Drawing Prepared: KJY		4 of 5	A

INDICATIVE PLANT LIST - LANDSCAPING AREAS

Botanic Name	Common Name	Mature Height
Trees		
Eucalyptus albens	White Box	12m
Eucalyptus blakelyi	Bangalay	10m
Eucalyptys dealbata	Tumbledown Red Gum	6m
Eucalyptus melanophloia	Silver-leaved Ironbark	12m
Eucalyptus nicholii	Narrow Leaved peppermint	6m
Eucalyptus populnea	Bimble Box	10m
Eucalyptus sideroxylon 'Rosea'	Red Flowering Ironbark	8m
Shrubs		
Atriplex nummularia	Old Man Saltbush	2m
Banksia 'Start of the Season'	Dwarf coastal banksia	1.5m
Callistemon 'Little John'	Dwarf Bottlebrush	1m
Callistemon 'Anzac'	Dwarf white bottlebrush	1m
Callistemon Citrinus 'Angela'	Angela Bottlbrush	1.5m
Callistemon pityoides	Alpine Bottlebrush	1m
Correa 'Dusky Bells'	Correa	1m
Dodonaea viscosa	Hop Bush	2.5m
Eremophila glabra	Common Emu bush	0.75m
Eremophila Maculata	Emu Bush	1m
Eremophila nivea	Silver emu bush	1m
Grevillea 'Lady O'	Small growing Grevillea	1.5m
Grevillea 'Pink Midget'	Dwarf Grevillea	0.4m
Grevillea juniperina 'Gold Cluster'	Golden Ground Cover	0.3m
Grevillea rosmarinifolia	Rosemary Grevillea	0.7m
Kunzea parvifolia	Violet Kunzea	0.75m
Leucadendron 'Misty Sunrise'	Apricot Leucadendron	1.5m
Leucadendron 'Yellow Countess'	Yellow Leucadendron	1m
Melaleuca 'Little Red'	Honey myrtle	1m
Melaleuca thymifolia	Thyme Honey myrtle	0.75m
Loropetalum 'Purple Pixie'	Purple Foliage Witch Hazel	1.2m
Olearia elliptica	Sticky Daisy bush	0.75m
Pimelea linifolia	Queen of the Bush	0.5m
Rosmarinus officinalis	Rosemary	0.5m
Westringia 'Wynyabbie Gem'	Coastal Rosemary	2m
Westringia 'Zena'	Dwarf Coastal Rosemary	0.9m
Ground Covers		
Billardiera candida	White Billardiera	0.3m
Carpobrotus glaucescens 'Aussie Rambler'	Pig Face	0.2m
Eremophila 'Kalbarri Carpet'	Groundcover Emu Bush	0.2m
Eremophila 'Pancake'	Groundcover Emu Bush	1.5m
Eremophila debilis	Winter apple	0.5m
Eremophila glabra prostrate 'Blue Horizon'	Blue Horizon	0.25m
Gazania Tomentosa	Silver Treasure Flower	0.3m
Grevillea 'Bronze Rambler'	Bronze creeping spider flower	0.4m
Grevillea 'Mt Tamboritha'	Spider flower	0.4m
Hardenbergia violacea	False sarsaparilla	0.3m
Hardenbergia Violacea 'Alba'	Native Sarsaparilla	1m
Lampranthus aurantiacus	Trailling Ice Plant	0.3m
Myoporum Parvifolium	Creeping Boobialla	0.2m
Scaevola 'Pink Perfection'	Pink Fan FLower	0.5m
Scaevola aemula	Common Fan Flower	0.3m
Scaevola humilis 'purple haze'	Purple Fan Flower	0.3m

Botanic Name	Common Name	Mature Height
Strap Leaved Plants		
Dianella 'silver streak'	Dwarf Lily	0.3m
Dianella Caerulea	Paroo Lily	0.5m
Dietes Bicolor	Peacock Flower	0.75m
Dietes Grandiflora	Wild Iris	0.75m
Lomandra 'Blue Ridge'	Blue Foliage Lomandra	0.35m
Lomandra 'Lime Divine'	Lime Foliage Lomandra	0.5m
Lomandra 'Tanika'	Dwarf Mat Rush	0.5m
Lomandra longifolia	Mat-Rush	0.7m
Lomandra longifolia 'Great White'	Great White Lomandra	0.75m
Pennisetium 'Purple Lea'	Purple Grass	0.9m
Poa Labillardierei	Tussock Grass	0.9m

INDICATIVE PLANT LIST - REVEGETATION AREAS

Placement of rocks to create depth, imported soil and establishment planting of endemic species to allow for bush regeneration. Species to be locally propagated species from vegetation community PCT 529 which naturally occurs on the site.

PCT 529 - Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion

Trees

Eucalyptus crebra	Narrow-leaved Ironbark
Callitris glaucophylla	White Cypress Pine
Eucalyptus albens	White Box
Eucalyptus dealbata	Tumbledown Red Gum
Eucalyptus melanophloia	Silver-leaved Ironbark

Shrubs

Beyeria viscosa
Notelaea microcarpa var. microcarpa
Dodonaea viscosa subsp. angustifolia
Breynia cernua,
Solanum parvifolium,
Melichrus urceolatus,
Spartothamnella juncea
Psydrax oleifolia.

Ground layer & sub-shrub

Desmodium brachypodum
Austrostipa scabra subsp. scabra,
Austrodanthonia racemosa var. obtusata,
Microlaena stipoides var. stipoides,
Aristida ramosa
Cymbopogon refractus.
Dichondra species A,
Calotis anthemoides,
Vernonia cinerea var. cinerea,
Brunoniella australis
Arthropodium sp. B.
Desmodium varians
Glycine clandestina.

INDICATIVE PLANT LIST - BUSH TUCKER AREA

Establishment of a bush tucker garden to a allow indigenous education and demonstrations as well as self guided tours. Some examples of suitable plants for the Gunnedah climate:

Botanical Name	Common Name	Use
Acacia cyclops	Black-eyed Wattle	Seed pods ground to make flower and bread, Stem gum sunscreen, insect repellent and eczema treatment
Acacia acuminata	Raspberry Jam Wattle	Producing resin, wood for tools and weapons, seeds ground to flour for cooking
Atriplex nummularia	Old Man Salt Bush	Seeds and leaves are edible – leaf vegetable or used in cooking
Cymbopogon ambiguous	Native Lemongrass	Medicinal purposes, tea, or spice in cooking
Carpobrotus virescens	Karkalla Pigface	Edible Fruit
Carpobrotus rossii	Karkalla	Edible Fruit
Dianella Revoulta	Blueberry Lily	Edible Berries, roots and leaves used to remedy colds and headaches
Disphyma crassifolous ssp clavellatum - Round Baby Pigface		Edible leaves and fruit
Myoporum motanum	Western Boobialla	Edible Berries and gum used for glue and medicinal purposes.
Myoporum insulara 'Prostrate'	Boobialla	Edible Berries and essential oils
Platysace deflexa	Youlk	Edible roots similar to radish or carrots
Portulace oleracea	Purslane	Edible leaves as salad or in cooking
Prostanthera rotundifolia	Native Oregano	Medicinal and Herb in cooking
Santalum spicatum	Sandalwood Nut	Edible nut, oil and medicinal purposes
Sterculia quadrifida	Peanut Tree	Edible Seeds
Scaevola spinescens	Maroon Bush	Medicinal purposes consumed as a tea


Pimelea linifolia


Correa 'Dusky Bells'


Lomandra tanika 'Great White'


Grevillea 'Mt Tamboritha'


Callistemon 'Little John'


Leucadendron 'Yellow Countess'

INDICATIVE IMAGES OF PLANT SELECTION


Lomandra 'Tanika'


Eriostemon myoporoides


Kunzea parvifolia


Scaevola 'Purple Haze'


Scaevola 'Pink Perfection'


Eremophila 'Pancake'


Grevillea 'Lady O'


Dianella caerulea


Indigofera australis


Callistemon 'Angela'


Eremophila glabra prostrate 'Blue Horizon'


Westringia 'Zena'


Melaleuca thymifolia


Kunzea 'Badja Carpet'


Grevillea rosmarinifolia


Eremophila maculata

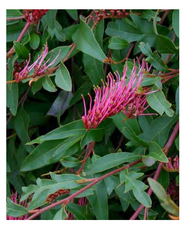

Westringia 'Wynyabbie Gem'


Callistemon pityoides


Hardenbergia violacea


Grevillea 'Bronze Rambler'


Dietes bicolour


Grevillea 'Royal Mantle'


Callistemon viminalis 'Red Alert'


Grevillea juniperina 'Gold Cluster'


Gazania tomentosa

Issue	Date	Description
	-	-

Architect: DUNN & HILLAM ARCHITECTS

Client: GunnedahShire – Open New Horizons

Project
GUNNEDAH KOALA SANCTUARY
3130 OXLEY HIGHWAY, GUNNEDAH

Title
LANDSCAPE PLANTING

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Drawing status
DEVELOPMENT APPLICATION

Job Number	5284	Drawing number	Issue
Drawing Prepared: KJY		5 of 5	A

Assessor Certificate

Multiple Dwellings

Assessed and issued in accordance with the BASIX Thermal Comfort Protocol for the Simulation Method

Building SustainabilityAssessments

Date:	17 December 2020	**BSA File ref:**	**16482**
Assessor			
Name:	Gavin Chambers **Company:** Building Sustainability Assessments	**Assessor #:**	DMN/13/1491
Address:	7 William Street, HAMILTON NSW 2303		
Phone:	(02) 4962 3439	**Email:**	enquiries@buildingsustainability.net.au
Declaration of interest in the project design:	None		
Project			
Address:	3130 Oxley Highway		
	GUNNEDAH NSW 2380	**Climate Zone:**	14
Assessment			
Software:	BERS Pro 4.4		

Affix assessor stamp

Documentation

All details, upon which this assessment has been based, are included in the project documentation that has been stamped and signed by the Assessor issuing this certificate, as identified below:

Drawings used for this assessment:

(Title, Ref.#, Revision, Issue date, etc)

Dunn & Hillam JobNo.20_301 16/12/2020 B

Thermal Performance Specification (copy on page 2)

Attached to the drawings and is on page: DA01-00

NATIONWIDE HOUSE ENERGY RATING SCHEME

0005521260 17 Dec 2020

Assessor Gavin Chambers

Accreditation No. DMN/13/1491

Address

3130 Oxley Highway ,
Gunnedah , NSW , 2380

hstar.com.au

Thermal performance specifications **Certificate #** **0005521260** **Page 1 of 2**

Unit No.	Floor Areas		Predict. loads (MJ/M²/y)		Star Rating	Basix Floor Type and Area m²
	Cond.	Uncond.	Heat	Cool		
CarR	131	12	148	22	4.9	*Susp Open: 143,*
VolA	161	22	150	20	4.9	*Susp Open: 183,*

December 2020				BSA Reference: 16482
Building Sustainability Assessments				Ph: (02) 4962 3439
enquiries@buildingsustainability.net.au				www. buildingsustainability.net.au
Important Note				
The following specification was used to achieve the thermal performance values indicated on the Assessor Certificate and takes precedence over any other specification.				
If different construction elements are applied then the Assessor Certificate is no longer valid.				
Thermal Performance Specifications (does not apply to garage)				
External Wall Construction				*Added Insulation*
Lightweight				R2.0
Internal Wall Construction				*Added Insulation*
Plasterboard on studs				None
Ceiling Construction				*Added Insulation*
Plasterboard				R3.5 to ceilings adjacent to roof space
Roof Construction	*Colour*			*Added Insulation*
Metal	Any			Foil + R1.0 blanket
Floor Construction	*Covering*			*Added Insulation*
Timber	As drawn			R1.0
Windows	*Glass and frame type*	*U Value*	*SHGC Range*	*Area sq m*
Performance glazing Type A		*4.80*	*0.46 - 0.56*	Caretaker Res
Performance glazing Type B		*4.80*	*0.53 - 0.65*	Caretaker Res
ALM-001-01 A	Aluminium Type A Single clear	*6.70*	*0.51 - 0.63*	Volunteer Res
ALM-002-01 A	Aluminium Type B Single clear	*6.70*	*0.63 - 0.77*	Volunteer Res
Type A windows are awning windows, bifolds, casements, tilt 'n 'turn' windows, entry doors, french doors				
Type B windows are double hung windows, sliding windows & doors, fixed windows, stacker doors, louvres				
Skylights	*Glass and frame type*	*U Value*	*SHGC*	*Area sq m*
U and SHGC values are according to AFRC. Alternate products may be used if the U value is lower and the SHGC is within the range specified				
External Window Shading	*(eaves, verandahs, pergolas, awnings etc)*			
All shade elements modelled as drawn				
Ceiling Penetrations	*(downlights, exhaust fans, flues etc)*			
No adjustment has been made for losses to insulation arising from ceiling penetrations.				

lindsay perry access

Disability Access Report

Gunnedah Koala Sanctuary

3130 Oxley Highway
GUNNEDAH NSW

For: Gunnedah Shire Council
Ref: LP_20266

Executive Summary

Development application documentation for The Gunnedah Koala Sanctuary has been reviewed against the requirements of the Building Code of Australia 2019 and The Disability Discrimination Act 1992 regarding access for people with a disability. The requirements of the Disability (Access to Premises) Standards 2010 have also been addressed.

We consider that the drawings presented for assessment, for the purposes of a development application, generally comply with the above-mentioned statutory requirements.

The key design principle of connectivity will enable equitable access for all occupants through the provision of accessible links between all buildings and facilities within The Gunnedah Koala Sanctuary while responding to the topography and existing conditions.

The recommendations throughout this report reflect the professional opinion and interpretation of Lindsay Perry. This may differ from that of other consultants. We aim to provide practical, performance-based advice based on project specifics that will maximize access for persons with a disability to the built environment.

Lindsay Perry is a qualified Access Advisor, being an accredited within Australia (ACAA No. 136) and at the international level (GAATES No. BE-02-106-18). Lindsay Perry Access Pty Ltd carries public liability insurance, professional indemnity insurance and workers compensation insurance.

LINDSAY PERRY
B.Arch, M.Dis.Stud.

Internationally Certified Access Consultant GAATES ICAC BE-02-106-18
ACAA Accredited Member No. 136
Registered Architect NSW 7021
Livable Housing Assessor 20047 | NDIS SDA Assessor SDA00049

Revision Summary

Date	Description	Revision
17 November 2020	DA Disability Access Report	draft
4 December 2020	DA Disability Access Report	1

1. Project Background

The project is a Koala Sanctuary and Park to be construction within a 50 acre bushland site entered from the Oxley Highway in Gunnedah. The park will include a koala hospital, accommodation, wildlife centre with café, an indigenous cultural centre and recreational facilities. It is anticipated that the development will be a tourism destination for both the domestic and international market.

It is expected that the number of visitors attending the site in a daily basis could be up to 200 people, especially if there is an event on the day. Typically, it is expected that 35-50 people will attend on weekdays with up to 135 during weekends and school holidays.

Overnight accommodation – caravan sites and eco-tourism tents – will be available for up to 75 people including up to 16 volunteers who may stay for up to six weeks at any one time.

Typically, four-six staff will attend the site daily (up to ten in peak times). A caretaker's residence is also provided within the development.

The main facilities are located centrally within the site with pedestrian pathways linking the various areas, facilities and site uses.

2. Reviewed Documentation

Documentation prepared by Dunn & Hillman has been reviewed as follows:

dwg no.	drawing name	revision
DA01-00	Cover Sheet	B
DA01-02	Site Plans	B
DA01-03	Wildlife Centre & Hospital	B
DA01-05	Petting Zoo	B
DA01-05	Volunteers Accommodation	B
DA01-06	Caretakers Residence	B
DA01-07	Maintenance Shed & Amenities Building	B

3. Accessibility in the Natural Environment

While there is no accessibility legislation that relates specifically to the natural environment, access for people with a disability is now an expectation within public outdoor areas. The highest level of accessibility achievable should be incorporated into outdoor spaces within the topographical constraints of the natural environment.

The built environment and natural environment are fundamentally different. The built environment creates an environment of fixed elevation and well-defined parameters that accommodate the necessity of everyday life. The natural environment offers dynamic and challenging opportunities on land, water, and even air. Although the natural environment can be constructed, modifying this environment is only usually done to provide general public access and ensure public safety. Therefore, the focus should be the provision of a system of paths that connect various elements, facilities and spaces within the context and constraints of the natural environment.

Figure 1 | Accessible Natural Environments

While accessibility legislation caters largely for mobility, there are other disability groups that need to be considered in the design of the natural environment including sensory disabilities (vision and hearing loss), intellectual disabilities and cognitive disabilities.

The Building Code of Australia provides requirements for building standards across Australia, including accessibility requirements. As there is no BCA classification for recreational areas, the principles of the BCA Class 9b for public buildings have been adopted in the assessment of these areas to ensure equitable access for people with disabilities to and within all areas.

Disability is often defined as any limitation, restriction or impairment which restricts everyday activities and has lasted or is likely to last for at least 6 months. Disabilities can be very varied. They can be physical, cognitive, intellectual, mental, sensory, or developmental. They can be present at birth or can occur during a person's lifetime. They can also be permanent or temporary. In Australia, almost one in five people – 4.3 million – have a disability with one in three having severe or profound core activity limitation.

Equity and dignity are important aspects in the provision of access to buildings for all users. The design approach needs to maintain a high level of equity for people with disabilities. In this respect, a wide range of disabilities needs consideration and a compromise reached between requirements of different disability groups. Measures need to be implemented to ensure inclusion of all users, not a particular disability group in isolation.

4. Legislation

Access assessment has been made against Access Legislation including:

- The Commonwealth Disability Discrimination Act 1992 (DDA)
- Disability (Access to Premises (Buildings)) Standards 2010
- Access Code for Buildings 2010
- The National Construction Code Building Code of Australia Volume 1 2019 (BCA)
  - Section D2.14 / D2.15 / D2.17 – landings, thresholds and slip resistance
  - Section D3 – Access for People with Disabilities
  - Section F2.4 – Accessible Sanitary Facilities
- Australian Standards AS1428.1(2009) Amendment 1 & 2, AS1428.2 (1992), AS1428.4(2009) – Design for Access and Mobility
- Australian Standard AS2890.6 (2009) – Parking Facilities – Off street carparking For People with Disabilities.

A summary of the requirements of relevant legislation follows.

- The DDA requires independent, equitable, dignified access to all parts of the building for all building users regardless of disability. The DDA makes it unlawful to discriminate against a person on the grounds of disability.

- The Disability (Access to Premises - buildings) Standards 2010 (the Premises Standards) commenced on 1 May 2011. Any application for a building approval for a new building or upgrade of an existing building on or after that date triggers the application of the Premises Standards. The purpose of the Premises Standards (and corresponding changes to the Building Code of Australia and state and territory building law) is:
  - to ensure that dignified, equitable, cost-effective and reasonably achievable access to buildings, and facilities and services within buildings, is provided for people with disability, and
  - to give certainty to building certifiers, developers and managers that if the Standards are complied with, they cannot be subject to a successful complaint under the DDA in relation to those maters covered by the Premises Standards.

  The Premises Standards include an Access Code written in the same style as the Building Code of Australia. It has a number of Performance Requirements that are expressed in broad terms and references a number of technical Deemed-to-Satisfy Provisions.

- The Building Code of Australia (BCA) is contained within the National Construction Code (NCC) and provides the minimum necessary requirements for safety, health, amenity and sustainability in the design and construction of new buildings (and new building work in existing buildings) throughout Australia. the BCA is a performance based code and compliance can be met through satisfying the deemed-to-satisfy provisions or by meeting the prescribed performance requirements. Performance Solutions offer a means of compliance with the Building Code of Australia (BCA) by demonstrating that the

performance requirements of the BCA, rather than the deemed-to-satisfy provisions, have been met. This can be done through methods such as a comparative analysis or expert judgement.

For the Wildlife Centre – Class 6 – BCA requires access to and within all areas normally used by the occupants.

For the Koala Hospital – Class 5 – BCA requires access to and within all areas normally used by the occupants.

For the Volunteer Accommodation – Class 3 – BCA requires access for people with disabilities as follows:

- From a pedestrian entrance required to be accessible to at least 1 floor containing sole-occupancy units and to the entrance doorway of each sole-occupancy unit located on that level.
- To and within not less than 1 of each type of room or space for use in common by the residents, including a cooking facility, sauna, gymnasium, swimming pool, common laundry, games room, TV room, individual shop, dining room, public viewing area, ticket purchasing service, lunch room, lounge room, or the like.
- Where a ramp complying with AS 1428.1 or a passenger lift is installed—
  a) to the entrance doorway of each sole-occupancy unit; and
  b) to and within rooms or spaces for use in common by the residents, located on the levels served by the lift or ramp.

For the Amenities Building – Class 10a – BCA requires the provision of accessible sanitary facilities.

For the Caretakers Residence – Class 1a – BCA has no accessibility requirements as the residence is of a private nature.

- AS1428 – Design for Access and Mobility
  - Part 1 (2009) of this standard contains access requirements that are mandatory for the provision of access for persons with a disability and is referred by the BCA.
  - Part 2 (1992) provides enhanced and best practice requirements.
  - Requirements for tactile indicators are included in Part 4.1 (2009) of this standard.

- AS2890.6 applies to the carparking areas generally.

5. Access and Approach | External Areas

The approach to the buildings within the Gunnedah Koala Sanctuary needs to be addressed when considering access for persons with a disability. The BCA has three requirements for the approach to buildings for people with a disability. An accessible path of travel is required to the building entrance from the allotment boundary at the main points of pedestrian entry, from accessible carparking areas and from any adjacent and associated accessible building.

In this instance, the approach to the building has been considered as follows:

- from the allotment boundary at the pedestrian entrance along Oxley Highway to the building entrances and various facilities
- from the accessible carparking area to the building entrances and various facilities
- between the buildings / facilities within the site.

Figure 2 | Overall Site Plan

5.1 Approach from Allotment Boundary

The BCA requires that a continuous accessible path of travel be provided from the allotment boundary at the main points of pedestrian entry to the main entrance.

Compliance Summary:

Performance based approach

Due to the location of the site, travel distances and nature of the proposed development, it is not practical to provide an accessible path of travel, or pedestrian access generally, between the allotment boundary and facilities within the site.

Visitors and staff will arrive via vehicle and as such accessible carparking and drop-off / set down points have been provided throughout the site to gain access to the various building and facilities.

5.2 Approach from Accessible Carparking

The BCA requires that a continuous accessible path of travel be provided from the accessible carparking areas to the main entrance.

Compliance Summary:

Compliant

The main carparking area is provided centrally within the site. There is an additional carpark provided in association with the Wildlife Centre being the main building on the site.

Pedestrian pathways link the carparking areas to the building entrances.

5.3 Approach between Associated Buildings

The BCA requires that a continuous accessible path of travel be provided between associated accessible buildings.

Compliance Summary:

Compliant

A formed accessible pedestrian link is provided between facilities within the site.

5.4 Pedestrian Areas Generally

The accessible path of travel refers to a pathway which is grade restricted and provides wheelchair access as per the requirements of AS1428.

Compliance Summary:

Capable of compliance

An accessible path of travel is required to all facilities / features within the site to promote inclusion for all visitors.

For compliance with AS1428.1, the following access requirements apply a should be addressed during detailed design stages to ensure inclusion for all.

a. The minimum unobstructed width of all pathways is to be 1000mm (AS1428.1, Clause 6.3). A width of 1200mm is preferred for compliance with AS1428.2.

b. All pathways are to be constructed with no lip or step at joints between abutting surfaces (a construction tolerance of 3mm is allowable, or 5mm for bevelling edges).

c. The maximum allowable crossfall of pathways is to be 1:40.

d. The ground abutting the sides of the pathways should follow the grade of the pathway and extend horizontally for 600mm. We note that this is not required where there is a kerb or handrail provided to the side of the pathway.

e. Pathways to have passing bays complying with AS1428.1 at maximum 20m intervals where a direct line of site is not available. They are required within 2m of the end of the pathway where it is not possible to continue travelling along the pathway.

5.5 Accessible Carparking

There is a requirement for the provision of accessible carparking within this development.

There are two (2) carparking areas within site. The main carparking areas is located centrally within the site (45 spaces) with a smaller carparking provided specifically for the wildlife centre (5 spaces).

Compliance Summary:

Compliant
Two (2) accessible carparking spaces are indicated adjacent to the wildlife centre. This meets BCA requirements for the provision of accessible carparking generally based on a total of 50 spaces.
Overall configuration of the accessible carparking, as documented meets current accessibility requirements.

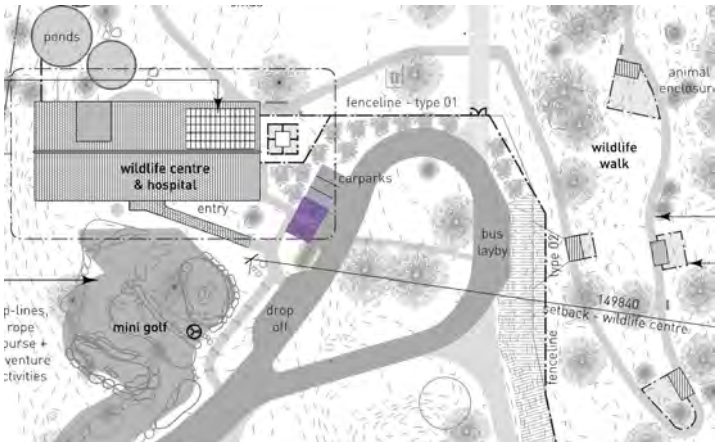

Figure 1 | Accessible Carparking & Drop-off

Access requirements for the accessible carparking are as follows.

a. Accessible carparking to be a minimum of 2400mm wide with a shared area to one side of the space 2400mm wide. Circulation space can be shared between adjacent accessible carparks.

b. Provide a bollard to the shared circulation space as illustrated in AS2890.6, Figure 2.2.

c. The maximum allowable crossfall of accessible carparking area to be, 1:33 (for outdoor spaces). This crossfall applies both parallel and perpendicular to the angle of parking.

d. For covered carparking, the clear height of the accessible carparking space to be 2500mm as illustrated in AS2890.6, Figure 2.7.

e. Designated accessible carparking is to be identified using the International Symbol for Access (ISA) between 800 and 1000mm high placed as a pavement marking in the centre of the space between 500-600mm from its entry point. The perimeter of the space is to be identified by an unbroken yellow & slip resistant line 80-100mm wide (except where there is a kerb or wall)

   Shared space to be identified using yellow slip-resistant & unbroken stipes 150 to 200mm wide with spaces 200 to 300mm between stripes. Stipes to be at an angle of 45° to the side of the space.

5.6 Drop-off Area / Bus Layby

A drop off area is provided at the wildlife centre. This area will need to facilitate access for people with disabilities.

Compliance Summary:

To be addressed during detailed design.

Where kerb ramps are to be provided at the roadway to provide an accessible path of travel for persons with a disability between the drop-off area and the footpath the kerb ramp is to comply with AS1428(2009), Clause 10.7. Maximum gradient of the kerb ramps to be 1:8 and maximum length to be 1520mm (providing a maximum height of 190mm).

Where the drop-off area is at the same level as the pedestrian areas, provide tactile indicators along its length to alert people with vision impairment of the hazard (vehicular area). Tactile indicators to be 600-800mm deep across the width pedestrian crossing. Tactile indicators to be detectable, durable, non-slip and have a minimum 30% luminance contrast to the background colour.

5.7 Accessible Ramps

An accessible ramp forms a part of the pedestrian access to the Wildlife Centre. A ramp is also provided within the amenities building to facilitate access to the barbeque area.

Compliance Summary:

Capable of compliance
The ramp to the wildlife centre is provided in two sections with a mid-landing.
Gradient is nominated as 1:14.
The ramp within the amenities building is a single section of ramp.

Access requirements for the accessible ramp are as follows.

a. Ramp to comply with AS1428.1, Clause 10.3. Maximum allowable gradient of the ramp is 1:14, minimum clear width to be 1000mm and maximum length between landings to be 9m (for 1:14 gradient).

b. Accessible ramp to have a maximum rise of 3.6m (BCA Clause 3.11).

c. Provide handrails, with extensions, to both sides of the ramps to comply with AS1428.1, Clause 12. Handrails to have an external diameter between 30-50mm to assist persons with a manual disability such as arthritis. Handrails are required on both sides of the ramp to cater for left and right-handed disabilities.

d. Where ramp is not enclosed, provide kerb rails in accordance with AS1428.1. The height of kerb rails is to be less than 65mm or greater than 150mm above the finished surface level. This is to ensure that the foot plate of a wheelchair cannot become lodged on the kerb rail.

e. Provide tactile indicators at the top and bottom of the ramps to comply with BCA Clause D3.8 and AS1428.4. Tactile indicators to be detectable, durable, non-slip and have a minimum 30% luminance contrast to the background colour. For discrete tactile indicators, 45% luminance contrast is required (60% where two-tone indicators are used).

5.8 Stairs

Stairs are provided as a part of the pedestrian access to the Wildlife Centre and also within the amenities building to provide access to the barbeque deck. AS1428.1 has access requirements for all public access stairs and is applicable in this instance.

Compliance Summary:

Capable of compliance

Access requirements for stairs are as follows.

a. Stairs to comply with AS1428.1(2009), Clause 11.2.

b. Where a stair intersects the property boundary, the stair shall be set back a minimum of 900mm so that handrail extensions and tactile indicators do not protrude into the traverse path of travel.

c. Stairs to have closed or opaque risers. Open risers cause confusion for persons with a vision impairment and may trigger conditions such as epilepsy due to light penetrating through the open riser.

d. Provide handrails, with extensions, to both sides of the stair (AS1428.1 (2009), Clause 11.2 & 12). Handrails to have an external diameter between 30-50mm to assist persons with a manual disability such as arthritis.

   Handrails are required on both sides of the stair to cater for left and right-handed disabilities. A central handrail is also an acceptable solution where adequate width is available. In this instance, the use of a double handrail is encouraged so that two users can travel in opposite directions and maintain their grip on the handrail.

e. Stair nosings to have minimum 30% luminance contrast strip 50-75mm wide to the top of the stair tread to assist persons with a vision impairment. The strip can be set back 15mm from the edge of the riser.

f. Stair nosings shall not project beyond the face of the riser.

g. Provide tactile indicators at the top and bottom of the stair to comply with BCA Clause D3.8 and AS1428.4.

   Tactile indicators to be detectable, durable, non-slip and have a minimum 30% luminance contrast to the background colour. For discrete tactile indicators, 45% luminance contrast is required (60% where two-tone indicators are used).

6. Specific Commentary

The following provides an overview of the accessibility status of the proposed buildings and facilities within the site. The intent of the design is to maximise accessibility generally and offer an inclusive environment for all users.

6.1 Wildlife Centre & Hospital

This building provides the main entry to ticketed areas of the Koala Sanctuary and contains the reception desk, shop, cafe and kitchen, administration offices, storage, public toilets, education deck and auditoria, large aviary/ animal enclosure, viewing deck and wildlife hospital.

The wildlife hospital and rehabilitation facility provides 4 small animal Intensive Care Units (ICU), 2 large ICU's and up to 12 small animal enclosures, a large clinic, office, and staff room. A viewing deck accessible from the picnic area will allow views into the clinic and the two large ICU's.

Figure 3 | Wildlife Centre & Hospital Building

Compliance Summary:

The Wildlife Centre and Hospital Building is generally considered compliant with current accessibility legislation as follows:

- Access is provided to and within all areas normally used by the occupants.
- Doorways, including the entrances, generally achieve circulation areas that will facilitate independent access for people with disabilities.
- Corridor areas are of a width that enables wheelchair turning areas.
- Two (2) unisex accessible sanitary compartments are provided within the building – left and right-handed configuration per BCA requirements.
- Ambulant toilets for male and female use are provided in addition to the unisex accessible sanitary compartments.
- The auditoria facilitate wheelchair seating along the deck.
- Airlock to the aviary will facilitate wheelchair compliant access.

Detailed design should address the following to ensure compliance with current accessibility requirements.

a. Ensure seamless transition between internal and external spaces.

b. Consider providing an accessible section of reception counter.

c. Ensure the doorway to the unisex accessible sanitary compartment entranced from the deck / education space, and door to staff room, achieves adequate circulation at the latch side for wheelchair access.

6.2 Volunteer Accommodation

The volunteer's accommodation will be provided as a backpackers-style house accommodating up to 16 singles in 5 bed dorms, with a large common lounge room and kitchen/ dining.

The BCA has a requirement for accessible accommodation in a building of this nature. A performance-based approach to accessibility has been adopted for the volunteer's accommodation given the nature of the work that will be carried out by volunteers generally.

The physical nature of this role would preclude people with limited mobility from fulfilling the required tasks. Therefore, we do not see the provision accessible accommodation as essential in this instance. We note that accessible accommodation for the general public (eco-tourism tents) has been provided.

6.3 Eco-tourism Tents & Amenities Building

Eco-tourism tents are provided within the site for visitor accommodation. They are located in close proximity to the amenities building. 2 couples tents with ensuites and 3 family or school group tents will be provided accessed by pedestrian pathways. The provision of an accessible tent is noted.

The amenities building offers toilets, showers and laundry to support the eco-tourism tents. A large barbeque with picnic tables is provided. The laundry is oversized to also act as bushfire refuge.

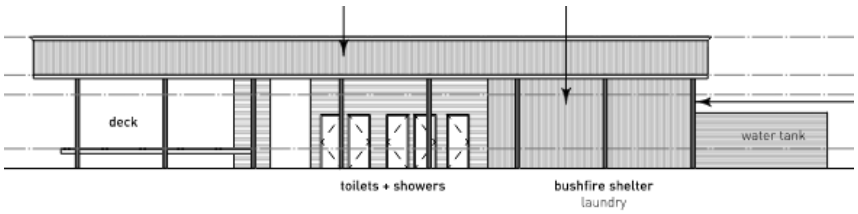

Figure 4 | Amenities Building

Compliance Summary:

The Amenities Building is generally considered compliant with current accessibility legislation as follows:

- Access is provided to and within all areas normally used by the occupants.
- Doorways achieve circulation areas that will facilitate independent access for people with disabilities.
- Two (2) unisex accessible bathrooms are provided within the building – left and right-handed configuration per BCA requirements.
- An accessible ramp is provided to the barbeque deck

Detailed design should address the following to ensure compliance with current accessibility requirements.

a. Provide ambulant cubicles for male and female use as required by BCA.

6.4 Petting Zoo

The petting zoo provides a formed, level pathway to facilitate access for people with disabilities. We note that generous circulation areas have been provided for wheelchair access.

Detailed design should address the following to ensure compliance with current accessibility requirements.

a. The height of pens should consider site lines from a seated position to cater to people using a wheelchair.

6.5 Wildlife Sanctuary Walk, Pond & Picnic Zone & Recreational Areas

The Wildlife Sanctuary Walk will comprise an accessible pathway through the bushland with roaming wallabies, kangaroos and emus. Smaller enclosures hold other native animals. Each enclosure has a shade shelter at the viewing point.

The Pond and Picnic Zone is a large grassed area with minimal picnic seating, an agricultural themed playground and a large constructed pond. Kangaroos and emus will roam freely in this area. A koala enclosure will be built within the picnic area, around a cluster of existing trees.

A bush-themed mini-golf course and zip lines will be provided within the development. The platform for the zip line will be constructed near the entry to The Wildlife Centre to launch twin zip lines going over the mini-gold course.

An accessible picnic table is provided near the ponds.

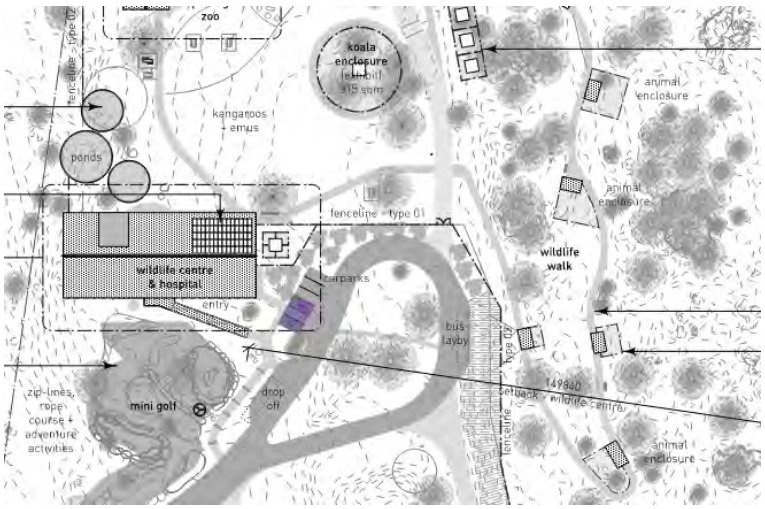

Figure 5 | Recreational Facilities

Recommendations:

a. Ensure formed and stable footpaths are provided to all recreational facilities.

6.6 Maintenance Shed

We consider the maintenance shed does not need to facilitate access for people with disabilities being a staff only area for storage and the like.

6.7 Indigenous Cultural Centre

The Indigenous Cultural Centre will comprise a large open area with a sheltered display area for the demonstration of cultural knowledge and skills It will be associated with the indigenous food bush regeneration area.

A bushwalking path will likely be marked through the sanctuary with some interpretive signage. Bush regeneration area will focus on indigenous food plants.

Detailed design should address the following to ensure compliance with current accessibility requirements.

b. Ensure a formed and stable pathway is provided to the cultural centre.

7 General Accessibility Features | Interior Areas

The following generally accessibility features apply throughout the proposed development to ensure an inclusive and equitable environment is created for all building occupants. They should be addressed during detailed design stages to ensure compliance of the built form.

6.1 Extent of Access Generally – BCA

Access for people with disabilities is required to and within all areas normally used by the occupants. This is achieved throughout the proposed building works as outline in the preceding section of this report.

6.2 Entrances

In a building required to be accessible, an accessway must be provided through the principal pedestrian entrance, and not less than 50% of all pedestrian entrances including the principal pedestrian entrance.

Compliance Summary:

Capable of compliance
Building entrances achieve adequate circulation areas for compliance.

The following access requirements apply to the entrance and should be addressed during preparation of the construction certificate documentation to ensure compliance.

a. Entrance to comply with AS1428.1(2009), Clause 13 as part of the accessible path of travel.

b. Doors are to have a minimum clear opening width of 850mm to comply AS1428.1(2009), Clause 13.2 as part of the accessible path of travel.

Where double door sets are provided, one door leaf is to be capable of being held in the closed position to provide door opening widths and circulation to comply with AS 1428.1.

c. Door threshold to be level to provide seamless entry as part of the accessible path of travel. Maximum allowable construction tolerance is 3mm for compliance with AS1428.1(2009), 5mm where beveled edges are provided between surfaces.

d. Door to have hardware within the accessible height range of 900-1100mm above the finished floor level (AS1428.1(2009), Clause 13.5)

e. For glass doors, provide decals to assist persons with a vision impairment. Decals to be solid and have a minimum 30% luminance contrast to the background colour and be not less than 75mm high located within the height range of 900-1100mm above the finished floor level. Decals are to be solid per AS1428.1, Clause 6.6.

6.3 Circulation Areas

BCA (Clause D3.3) requires the provision of turning spaces and passing areas to corridors to enable wheelchair circulation throughout a building.

Turning spaces 1540mm wide by 2070mm long are required within 2m of the end of corridors to enable a wheelchair to turn through 90° and passing areas 1800mm wide by 2000mm long are required every 20m along a corridor unless there is a clear line of sight.

6.4 Doorways Generally

AS1428 has requirements for doorways within the accessible path of travel to enable independent access for people using a wheelchair.

Access requirements for doorways within the accessible path of travel are as follows and should be addressed during preparation of the construction certificate documentation to ensure compliance.

a. Doorways within the accessible path of travel to have a minimum clear opening width of 850mm (AS1428.1(2009), Clause 13.2). We recommend the use of a 920 leaf door as a minimum to achieve adequate clear width.

   For double doors, the operable leaf must achieve this clear opening width.

b. All doorways within the accessible path of travel to have complying circulation areas as illustrated in AS1428.1(2009), Figure 31. Circulation areas to have a maximum crossfall of 1:40.

c. Doorways to have minimum 30% luminance contrast as described in AS1428.1(2009), Clause 13.1.

d. Doors to have hardware within the accessible height range of 900-1100mm above the finished floor level (AS1428.1(2009), Clause 13.5). Note that this is not applicable to childcare centres.

   Door handles and related hardware shall be able to be unlocked and opened with one hand per AS1428.1 (2009), Clause 13.5.1. The handles shall enable a person who cannot grip to operate the door without their hand slipping from the handle. We recommend the use of lever handles.

e. Doorways to have operational forces per AS1428.1 (2009), Clause 13.5.2. A maximum allowable force of 20N is required to operate the door.

6.5 Doorways within Vestibules and Air-locks

AS1428 has requirements for circulation areas between doorways within vestibules / airlocks to enable independent access for people using a wheelchair. Clause 13.4 requires a minimum dimension of 1450mm between doors. Where a doorway encroaches into the space, 1450mm plus the door leaf width is required.

6.6 Doorways within Vestibules and Air-locks to Ambulant Toilet Cubicles

AS1428 has requirements for circulation areas between doorways within vestibules / airlocks as part of the path of travel to ambulant toilet cubicles to enable independent access for people using a mobility aid. Figure 34(b) requires a minimum dimension of 900mm between doors. Where a doorway encroaches into the space, 900mm plus the door leaf width is required.

6.7 Hearing Augmentation at Service Counters

For buildings that are required to be accessible, the BCA (Clause D3.7) requires hearing augmentation systems at service counters **where the user is screened from the service provider**. We note that this may not be relevant to this project.

Requirements for hearing augmentation are contained in AS1428.5: Communication for People who are deaf or Hearing impaired. This standard is not referenced by BCA however, we recommend that the requirements of AS1428.5 be adopted in the provision of hearing augmentation.

Access requirements hearing augmentation at service counters are as follows and should be addressed during preparation of the construction certificate documentation to ensure compliance.

a. Hearing augmentation at service counters to comply with AS1428.5, Clause 3.4 which recommend that provision of an assisted listening system (ALS). Specifications for the ALS are provided in AS1428.5, Clause 4.3.

b. The hearing augmentation system is to be identified using the International Symbol for Deafness – refer to AS1428.5, Clause 5.1 – and displayed at the reception counters.

6.8 Hearing Augmentation

For buildings that are required to be accessible, the BCA (Clause D3.7) requires hearing augmentation systems within auditoriums, meeting rooms and the like **where an inbuilt amplification system, other than the one used for emergency warning is installed**. The following systems can be used:

- An induction loop to at least 80% of the floor area;
- A system requiring the use of receivers (infrared or the like) to not less than 95%.

Requirements for hearing augmentation are now contained in AS1428.5: Communication for People who are deaf or Hearing impaired. This standard will not be referenced by BCA. However, we recommend that the requirements of AS1428.5 be adopted in the provision of hearing augmentation within the building.

The hearing augmentation system is to be identified using the International Symbol for Deafness.

6.9 Exempt Areas

BCA Clause D3.4 does not require access for people with disabilities to areas that would be inappropriate due to the particular use of the area or would pose a health and safety risk. This includes the path of travel to these areas.

6.10 Floor Finishes

All floor finishes are to be flush to provide an accessible path of travel throughout the different areas of the building. Maximum allowable construction tolerance is 3mm (5mm for bevelled edges) as part of the accessible path of travel. Refer to AS1428.1(2009), Clause 7.2 for further details. This should be implemented during construction to ensure compliance.

6.11 Carpet

AS1428.1 has access requirements for carpet. Where carpet is used as the floor surface, pile height should not exceed 4mm. Exposed edges will be fastened to the floor surface. Carpet trims shall have a vertical face not more than 3mm high.

BCA states that clause 7.4.1(a) of AS 1428.1 does not apply and is replaced with 'the pile height or pile thickness shall not exceed 11 mm and the carpet backing thickness shall not exceed 4 mm.

6.12 Controls

Controls such as light switches, GPOs, alarm keypads, card swipes, intercoms, etc are to be located within the accessible height range of 900-1100mm above the floor level and not within 500mm of an internal corner to comply with AS1428.1(2009), Clause 14. This should be implemented during construction to ensure compliance.

6.13 Visual Indication to Glazing

Provide decals to all full height glazing that can be mistaken for a doorway to assist persons with a vision impairment. Decals to be solid and have a minimum 30% luminance contrast to the background colour and be not less than 75mm high located within the height range of 900-1100mm above the finished floor level. Decals are to be solid. AS1428.1, Clause 6.6.

6.14 Tactile Indicators

For a building that is required to be accessible, tactile ground surface indicators must be provided to warn people who are blind or have a vision impairment that they are approaching a stairway (other than a fire isolated stair); an escalator; a moving walkway; a ramp (other than a fire isolated ramp, step ramp, kerb ramp or swimming pool ramp); and in the absence of a suitable barrier, an overhead obstruction less than 2m above the floor level or an accessway ,meeting a vehicular way if there is no kerb or kerb ramp (BCA D3.8).

Tactile indicators are generally required to be 600-800mm deep across the width of the hazard and set back 300mm from the edge of the hazard (refer AS1428.4.1, Figure A1). Tactile indicators to be detectable, durable, non-slip and have a minimum 30% luminance contrast to the background color (45% for discrete tactile indicators and 60% for discrete two-tone tactile indicators).

6.15 Signage

Signage to identify sanitary facilities, hearing augmentation and required exits are to be provided in accordance with BCA Clause D3.6. This includes provision of the International Symbol for Access or International Symbol for Deafness as appropriate. Signage to comply with AS1428.1 (2009), Clause 8.

Access requirements for signage are as follows. Note that this does not include general wayfinding signage.

a. Braille and tactile signage formats as outlined within BCA Specification D3.6 that incorporate the international symbol of access or deafness, as appropriate, in accordance with AS 1428.1 must be provided to identify the following:

- a sanitary facility, except a sanitary facility associated with a bedroom in a Class 1b building or a sole-occupancy unit in a Class 3 or Class 9c building
- a space with a hearing augmentation system
- each door required by E4.5 to be provided with an exit sign and state level
- an accessible unisex sanitary facility and identify if the facility is suitable for left or right handed use
- an ambulant accessible sanitary facility 1 and be located on the door of the facility

- where a pedestrian entrance is not accessible, directional signage incorporating the international symbol of access to direct a person to the location of the nearest accessible pedestrian entrance
- where a bank of sanitary facilities is not provided with an accessible unisex sanitary facility, directional signage incorporating the international symbol of access must be placed at the location of the sanitary facilities that are not accessible, to direct a person to the location of the nearest accessible unisex sanitary

b. Braille and tactile components of the sign to be located not less than 1200mm and not higher than 1600mm affl.

c. Signage to be located at the latch side of the doorway with the leading edge of the sign 50-300mm from the architrave. Where this is not possible, the sign can be located on the door.

Sample signs are as follows. These are examples only – ensure selected signage complies with BCA Specification D3.6 including provision of Braille locator for multiple lines of text and characters.

6.16 Thresholds

The threshold of a doorway must not incorporate a step or ramp at any point closer to the doorway than the width of the door leaf unless in a building required to be accessible by Part D3, the doorway opens to a road or open space; and is provided with a threshold ramp or step ramp in accordance with AS 1428.1.

6.17 Slip Resistance

The BCA defines the following slip resistance requirements for stairs and ramps:

Application	Surface Conditions	
	Dry	Wet
Ramp steeper than 1:14	P4 or R11	P5 or R12
Ramp steeper than 1:20 but not steeper than 1:14	P3 or R10	P4 or R11
Tread or Landing surface	P3 or R10	P4 or R11
Nosing or landing edge strip	P3	P4

7 Sanitary Facilities

The BCA / Access Code for Buildings (Clause F2.4) require the provision of sanitary facilities catering for persons with a disability.

7.1 Distribution of Accessible Sanitary Facilities

The following is required to satisfy BCA requirements, noting that not all are applicable to all developments:

- A unisex accessible toilet at each level. Where more than one bank of toilets is provided at any level, at least 50% of those banks will have an accessible toilet facility.

- A unisex accessible shower is required where showers are required by F2.3. In this regard, BCA only requires accessible showers within hospitals, early childhood centres, theatres and sporting venues. Showers are not r*equired* within commercial, retail or industrial premises. If ***required by Clause F2.3,*** where one or more showers are provided, 1 accessible shower for every 10 or part thereof must be provided.

- To minimize the risk of a complaint made under the DDA, we recommend that where showers are provided for general use, an accessible shower should be provided.

- At each bank of toilets where there is one or more toilets in additional to an unisex accessible sanitary compartment at the bank of toilets, a sanitary compartment suitable for a person with an ambulant disability in accordance with AS1428.1 must be provided for use by males and females

- One unisex accessible adult change facility must be provided in certain buildings but is not required within this development.

7.2 Unisex Accessible Toilets

Access requirements for the accessible toilet facilities are as follows. For compliance with AS1428.1(2009), the minimum room dimensions of the accessible toilet are to be 1900x2300mm plus additional area for the handbasin. These are CLEAR dimensions. Provision for wall linings needs to be considered.

a. Accessible toilet facilities to be unisex facilities for compliance with the BCA.

b. Unisex accessible facilities to comply with AS1428.1(2009), Clause 15 including set-out of fittings and fixtures, circulation areas and doorways.

c. Where more than one unisex accessible toilet is provided within the building, they should be in a mirrored configuration to allow for both left and right handed use.

WC Pan:

d. Crucial dimensions for the toilet are 450mm from centreline of pan to side wall, 800mm from front of pan to rear wall and a seat height of 470mm.

e. A minimum clear dimension of 1400mm is required from the toilet pan to any other fixture (see figure 43).

f. Grabrails to be provided at the side and rear of the toilet in compliance with AS1428.1 at a height of 800mm.

g. Toilet seat shall be of the full round type, be securely fixed in position when in use and have fixings that create lateral stability. They should be load rated to 150kg, have a minimum 30% luminance contrast to the background colour (eg pan, wall or floor) and remain in the upright position when fully raised.

h. Provide a backrest to accessible toilets to comply with AS1428.1, Clause 15.2.4.

Basin:

i. For the basin, a minimum dimension of 425mm is required from the centreline of the basin to the side wall and height of basin to be between 800 and 830mm.

j. Taps to have lever handles, sensor plates or similar controls. For lever taps, a minimum 50mm clearance to be provided to adjacent surfaces.

Door:

k. Doorways to have a minimum clear opening width of 850mm to comply AS1428.1(2009), Clause 13.2 as part of the accessible path of travel. Adequate circulation area at the latch side of the doorway is required to allow independent access to the facility – for details refer to AS1428.1, Figure 31.

l. Door hardware to be located within the accessible height range of 900-1100mm above the finished floor level. The use of lever handles is encouraged to assist persons with a manual disability such as arthritis.

Controls:

m. Controls such as light switches within the accessible toilet facilities to be in the accessible height range of 900-1100mm above the finished floor level to comply with AS1428.1(2009), Clause 14. Controls should be located not less than 500mm to a corner.

7.3 Cubicles for People with an Ambulant Disability

Ambulant cubicles are required in addition to the unisex accessible sanitary compartment. Access requirements for ambulant toilets are as follows.

a. Options for the configuration of the ambulant cubicles are illustrated in AS1428.1, Figure 53.

b. Provide an ambulant cubicle within each bank of male and female toilets in compliance with AS1428.1, Clause 16.

c. Minimum width of ambulant cubicles to be 900-920mm.

d. Provide grabrails to ambulant cubicles to comply with AS1428.1, Clause 17 and Figure 53A.

e. Doors to have a minimum opening width of 700mm and comply with AS1428.1, Figure 53B.

f. Provide signage to the ambulant cubicles to comply with AS1428.1, Clause 16.4.

7.4 Unisex Accessible Shower Facility

Access requirements for accessible showers are as follows.

a. Showers are to comply with AS 1428.1, Clause 15.5 and include accessible features such as grabrails, adjustable height shower rose and fixtures within an accessible height range.

b. Floor waste to be positioned 550mm and 580mm from enclosing shower walls as illustrated in AS1428.1 (2009), Figure 47a.

c. The minimum dimension of an accessible shower to be 1160 x 1000mm. A folding seat, at a height of 470mm is to be provided. All taps to be located within the height range of 900-1100mm above the finished floor level.

d. Circulation space in front of the shower is to be provided as illustrated in AS1428.1, Figure 47.

7.5 Accessible Adult Change Facility

An adult change facility is required within the building per BCA Clause F2.9 and must be constructed in accordance with Specification F2.9. Note that this is **in addition to the required unisex accessible toilet facilities**. The adult change facility cannot be combined with any other sanitary compartment.

A facility of this nature is desirable but not essential within this development.

Adult change facilities are required in the following developments:

6 Best Practice Measures

The following best practice commentary provides best-practice accessibility measured for consideration in the proposed development.

The federal Disability Discrimination Act, 1992 is the only act dealing exclusively with disability legislation. The act is a complaint-based law administered by the Human Rights Commission (HRC) under the Disability Discrimination Commissioner. It provides a detailed definition of discrimination, covering both direct and indirect forms of discrimination.

The DDA encompasses all new building works (including alterations and additions) and existing conditions. The Access to Premises Advisory Notes were produced by the Disability Discrimination Commissioner and issued by HRC in 1997 to assist those people responsible for new building work including architects, developers and building owners. They encourage the enhanced and best practice requirements of AS1428.2 be implemented in the construction of new building works.

Although not required by the BCA, as AS1428.2 is referenced by the Access to Premises Advisory Notes, the adoption of the enhanced accessibility requirements of this standard minimises the risk of a complaint made under the DDA.

6.1 Accessible Service Counters

The provision of an accessible section of counter will benefit people using wheelchairs.

AS1428.2 contains access requirements for service counters which is an enhanced requirement for accessibility but is not mandatory. Compliance with this clause will offer protection from a complaint made under the DDA but is not required by the BCA.

Access requirements for the accessible reception counter, if provided, are as follows.

a. Accessible counters to comply with AS1428.2, Clause 24.1. Height of the counter is to be between 750mm(±20) and 850mm (±20) above the finished floor level and have foot and knee clearance under the counter as outlines in Figure 25. The minimum width of the accessible counter and clearance below is 900mm.

6.2 Hearing Augmentation at Service Counters

For buildings that are required to be accessible, the BCA (Clause D3.7) requires hearing augmentation systems at service counters **where the user is screened from the service provider**.

With the introduction of sneeze-screens as part of COVID-19 mitigation measures, the provision of hearing augmentation at service counters has become a critical accessibility issue for people with hearing impairment.

Requirements for hearing augmentation are contained in AS1428.5: Communication for People who are deaf or Hearing impaired. This standard is not referenced by BCA however, we recommend that the requirements of AS1428.5 be adopted in the provision of hearing augmentation.

6.3 Luminance Contrast

Luminance contrast assists people with a vision impairment to navigate the built environment. Mandatory items that require luminance contrast are tactile indicators, accessible toilet seats and doorways as outlined in other sections of this report. The following can also be provided as a best practice measure to ensure ease of use:

- Minimum 30% luminance contrast between floors and walls or between walls and skirting boards;
- Minimum 30% luminance contrast between the ground surface and obstructions such as columns, bollards and street furniture;
- To assist people with vision impairment locate the building entrance, consider providing features with a minimum 30% luminance contrast to the background surface such as an entry mat or awning.
- Minimum 30% luminance contrast between the floor and the entrance mat (this allows people with vision impairment to locate the entrance;
- Minimum 30% luminance contrast between walls and handrails.

6.4 Visual Indication to Glazing (additional measures)

To ensure full height glazing that can be mistaken for a doorway is highlighted, we recommend the provision of a “double decal” as per international precedent. This involves the provision of two (2) decal strips that have a minimum 30% luminance contrast to each other. As such, the background colour does not need to be relied upon.

6.5 Workstations and Desks

Consideration should be given to the provision of accessible workstations within the building. Adjustable height workstations and desks promote an inclusive environment for all users.

6.6 Seating

A proportion of accessible seating should be provided that offers compliance with AS1428.2:1992 Clause 27.

Provide a seat height of 450mm; with side arms that extend a further 260mm +/- 40mm in height. Seating to have a back height of 750mm-790mm (AS 1428.2:1992 Clause 27.2). · Armrests must not extend beyond the perimeter of the base or legs of the seat to ensure stability of the chair when rising with use of only one armrest.· Heel space of at least 150mm with a minimum width of 350mm should be provided under seats to assist in rearward adjustments of feet when rising.

Seats located adjacent to pathways to set back at least 600mm to allow leg room without obstructing the adjacent path (AS 1428.2:1992 Clause 27.1(a)).

6.7 Furniture and Joinery Hardware

The use of D-type pull handles to furniture which provide a minimum 35mm clearance between the rear face of the handle and the face of the drawer is generally recommended to promote accessibility and inclusion.

6.8 Wayfinding – Signage

Signs and symbols should be provided to inform all users. A signage system which informs all users is encouraged. The use of pictograms is recommended as is the use of luminance contrast to ensure the message is clear and legible.

Signs including symbols, numbering and lettering shall be located where they are clearly visible to people in both a seated and standing position. That is, they should be placed within a zone at a height not less than 1400 mm and not more than 1600 mm above the plane of the finished floor. Where space in this zone is used up, the zone for placement of signs may be extended downward to not less than 1000 mm from the plane of the finished floor. This height assists people to read from either a seated or a standing position, and also assists people with low vision to read the information on the sign. Letters and symbols in relief assist people with severe visual disabilities.

The use of the International Symbol for Access (ISA) is encouraged to represent facilities for persons with a disability.

6.9 Wayfinding – Landmarks and Tactile Indicators

To assist people with vision impairment navigate their environment, the use of directional tactile indicators can be implemented, noting that their use should be minimised. The design of directional tactile indicators is site / building specific.

Additionally, landmarks such as statues, sculpture, fountains, or other unique features can be used as a means of way-finding throughout a building. This especially assists people with intellectual disabilities.

6.10 Terminology (Best-practice recommendation)

The use of positive terminology such as “accessible” should be used when referring to accessible facilities such as toilets and carparking. This term is preferable to “disabled” which is commonly used. This principle is to be adopted through the design and documentation of a project and on signage throughout the completed building.

8 Conclusion

This report demonstrates that the fundamental aims of accessibility legislation are achievable within Gunnedah Koala Sanctuary. Spatial planning and general arrangements of facilities will offer inclusion for all building users.

Disability is often defined as any limitation, restriction or impairment which restricts everyday activities and has lasted or is likely to last for at least 6 months. Disabilities can be very varied. They can be physical, cognitive, intellectual, mental, sensory, or developmental. They can be present at birth or can occur during a person’s lifetime. They can also be permanent or temporary. In Australia, almost one in five people – 4.3 million – have a disability with one in three having severe or profound core activity limitation.

This report is limited to items within drawings listed in this report only.

All dimensions quoted throughout this report and within Australian Standards are CLEAR dimensions, not structural. This needs to be considered in the preparation of the construction certificate documentation to account for wall linings and the like.

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Bush Fire Assessment Report

3130 Oxley Highway, Gunnedah

Proposed Koala Park

Prepared for:

Gunnedah Shire Council

January 2021

Integrated Consulting
Planning | Bushfire | Surveying

Report Details	
Project Number	19038
Project Name	Gunnedah Koala Park Bush Fire Assessment Report
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Client	Gunnedah Shire Council
Prepared by	Erika Dawson BPAD Level 3 Accredited Practitioner (NSW & WA) 36371
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A	19/10/2020	Draft for client review
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Disclaimer

This report is prepared solely for Gunnedah Shire Council (the 'client') and any future landowners (or their delegated representatives) of the subject lot(s) and is not for the benefit of any other person and may not be relied upon by any other person.

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1 Introduction

1.1 Purpose

This Bush Fire Assessment Report (**BFAR**) has been prepared to support a Development Application (**DA**) for a proposed Koala Park on Lots 328 & 329 DP 755503, being 3130 Oxley Highway, Gunnedah.

The DA is to be lodged with Gunnedah Shire Council and will require referral to the NSW Rural Fire Service for a Bush Fire Safety Authority (**BFSA**) as part of the DA assessment process. This report has been prepared in accordance with *Planning for Bush Fire Protection 2019* (**PBP**) to provide sufficient information for both approval authorities.

1.2 The Development

The proposed development involves the construction and use of a Koala Park. Specifically, the development will incorporate the following (with plan references provided in brackets):

- Site Entry (A)
- Carpark (B)
- Hospital Drop-off & Bus set down (C)
- Wildlife Centre + Hospital (D)
- Pond & Picnic Zone (E)
- Petting Zoo (F)
- Wildlife Sanctuary walk (G)
- Wildlife Sanctuary (H)
- Volunteers Accommodation (I)
- Maintenance Shed (J)
- Eucalyptus Plantation (L)
- Signage (M)
- Caravan sites (N) (14 caravan sites with gravel connecting road. Including power, common soil waste dump pit)
- Eco-tourism tents (O) (2 couples' tents with ensuites and 3 family or school group tents accessed by pedestrian pathways. New planting in and around tents (subject to APZ requirements))
- Amenities Block (P) (115m^2 internally, 80m^2 external Toilets, showers and laundry to support tents. Large BBQ deck with picnic tables. Laundry oversized to also act as bushfire refuge as required by eco-tourism bushfire protection)
- Mini Golf (Q)
- Indigenous Cultural Centre (R) (A large open area with a sheltered display area for the demonstration of cultural knowledge and skills in the repatriated quarry area. Associated with the indigenous food bush regeneration area.
- Zip lines, Rope Courses and Adventure Activities (S)
- Caretakers House (T)

Plans of the development are provided in **Appendix A**.

1.3 The Site

1.3.1 Location

The subject site is comprised of two parcels, Lots 328 & 329 DP 755503 which are located on the northern side of the Oxley Highway approximately 1.8km west of the intersection with Farrar Road. The location of the site is shown in **Figure 1** and an aerial image in **Figure 2.**

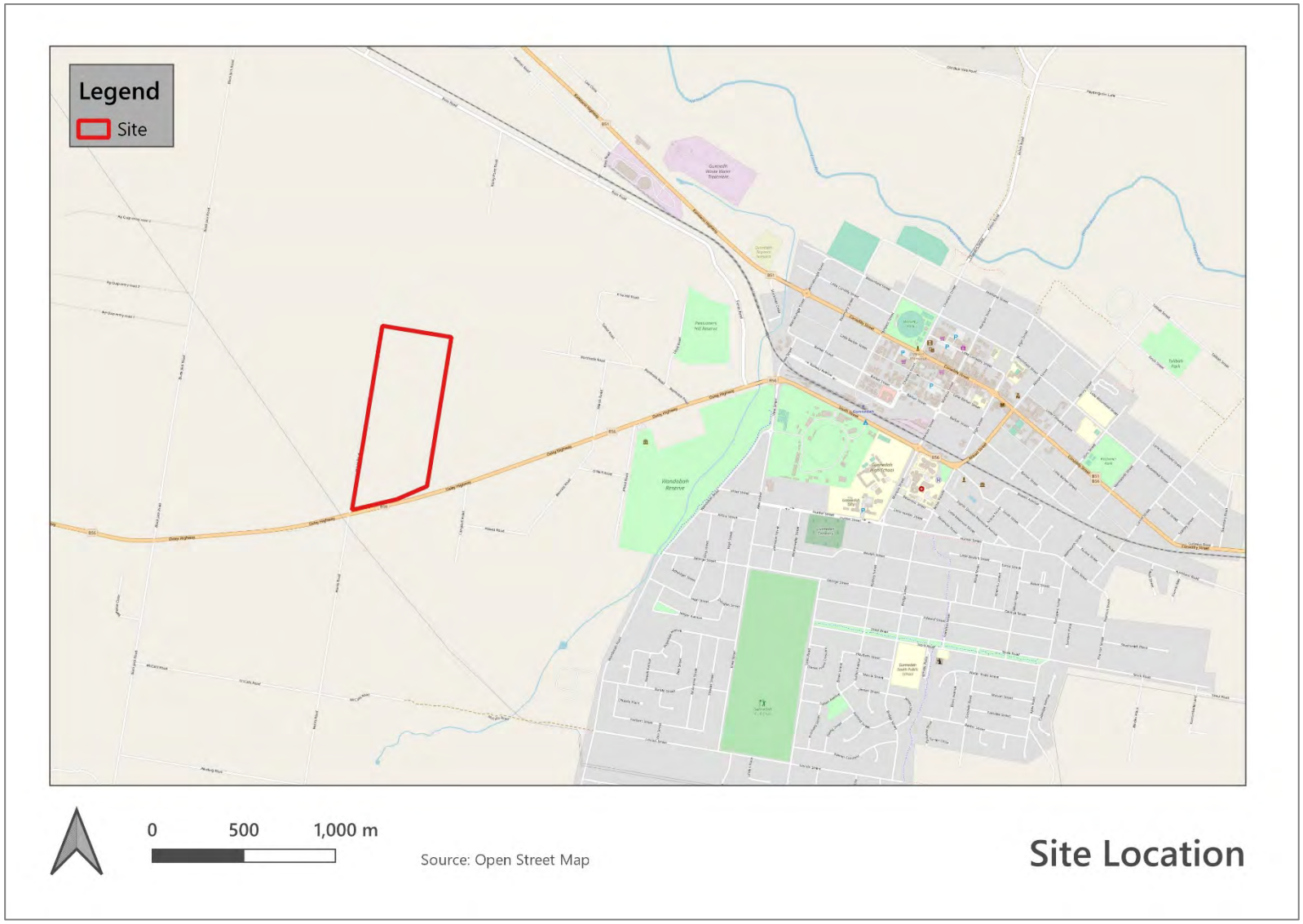


Figure 1: Site Location

Figure 2: Site Aerial Photograph

1.3.2 Site Details

Lot 328 has an area of 17.6 ha (45 acres - 6165m² as per Certificate of Title (**CT**)) and Lot 329 has an area of 17.76 ha (43 ¾ acres – 340.8m² as per the CT). The original portions were modified (as per notification 2 on the CT) as a result of the road widening of the Oxley Highway that occurred as part of DP 264027.

Lot 328 contains the Gunnedah Kart Track and Clubhouse, and Balcary Park Motorcycle Track and Clubhouse. Lot 328 has access from the crown road that forms the western boundary of the site. The site has previously experienced significant clearing to facilitate the development on site. It contains grassland and remnant dry sclerophyll forest where vegetation has not previously been removed.

Lot 329 predominantly contains remnant dry sclerophyll forest and an area of grassland at the southern end of the site. Some areas on site have been previously disturbed as the site has been used for a quarry and material storage area.

The site is predominantly zoned RU1 Primary Production under *Gunnedah Local Environmental Plan 2012* and a small portion is zoned E3 Environmental Management as shown in **Figure 3**. The land to the north east and south of the site is zoned E3 Environmental Management, to the south east and south R5 Large Lot Residential, to the south west RU4 Primary Production Small Lots, to the west RU1 Primary Production and to the north west IN1 General Industrial.

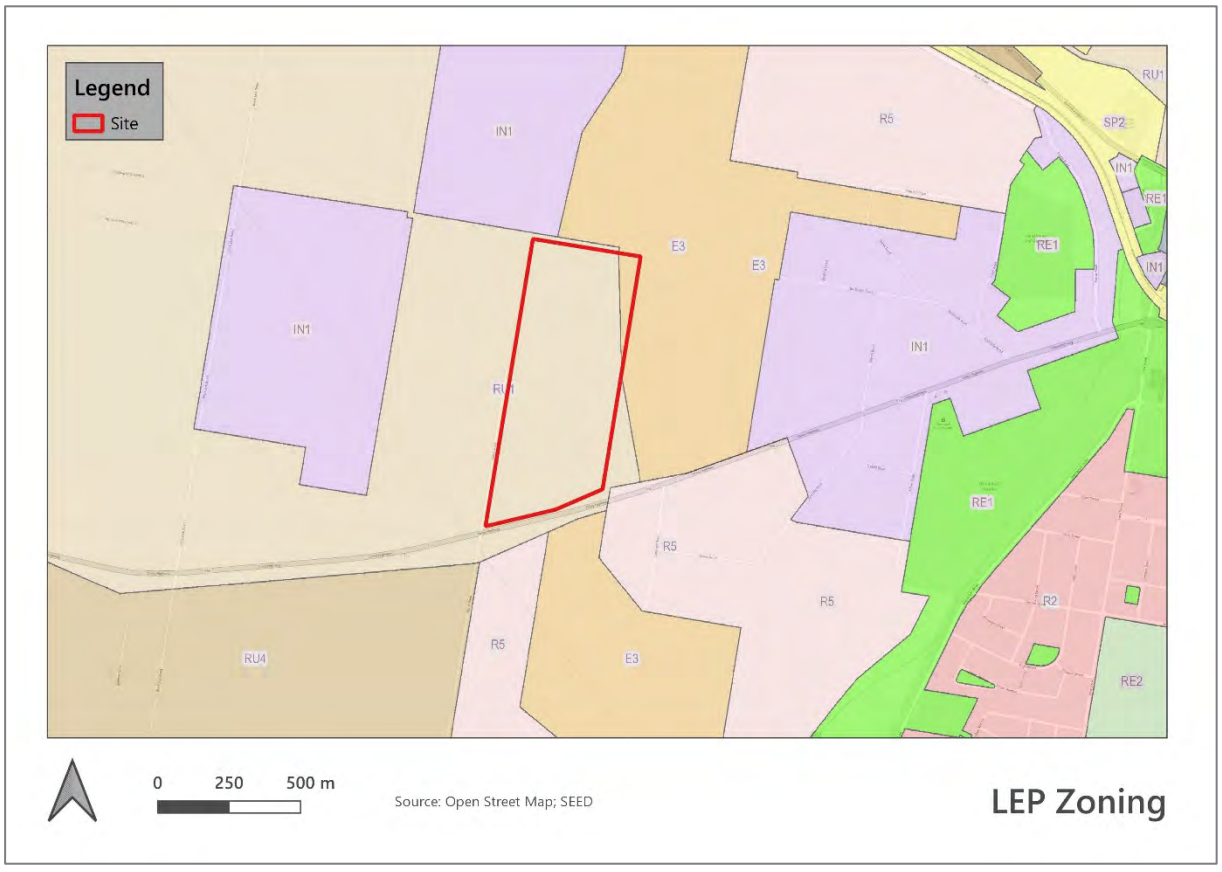


Figure 3: LEP Zoning Map

1.3.3 Environmental Significance

There are no environmentally significant features on the site mapped by the LEP. None of the site is mapped as being of Biodiversity Values under the Biodiversity Values Map (refer **Figure 4**).

Part of the site is mapped as being vulnerable regulated land (orange) under the Native Vegetation Regulatory Map (refer **Figure 5**).

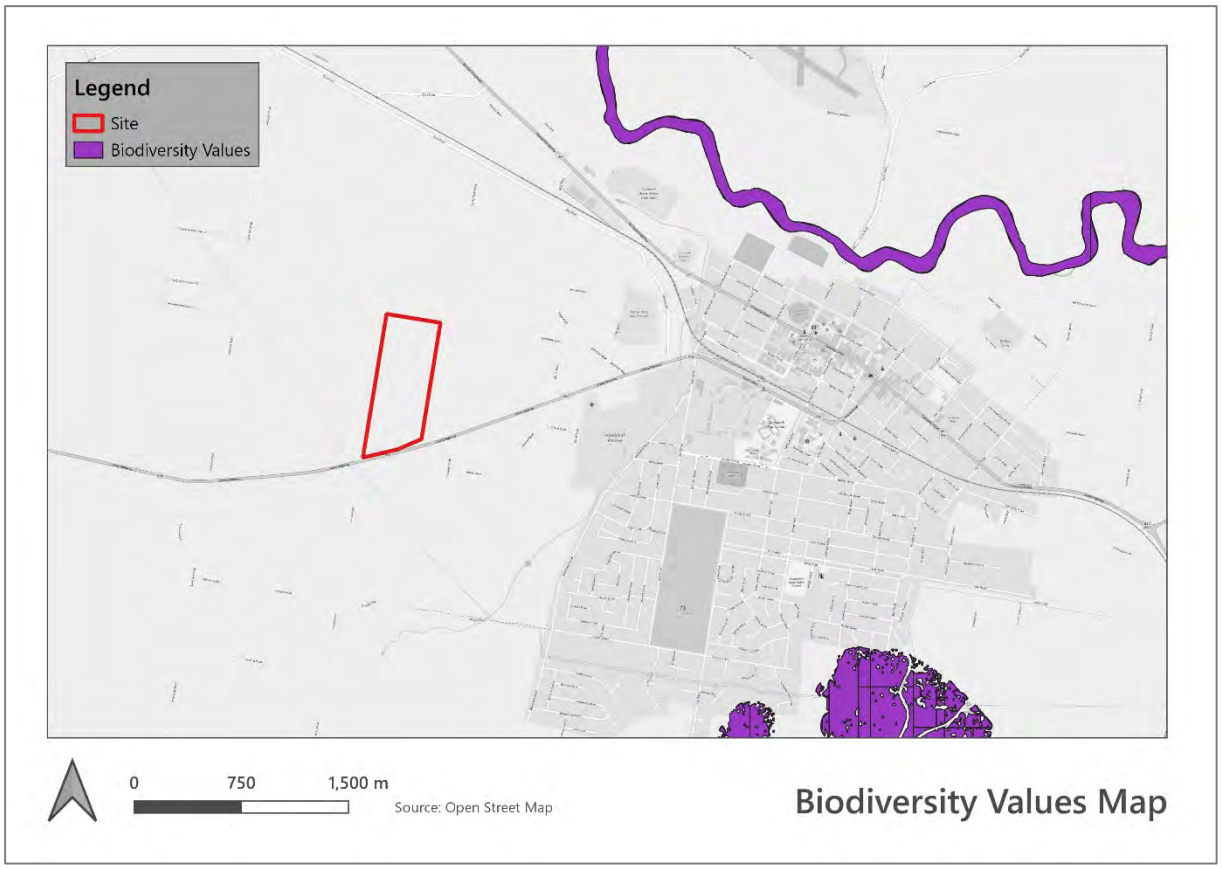
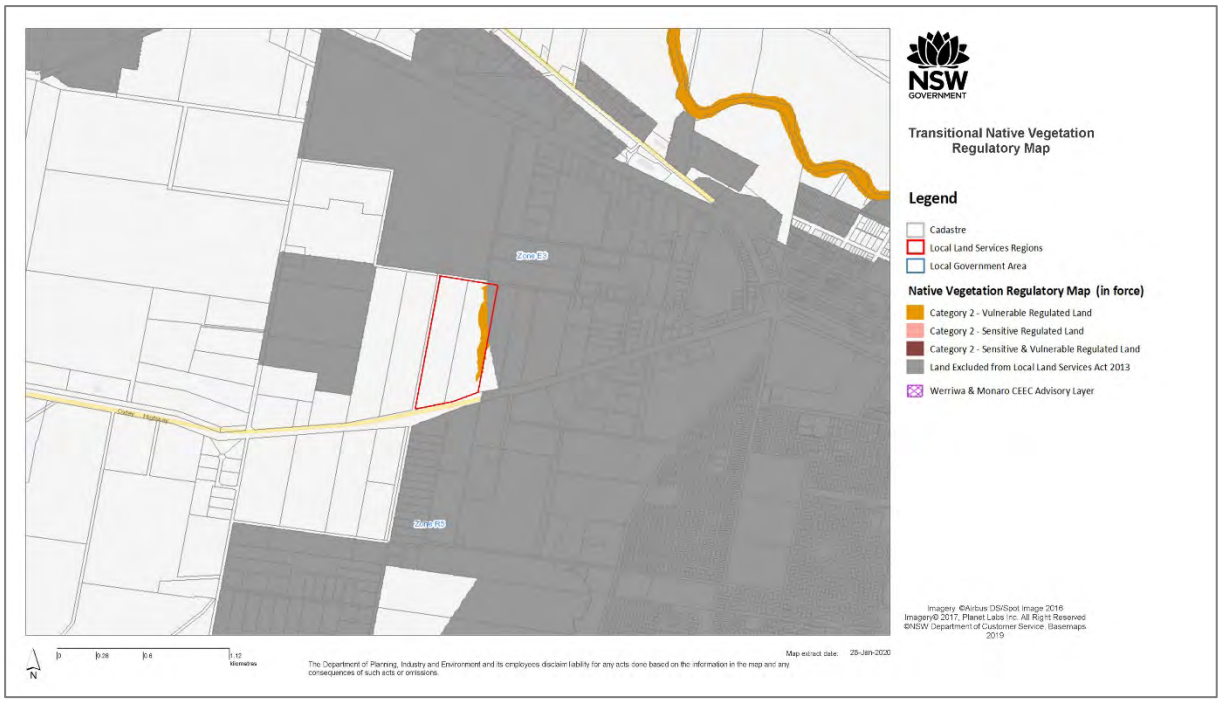


Figure 4: Biodiversity Values Map



Source: (NSW Planning & Environment n.d.)

Figure 5: Native Vegetation Regulatory Map

1.3.4 Threatened Species

A Biodiversity Development Assessment Report (BDAR) has been prepared by Area Environmental for the proposed development. It will be provided with the DA under separate cover.

1.3.5 Indigenous Heritage

An Aboriginal Heritage Information Management System (AHIMS) Search was undertaken for the site. No items of indigenous heritage have been recorded or identified on the site (refer **Appendix B**).

1.4 Legislative Framework

1.4.1 Bush Fire Prone Land

The site is designated as bush fire prone land in accordance with Section 10.3 of the *Environmental Planning & Assessment Act 1979* (**EP&A Act**). As shown in **Figure 6** the site is mapped as being within the buffer (yellow).

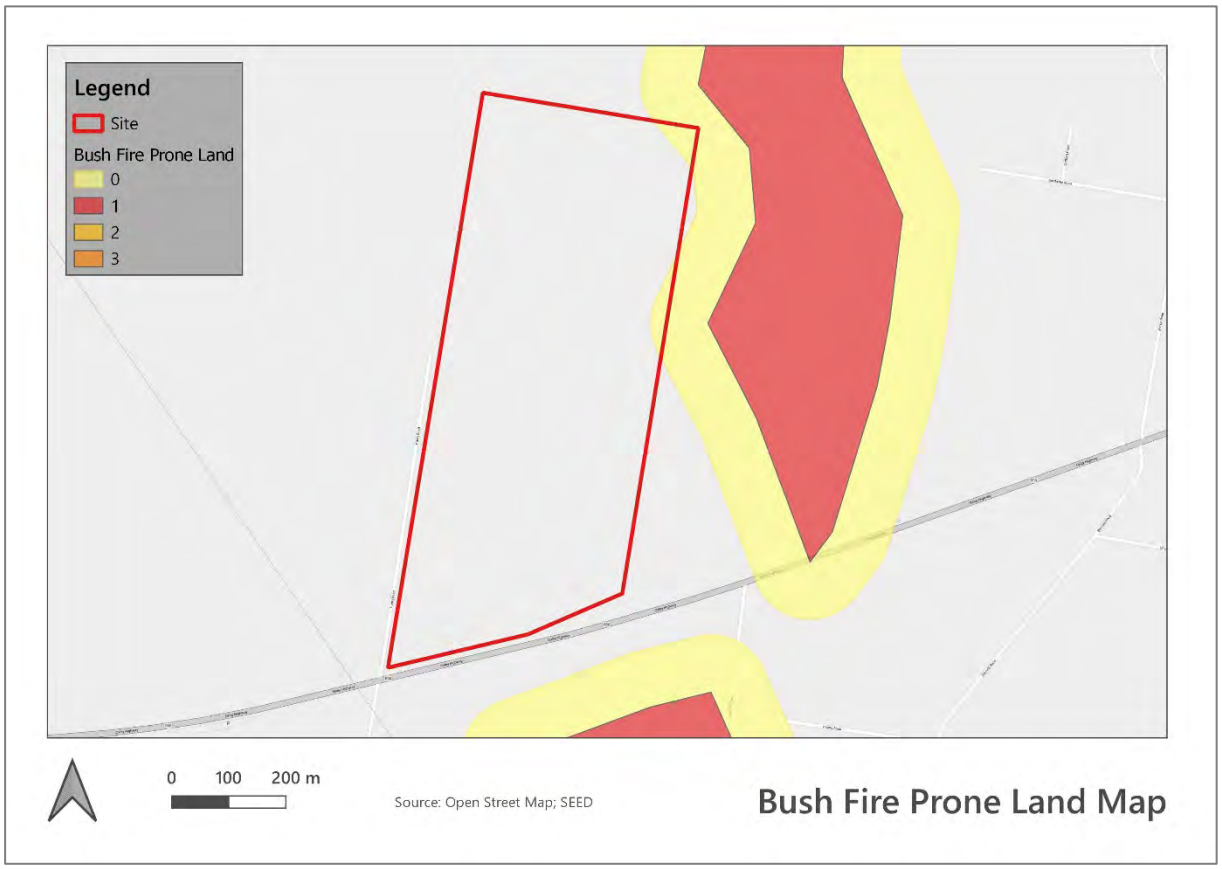


Figure 6: Bush Fire Prone Land Map

1.4.2 Bush Fire Safety Authority

Special Fire Protection Purposes (**SFPP**) development includes tourist accommodation as defined by the *Rural Fires Act 1997* (**RF Act**). SPFF developments within a bush fire prone area require a BFSA to be obtained under section 100B of the RF Act.

Clause 44 of the *Rural Fires Regulation 2013* specifies the requirements for any application for a BFSA. These requirements have been addressed within this report and a checklist provided in **Appendix C** outlining where each requirement has been specifically addressed.

1.4.3 Integrated Development

As the development requires both development consent and a BFSA under Section 100B of the RF Act in order for it to be carried out, the development becomes Integrated Development pursuant to Section 4.46 of the EP&A Act.

In this regard, Council is required to refer the DA to the NSW Rural Fire Service (**RFS**) to obtain the BFSA before it can determine the application in accordance with Section 4.46 of the EP&A Act.

1.4.4 Planning for Bush Fire Protection

PBP applies to all DAs on bush fire prone land. As required by Section 1.4 of PBP, this report has been prepared to address the requirements of the PBP as:

- a SFPP development (caravan sites, eco-tourism tents, Amenities Block/Refuge Building)
- other residential development (Volunteers Accommodation, caretakers house); and
- other non-residential development (Wildlife Centre & Hospital).

Specifically, the following has been addressed in this report:

- The objectives of PBP, as outlined in Section 1.1 of PBP; and
- The performance criteria of the relevant Bush Fire Protection Measures (**BFPM**).

2 Bush Fire Assessment

2.1 Methodology

The methodology utilised for this bush fire assessment is consistent with Appendix 1 of PBP. The following provides the required information in accordance with the methodology.

2.2 Vegetation Formations

A site inspection was carried out on 7 February 2020 of the site and land within 140m of the site (**assessment area**). All vegetation within the assessment area has been classified in accordance with *Ocean Shores to Desert Dunes* (Keith 2004) as required by A1.2 of PBP.

The classified vegetation within the assessment area has been mapped and is shown in **Figure 8** in **Appendix D**. Photographs of the classified vegetation from the site inspection are provided in the following plates for each of the assessment plots.

Plot 1	
Vegetation Description	Grassland with scattered remnant trees.
Existing Classification	Grassland
Post Development Classification	Grassland, Exclusion (plantation) & APZ

Plate 1: Plot 1

Plate 2: Plot 1

Plot 1	
Vegetation Description	Grassland with scattered remnant trees.
Existing Classification	Grassland
Post Development Classification	Grassland, Exclusion (plantation) & APZ

Plate 3: Plot 1

Plate 4: Plot 1

Plate 5: Plot 1

Plate 6: Plot 1

Plot 1	
Vegetation Description	Grassland with scattered remnant trees.
Existing Classification	Grassland
Post Development Classification	Grassland, Exclusion (plantation) & APZ

Plate 7: Plot 1

Plate 8: Plot 1

Plate 9: Plot 1

Plate 10: Plot 1

Plot 2	
Vegetation Description	Remnant cypress pines. This plot will be changed to a eucalypt plantation as part of the development. The vegetation will be regularly harvested for koala food and as such will not become "unmanaged" vegetation.
Existing Classification	Forest
Post Development Classification	Low threat vegetation – exclusion (low threat vegetation)

Plate 11: Plot 2

Plate 12: Plot 2

Plot 3	
Vegetation Description	Remnant forest vegetation, some areas heavily disturbed. Mapped as Dry Sclerophyll Forests (Shrubby sub-formation)
Existing Classification	Forest
Post Development Classification	Forest

Plate 13: Plot 3

Plate 14: Plot 3

Plot 3	
Vegetation Description	Remnant forest vegetation, some areas heavily disturbed. Mapped as Dry Sclerophyll Forests (Shrubby sub-formation)
Existing Classification	Forest
Post Development Classification	Forest

Plate 15: Plot 3

Plate 16: Plot 3

Plate 17: Plot 3

Plate 18: Plot 3

Plot 4	
Vegetation Description	Area previously cleared of vegetation and is highly disturbed
Existing Classification	Low Threat Vegetation – exclusion (non-vegetated area)
Post Development Classification	Low Threat Vegetation – exclusion (non-vegetated area)

Plate 19: Plot 4

Plate 20: Plot 4

Plate 21: Plot 4

Plate 22: Plot 4

Plot 4	
Vegetation Description	Area previously cleared of vegetation and is highly disturbed
Existing Classification	Low Threat Vegetation – exclusion (non-vegetated area)
Post Development Classification	Low Threat Vegetation – exclusion (non-vegetated area)

Plate 23: Plot 4

Plate 24: Plot 4

Plate 25: Plot 4

Plate 26: Plot 4

Plot 4	
Vegetation Description	Area previously cleared of vegetation and is highly disturbed
Existing Classification	Low Threat Vegetation – exclusion (non-vegetated area)
Post Development Classification	Low Threat Vegetation – exclusion (non-vegetated area)

Plate 27: Plot 4

Plate 28: Plot 4

Plate 29: Plot 4

Plot 5	
Vegetation Description	Patch of remnant forest vegetation amongst heavily disturbed areas of grassland.
Existing Classification	Forest
Post Development Classification	Forest

Plate 30: Plot 5

Plate 31: Plot 5

Plate 32: Plot 5

Plot 6	
Vegetation Description	Patch of remnant forest vegetation amongst heavily disturbed areas of grassland.
Existing Classification	Forest
Post Development Classification	Forest

Plate 33: Plot 6

Plate 34: Plot 6

Plate 35: Plot 6

Plot 7	
Vegetation Description	Motorcycle track with semi managed grassland vegetation and scattered remnant trees.
Existing Classification	Grassland
Post Development Classification	Grassland

Plate 36: Plot 7

Plate 37: Plot 7

Plate 38: Plot 7

Plate 39: Plot 7

Plot 8	
Vegetation Description	Grassland with scattered remnant trees off site.
Existing Classification	Grassland
Post Development Classification	Grassland

Plate 40: Plot 8

Plate 41: Plot 8

Plate 42: Plot 8

Plate 43: Plot 8

Plot 9	
Vegetation Description	Site not accessible. Review of state vegetation type map shows it mapped as Dry Sclerophyll Forests (Shrubby sub-formation) Aerial imagery shows woodland type vegetation structure.
Existing Classification	Woodland
Post Development Classification	Woodland
	No photos available

Plot 10	
Vegetation Description	Site not accessible. Review of state vegetation type map shows it mapped as Dry Sclerophyll Forests (Shrubby sub-formation) Aerial imagery shows closer to forest type vegetation structure than Plot 9
Existing Classification	Forest
Post Development Classification	Forest
	No photos available

Plot 11	
Vegetation Description	Remnant forest vegetation. Mapped as Dry Sclerophyll Forests (Shrubby sub-formation)
Existing Classification	Forest
Post Development Classification	Forest

Plate 44: Plot 11

Plate 45: Plot 11

Plot 12	
Vegetation Description	Grassland vegetation around existing dwellings, with areas of managed vegetation and scattered trees.
Existing Classification	Grassland
Post Development Classification	Grassland

Plate 46: Plot 12

Plate 47: Plot 12

Plot 13	
Vegetation Description	Site not accessible. Review of state vegetation type map shows it mapped as Dry Sclerophyll Forests (Shrubby sub-formation) and extends from subject site. Conservatively mapped as forest.
Existing Classification	Forest
Post Development Classification	Forest
	No photos available

Plot 14	
Vegetation Description	Remnant stand of Cypress pines
Existing Classification	Forest
Post Development Classification	Forest

Plate 48: Plot 14

Plate 49: Plot 14

Plot 14	
Vegetation Description	Remnant stand of Cypress pines
Existing Classification	Forest
Post Development Classification	Forest

Plate 50: Plot 14

Plot 15	
Vegetation Description	Remnant stand of Cypress pines
Existing Classification	Forest
Post Development Classification	Forest

Plate 51: Plot 15

Plot 16	
Vegetation Description	Remnant forest vegetation. Mapped as Dry Sclerophyll Forests (Shrubby sub-formation)
Existing Classification	Forest
Post Development Classification	Forest

Plate 52: Plot 16

Plate 53: Plot 16

Plate 54: Plot 16

Plate 55: Plot 16

Plot 16	
Vegetation Description	Remnant forest vegetation. Mapped as Dry Sclerophyll Forests (Shrubby sub-formation)
Existing Classification	Forest
Post Development Classification	Forest

Plate 56: Plot 16

Plot 17	
Vegetation Description	Unmanaged and semi managed grassland vegetation with scattered trees.
Existing Classification	Grassland
Post Development Classification	Grassland

Plate 57: Plot 17

Plate 58: Plot 17

Plot 17	
Vegetation Description	Unmanaged and semi managed grassland vegetation with scattered trees.
Existing Classification	Grassland
Post Development Classification	Grassland

Plate 59: Plot 17

Plate 60: Plot 17

2.3 Effective Slope

The topography for the site is shown in **Figure 7**. To determine the effective slope, 1m contour data has been sourced from Geoscience Australia's Digital Elevation Data (**ELVIS**) and a survey of the site. The contour data was verified by ground truthing during the site inspection.

2.4 Fire Weather

The subject site is located within the Gunnedah LGA. Pursuant to A1.6 of the PBP and the RFS' *NSW Local Government Areas FDI* (NSW Rural Fire Service 2017), the relevant Fire Danger Index (**FDI**) for the site is 80.

Figure 7: Contours

2.5 Asset Protection Zone Determination

Asset Protection Zones (**APZ**) have been determined for the proposed development in accordance with Tables A1.12.1 and A1.12.3 of PBP.

2.5.1 Special Fire Protection Purpose APZs

The caravan sites, eco-tourism tents and amenities block (refuge building) are classed as SFPP development. Therefore, the APZs for these components of the development have been determined in accordance with Table A1.12.1 of PBP. Noting that Table 6.8a of PBP does not require an APZ for the eco-tourism tent; only the associated refuge building. Therefore, only the caravan sites and amenities block have been considered below.

In addition, Section 8.3.11 of PBP requires Class 9b buildings to have an APZ sized to 10kW/m². As such the Wildlife Centre Building has also been included in the table below.

The following table summarises the APZs required by PBP and the size of APZ actually to be provided for each component.

Table 1: SFPP APZ Calculation

Plot	Vegetation Classification	Effective Slope	APZ Required	APZ Provided
Caravan Sites				
1a	Grassland	Downslope >0°-5°	40m	40m
1b	Grassland	Upslope	36m	67m
2	Exclusion	N/A	N/A	N/A
3	Forest	Flat/Upslope	67m	67m
4	Exclusion	N/A	N/A	N/A
5	Forest	Flat/Upslope	67m	67m
6	Forest	Flat/Upslope	67m	67m
8	Grassland	Downslope >0°-5°	40m	40m
16	Forest	Upslope	67m	67m
17	Grassland	Flat/Upslope	36m	40m
Amenities Block/Refuge Building				
1a	Grassland	Downslope >0°-5°	40m	67m
1b	Grassland	Upslope	36m	67m
2	Exclusion	N/A	N/A	N/A
3	Forest	Flat/Upslope	67m	67m
4	Exclusion	N/A	N/A	N/A
5	Forest	Flat/Upslope	67m	67m
6	Forest	Flat/Upslope	67m	67m
16	Forest	Upslope	67m	67m
17	Grassland	Flat/Upslope	36m	67m
Wildlife Centre/Hospital Building				
1a	Grassland	Downslope >0°-5°	40m	67m
1b	Grassland	Upslope	36m	67m

Table 1: SFPP APZ Calculation

Plot	Vegetation Classification	Effective Slope	APZ Required	APZ Provided
3	Forest	Downslope >0°-5°	79m	79m
4	Exclusion	N/A	N/A	N/A
5	Forest	Flat/Upslope	67m	67m

As shown above, the development will provide for APZ that are compliant with Table A1.12.1 of PBP for the SFPP development components, being:

- Caravan Sites:
    - 67m towards the forest vegetation plots; and
    - 40m to the downslope grassland plots.
- Amenities Block/Refuge Building = 67m
- Wildlife Centre/Hospital Building:
    - 79m towards the downslope forest vegetation plots; and
    - 67m to the upslope forest vegetation plots.

The location and extent of the APZs are shown on **Figure 9**.

It is noted that for APZs within forest vegetation, an outer protection area will be provided pursuant to Table A1.12.4 of PBP. This will equate to:

- The outer 20m of the APZ for all upslope forest vegetation; and
- The outer 25m of the APZ for all downslope >0°-5° forest vegetation.

The outer APZ will only be applied to the Wildlife Centre/Hospital Building, as shown in Figure 10.

2.5.2 Other Residential Development/Other Development APZs

The Volunteers accommodation and caretakers dwelling are classed as other residential development. Therefore, the APZs for these components of the development have been determined in accordance with Table 1.12.3 of PBP.

The following table summarises the APZs required by PBP and the size of APZ actually to be provided for each component.

Table 2: Other Residential/Other Development APZ Calculation

Plot	Vegetation Classification	Effective Slope	APZ Required	APZ Provided
Volunteers Accommodation				
1a	Grassland	Downslope >0°-5°	11m	25m
1b	Grassland	Upslope	10m	25m
2	Exclusion	N/A	N/A	N/A
3a	Forest	Downslope >0°-5°	25m	25m
3b	Forest	Flat/Upslope	20m	25m
4	Exclusion	N/A	N/A	N/A
5	Forest	Flat/Upslope	20m	25m
6	Forest	Flat/Upslope	20m	25m

Table 2: Other Residential/Other Development APZ Calculation

Plot	Vegetation Classification	Effective Slope	APZ Required	APZ Provided
13	Forest	Flat/Upslope	20m	25m
14	Forest	Downslope >0°-5°	25m	25m
17	Grassland	Flat/Upslope	10m	25m
Caretakers Dwelling				
1a	Grassland	Downslope >0°-5°	11m	25m
1b	Grassland	Upslope	10m	25m
2	Exclusion	N/A	N/A	N/A
4	Exclusion	N/A	N/A	N/A
5a	Forest	Downslope >0°-5°	25m	25m
5b	Forest	Flat/Upslope	20m	25m
6	Forest	Downslope >0°-5°	25m	25m
12	Grassland	Downslope >5°-10°	12m	25m
14	Forest	Downslope >0°-5°	25m	25m
17	Grassland	Downslope >0°-5°	11m	25m

As shown above, the development will provide for APZ that are compliant with Table 1.12.3 of PBP for the other residential development components, being:

- Volunteers Accommodation = 25m
- Caretakers Dwelling = 25m

The location and extent of the APZs are shown on **Figure 9**.

2.6 Indicative BAL Determination

2.6.1 Indicative SFPP Development BALs

PBP requires an APZ for SFPP development to be sized to achieve 10kW/m² at 1200K. Therefore, where compliant SFPP APZs are provided the maximum radiant heat exposure for the building would be 10kW/m². Consequently, the BAL for these buildings would be BAL-12.5, being a radiant heat flux exposure threshold of ≤ 12kW/m². Noting that this would only apply to:

- the Amenities/Refuge Building as outlined in **Section 3.5.1**.
- the Wildlife/Hospital Building as outlined in **Section 5.4.1**.

2.6.2 Indicative BALs for Other Residential/Other Development

The Bushfire Attack Levels (**BAL**) have been determined for the Other Residential/Other Development components of the development using Table A1.12.6 of PBP.

The Inputs used in the calculation of the BAL are as outlined in the following table.

Table 3: Indicative Bushfire Attack Level (BAL) Determination Inputs

Criteria	Input
Relevant FDI (as per Section 2.4)	80
Classified vegetation (As per Section 2.2)	**Table 4**
Separation Distance	**Table 4**
Effective Slope (as per Section 0)	**Table 4**

Table 4: Other Residential/Other Development Indicative Bushfire Attack Level (BAL) Determination

Plot	Vegetation Classification	Effective Slope	Separation Distance	BAL
Volunteers Accommodation				
1a	Grassland	Downslope >0°-5°	25m	BAL-12.5
1b	Grassland	Upslope	25m	BAL-12.5
2	Exclusion	N/A	N/A	N/A
3a	Forest	Downslope >0°-5°	78m	BAL-12.5
3b	Forest	Flat/Upslope	81m	BAL-12.5
4	Exclusion	N/A	N/A	N/A
5	Forest	Flat/Upslope	45m	BAL-12.5
			Worst Case BAL	**BAL-12.5**
Caretakers Dwelling				
1a	Grassland	Downslope >0°-5°	25m	BAL-12.5
1b	Grassland	Upslope	25m	BAL-12.5
2	Exclusion	N/A	N/A	N/A
4	Exclusion	N/A	N/A	N/A
5a	Forest	Downslope >0°-5°	25m	BAL-29
5b	Forest	Flat/Upslope	29m	BAL-19
6	Forest	Downslope >0°-5°	55m	BAL-12.5
12	Grassland	Downslope >5°-10°	40m	BAL-12.5
			Worst Case BAL	**BAL-29**

3 SFPP Bush Fire Protection Measures

3.1 Introduction

This section of the report applies to the following components of the development:

- Caravan accommodation
- Safari Tents; and
- Refuge Building.

SPFF are required to comply with the Bush Fire Protection Measures (BFPM) outlined in Section 6.8 of PBP. There are six key BFPMs outlined by PBP:

- Asset Protection Zones and Defendable Space;
- Construction Standards and Design;
- Access Standards;
- Water Supply and Utility Services;
- Emergency Management Arrangements; and
- Landscaping

The BFPMs relevant to the development have been considered in **Section 3.5**. The plan in **Appendix E** illustrates the BFPM as applied to the development.

PBP requires consideration of the development in relation to the aims and objectives of PBP and also the objectives for SFPP. These matters have been considered respectively in **Sections 3.2** and **3.3**.

3.2 PBP Aims & Objectives

The 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.*

The objectives of PBP are to:

- *afford buildings and their occupants protection from exposure to a bush fire;*
- *provide for a defendable space to be located around buildings;*
- *provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;*
- *ensure that appropriate operational access and egress for emergency service personnel and occupants is available;*
- *provide for ongoing management and maintenance of BPMs; and*
- *ensure that utility services are adequate to meet the needs of firefighters.*

The development has been designed to provide for the SFPP components of the development to have radiant heat levels of a maximum of 10kW/m² and to avoid flame contact, thus providing for appropriate separation and exposure to the hazards. The development design in conjunction with the bush fire protection measures will provide for safe operational access and egress for emergency services personnel and possible residents within the development, as well as sufficient water supply. Therefore, the proposed development is considered to be consistent with the objectives of PBP.

3.3 PBP Objectives for SFPP Developments

Section 6.2 of PBP contains the specific objectives for SFPP Developments:

- *minimise levels of radiant heat, localised smoke and ember attack through increased APZ, building design and siting;*
- *provide an appropriate operational environment for emergency service personnel during firefighting and emergency management;*
- *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; and*
- *ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.*

In complying with the BFPM, the proposed development complies with objectives for SFPP developments outlined above.

3.4 Objectives for Specific Uses

PBP recognises that Particular SFPP developments demonstrate different characteristics and may require different levels of protection. As such, tailored objectives are specified for these development types. This is in recognition of:

- lower occupancy levels;
- the presence of a resident/manager on site, thereby improving the potential for informed emergency evacuation decisions; and
- construction under AS 3959 or NASH Standard may be impractical (i.e. tents and caravans).

In particular, PBP provides the following guidance for specific tourism uses associated with the development:

- ***Caravan parks*** *– Standard type caravans and motor homes used for short-term tourist accommodation generally cannot achieve any level of construction under AS 3959 or NASH Standard. The emphasis is therefore placed on APZs and emergency management, with consideration given to leaving early and non-operation on days of elevated bush fire danger.*
- ***Ecotourism*** *– Due to its focus on the natural environment and creating minimal impact, the principles of ecotourism and the establishment of APZs for bush fire mitigation are often in conflict. All relevant parties must accept that there is an increase for the potential for loss of structures due to the competing objectives to reduce the environmental footprints of these types of developments. The emphasis is therefore placed on emergency management, leaving early and non-operation on days of extreme or catastrophic fire weather. At least one building must be provided on site that can be used as a refuge for the maximum number of occupants on site. The building must have a minimum 10kW/m² APZ, be constructed to BAL-12.5 and have vehicular access. Cabins must be within a 100m walking distance of the refuge building.*

These provisions are recognised in the following considerations of the Bush Fire Protection Measures for the development.

3.5 Bush Fire Protection Measures

3.5.1 Asset Protection Zones & Building Construction

The intent of measures for the Asset Protection Zone (APZ) and Building Construction BFPM is:

> *to provide suitable building design, construction and sufficient space to ensure that radiant heat levels do not exceed critical limits for firefighters and other emergency services personnel undertaking operations, including supporting or evacuating occupants.*

The following table outlines the Performance Criteria and associated Acceptable Solutions for the BFPM, and how the development responds.

Table 5: Asset Protection Zones & Building Construction

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
ASSET PROTECTION ZONES					
Radiant heat levels of greater than 10kW/m² (calculated at 1200K) will not be experienced on any part of the building.	The building is provided with an APZ in accordance with Table A1.12.1 in Appendix 1.	☒	☐	☐	A compliant APZ is to be provided around the Caravan sites and refuge building/amenities building as outlined in **Table 1** and shown on **Figure 9**. An APZ is not required for the tents as they are considered as a variation as outlined below.
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	APZs are located on lands with a slope less than 18 degrees.	☒	☐	☐	APZs will be on less than 18 degrees slope.
• APZs are managed and maintained to prevent the spread of fire to the building. • The APZ is provided in perpetuity.	The APZ is managed in accordance with the requirements of Appendix 4 of this document, and	☒	☐	☐	APZ are to be managed in accordance with Appendix 4 of PBP as outlined in **Appendix F** of this report.
	APZ are wholly within the boundaries of the development site; and	☒	☐	☐	APZs are to be wholly within the subject site.

Table 5: Asset Protection Zones & Building Construction

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Other structures located within the APZ need to be located further than 6m from the refuge building.	☒	☐	☐	All other structures located within the APZ are to be located further than 6m from the refuge building.
Variations					
Camping and primitive camping: no performance criteria applicable.	N/A.	☐	☐	☒	Conservatively the camping component of the development has been considered as ecotourism, which will provide for a refuge building as opposed to providing noting in accordance with straight camping. See below.
Bed and breakfast and farmstay: the building will not be exposed to radiant heat levels exceeding 29kW/m² (1090K).	An APZ is provided in accordance with Tables A1.12.2 or A1.12.3 in Appendix 1 of this document around the entire building or structure.	☐	☐	☒	Nil proposed.
Ecotourism: radiant heat levels of greater than 10kW/m² (1200K) are not experienced by emergency service personnel and occupants during firefighting and emergency management around a building on site that can be used as a refuge.	An APZ is provided in accordance with Table A1.12.1 in Appendix 1 of this document around the entire refuge building or structure.	☒	☐	☐	A compliant APZ is to be provided around the refuge building as outlined in **Table 1** and shown on **Figure 9**.
Manufactured home estates: APZs achieve radiant heat levels that are commensurate with the construction standard for the proposed dwellings.	• an APZ in accordance with Table A1.12.1 in Appendix 1 of this document is provided to all new dwellings; or • an APZ in accordance with Table A1.12.2 or A1.12.3 in Appendix 1 of this document is provided where it is demonstrated that all new dwellings	☐	☐	☒	Nil proposed.

Table 5: Asset Protection Zones & Building Construction

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	will be constructed in accordance with BAL-29.				
LANDSCAPING					
Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Landscaping is in accordance with Appendix 4; and	☒	☐	☐	Landscaping is to be managed in accordance with Appendix 4 of PBP as outlined in **Appendix F** of this report.
	Fencing is constructed in accordance with section 7.6.	☒	☐	☐	Any fencing is to be constructed in accordance with Section 7.6 of PBP, being: • all fences in bush fire prone areas should be made of either hardwood or non-combustible material. • where the fence is within 6m of a building or in areas of BAL-29 or greater, they should be made of non-combustible material only.
CONSTUCTION STANDARDS					
The proposed building can withstand bush fire attack in the form of wind, embers, radiant heat and flame contact.	A construction level of BAL-12.5 under AS 3959 or NASH Standard and section 7.5 of PBP is applied.	☒	☐	☐	As outlined in **Section 2.6.1**, the amenities/refuge building is to be constructed to BAL-12.5. Caravans are not buildings as defined by the BCA. Noting in Section 6.3.1 of PBP that caravans cannot achieve AS3959 Construction Standards, the emphasis is therefore placed on APZs and emergency management, with consideration given to leaving early and non-operation on days of elevated bush fire danger.
Variations					
Camping and primitive camping: no performance criteria applicable.	N/A.	☐	☐	☒	Nil proposed.

Table 5: Asset Protection Zones & Building Construction

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Bed and breakfast and farmstay: the proposed building can withstand bush fire attack in the form of wind, embers, radiant heat and flame contact.	Construction is applied in accordance with Appendix 1 of PBP.	☐	☐	☒	Nil proposed.
Ecotourism: the proposed refuge building can withstand bush fire attack in the form of wind, embers, radiant heat and flame contact.	A construction level of BAL-12.5 or greater is applied to the refuge building in accordance with AS 3959 or NASH Standard and 7.5 of PBP.	☒	☐	☐	As outlined in **Section 2.6.1**, the amenities/refuge building is to be constructed to BAL-12.5.
Manufactured home estates: the proposed manufactured home can withstand bush fire attack in the form of wind, embers, radiant heat and flame contact.	• Where an APZ is provided in accordance with Table A1.12.1 in Appendix 1 of this document the construction standards for BAL-12.5 shall apply; or • Where an APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1 of this document the construction standards for BAL-29 shall apply.	☐	☐	☒	Nil proposed.
ECOTOURISM					
Occupants of the ecotourism facility are provided with appropriate shelter in the event of a bush fire.	A refuge building is provided;	☒	☐	☐	A refuge building is provided.
	The refuge building must have sufficient space for all occupants and comply with the occupancy levels permissible for that structure; and	☒	☐	☐	The refuge building will have sufficient space (floor area and volume) for all occupants (maximum 18) and comply with the occupancy levels permissible for that structure;

Table 5: Asset Protection Zones & Building Construction

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	The refuge building must be constructed to BAL-12.5 or greater in accordance with AS 3959 or NASH Standard and 7.5 of PBP.	☒	☐	☐	As outlined in **Section 2.6.1**, the amenities/refuge building is to be constructed to BAL-12.5.

3.5.2 Access

The intent of measures for the Access BFPM is:

to provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area.

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Access BFPM, and how the development responds.

Table 6: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
ACCESS					
Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	SFPP access roads are two-wheel drive, all-weather roads	☒	☐	☐	The access roads are to be two-wheel drive, all-weather roads.
	Access is provided to all structures;	☒	☐	☐	Access will be provided to all structures.

Table 6: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Traffic management devices are constructed to not prohibit access by emergency services vehicles;	☒	☐	☐	Traffic management devices will be constructed to not prohibit access by emergency services vehicles.
	Access roads must provide suitable turning areas in accordance with Appendix 3; and	☒	☐	☐	Access roads must provide suitable turning areas in accordance with Appendix 3 of PBP as provided in **Appendix G** of this report.
	One way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.	☒	☐	☐	One-way access roads are wider than 3.5m.
Variations					
Primitive camping: Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	Access is provided in accordance with the property access requirements of Table 5.3b.	☐	☐	☒	Nil proposed.
Bed and breakfast and farmstay: Firefighting vehicles are provided with safe, all-weather access to structures.	Access is provided in accordance with the property access requirements of Table 5.3b.	☐	☐	☒	Nil proposed.
Ecotourism: fire fighting vehicles are provided with safe, all-weather access to the proposed refuge building.	Vehicular access is provided to the refuge building from a public road in accordance with property access requirements of Table 5.3b;	☒	☐	☐	Vehicular access from the public road to the refuge building will be as follows: • minimum 4m carriageway width; • a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches;

Table 6: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
					• provide a suitable turning area in accordance with Appendix 3 of PBP; • curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress; • the minimum distance between inner and outer curves is 6m; • the crossfall is not more than 10 degrees; and • maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.
	Accommodation is within 100m of the refuge building; and	☒	☐	☐	All ecotourism accommodation is within 100m of the refuge building, as shown on the plans in **Appendix A**.
	Pedestrian paths from accommodation to the refuge building/s are provided and clearly signposted.	☒	☐	☐	Pedestrian paths are provided from the accommodation to the refuge building/s and are clearly signposted.
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 and causeways are to clearly indicate load rating.	☒	☐	☐	The capacity of road surfaces and any bridges/ causeways is to be sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes). No bridges and causeways.
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;	☒	☐	☐	Hydrants are to be located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression

Table 6: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005; and	☒	☐	☐	Hydrants are to be provided in accordance with the relevant clauses of AS 2419.1:2005
	there is suitable access for a Category 1 fire appliances to within 4m of the static water supply where no reticulated supply is available.	☒	☐	☐	Reticulated water supply to be provided.
PERIMETER ROADS					
Perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	There are two-way sealed roads;	☐	☒	☐	The perimeter roads are two way. The primary entrance road is sealed. The secondary access road is to be unsealed. Therefore, a performance solution has been provided in **Section 3.5.2.1** for the unsealed component.
	Minimum 8m carriageway width kerb to kerb;	☐	☒	☐	The primary access road is to have a width of 8m, which complies with the Acceptable Solution. The secondary access road is to have a width of 5m, which does not comply with the Acceptable Solution. Therefore, a performance solution has been provided in **Section 3.5.2.1**.
	Parking is provided outside of the carriageway width;	☒	☐	☐	No parking provided within the carriageway.
	Hydrants are to be located clear of parking areas;	☒	☐	☐	Hydrants are to be located clear of parking areas.
	There are through roads, and these are linked to the internal road system at an interval of no greater than 500m;	☐	☐	☒	Not considered relevant in this instance.

Table 6: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Curves of roads have a minimum inner radius of 6m;	☒	☐	☐	Curves of roads are to have a minimum inner radius of 6m
	The maximum grade road is 15 degrees and average grade of not more than 10 degrees;	☒	☐	☐	The maximum grade road is 15 degrees and average grade of not more than 10 degrees;
	The road crossfall does not exceed 3 degrees; and	☒	☐	☐	The road crossfall does not exceed 3 degrees
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☒	☐	☐	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is to be provided.
Non-perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating.	Minimum 5.5m carriageway width kerb to kerb;	☒	☐	☐	The caravan sites access would be designed to provide a 5.5m carriageway.
	Parking is provided outside of the carriageway width;	☒	☐	☐	Parking is to be provided outside of the carriageway area.
	Hydrants are located clear of parking areas;	☒	☐	☐	Hydrants are to be located clear of parking areas
	There are through roads, and these are linked to the internal road system at an interval of no greater than 500m;	☒	☐	☐	This road links to the perimeter road system.
	Curves of roads have a minimum inner radius of 6m;	☒	☐	☐	Curves of roads are to have a minimum inner radius of 6m.
	The maximum grade road is 15 degrees and average grade of not more than 10 degrees;	☒	☐	☐	The maximum grade road is 15 degrees and average grade of not more than 10 degrees.

Table 6: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	The road crossfall does not exceed 3 degrees; and	☒	☐	☐	The road crossfall is not to exceed 3 degrees.
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☒	☐	☐	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is to be provided.

3.5.2.1 Performance Solution Access

The development has provided the secondary access road which:

- Is unsealed; and
- Has a width of 5m.

The secondary access road does not comply with the Acceptable Solutions for a Perimeter Road.

Pursuant to Section 1.4.5 of PBP:

> *Performance based solutions must provide substantiated evidence and clearly demonstrate how the specific objectives and performance criteria are to be satisfied.*

Furthermore, Section A2.4 of PBP requires:

> *For performance based applications, it must be demonstrated how the product, design or material can meet the performance criteria of this document including the intent of measures and also, the aim and objectives.*

The Intent and Performance Criteria are outlined in the table below.

Table 7: Applicable Performance Criteria & Acceptable Solutions for Access

Intent	Performance Criteria	Acceptable Solution
To provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area.	Perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	• there are two-way sealed roads • minimum 8m carriageway width kerb to kerb;

To achieve appropriate access, it is necessary to demonstrate that the performance solution complies with the Performance Criteria. It is proposed in this instance to demonstrate this through evidence to demonstrate that the design meets the performance criteria.

The secondary access road is intended only to be used in times of emergencies and will not ordinarily be used by occupants. It is considered safer to provide a single point of ingress/egress for the public (i.e. the primary access road) that will be sign posted and familiar for users of the development. Furthermore, the camping and caravan components of the development will not operate during elevated fire danger periods (i.e. Catastrophic, Extreme and Severe).

The secondary access road will be used by emergency services in times of a bushfire emergency if required. Whilst the road has a carriageway of 5m, it is intended to provide passing bays every 200m along the road (3m wide x 20m long) to enable emergency services vehicles to pass. As the road will be used infrequently, it will remain in good repair. Therefore, providing it as an unsealed road will not affect its ability to operate as a safe means of access to/from the site.

The area to the west of the secondary access road will all be managed as an APZ for the refuge building and the caravan accommodation. Further, the land surrounding the caretakers dwelling will be managed as an APZ. Therefore, providing lower radiant heat levels surrounding the perimeter road.

Based on the above performance solution, it can be seen that the secondary access road will provide for:

- safe access and egress for fire fighting vehicles whilst occupants are evacuating; and
- a safe operational environment for emergency service personnel during fire fighting and emergency management on the interface.

Consequently, the performance solution will provide for safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area. Therefore, the proposed performance solution is considered to be consistent with both the intent and Performance Criterion of the BFPM and the overall aims and objectives of PBP.

3.5.3 Services - Water Gas & Electricity

The intent of measures for the Services - Water Gas & Electricity BFPM is:

> *to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.*

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Services – Water, Electricity and Gas BFPM, and how the development responds.

Table 8: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
WATER SUPPLY					
An adequate water supply for firefighting purposes is installed and maintained.	• Reticulated water is to be provided to the development, where available; or • A 10,000 litres minimum static water supply for firefighting purposes is provided for each occupied building where no reticulated water is available.	☒	☐	☐	Reticulated water is to be provided to the development.
Variations					
Caravan and camping grounds: an adequate water supply for firefighting purposes is installed and maintained.	• Either a reticulated water supply is provided; or • a 10,000 litres minimum water supply on site.	☒	☐	☐	A reticulated water supply is provided.

Table 8: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Primitive camping: an adequate water supply for firefighting purposes is installed and maintained.	• Either a reticulated water supply is provided; or • a 10,000 litres minimum water supply on site.	☐	☐	☒	Nil proposed.
• Water supplies are located at regular intervals. • The water supply is accessible and reliable for firefighting operations.	Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2005;	☒	☐	☐	Reticulated water supply is to comply.
	Hydrants are not located within any road carriageway; and	☒	☐	☐	Reticulated water supply is to comply.
	Reticulated water supply to SFPPs uses a ring main system for areas with perimeter roads.	☒	☐	☐	Reticulated water supply is to comply.
Flows and pressure are appropriate.	Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.	☒	☐	☐	Reticulated water supply is to comply.
The integrity of the water supply is maintained.	All above-ground water service pipes external to the building are metal, including and up to any taps.	☒	☐	☐	Reticulated water supply is to comply.
Water supplies are adequate in areas where reticulated water is not available.	A connection for firefighting purposes is located within the IPA or non hazard side and away from the structure; a 65mm Storz outlet with a ball valve is fitted to the outlet;	☐	☐	☒	Reticulated water supply to be provided.
	Ball valve and pipes are adequate for water flow and are metal;	☐	☐	☒	Reticulated water supply to be provided.

Table 8: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Supply pipes from tank to ball valve have the same bore size to ensure flow volume;	☐	☐	☒	Reticulated water supply to be provided.
	Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank;	☐	☐	☒	Reticulated water supply to be provided.
	A hardened ground surface for truck access is supplied within 4m of the access hole;	☐	☐	☒	Reticulated water supply to be provided.
	Above-ground tanks are manufactured from concrete or metal;	☐	☐	☒	Reticulated water supply to be provided.
	Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959);	☐	☐	☒	Reticulated water supply to be provided.
	Unobstructed access is provided at all times;	☐	☐	☒	Reticulated water supply to be provided.
	Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters; and	☐	☐	☒	Reticulated water supply to be provided.
	Underground tanks are clearly marked,	☐	☐	☒	Reticulated water supply to be provided.
	All exposed water pipes external to the building are metal, including any fittings;	☐	☐	☒	Reticulated water supply to be provided.

Table 8: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; Any hose and reel for firefighting connected to the pump shall be 19mm internal diameter; and	☐	☐	☒	Reticulated water supply to be provided.
	Fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels, and installed in accordance with the relevant clauses of AS 2441:2005 Installation of fire hose reels.	☐	☐	☒	Reticulated water supply to be provided.
ELECTRICITY SERVICES					
Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings	Where practicable, electrical transmission lines are underground;	☒	☐	☐	Where possible electricity is to be underground.
	Where overhead, electrical transmission lines are proposed as follow:				
	• lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and	☒	☐	☐	If not possible to be provided underground, short pole spacings are to be provided.
	• no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.	☒	☐	☐	Vegetation is to be managed to comply with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.
GAS SERVICES					

Table 8: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used;	☒	☐	☐	Reticulated or bottled gas is to be installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is to be used.
	All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side;	☒	☐	☐	All fixed gas cylinders are to be kept clear of all flammable materials to a distance of 10m and shielded on the hazard side
	Connections to and from gas cylinders are metal;	☒	☐	☐	Connections to and from gas cylinders are to be metal.
	If gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion;	☒	☐	☐	If gas cylinders need to be kept close to the building, safety valves are to be directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion.
	Polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used; and	☒	☐	☐	Polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used
	Above-ground gas service pipes external to the building are metal, including and up to any outlets.	☒	☐	☐	Above-ground gas service pipes external to the building are to be metal, including and up to any outlets.

3.5.4 Emergency Management Planning

The intent of measures for the Emergency Management Planning BFPM is:

To provide suitable emergency and evacuation arrangements for occupants of SFPP developments.

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Emergency Management Planning BFPM, and how the development responds.

Table 9: Emergency Management Planning

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
EMERGENCY MANAGEMENT					
A Bush Fire Emergency Management and Evacuation Plan is prepared.	Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the: • The NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan; • NSW RFS Schools Program Guide; • Australian Standard AS 3745:2010 Planning for emergencies in facilities; and • Australian Standard AS 4083:2010 Planning for emergencies – Health care facilities (where applicable).	☒	☐	☐	A Draft Bush Fire Emergency Management and Evacuation Plan has been prepared consistent with NSW RFS document: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan* and *Australian Standard AS 3745:2010 Planning for emergencies in facilities*. It is provided in **Appendix H**.
	The Bush Fire Emergency Management and Evacuation Plan should include planning for the early relocation of occupants.	☒	☐	☐	Bush Fire Emergency Management and Evacuation Plan provides for planning for the early relocation of occupants.

Table 9: Emergency Management Planning

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Note: A copy of the Bush Fire Emergency Management and Evacuation Plan should be provided to the Local Emergency Management Committee for its information prior to occupation of the development.	☒	☐	☐	To be conditionally required as part of the development consent.
Variations					
Caravan and camping grounds: a Bush Fire Emergency Management and Evacuation Plan is prepared. **Primitive camping**: a Bush Fire Emergency Management and Evacuation Plan is prepared.	A Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, and AS 3745:2010;	☒	☐	☐	A Draft Bush Fire Emergency Management and Evacuation Plan has been prepared consistent with NSW RFS document: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan* and *Australian Standard AS 3745:2010 Planning for emergencies in facilities*. It is provided in **Appendix H**.
	For proposals in isolated or remote areas which involve large travel distances through bush fire prone vegetation, the following issues should be determined and addressed: • the amount of travel likely to be generated during an emergency evacuation; • the capacity of the broader road network to facilitate safe emergency evacuation; • limitations/constraints inherent in the road system; and	☐	☐	☒	Not considered to be an isolated or remote area involving large travel distances through bush fire prone vegetation.

Table 9: Emergency Management Planning

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	• management of potential traffic conflicts (such as emergency vehicles versus evacuating members of the public).				
	The Bush Fire Emergency Management and Evacuation Plan must consider a mechanism for the early relocation of occupants on days when adverse fire weather is notified or adverse fire activity occurs in the local government area in which the development operates.	☒	☐	☐	Bush Fire Emergency Management and Evacuation Plan provides mechanisms for the early relocation of occupants on days when adverse fire weather is notified or adverse fire activity occurs in the local government area in which the development operates.
	Note: A copy of the Bush Fire Emergency Management and Evacuation Plan shall be provided to the Local Emergency Management Committee for its information prior to occupation of the development.	☒	☐	☐	To be conditionally required as part of the development consent.
Appropriate and adequate management arrangements are established for consultation and implementation of the Bush Fire Emergency Management and Evacuation Plan.	An Emergency Planning Committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures Manual; and	☒	☐	☐	An Emergency Planning Committee is established to consult with residents and staff in developing and implementing an Emergency Procedures Manual.

Table 9: Emergency Management Planning

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Detailed plans of all emergency assembly areas including on site and off-site arrangements as stated in AS 3745:2010 are clearly displayed, and an annually emergency evacuation is conducted.	☒	☐	☐	Detailed plans of all emergency assembly areas (including on site and off-site arrangements as stated in AS 3745:2010) are to be clearly displayed, and an annually emergency evacuation is to be conducted.

4 Other Residential Development Bush Fire Protection Measures

4.1 Introduction

This section of the report applies to the following components of the development:

- Volunteers Accommodation; and
- Caretakers Dwelling.

Section 8.1 of PBP provides that in order for Other Developments to comply with PBP, the following conditions must be met:

- satisfy the aim and objectives of PBP outlined in Chapter 1;
- consider any issues listed for the specific purpose for the development set out in this chapter; and
- propose an appropriate combination of BPMs.

Further,

> *It is important to ensure that a defendable space is provided for the size and scale of the development. Proposed measures must operate in combination to minimise the impact of bush fire and ensure that access and services are adequate.*

These have been addressed below.

4.2 PBP Aims & Objectives

The 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.*

The objectives of PBP are to:

- *afford buildings and their occupants protection from exposure to a bush fire;*
- *provide for a defendable space to be located around buildings;*
- *provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;*
- *ensure that appropriate operational access and egress for emergency service personnel and occupants is available;*
- *provide for ongoing management and maintenance of BPMs; and*
- *ensure that utility services are adequate to meet the needs of firefighters.*

The development has been designed to provide for the residential components of the development to have radiant heat levels of a maximum of 29kW/m², and to avoid flame contact, thus providing for appropriate separation and exposure to the hazards. The development design in conjunction with the bush fire protection measures will provide for safe operational access and egress for emergency services personnel and possible residents within the development, as well as sufficient water supply. Therefore, the proposed development is considered to be consistent with the objectives of PBP.

4.3 Specific Purpose Issues

Whilst not specifically listed as a use in Section 8.2.1 of PBP, the residential component of the development is considered to be "increased residential densities". In relation to increased densities, PBP states:

> *In some situations increased densities may not be appropriate having regard to the strategic principles (see section 4.1), even though zoning has been approved for the proposed use. A Bush Fire Strategic Study may be required for these proposals as part of the broader BFDB process.*
>
> *Increased resident densities of existing lots that are bush fire prone may heighten the level of risk to the occupants. The presence of additional dwellings can impact on the evacuation and sheltering of residents during a bush fire.*
>
> *Where a new dwelling or dwellings are proposed on existing lots which already contain one or more dwellings, this is considered to be an increase in residential density and can include the following:*
>
> - *dual occupancy;*
> - *multi-dwelling housing;*
> - *secondary dwellings;*
> - *rural workers dwellings; and*
> - *boarding houses.*
>
> *This increase in residential density does not necessarily require a subdivision approval. However, the same principles and criteria associated with subdivisions in bush fire prone areas will apply. This includes ensuring an APZ based on a radiant heat threshold of 29kW/m² for any new dwellings, along with suitable provision for construction, access, water and landscaping.*

It is not considered in this instance that a Bush Fire Strategic Study is required. This BFAR is considered appropriate in this instance for the proposed development.

The residential components of the development form part of a larger SFPP development. The residential component of the development is to be located in the lower risk areas of the site. Therefore the increased densities of residential development is considered to be appropriate for the bushfire risk to the site.

The residential development will be provided with:

- APZs size to achieve ≤ 29kW/m²;
- Requisite construction standards;
- PBP compliant access;
- PBP compliant water supply; and
- PBP compliant landscaping.

Therefore the residential component of the development is considered to comply with the specific purpose issues.

4.4 Bush Fire Protection Measures

Section 8.2 of PBP requires residential development to comply with Chapter 7 of PBP. Consideration of the BFPM outlined in Chapter 7 of PBP are provided below, outlining how the residential component of the development complies.

4.4.1 Asset Protection Zone

The following table outlines the Performance Criteria and associated Acceptable Solutions for the APZ BFPM, and how the development responds.

Table 10: Asset Protection Zones

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
• APZs are provided commensurate with the construction of the building; and • A defendable space is provided.	An APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1.	☒	☐	☐	**Table 2** outlines the minimum APZs required for compliance with the Acceptable Solution for both buildings. The proposed development provides a compliant APZ for both buildings, thus complying with the Acceptable Solution.
APZs are managed and maintained to prevent the spread of a fire to the building.	APZs are managed in accordance with the requirements of Appendix 4 of PBP.	☒	☐	☐	The APZ is to be managed in accordance with the requirements of Appendix 4 of PBP (and contained in **Appendix F** of this report).
• The APZ is provided in perpetuity. • APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	APZs are wholly within the boundaries of the development site.	☒	☐	☐	APZ is wholly within the subject site.
	APZ are located on lands with a slope less than 18 degrees.	☒	☐	☐	The APZ will be located on land with a slope of less than 18 degrees.
Variations					
Home-based child care: the building must not be exposed to radiant heat levels exceeding 29kW/m² (1090K).	An APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1.	☐	☐	☒	

4.4.2 Access

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Access BFPM, and how the development responds.

Table 11: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	Property access roads are two-wheel drive, all weather roads.	☒	☐	☐	Property access roads are two-wheel drive, all weather roads.
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 and causeways are to clearly indicate load rating.	☒	☐	☐	The capacity of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes), bridges and causeways are to clearly indicate load rating.
There is appropriate access to water supply.	• Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005; • There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	☒	☐	☐	Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005.
Firefighting vehicles can access the dwelling and exit the property safely.	• At least one alternative property access road is provided for individual dwellings or groups of dwellings that are located more than 200 metres from a public through road; • There are no specific access requirements in an urban area where an unobstructed path (no	☒	☐	☐	• Two access roads are provided within the site to provide access to public roads. • minimum 4m carriageway width provided; • a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches; • property access must provide a suitable turning area in accordance with Appendix 3;

Table 11: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles. In circumstances where this cannot occur, the following requirements apply: • minimum 4m carriageway width; • in forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay; • a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches; • property access must provide a suitable turning area in accordance with Appendix 3; • curves have a minimum inner radius of 6m and are minimal in				• curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress; • the minimum distance between inner and outer curves is 6m; • the crossfall is not more than 10 degrees; • maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads; and • a development comprising more than three dwellings has formalised access by dedication of a road and not by right of way.

Table 11: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	number to allow for rapid access and egress; • the minimum distance between inner and outer curves is 6m; • the crossfall is not more than 10 degrees; • maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads; and • a development comprising more than three dwellings has formalised access by dedication of a road and not by right of way. *Note: Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.*				

4.4.3 Water Supplies

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Water Supplies BFPM, and how the development responds.

Table 12: Water Supplies

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
An adequate water supply is provided for firefighting purposes.	Reticulated water is to be provided to the development, where available; and	☒	☐	☐	Reticulated water is to be provided to the development.
	A static water supply is provided where no reticulated water is available.	☐	☐	☒	Reticulated water supply provided.
• water supplies are located at regular intervals; and • the water supply is accessible and reliable for firefighting operations.	Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2005;	☒	☐	☐	Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2005.
	Hydrants are not located within any road carriageway; and	☒	☐	☐	Hydrants are not located within any road carriageway
	Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	☐	☐	☒	Not an urban subdivision.
Flows and pressure are appropriate.	Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.	☒	☐	☐	Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.
The integrity of the water supply is maintained.	All above-ground water service pipes external to the building are metal, including and up to any taps.	☒	☐	☐	All above-ground water service pipes external to the building are metal, including and up to any taps.
A static water supply is provided for firefighting purposes in areas where reticulated water is not available.	Where no reticulated water supply is available, water for firefighting purposes is provided in accordance with Table 5.3d;	☐	☐	☒	Reticulated water supply provided.

Table 12: Water Supplies

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; 65mm Storz outlet with a ball valve is fitted to the outlet;	☐	☐	☒	Reticulated water supply provided.
	Ball valve and pipes are adequate for water flow and are metal;	☐	☐	☒	Reticulated water supply provided.
	Supply pipes from tank to ball valve have the same bore size to ensure flow volume;	☐	☐	☒	Reticulated water supply provided.
	Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank;	☐	☐	☒	Reticulated water supply provided.
	A hardened ground surface for truck access is supplied within 4m;	☐	☐	☒	Reticulated water supply provided.
	Above-ground tanks are manufactured from concrete or metal;	☐	☐	☒	Reticulated water supply provided.
	Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F of AS 3959);	☐	☐	☒	Reticulated water supply provided.
	Unobstructed access can be provided at all times;	☐	☐	☒	Reticulated water supply provided.
	Underground tanks are clearly marked;	☐	☐	☒	Reticulated water supply provided.

Table 12: Water Supplies

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters;	☐	☐	☒	Reticulated water supply provided.
	All exposed water pipes external to the building are metal, including any fittings;	☐	☐	☒	Reticulated water supply provided.
	Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19mm internal diameter; and	☐	☐	☒	Reticulated water supply provided.
	Fire hose reels are constructed in accordance with AS/NZS 1221:1997, and installed in accordance with the relevant clauses of AS 2441:2005.	☐	☐	☒	Reticulated water supply provided.

4.4.4 Electricity Services

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Electricity Services BFPM, and how the development responds.

Table 13: Electricity Services

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.	Where practicable, electrical transmission lines are underground; and	☒	☐	☐	Where possible electricity is to be underground.
	Where overhead, electrical transmission lines are proposed as follows: • lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and • no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.	☒	☐	☐	If not possible to be provided underground, short pole spacings are to be provided. Vegetation is to be managed to comply with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

4.4.5 Gas Services

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Gas Services BFPM, and how the development responds.

Table 14: Water Supplies

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used;	☒	☐	☐	Any reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used.
	All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side;	☒	☐	☐	All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side.
	Connections to and from gas cylinders are metal;	☒	☐	☐	Connections to and from gas cylinders are metal
	Polymer-sheathed flexible gas supply lines are not used; and	☒	☐	☐	Polymer-sheathed flexible gas supply lines are not used.
	Above-ground gas service pipes are metal, including and up to any outlets.	☒	☐	☐	Above-ground gas service pipes are metal, including and up to any outlets.

4.4.6 Construction Standards

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Construction Standards BFPM, and how the development responds.

Table 15: Construction Standards

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
The proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact.	BAL is determined in accordance with Tables A1.12.5 to A1.12.7; and	☒	☐	☐	The indicative BALs have been determined as outlined in **Section 2.6.2.**
	Construction provided in accordance with the NCC and as modified by section 7.5 (please see advice on construction in the flame zone).	☒	☐	☐	Construction is to be provided in accordance with the NCC and as modified by section 7.5 of PBP.
Proposed fences and gates are designed to minimise the spread of bush fire.	Fencing and gates are constructed in accordance with section 7.6.	☒	☐	☐	Fencing and gates are constructed in accordance with section 7.6
Proposed Class 10a buildings are designed to minimise the spread of bush fire.	Class 10a buildings are constructed in accordance with section 8.3.2.	☒	☐	☐	No class 10a buildings proposed within 6m of the residential buildings.
Variations					
Home-based child care: the proposed building can withstand bush fire attack in the form of wind, localised smoke, embers and expected levels of radiant heat.	An APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1 of this document around the entire building or structure; and	☐	☐	☒	No Home-based child care
	The existing dwelling is required to be upgraded to improve ember protection. This is to be achieved by enclosing or covering openings with a corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture of 2mm. Where applicable this includes the	☐	☐	☒	No Home-based child care

Table 15: Construction Standards

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	openable portion of the windows, vents, weepholes and eaves, but does not include roof tile spaces. Weather strips, draught excluders or draught seals shall be installed at the base of side hung external doors as per AS 3959. The subfloor space must be enclosed.				

4.4.7 Landscaping

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Landscaping BFPM, and how the development responds.

Table 16: Landscaping

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Compliance with the NSW RFS 'Asset protection zone standards' (see Appendix 4);	☒	☐	☐	Compliance with the NSW RFS 'Asset protection zone standards' as provided in **Appendix F**.
	A clear area of low-cut lawn or pavement is maintained adjacent to the house;	☒	☐	☐	A clear area of low-cut lawn or pavement is to be maintained adjacent to the dwellings.
	Fencing is constructed in accordance with section 7.6; and	☒	☐	☐	Fencing is constructed in accordance with section 7.6 of PBP.
	Trees and shrubs are located so that: • the branches will not overhang the roof; • the tree canopy is not continuous; and • any proposed windbreak is located on the elevation from which fires are likely to approach.	☒	☒	☐	Trees and shrubs are located so that: • the branches will not overhang the roof; • the tree canopy is not continuous; and any proposed windbreak is located on the elevation from which fires are likely to approach.

4.4.8 Emergency Management

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Emergency Management BFPM, and how the development responds.

Table 17: Emergency Management

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Variations					
Home-based child care: a bush fire emergency and evacuation management plan is prepared.	a Bush Fire Emergency Management and Evacuation Plan is prepared by the operator consistent with the NSW RFS publication: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, and the AS 3745:2010.	☐	☐	☒	No Home-based child care

The development will operate under a Bush Fire Emergency Management and Evacuation Plan prepared for the SFPP component for the development.

5 Other Non-Residential Development Bush Fire Protection Measures

5.1 Introduction

This section of the report applies to the following components of the development:

- Wildlife Centre & Hospital Building

This is a Public Assembly Building with a floor area less than 500m².

Section 8.1 of PBP provides that in order for Other Developments to comply with PBP, the following conditions must be met:

- satisfy the aim and objectives of PBP outlined in Chapter 1;
- consider any issues listed for the specific purpose for the development set out in this chapter; and
- propose an appropriate combination of BPMs.

Further,

> *It is important to ensure that a defendable space is provided for the size and scale of the development. Proposed measures must operate in combination to minimise the impact of bush fire and ensure that access and services are adequate.*

These have been addressed below.

5.2 PBP Aims & Objectives

The 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.*

The objectives of PBP are to:

- *afford buildings and their occupants protection from exposure to a bush fire;*
- *provide for a defendable space to be located around buildings;*
- *provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;*
- *ensure that appropriate operational access and egress for emergency service personnel and occupants is available;*
- *provide for ongoing management and maintenance of BPMs; and*
- *ensure that utility services are adequate to meet the needs of firefighters.*

The development has been designed to provide for the building to have radiant heat levels of a maximum of 10kW/m², and to avoid flame contact, thus providing for appropriate separation and exposure to the hazards. The development design in conjunction with the bush fire protection measures will provide for safe operational access and egress for emergency services personnel and possible residents within the development, as well as sufficient water supply. Therefore, the proposed development is considered to be consistent with the objectives of PBP.

5.3 Specific Purpose Issues

Section 8.3.11 of PBP outlines the specific purpose issues for public assembly buildings, stating:

> *Public assembly buildings are not defined as SFPP by the RF Reg but require referral under EP&A Act s.4.14 to the NSW RFS. Buildings used for public assembly with a floor space area of greater than 500m² are required to consider bush fire. These developments will be treated technically as SFPP due to the evacuation challenges*

presented by large numbers of occupants. Assembly buildings can accommodate large numbers of persons of various physical capabilities. Emergency management planning for these developments must account for the total number of occupants and be commensurate with the level of risk. These developments must not experience radiant heat levels of greater than 10kW/m² on any part of the building. Assembly buildings include places of public worship.

Due to the variation in risk associated with the occupants of assembly buildings, a variety of bush fire safety solutions may apply based on the merits of the situation.

Whilst the building is less than 500m² in area, it has for the purpose of this assessment been considered in accordance with the SFPP development BFPM requirements to provide a conservative approach.

5.4 Bush Fire Protection Measures

As outlined above, the SFPP BFPM outlined in Chapter 6 of PBP are provided below, outlining how the development complies.

5.4.1 Asset Protection Zones & Building Construction

The intent of measures for the Asset Protection Zone (APZ) and Building Construction BFPM is:

> *to provide suitable building design, construction and sufficient space to ensure that radiant heat levels do not exceed critical limits for firefighters and other emergency services personnel undertaking operations, including supporting or evacuating occupants.*

The following table outlines the Performance Criteria and associated Acceptable Solutions for the BFPM, and how the development responds.

Table 18: Asset Protection Zones & Building Construction

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
ASSET PROTECTION ZONES					
Radiant heat levels of greater than 10kW/m² (calculated at 1200K) will not be experienced on any part of the building.	The building is provided with an APZ in accordance with Table A1.12.1 in Appendix 1.	☒	☐	☐	A compliant APZ is to be provided around the Wildlife/Hospital building as outlined in **Table 1** and shown on **Figure 9** and **Figure 10**.
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	APZs are located on lands with a slope less than 18 degrees.	☒	☐	☐	APZs will be on less than 18 degrees slope.
• APZs are managed and maintained to prevent the spread of fire to the building. • The APZ is provided in perpetuity.	The APZ is managed in accordance with the requirements of Appendix 4 of this document, and	☒	☐	☐	APZ are to be managed in accordance with Appendix 4 of PBP as outlined in **Appendix F** of this report.
	APZ are wholly within the boundaries of the development site; and	☒	☐	☐	APZs are to be wholly within the subject site.
	Other structures located within the APZ need to be located further than 6m from the refuge building.	☒	☐	☐	All other structures located within the APZ are to be located further than 6m from the refuge building.

Table 18: Asset Protection Zones & Building Construction

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Variations					
Camping and primitive camping: no performance criteria applicable.	N/A.	☐	☐	☒	Nil proposed.
Bed and breakfast and farmstay: the building will not be exposed to radiant heat levels exceeding 29kW/m² (1090K).	An APZ is provided in accordance with Tables A1.12.2 or A1.12.3 in Appendix 1 of this document around the entire building or structure.	☐	☐	☒	Nil proposed.
Ecotourism: radiant heat levels of greater than 10kW/m² (1200K) are not experienced by emergency service personnel and occupants during firefighting and emergency management around a building on site that can be used as a refuge.	An APZ is provided in accordance with Table A1.12.1 in Appendix 1 of this document around the entire refuge building or structure.	☐	☐	☒	Nil proposed.
Manufactured home estates: APZs achieve radiant heat levels that are commensurate with the construction standard for the proposed dwellings.	• an APZ in accordance with Table A1.12.1 in Appendix 1 of this document is provided to all new dwellings; or • an APZ in accordance with Table A1.12.2 or A1.12.3 in Appendix 1 of this document is provided where it is demonstrated that all new dwellings will be constructed in accordance with BAL-29.	☐	☐	☒	Nil proposed.

Table 18: Asset Protection Zones & Building Construction

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
LANDSCAPING					
Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Landscaping is in accordance with Appendix 4; and	☒	☐	☐	Landscaping is to be managed in accordance with Appendix 4 of PBP as outlined in **Appendix F** of this report.
	Fencing is constructed in accordance with section 7.6.	☒	☐	☐	Any fencing is to be constructed in accordance with Section 7.6 of PBP, being: • all fences in bush fire prone areas should be made of either hardwood or non-combustible material. • where the fence is within 6m of a building or in areas of BAL-29 or greater, they should be made of non-combustible material only.
CONSTUCTION STANDARDS					
The proposed building can withstand bush fire attack in the form of wind, embers, radiant heat and flame contact.	A construction level of BAL-12.5 under AS 3959 or NASH Standard and section 7.5 of PBP is applied.	☒	☐	☐	As outlined in **Section 2.6.1**, the Wildlife/Hospital building is to be constructed to BAL-12.5.
Variations					
Camping and primitive camping: no performance criteria applicable.	N/A.	☐	☐	☒	Nil proposed.
Bed and breakfast and farmstay: the proposed building can withstand bush fire attack in the form of wind, embers, radiant heat and flame contact.	Construction is applied in accordance with Appendix 1 of PBP.	☐	☐	☒	Nil proposed.
Ecotourism: the proposed refuge building can withstand bush fire attack in the form of	A construction level of BAL-12.5 or greater is applied to the refuge building	☐	☐	☒	Nil proposed.

Table 18: Asset Protection Zones & Building Construction

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
wind, embers, radiant heat and flame contact.	in accordance with AS 3959 or NASH Standard and 7.5 of PBP.				
Manufactured home estates: the proposed manufactured home can withstand bush fire attack in the form of wind, embers, radiant heat and flame contact.	• Where an APZ is provided in accordance with Table A1.12.1 in Appendix 1 of this document the construction standards for BAL-12.5 shall apply; or • Where an APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1 of this document the construction standards for BAL-29 shall apply.	☐	☐	☒	Nil proposed.
ECOTOURISM					
Occupants of the ecotourism facility are provided with appropriate shelter in the event of a bush fire.	A refuge building is provided;	☐	☐	☒	Nil proposed.
	The refuge building must have sufficient space for all occupants and comply with the occupancy levels permissible for that structure; and	☐	☐	☒	Nil proposed.
	The refuge building must be constructed to BAL-12.5 or greater in accordance with AS 3959 or NASH Standard and 7.5 of PBP.	☐	☐	☒	Nil proposed.

5.4.2 Access

The intent of measures for the Access BFPM is:

to provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area.

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Access BFPM, and how the development responds.

Table 19: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
ACCESS					
Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	SFPP access roads are two-wheel drive, all-weather roads	☒	☐	☐	The access roads are to be two-wheel drive, all-weather roads.
	Access is provided to all structures;	☒	☐	☐	Access will be provided to all structures.
	Traffic management devices are constructed to not prohibit access by emergency services vehicles;	☒	☐	☐	Traffic management devices will be constructed to not prohibit access by emergency services vehicles.
	Access roads must provide suitable turning areas in accordance with Appendix 3; and	☒	☐	☐	Access roads must provide suitable turning areas in accordance with Appendix 3 of PBP as provided in **Appendix G** of this report.
	One way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.	☐	☐	☒	No one way access roads proposed.

Table 19: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
Variations					
Primitive camping: Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	Access is provided in accordance with the property access requirements of Table 5.3b.	☐	☐	☒	Nil proposed.
Bed and breakfast and farmstay: Firefighting vehicles are provided with safe, all-weather access to structures.	Access is provided in accordance with the property access requirements of Table 5.3b.	☐	☐	☒	Nil proposed.
Ecotourism: fire fighting vehicles are provided with safe, all-weather access to the proposed refuge building.	Vehicular access is provided to the refuge building from a public road in accordance with property access requirements of Table 5.3b;	☐	☐	☒	Nil proposed.
	Accommodation is within 100m of the refuge building; and	☐	☐	☒	Nil proposed.
	Pedestrian paths from accommodation to the refuge building/s are provided and clearly signposted.	☐	☐	☒	Nil proposed.
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 and causeways are to clearly indicate load rating.	☒	☐	☐	The capacity of road surfaces and any bridges/ causeways is to be sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes). No bridges and causeways.
There is appropriate access to water supply.	Hydrants are located outside of parking reserves and road carriageways to ensure	☒	☐	☐	Hydrants are to be located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression

Table 19: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	accessibility to reticulated water for fire suppression;				
	Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005; and	☒	☐	☐	Hydrants are to be provided in accordance with the relevant clauses of AS 2419.1:2005
	there is suitable access for a Category 1 fire appliances to within 4m of the static water supply where no reticulated supply is available.	☒	☐	☐	Reticulated water supply to be provided.
PERIMETER ROADS					
Perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	There are two-way sealed roads;	☐	☒	☐	The perimeter roads are two way. The primary entrance road is sealed. The secondary access road is to be unsealed. Therefore a performance solution has been provided in **Section 3.5.2.1** for the unsealed component.
	Minimum 8m carriageway width kerb to kerb;	☐	☒	☐	The primary access road is to have a width of 8m, which complies with the Acceptable Solution. The secondary access road is to have a width of 5m, which does not comply with the Acceptable Solution. Therefore a performance solution has been provided in **Section 3.5.2.1**.
	Parking is provided outside of the carriageway width;	☒	☐	☐	No parking provided within the carriageway
	Hydrants are to be located clear of parking areas;	☒	☐	☐	Hydrants are to be located clear of parking areas

Table 19: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	There are through roads, and these are linked to the internal road system at an interval of no greater than 500m;	☐	☐	☒	Not considered relevant in this instance.
	Curves of roads have a minimum inner radius of 6m;	☒	☐	☐	Curves of roads are to have a minimum inner radius of 6m
	The maximum grade road is 15 degrees and average grade of not more than 10 degrees;	☒	☐	☐	The maximum grade road is 15 degrees and average grade of not more than 10 degrees;
	The road crossfall does not exceed 3 degrees; and	☒	☐	☐	The road crossfall does not exceed 3 degrees
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☒	☐	☐	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is to be provided.
Non-perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating.	Minimum 5.5m carriageway width kerb to kerb;	☐	☐	☒	Nil provided as this part of the development.
	Parking is provided outside of the carriageway width;	☐	☐	☒	Nil provided as this part of the development.
	Hydrants are located clear of parking areas;	☐	☐	☒	Nil provided as this part of the development.
	There are through roads, and these are linked to the internal road system at an interval of no greater than 500m;	☐	☐	☒	Nil provided as this part of the development.
	Curves of roads have a minimum inner radius of 6m;	☐	☐	☒	Nil provided as this part of the development.

Table 19: Access

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	The maximum grade road is 15 degrees and average grade of not more than 10 degrees;	☐	☐	☒	Nil provided as this part of the development.
	The road crossfall does not exceed 3 degrees; and	☐	☐	☒	Nil provided as this part of the development.
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☐	☐	☒	Nil provided as this part of the development.

5.4.3 Services - Water Gas & Electricity

The intent of measures for the Services - Water Gas & Electricity BFPM is:

> *to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.*

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Services – Water, Electricity and Gas BFPM, and how the development responds.

Table 20: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
WATER SUPPLY					
An adequate water supply for firefighting purposes is installed and maintained.	• Reticulated water is to be provided to the development, where available; or • A 10,000 litres minimum static water supply for firefighting purposes is provided for each occupied building where no reticulated water is available.	☒	☐	☐	Reticulated water is to be provided to the development.
Variations					
Caravan and camping grounds: an adequate water supply for firefighting purposes is installed and maintained.	• Either a reticulated water supply is provided; or • a 10,000 litres minimum water supply on site.	☐	☐	☒	Not provided as this part of the development.
Primitive camping: an adequate water supply for firefighting purposes is installed and maintained.	• Either a reticulated water supply is provided; or • a 10,000 litres minimum water supply on site.	☐	☐	☒	Nil proposed.
• Water supplies are located at regular intervals. • The water supply is accessible and reliable for firefighting operations.	Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2005;	☒	☐	☐	Reticulated water supply is to comply.
	Hydrants are not located within any road carriageway; and	☒	☐	☐	Reticulated water supply is to comply.

Table 20: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Reticulated water supply to SFPPs uses a ring main system for areas with perimeter roads.	☒	☐	☐	Reticulated water supply is to comply.
Flows and pressure are appropriate.	Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.	☒	☐	☐	Reticulated water supply is to comply.
The integrity of the water supply is maintained.	All above-ground water service pipes external to the building are metal, including and up to any taps.	☒	☐	☐	Reticulated water supply is to comply.
Water supplies are adequate in areas where reticulated water is not available.	A connection for firefighting purposes is located within the IPA or non hazard side and away from the structure; a 65mm Storz outlet with a ball valve is fitted to the outlet;	☐	☐	☒	Reticulated water supply to be provided.
	Ball valve and pipes are adequate for water flow and are metal;	☐	☐	☒	Reticulated water supply to be provided.
	Supply pipes from tank to ball valve have the same bore size to ensure flow volume;	☐	☐	☒	Reticulated water supply to be provided.
	Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank;	☐	☐	☒	Reticulated water supply to be provided.
	A hardened ground surface for truck access is supplied within 4m of the access hole;	☐	☐	☒	Reticulated water supply to be provided.

Table 20: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Above-ground tanks are manufactured from concrete or metal;	☐	☐	☒	Reticulated water supply to be provided.
	Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959);	☐	☐	☒	Reticulated water supply to be provided.
	Unobstructed access is provided at all times;	☐	☐	☒	Reticulated water supply to be provided.
	Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters; and	☐	☐	☒	Reticulated water supply to be provided.
	Underground tanks are clearly marked,	☐	☐	☒	Reticulated water supply to be provided.
	All exposed water pipes external to the building are metal, including any fittings;	☐	☐	☒	Reticulated water supply to be provided.
	Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; Any hose and reel for firefighting connected to the pump shall be 19mm internal diameter; and	☐	☐	☒	Reticulated water supply to be provided.
	Fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels, and installed in accordance with the relevant clauses of AS 2441:2005 Installation of fire hose reels.	☐	☐	☒	Reticulated water supply to be provided.

Table 20: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
ELECTRICITY SERVICES					
Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings	Where practicable, electrical transmission lines are underground;	☒	☐	☐	Where possible electricity is to be underground.
	Where overhead, electrical transmission lines are proposed as follow:				
	• lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and	☒	☐	☐	If not possible to be provided underground, short pole spacings are to be provided.
	• no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.	☒	☐	☐	Vegetation is to be managed to comply with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.
GAS SERVICES					
Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used;	☒	☐	☐	Reticulated or bottled gas is to be installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is to be used.
	All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side;	☒	☐	☐	All fixed gas cylinders are to be kept clear of all flammable materials to a distance of 10m and shielded on the hazard side
	Connections to and from gas cylinders are metal;	☒	☐	☐	Connections to and from gas cylinders are to be metal.

Table 20: Services - Water Gas & Electricity

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	If gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion;	☒	☐	☐	If gas cylinders need to be kept close to the building, safety valves are to be directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion.
	Polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used; and	☒	☐	☐	Polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used
	Above-ground gas service pipes external to the building are metal, including and up to any outlets.	☒	☐	☐	Above-ground gas service pipes external to the building are to be metal, including and up to any outlets.

5.4.4 Emergency Management Planning

The intent of measures for the Emergency Management Planning BFPM is:

To provide suitable emergency and evacuation arrangements for occupants of SFPP developments.

The following table outlines the Performance Criteria and associated Acceptable Solutions for the Emergency Management Planning BFPM, and how the development responds.

Table 21: Emergency Management Planning

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
EMERGENCY MANAGEMENT					
A Bush Fire Emergency Management and Evacuation Plan is prepared.	Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the: • The NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan; • NSW RFS Schools Program Guide; • Australian Standard AS 3745:2010 Planning for emergencies in facilities; and • Australian Standard AS 4083:2010 Planning for emergencies – Health care facilities (where applicable).	☒	☐	☐	A Draft Bush Fire Emergency Management and Evacuation Plan has been prepared consistent with NSW RFS document: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan* and *Australian Standard AS 3745:2010 Planning for emergencies in facilities*. It is provided in **Appendix H**.
	The Bush Fire Emergency Management and Evacuation Plan should include planning for the early relocation of occupants.	☒	☐	☐	Bush Fire Emergency Management and Evacuation Plan provides for planning for the early relocation of occupants.

Table 21: Emergency Management Planning

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Note: A copy of the Bush Fire Emergency Management and Evacuation Plan should be provided to the Local Emergency Management Committee for its information prior to occupation of the development.	☒	☐	☐	To be conditionally required as part of the development consent.
Variations					
Caravan and camping grounds: a Bush Fire Emergency Management and Evacuation Plan is prepared. **Primitive camping:** a Bush Fire Emergency Management and Evacuation Plan is prepared.	A Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, and AS 3745:2010;	☐	☐	☒	Not part of this component of the devleopmetn
	For proposals in isolated or remote areas which involve large travel distances through bush fire prone vegetation, the following issues should be determined and addressed: • the amount of travel likely to be generated during an emergency evacuation; • the capacity of the broader road network to facilitate safe emergency evacuation; • limitations/constraints inherent in the road system; and	☐	☐	☒	Not isolated or remote areas

Table 21: Emergency Management Planning

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	• management of potential traffic conflicts (such as emergency vehicles versus evacuating members of the public).				
	The Bush Fire Emergency Management and Evacuation Plan must consider a mechanism for the early relocation of occupants on days when adverse fire weather is notified or adverse fire activity occurs in the local government area in which the development operates.	☒	☐	☐	Bush Fire Emergency Management and Evacuation Plan provides mechanisms for the early relocation of occupants on days when adverse fire weather is notified or adverse fire activity occurs in the local government area in which the development operates.
	Note: A copy of the Bush Fire Emergency Management and Evacuation Plan shall be provided to the Local Emergency Management Committee for its information prior to occupation of the development.	☒	☐	☐	To be conditionally required as part of the development consent.
Appropriate and adequate management arrangements are established for consultation and implementation of the Bush Fire Emergency Management and Evacuation Plan.	An Emergency Planning Committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures Manual; and	☒	☐	☐	An Emergency Planning Committee is established to consult with residents and staff in developing and implementing an Emergency Procedures Manual.

Table 21: Emergency Management Planning

Performance Criteria	Acceptable Solution	Development Response			
Intent may be achieved where:		Acceptable Solution	Performance Solution	N/A	Comment
	Detailed plans of all emergency assembly areas including on site and off-site arrangements as stated in AS 3745:2010 are clearly displayed, and an annually emergency evacuation is conducted.	☒	☐	☐	Detailed plans of all emergency assembly areas (including on site and off-site arrangements as stated in AS 3745:2010) are to be clearly displayed, and an annually emergency evacuation is to be conducted.

6 Recommendations

6.1 Summary of Bush Fire Protection Measures

This BFAR has assumed that the proposed development will be carried out in accordance with a number of BFPM. The following table provides a summary of the BFMP that must be incorporated into the development to ensure it best protects the development from the effects of bushfire in accordance with the requirements of PBP and other best practice guidelines. The BFPM are also shown on **Figure 9** and **Figure 10** in **Appendix E**.

Table 22: Summary of Recommendations

Provision	Measures
Asset Protection Zone	• To be provided surrounding the buildings in the location and extent as shown on **Figure 9** and **Figure 10** in **Appendix E** and as outlined in **Section 2.5**.
	• To be established and maintained in perpetuity in accordance with the requirements outlined in **Appendix F**.
Construction Standards	• The buildings are to be constructed in accordance with the relevant BAL as calculated in accordance with the relevant legislative requirements at the time of the CC or as conditionally required from any consent issued for this DA.
Access	**Perimeter Roads**
	• two-way sealed roads;
	• minimum 8m carriageway width kerb to kerb (and 5m for the secondary access road with a 3m x 20m passing bay at 200m intervals).
	• parking is provided outside of the carriageway width
	• hydrants are to be located clear of parking areas
	• curves of roads have a minimum inner radius of 6m;
	• the maximum grade road is 15 degrees and average grade of not more than 10 degrees
	• the road crossfall does not exceed 3 degrees
	• a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided
	Non-Perimeter Roads
	• minimum 5.5m carriageway width kerb to kerb
	• parking is provided outside of the carriageway width
	• hydrants are located clear of parking areas
	• curves of roads have a minimum inner radius of 6m
	• the maximum grade road is 15 degrees and average grade of not more than 10 degrees
	• the road crossfall does not exceed 3 degrees
	• a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.
	Property Access Roads
	• property access roads are two-wheel drive, all-weather roads

Table 22: Summary of Recommendations

Provision	Measures
	• the capacity of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes), bridges and causeways are to clearly indicate load rating
	• hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005;
	• minimum 4m carriageway width;
	• a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches
	• property access must provide a suitable turning area in accordance with Appendix 3;
	• curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress
	• the minimum distance between inner and outer curves is 6m
	• the crossfall is not more than 10 degrees
	• maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads
Water Supply	• reticulated water is to be provided to the development,
	• fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2005
	• hydrants are not located within any road carriageway
	• reticulated water supply to SFPPs uses a ring main system for areas with perimeter roads.
	• fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.
	• all above-ground water service pipes external to the building are metal, including and up to any taps.
Electricity	• Where practicable, electrical transmission lines are underground. Where electricity transmission lines are above ground, short pole spacings are to be providing (i.e. less than 30m) and vegetation around the power lines are to be managed in accordance with *ISSC3 Guideline for Managing Vegetation Near Power Lines*.
Gas Supplies	• reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used;
	• all fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side;
	• connections to and from gas cylinders are metal;
	• if gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion;
	• polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used; and
	• above-ground gas service pipes external to the building are metal, including and up to any outlets.

Table 22: Summary of Recommendations

Provision	Measures
Emergency Evacuation Plan	• Preparation and implementation of a Bush Fire Emergency Management and Evacuation Plan consistent with Section 6.8.4 of PBP.

7 Conclusion

On completion, the proposed development will ensure that all habitable development is located in an area that has an acceptable bushfire hazard level. With the implementation of the recommendations, as outlined in **Sections 3** to **5** and as shown on **Figure 9** and **Figure 10** in **Appendix E**, the proposed development is considered to be appropriately protected from bushfire and complies with the requirements of PBP. The proposed development is not expected to increase the bushfire risk.

8 References

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Appendix A

Development Plans

Location Plan, sourced from SixMaps + NTS

The Gunnedah Koala Park - Development Application

3130 Oxley Highway, Gunnedah - Lot 328 DP 755503, Lot 329 DP 755503 - 35.27ha
Gunnedah Shire Council - Gunnedah Local Environmental Plan 2012 - Northern Region Planning Panel

Description of proposed works

Architectural Drawing List

Drawing No.	Drawing Title	Current Revision	Date
DA01 -01	Cover Sheet	B	Fri, 13 Nov 2020
DA01 -01	Not Included	A	Thu, 12 Nov 2020
DA01 -02	Site Plans	B	Fri, 13 Nov 2020
DA01 -03	Wildlife Centre & Hospital	B	Fri, 13 Nov 2020
DA01 -05	Petting Zoo	B	Fri, 13 Nov 2020
DA01 -06	Volunteers Accommodation	B	Fri, 13 Nov 2020
DA01 -06	Caretakers Residence	B	Fri, 13 Nov 2020
DA01 -07	Maintenance Shed - Amenities Building	B	Fri, 13 Nov 2020

Supporting Documentation

Document No.	Document Title	Current Revision	Date
	Statement of Environmental Effects - S.J.B Planning		
	Bushfire Assessment Report - Integrated Consulting		
	Studies by Assessment Report - AREA Environmental Consultants & Communication		
OJJ-0249	Cultural Heritage Assessment - AREA environmental Consultants & Communication		
5284	Survey - Stewart Surveys Pty Ltd		
5284	Landscape Design - Stewart Surveys Pty Ltd		
5284	Stormwater Management Plan - Stewart Surveys Pty Ltd		
	BCA Report - Design Confidence		
	DDA Report - Lindsay Perry		
10401	Traffic Impact Assessment - Arndll Payne & Partners		
10401	Water & Sewer Design Report - Arndll Payne & Partners		
19501	Noise Impact Assessment - Wilkinson Murray		
7778	Cost Estimate Report - Mitchell Brandtman		

Schedule of Areas

	Existing Area	Proposed Area
Site Area	155595.16 sq.m	155595.16 sq.m
Built Area	0.00 sq.m	967.12 sq.m
Area To Be Demolished	-	0.00 sq.m
New Build		0.00 sq.m
Roof Area	0.00 sq.m	2459.81 sq.m
Decks	0.00 sq.m	0.00 sq.m
Roofs	0.00 sq.m	2092.81 sq.m
Landscaped Area	0.00 sq.m	0.00 sq.m
Porous Paving	0.00 sq.m	0.00 sq.m
Gross Floor Area (by DCP)	0.00 sq.m	0.00 sq.m
Floor Space Ratio	0.00	0.00

Rev	Date	By	Notes
B	12/11/20	ST	Preliminary DA issue to consultants
A	12/11/20	ST	Preliminary DA drawings for client approval

notes
1 all dimensions in mm
2 do not scale from drawing
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4 clarification to be sought from the architect in the event of any discrepancies in the documentation or if further information is required

Consultants

Surveyor -
contact ph

Structural Engineer -
contact ph

Civil Engineer -
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Quantity Surveyor -
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Builder - TBA
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Nominated Architect Mike Dunn NSW ARB No. 7547

Client Gunnedah Shire Council
Project Gunnedah Koala Sanctuary
3130 Oxley Highway, Gunnedah
Issue Feasibility
Date Fri, 13 Nov 2020
Scale 1:100 @A1
Drawing Cover Sheet
Drw No. DA01-00 Rev B
Job No. 20_001

PRELIMINARY

Key

A - Site Entry
Enter at a point approximately 200m from the intersection of 4Units Rd and Oxley Highway
lockable gate, welcome and orientation signage

B - Carpark - 500m2 approx.
40 car parking spaces with interspersed landscaping and vegetation buffer. Centre road to be sealed, car parking spaces to be compacted gravel. Clearly marked path towards Main building

C - Hospital Drop-off & Bus setdown
Parking for site vehicles, accessible, and insured animal drop off parking. Bus drop off zone and parking on a one-way loop road. 2 accessible, 2 insured animal drop off, 1 bus drop off and 1 bus parking. All surfaces sealed

D - Wildlife Centre + Hospital
Wildlife Centre - 360m2 internally, 294m2 externally, 3.1m fencing
Treatment area.
The main entry to ticketed areas. This building contains the reception desk, shop, cafe and kitchen, administration offices, storage, public toilets, education deck and auditoria, large walk-in animal enclosure and viewing deck and wildlife hospital.
Amenities have been provided for a capacity of up to 200 people at a time in the Park, including 10 M.F. UA toilets.
Cafe, 20-30 people. Education deck and auditoria, 70 people.
The building will be a large portal frame structure with a framed floor, concrete or eco-ply cladding, and hardwood decking. The viewing deck and aviary will be screened.
Wildlife hospital and rehabilitation facility with 2 small animal intensive Care Units (ICU), 2 large ICU's and up to 12 small animal enclosures, a large clinic, office, and staff room. Externally 2 stage and 8 stage 2 rehabilitation enclosures are provided.
A viewing deck accessible from the picnic area will allow views into the clinic and the two large ICU's.
All ICU's to be able to be cleaned with a pressure hose. Specific requirements of wildlife guidelines must be met incl. gurneys, natural light and air, the ability to isolate infectious diseases.

E - Pond & Picnic Zone - 6000m2
Large grassed area with minimal picnic seating, an agricultural themed playground and a large constructed pond. Kangaroos and emus will roam freely in this area. A koala enclosure will also be built within the picnic area, around a cluster of existing trees.
Dry rock bed landscaped edge to ponds to allow pond levels to vary. New trees are planting throughout.

F - Petting Zoo - 923m2 + 1.6ha paddock
Large, enlarged breakout shed with doors for domestic animals. Walls only to north and western elevations, and partially to south adjacent to pen 1.
Insulated roof, rough sawn timber internal lining up to 1800mm. Cattle yard style pens. Non-packed dirt floor. Water supply to each pen. Large store/ work room, including cool room for animal food storage.

G - Wildlife Sanctuary walk
An accessible path through the bushland with roaming wallabies, kangaroos and emus. Smaller enclosures hold other native animals, each enclosure has a shade shelter at the viewing point.
Water supply at each enclosure and a semi-natural pond/ dam for water for free roaming animals.
Eastern fence to be predator-proof, 2 metres high with 45 degree top and submerged, based to prevent fox and dog entry. Smaller enclosures to have fencing appropriate to each animal.

H - Wildlife Sanctuary - 2.6ha, 688.1m fencing
A large area of bushland fenced with predator proof fencing to allow animals to live in the wild.
External fence to be predator proof, 2m metres high with 45 degree top and submerged, based to prevent fox and dog entry.

I- Volunteers Accommodation - 183m2
Backpackers style house accommodating up to 16 singles in 5 bedrooms, with a large common lounge room and kitchen/ dining. Could be site fabricated house. Will require a BAL rating and Asset Protection zone for bushfire protection.

J - Maintenance Shed - 57m2
Precolour steel shed on slab. An area associated with this shed should be enclosed for propagating native plants and areas provided for storage of landscape materials such as gravel and mulch.
Can be "off the shelf" farm shed with roller doors and workbench.

K - Asset Protection Zones (APZ)
These areas will need to be maintained, and possibly have some vegetation removed, in order to maintain a zone around the buildings for bushfire protection.
Trees within these zones will incur some biodiversity offsetting costs.

L - Eucalyptus Plantation - 2.6ha
An area of degraded land that will be planted with species of trees particular to the feeding requirements of koalas.
These trees should also be progressed through all parts of the site. Trees can reasonably small and harvested regularly for the feeding of koalas.

M - Signage
12-15m high up to 1200mm wide Koala Ily Trail sign to be read from both directions. Power supply for lighting as reqm.

N - Caravan sites - 55m2 each
14 caravan sites with gravel connecting road, including power, common services dump pit.
Will require an Asset Protection Zone.

O- Eco-tourism tents - 35m2 incl. decks
2 coupled tents with ensuites and 3 family or school group tents accessed by pedestrian pathways. View planning in and around tents due to APZ requirements.
At least one tent will need to be accessible.

P - Amenities Block - 115m2 internally, 80m2 externally
Toilets, showers and laundry to support tents. Large bbq deck with picnic tables. Laundry overspec to also act as bushfire refuge as required by eco-tourism bushfire protection.

Q - Mini Golf - 1900m2
A bush-themed mini-golf course
specific design by others

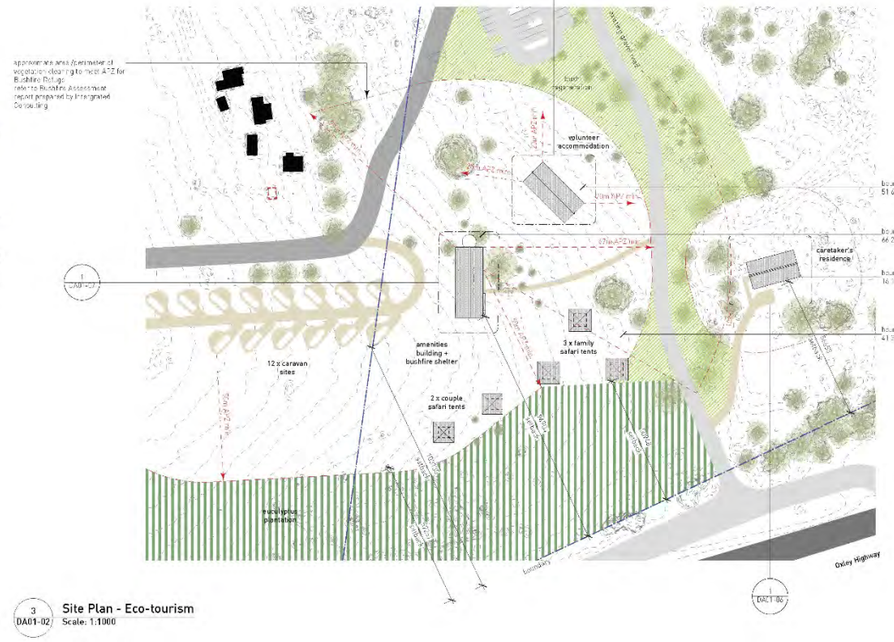
R- Indigenous Cultural Centre - 5000m2
A large open area with a sheltered display area for the demonstration of cultural knowledge and skills in the rehabilitated quarry area. Associated with the Indigenous food bush regeneration area.
Some fencing may be required around the area to restrict animals into the area if spear throwing demonstrations are undertaken.
A bushwalking path should be provided through this sanctuary with some interpretive signage. Bush regeneration areas will focus on indigenous food plants. Formalise existing dams to ensure constant water source.

S- Zip-lines, Rope Courses, and Adventure Activities -
A platform can be built near the entry to the main building to launch two zip lines going over the river gorge course.
specific design by others

T - Caretakers House - 170sqm
Small family sized house including 3 bedrooms, kitchen, dining, living and laundry

1 DA01-02 **Master Plan**
Scale: 1:2500

2 DA01-02 **Site Plan - Wildlife Sanctuary**
Scale: 1:1000



3 DA01-02 **Site Plan - Eco-tourism**
Scale: 1:1000

Rev	Date	By	Notes
B	13/11/20	SF	Rev in reply to LA issues re covenants
A	12/11/20	SF	Rev in reply to LA comments for client approval

notes
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Consultants

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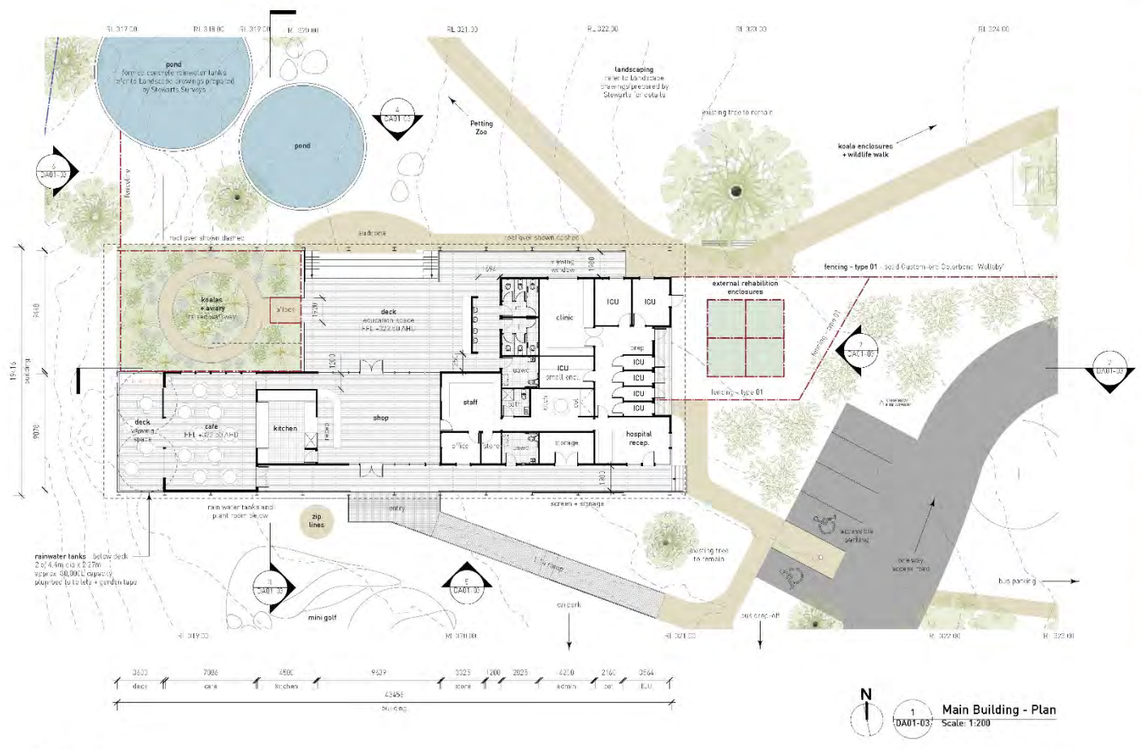
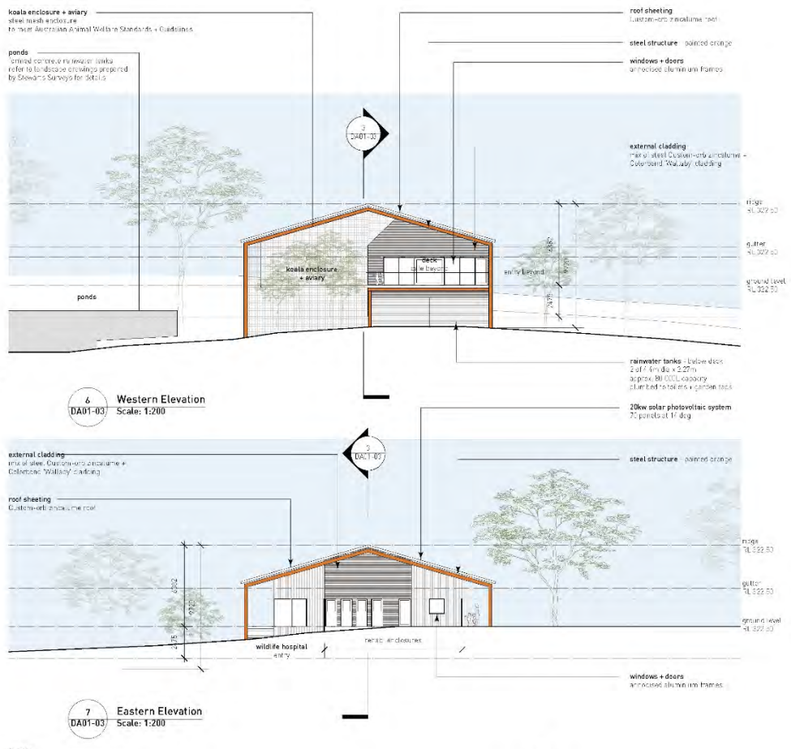
Client	Gunnedah Shire Council
Project	Gunnedah Koala Sanctuary 3130 Oxley Highway, Gunnedah
Issue	Feasibility
Date	Fri, 13 Nov 2020
Scale	@A1
Drawing	Site Plans
Drw No.	DA01_02 Rev H
Job No.	20_087
Drawn:	SF Check: LH

PRELIMINARY



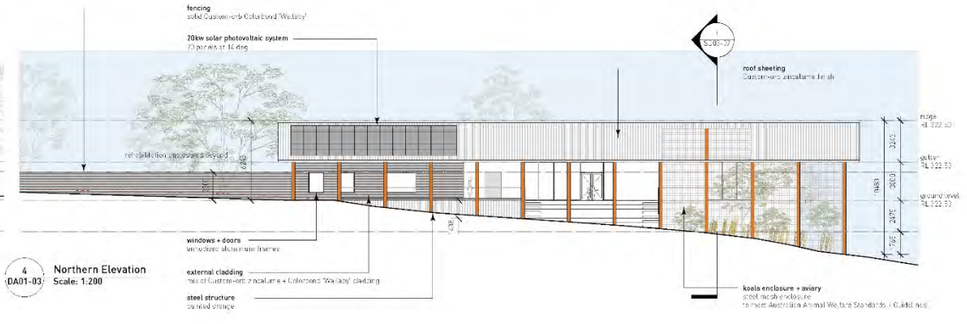
1 DA01-03 **Main Building - Plan** Scale: 1:200



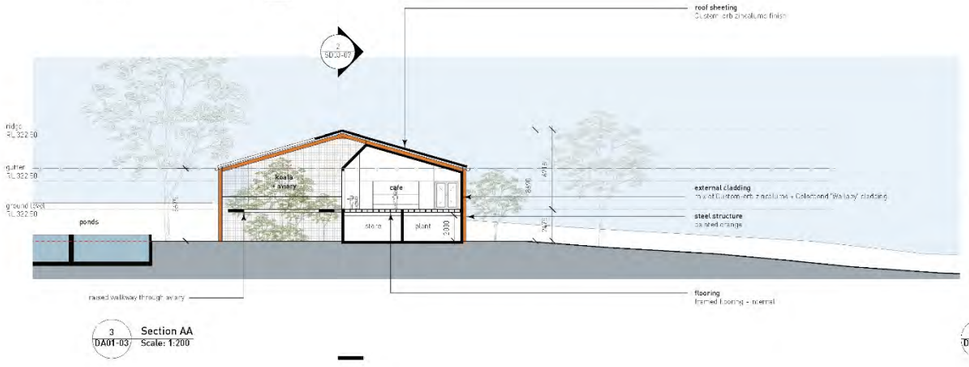
6 DA01-03 **Western Elevation** Scale: 1:200

7 DA01-03 **Eastern Elevation** Scale: 1:200

5 DA01-03 **Southern Elevation** Scale: 1:200



4 DA01-03 **Northern Elevation** Scale: 1:200



3 DA01-03 **Section AA** Scale: 1:200

2 DA01-03 **Section BB** Scale: 1:200

PRELIMINARY

Rev	Date	By	Notes
B	13/11/20	TH	Rev in prep for DA issue to consultants
A	12/11/20	TH	Rev in prep for DA drawings for client approval

notes
1. all dimensions in mm.
2. do not scale from drawing.
3. this drawing has been prepared for Feasibility purposes only and shall not be used for Development approval purposes or construction.
4. all information to be sought from the architect in the event of any discrepancies in the documentation or if further information is required.

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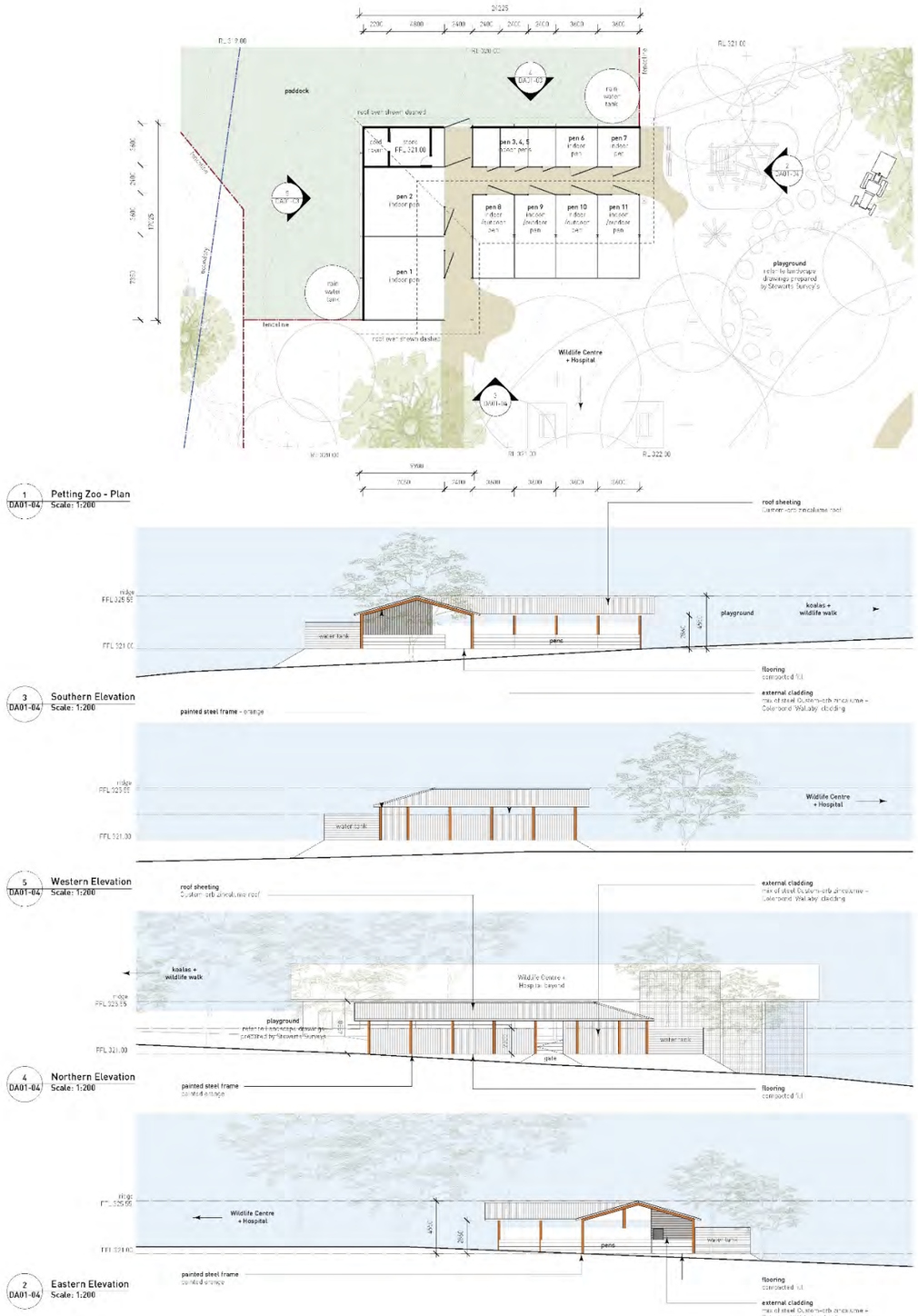
Client	Gunnedah Shire Council
Project	Gunnedah Koala Sanctuary 3130 Oxley Highway, Gunnedah
Issue	Feasibility
Date	Fri, 13 Nov 2020
Scale	1:200 @A1
Drawing	Wildlife Centre & Hospital
Drw No.	DA01 03 Rev B
Job No.	20_057
Drawn:	SF Check: LH



Rev	Date	By	Notes
B	13/11/20	SF	Preliminary DA issue to consultants
A	12/11/20	SF	Preliminary DA drawings for client approval

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Civil Engineer -
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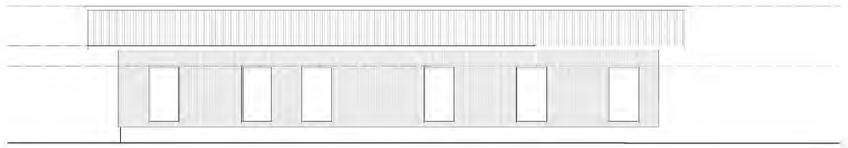
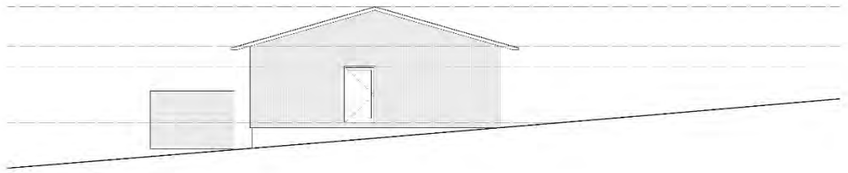
Client	Gunnedah Shire Council
Project	Gunnedah Koala Sanctuary 3130 Oxley Highway, Gunnedah
Issue	Feasibility
Date	Fri, 13 Nov 2020
Scale	1:200 @A1
Drawing	Petting Zoo
Drw No.	DA01-05 Rev B
Job No.	20_001
Drawn:	SF Check: LH

PRELIMINARY

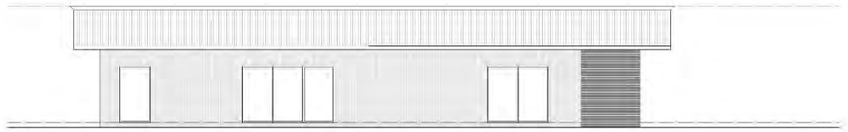


2 DA01-05 South Elevation - Volunteer's
Scale: 1:100

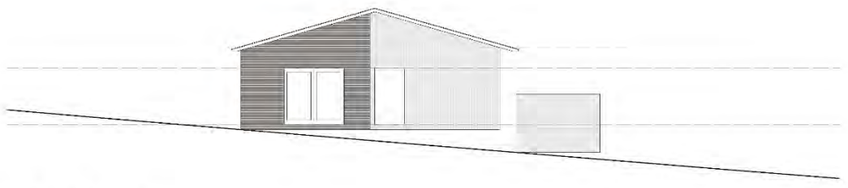
rainwater tanks
2 of 3.2m dia x 2.27m
approx. 55,000L capacity
plumbed to toilets + garden taps



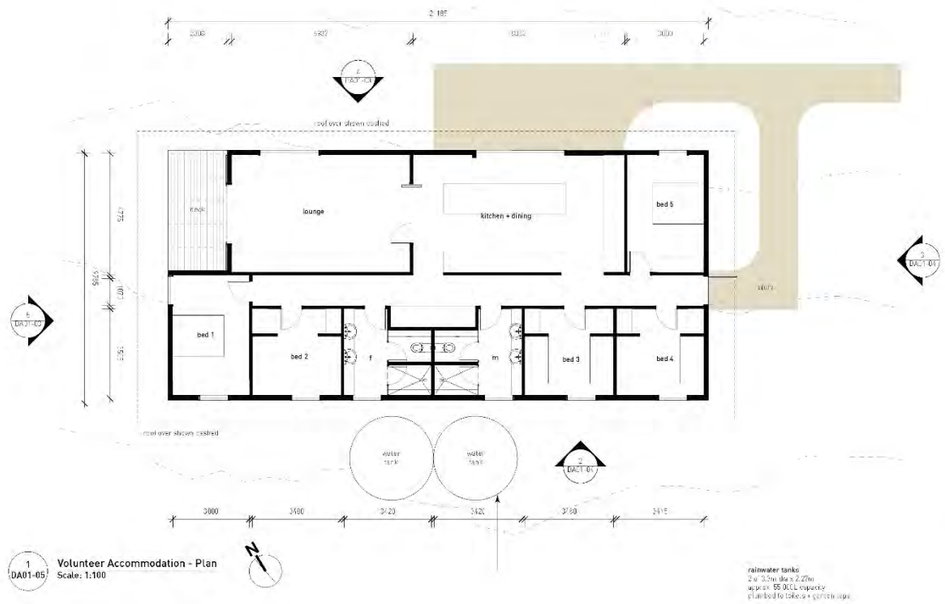
3 DA01-05 East Elevation - Volunteer's
Scale: 1:100



4 DA01-05 North Elevation - Volunteer's
Scale: 1:100



5 DA01-05 West Elevation - Volunteer's
Scale: 1:100



1 DA01-05 Volunteer Accommodation - Plan
Scale: 1:100

rainwater tanks
2 of 3.2m dia x 2.27m
approx. 55,000L capacity
plumbed to toilets + garden taps

Rev	Date	By	Notes
3	13/11/20	SF	Preliminary DA issue to consultants
2	12/11/20	SF	Preliminary DA drawings for client approval

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Consultants

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Nominated architect: Miranda Dunn NSW ARB 8 5521

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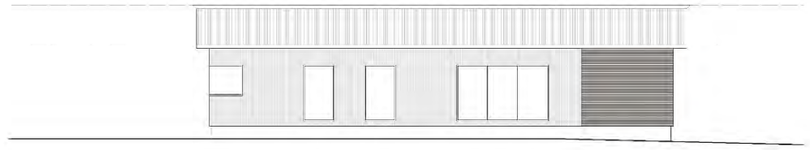
Client	Gunnedah Shire Council
Project	Gunnedah Koala Sanctuary 3130 Oxley Highway, Gunnedah
Issue	Feasibility
Date	Fri, 13 Nov 2020
Scale	1:100 @A1
Drawing	Volunteers Accommodation
Drw No.	DA01_05
Rev	H
Job No.	20_001
Drawn:	SF
Check:	LH

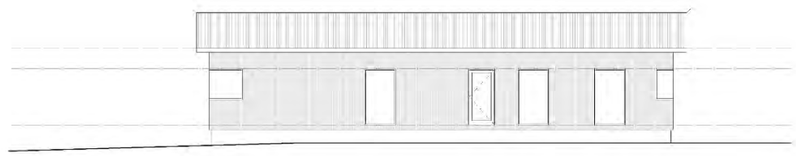
PRELIMINARY



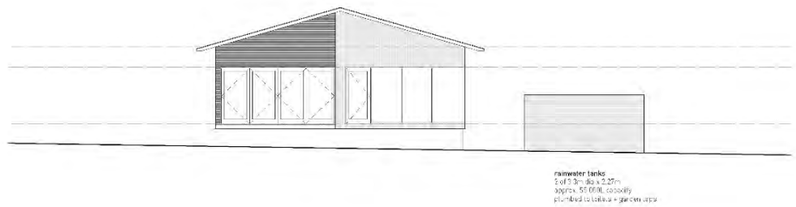
2 DA01-06 **North Elevation - Caretaker's**
Scale: 1:100

3 DA01-06 **East Elevation - Caretaker's**
Scale: 1:100

1 DA01-06 **Floor Plan - Caretaker's**
Scale: 1:100



4 DA01-06 **South Elevation - Caretaker's**
Scale: 1:100



5 DA01-06 **West Elevation - Caretaker's**
Scale: 1:100

Rev	Date	By	Notes
4	13/11/20		Preliminary DA issue to consultants
A	12/11/20		Preliminary DA drawings for client approval

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Consultants

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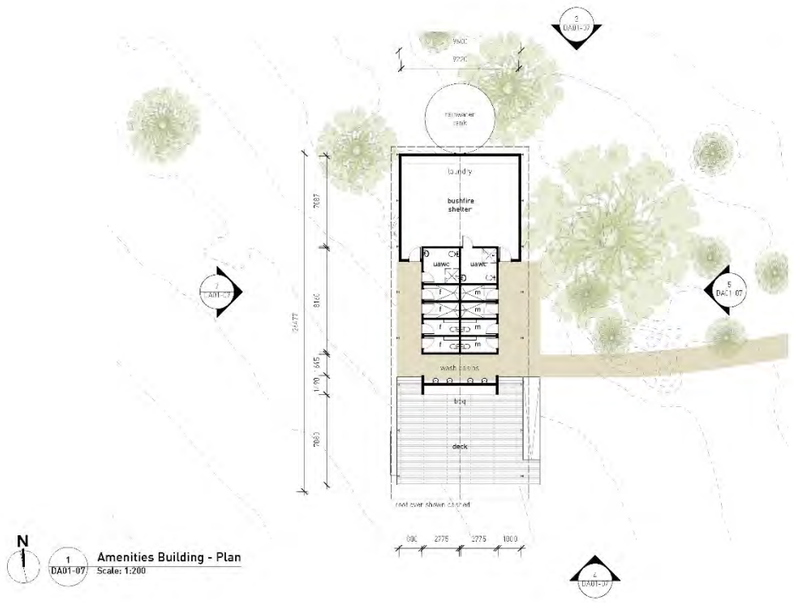
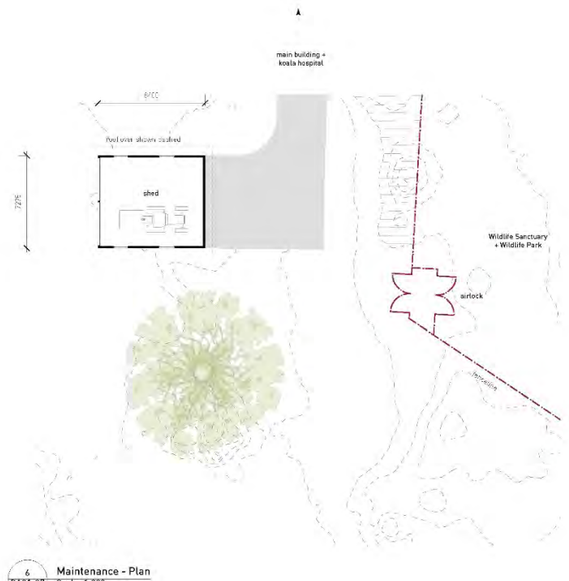
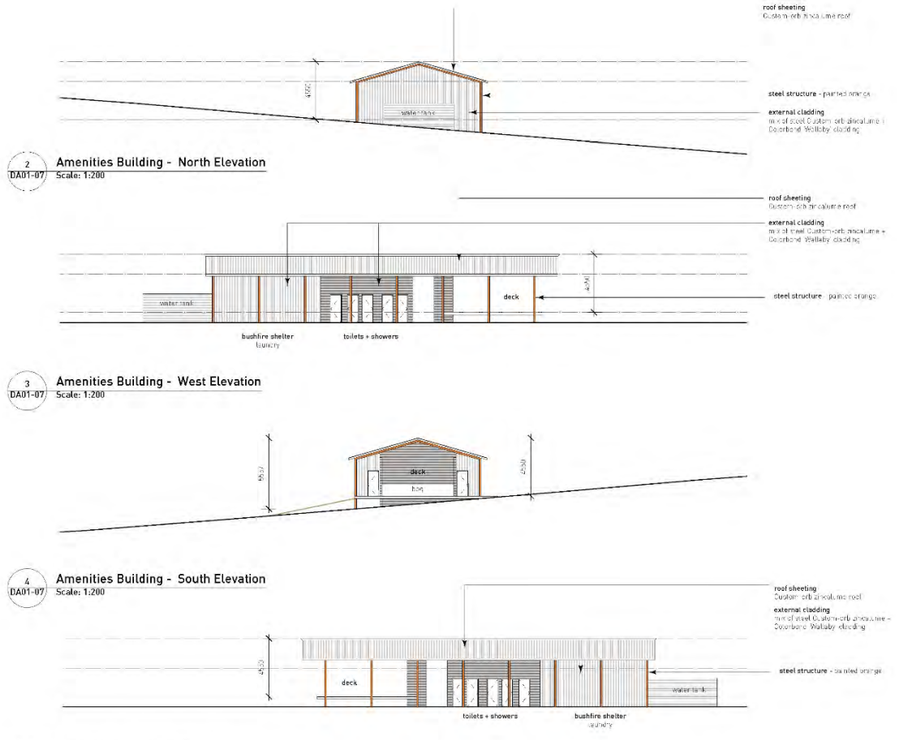
Client	Gunnedah Shire Council
Project	Gunnedah Koala Sanctuary 3130 Oxley Highway, Gunnedah
Issue	Feasibility
Date	Fri, 13 Nov 2020
Scale	1:100 @A1
Drawing	Caretaker's Residence
Drw No.	DA01_06
Rev	H
Job No.	20_001
Drawn:	SF
Check:	LH

PRELIMINARY







Rev	Date	By	Notes
E	13/11/20	SF	Preliminary DA issue to consultants
A	12/11/20	SF	Preliminary DA issue subject to client approval

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Consultants

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Nominated Architect Dunn NSW ARB No 5501

Client	Gunnedah Shire Council
Project	Gunnedah Koala Sanctuary 3130 Oxley Highway, Gunnedah
Issue	Feasibility
Date	Fri, 13 Nov 2020
Scale	1:200 @A1
Drawing	Maintenance Shed + Amenities Building
Drw No.	DA1 07 Rev H
Job No.	20_007
Drawn:	SF Check: LH

PRELIMINARY

Appendix B

AHIMS Search

Office of Environment & Heritage
NSW GOVERNMENT

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 19038
Client Service ID : 479848

Integrated Consulting
PO Box 9026
Bathurst West New South Wales 2795
Attention: Erika Dawson
Email: erika@integratedconsulting.com.au

Date: 28 January 2020

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 328, DP:DP755503 with a Buffer of 50 meters, conducted by Erika Dawson on 28 January 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

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Web: www.environment.nsw.gov.au

Office of Environment & Heritage
NSW GOVERNMENT

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 19038
Client Service ID : 479849

Integrated Consulting
PO Box 9026
Bathurst West New South Wales 2795
Attention: Erika Dawson
Email: erika@integratedconsulting.com.au

Date: 28 January 2020

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 329, DP:DP755503 with a Buffer of 50 meters, conducted by Erika Dawson on 28 January 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

Appendix C

Bush Fire Safety Authority Checklist

Table 23: Clause 44 Rural Fires Regulations 2013 Considerations

Requirement	Section of Report where addressed	Compliance		
		Yes	No	N/A
(1) For the purposes of section 100B (4) of the Act, an application for a bush fire safety authority must be made in writing and must include the following:				
(a) a description (including the address) of the property on which the development the subject of the application is proposed to be carried out,	Section 1.3.	☒	☐	☐
(b) a classification of the vegetation on and surrounding the property (out to a distance of 140 metres from the boundaries of the property) in accordance with the system for classification of vegetation contained in *Planning for Bush Fire Protection,*	Section 2.2.	☒	☐	☐
(c) an assessment of the slope of the land on and surrounding the property (out to a distance of 100 metres from the boundaries of the property),	Section 2.3	☒	☐	☐
(d) identification of any significant environmental features on the property,	Section 1.3.3	☒	☐	☐
(e) the details of any threatened species, population or ecological community identified under the *Threatened Species Conservation Act 1995* that is known to the applicant to exist on the property,	Section 1.3.4	☒	☐	☐
(f) the details and location of any Aboriginal object (within the meaning of the *National Parks and Wildlife Act 1974*) or Aboriginal place (within the meaning of that Act) that is known to the applicant to be situated on the property,	Section 1.3.5	☒	☐	☐
(g) a bush fire assessment for the proposed development (including the methodology used in the assessment) that addresses the following matters:	Section 2.1	☒	☐	☐
i. the extent to which the development is to provide for setbacks, including asset protection zones,	Section 2.5	☒	☐	☐
ii. the siting and adequacy of water supplies for fire fighting,	Sections 3.5.3, 4.4.3, 5.4.3	☒	☐	☐
iii. the capacity of public roads in the vicinity to handle increased volumes of traffic in the event of a bush fire emergency,	Sections 3.5.2, 4.4.2, 5.4.2	☒	☐	☐
iv. whether or not public roads in the vicinity that link with the fire trail network have two-way access,	Sections 3.5.2, 4.4.2, 5.4.2	☒	☐	☐

Table 23: Clause 44 Rural Fires Regulations 2013 Considerations

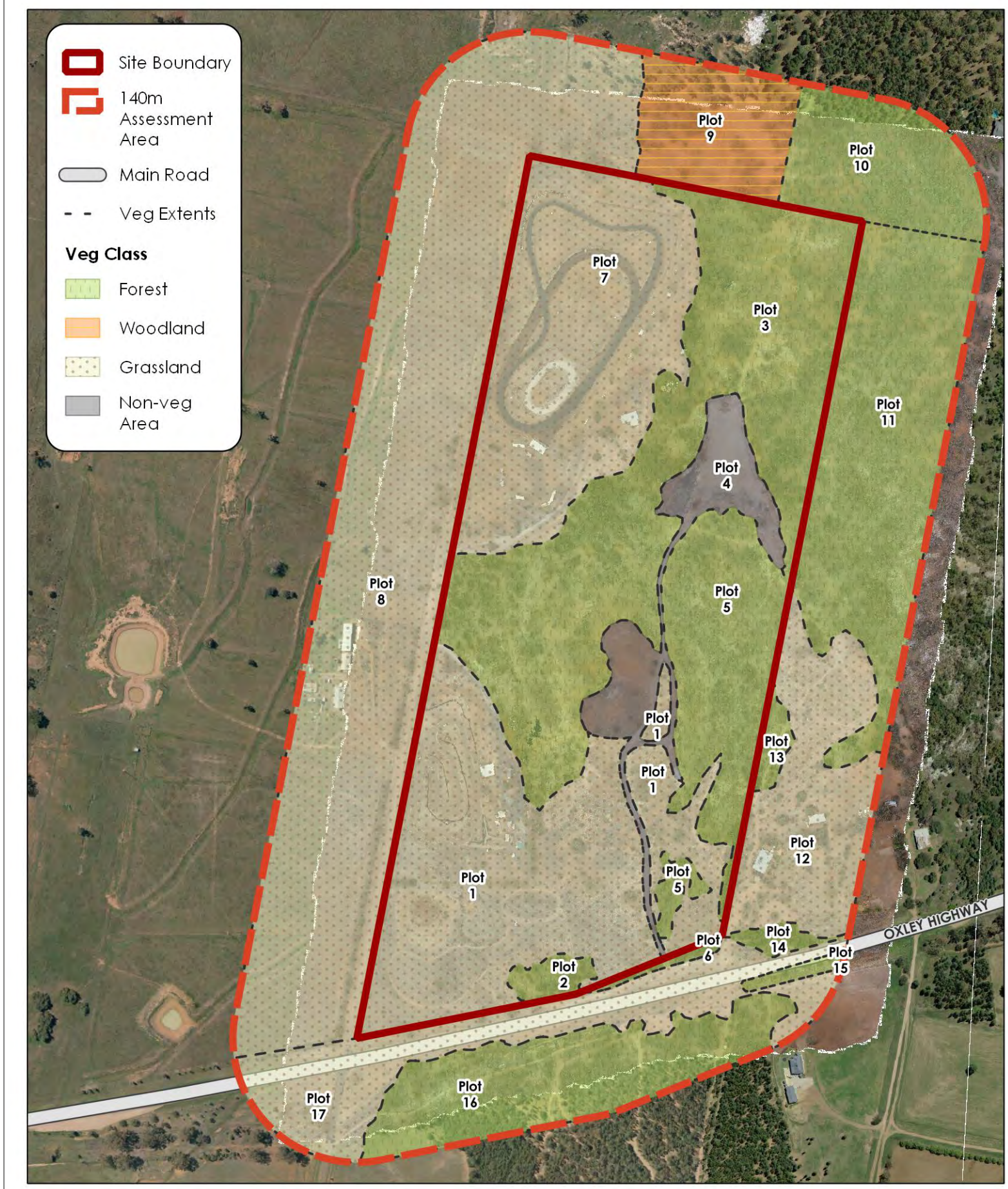
Requirement	Section of Report where addressed	Compliance		
		Yes	No	N/A
v. the adequacy of arrangements for access to and egress from the development site for the purposes of an emergency response,	Sections 3.5.2, 4.4.2, 5.4.2	☒	☐	☐
vi. the adequacy of bush fire maintenance plans and fire emergency procedures for the development site,	Section 3.5.4, 4.4.8, 5.4.4	☒	☐	☐
vii. the construction standards to be used for building elements in the development,	Sections 3.5.1, 4.4.6, 5.4.1	☒	☐	☐
viii. the adequacy of sprinkler systems and other fire protection measures to be incorporated into the development,	Nil applicable	☒	☐	☐
(h) an assessment of the extent to which the proposed development conforms with or deviates from the standards, specific objectives and performance criteria set out in Chapter 4 (Performance Based Controls) of Planning for Bush Fire Protection.	Sections 3-5.	☒	☐	☐
(2) An application for a bush fire safety authority must also be accompanied by the prescribed information if:				
(a) the proposed development is subdivision for the purposes of dwelling houses, dual occupancies or secondary dwellings on property that is in an urban release area, and		☐	☐	☒
(b) the application specifies that the applicant wishes the Commissioner, when determining the application, to consider whether it would be appropriate for the future erection of the dwelling houses, dual occupancies or secondary dwellings concerned to be excluded from the application of section 79BA of the *Environmental Planning and Assessment Act 1979*.		☐	☐	☒
(3) The prescribed information is: (a) a plan of subdivision that shows:		☐	☐	☒
i. the bush fire attack levels that will apply to the property on completion of any clearing of vegetation proposed to be carried out as part of any subdivision work (within the meaning of the Environmental Planning and Assessment Act 1979), and		☐	☐	☒
ii. proposed setbacks of any buildings that are, or may in future, be erected on the property, including asset protection zones, and		☐	☐	☒

Table 23: Clause 44 Rural Fires Regulations 2013 Considerations

Requirement	Section of Report where addressed	Compliance		
		Yes	No	N/A
(b) any further information concerning the proposed development that the Commissioner may require.		☐	☐	☒

Appendix D

Classified Vegetation Map



Integrated Consulting
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Bathurst West
NSW 2795

BUSHFIRE ASSESSMENT REPORT
Gunnedah Koala Park

Vegetation Classification Plan

Size: A4
Scale: 1:5500
N

0 50 100 150 200 250 m

Ref: 19038_001_01_Veg_20200131
Projection: GDA94MGA56
Author: MM | Date: 2020-04-27
Data Source: Cadastre - Landgate; Imagery - Nearmap; Roads, Site Boundary, Veg, BAL, Buffers, BMS - Intergrated.

Disclaimer: Although the data within this map is considered accurate at the time of creation, Intergrated Consultanting does not guarantee, and accepts no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any data used within this map.

Figure 8: Vegetation Classification

Appendix E

Bush Fire Protection Measures Plan

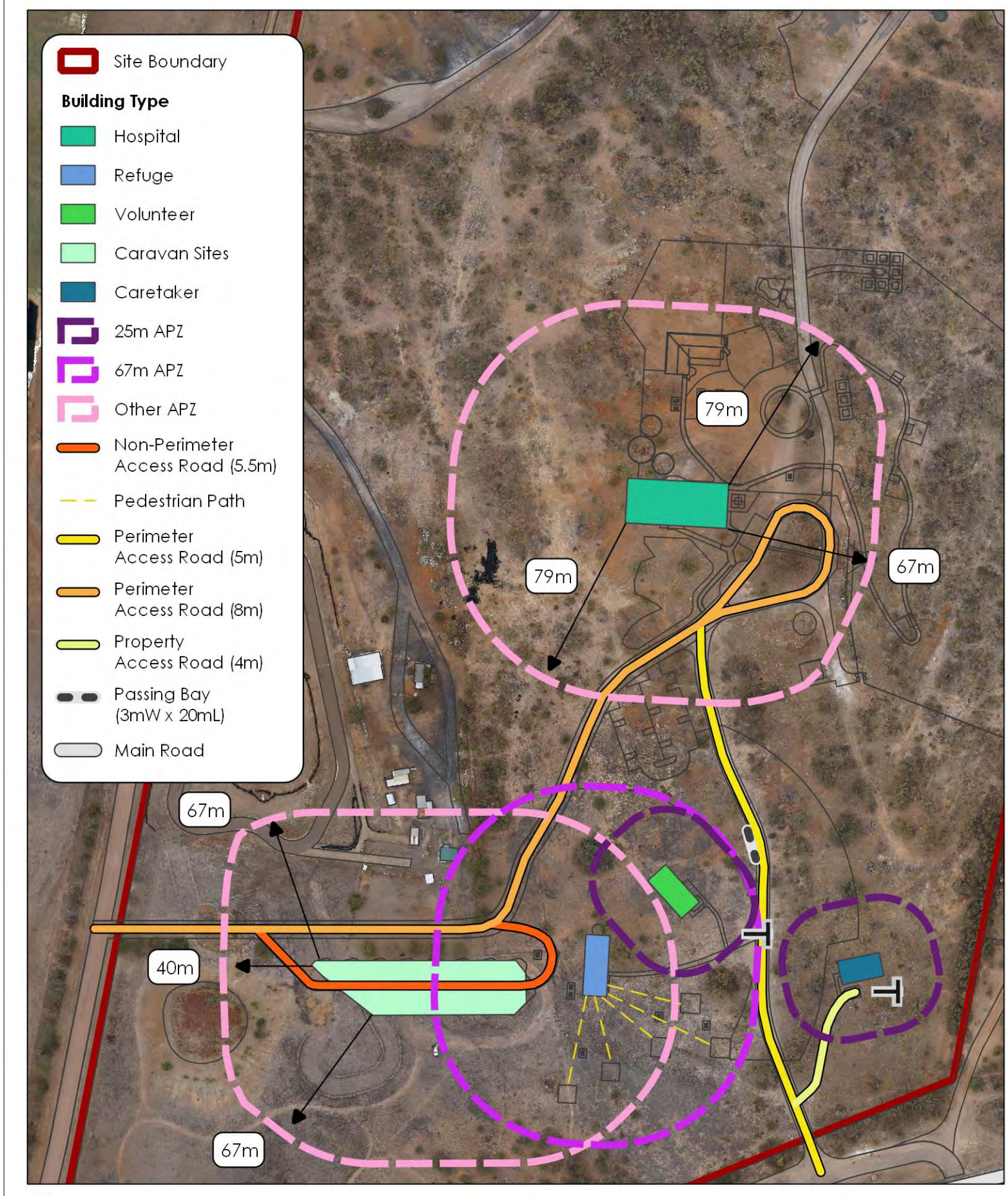


Figure 9: Bush Fire Protection Measures – Whole site

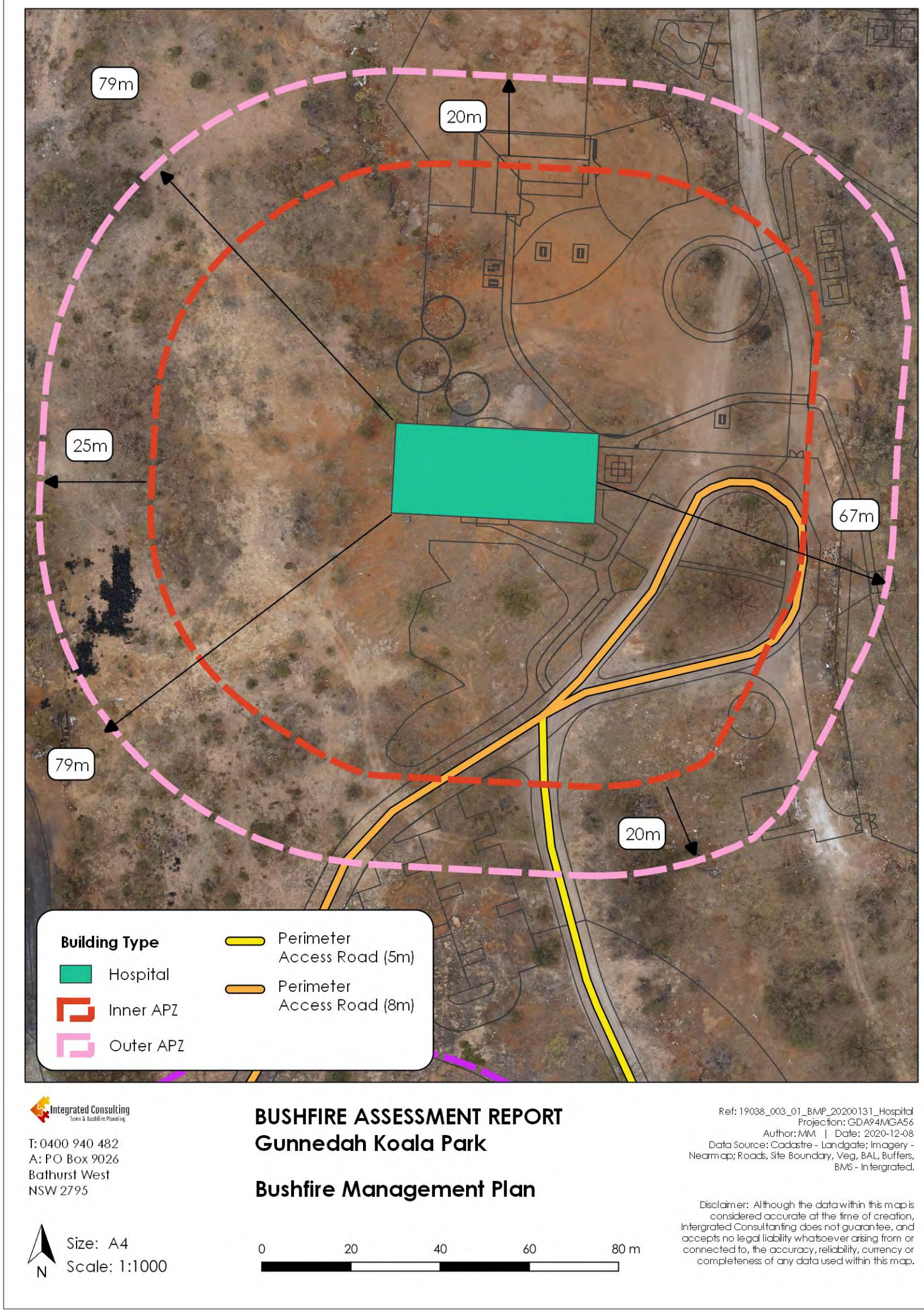


Figure 10: Bush Fire Protection Measures – Hospital

Appendix F

APZ & Landscaping Measures

APPENDIX 4

ASSET PROTECTION ZONE REQUIREMENTS

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

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

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

A4.1 Asset Protection Zones

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

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

An APZ provides:

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

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

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

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

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

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

A4.1.1 Inner Protection Areas (IPAs)

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

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

When establishing and maintaining an IPA the following requirements apply:

Trees

- tree canopy cover should be less than 15% at maturity;
- trees at maturity should not touch or overhang the building;
- lower limbs should be removed up to a height of 2m above the ground;
- tree canopies should be separated by 2 to 5m; and
- preference should be given to smooth barked and evergreen trees.

Shrubs

- create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided;
- shrubs should not be located under trees;
- shrubs should not form more than 10% ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

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

A4.1.2 Outer Protection Areas (OPAs)

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

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

When establishing and maintaining an OPA the following requirements apply:

Trees

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

Shrubs

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

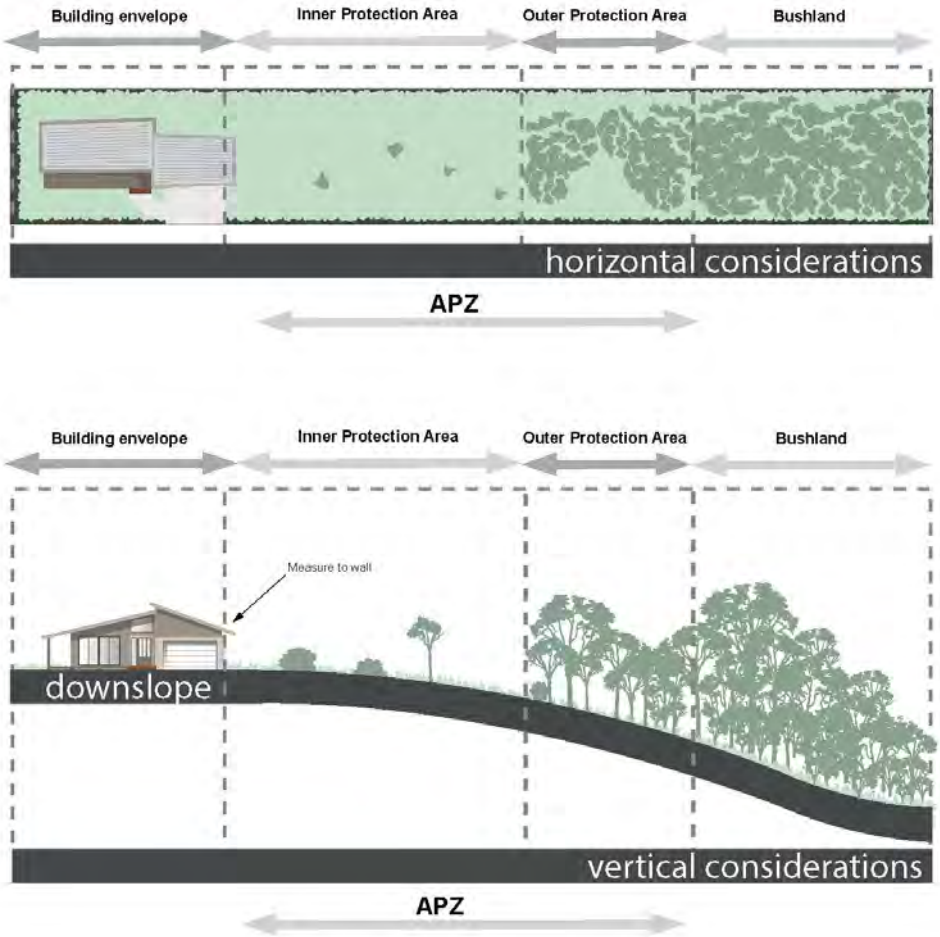
Grass

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

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

Figure A4.1

Typical Inner and Outer Protection Areas.



Appendix G

Access Standards

APPENDIX 3

ACCESS

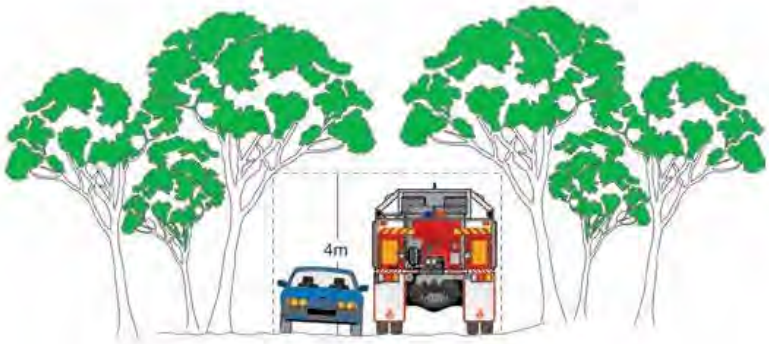
This appendix provides design principles for emergency service vehicle access.

A3.1 Vertical clearance

An unobstructed clearance height of 4 metres should be maintained above all access ways including clearance from building construction, archways, gateways and overhanging structures (e.g. ducts, pipes, sprinklers, walkways, signs and beams). This also applies to vegetation overhanging roads.

Figure A3.1

Vertical clearance.



A3.2 Vehicle turning requirements

Curved carriageways should be constructed using the minimum swept path as outlined in Table A3.2.

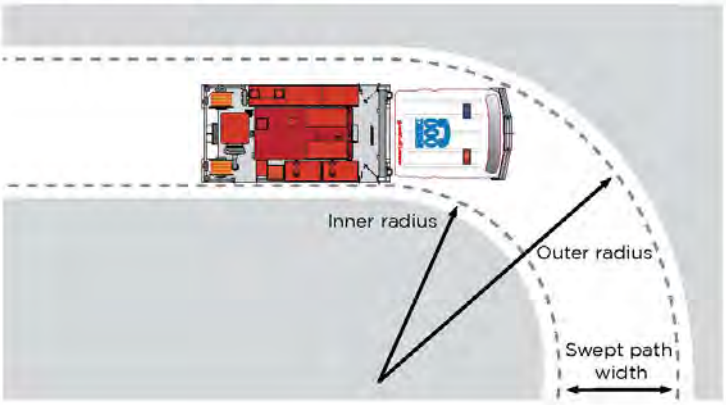
Table A3.2

Minimum curve radius for turning vehicles.

Curve radius (inside edge in metres)	Swept path (metres width)
< 40	4.0
40 - 69	3.0
70 - 100	2.7
> 100	2.5

Figure A3.2a

Swept path width for turning vehicles.



The radius dimensions given are for wall to wall clearance where body overhangs travel a wider arc than the wheel tracks (vehicle swept path). The swept path shall include an additional 500mm clearance either side of the vehicle.

Figure A3.2b

Roundabout swept path.

Example of a swept path as applied to a roundabout. The distance between inner and outer turning arcs allows for expected vehicle body swing of front and rear overhanging sections (the swept path).

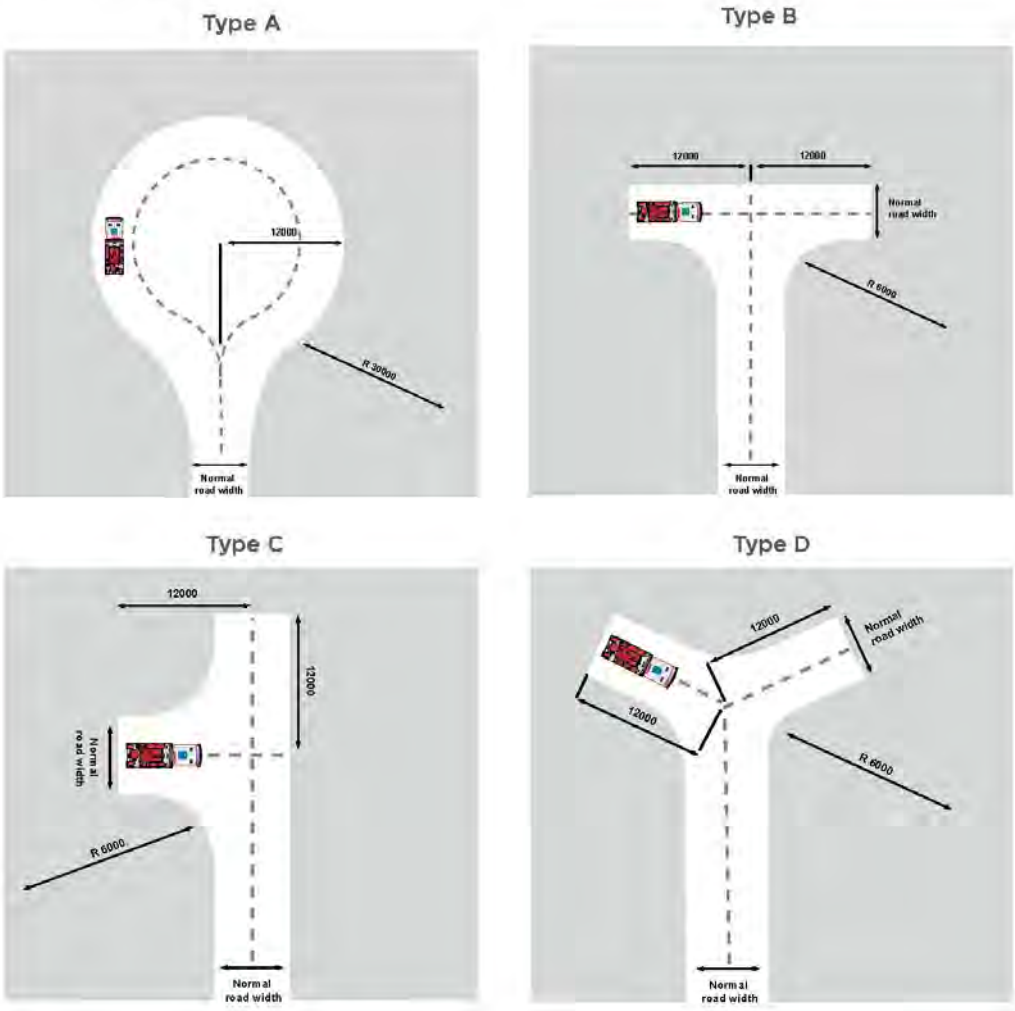
A3.3 Vehicle turning head requirements

Dead ends that are longer then 200m must be provided with a turning head area that avoids multipoint turns. "No parking" signs are to be erected within the turning head.

The minimum turning radius shall be in accordance with Table A3.2. Where multipoint turning is proposed the NSW RFS will consider the following options:

Figure A3.3

Multipoint turning options.



A3.4 Passing bays

The construction of passing bays, where required, shall be 20m in length and provide a minimum trafficable width at the passing point of 6m.

Figure A3.4

Passing bays can provide advantages when designed correctly. Poor design can and does severely impede access.

A3.5 Parking

Parking can create a pinch point in required access. The location of parking should be carefully considered to ensure fire appliance access is unimpeded. Hydrants shall be located outside of access ways and any parking areas to ensure that access is available at all times.

Figure A3.5

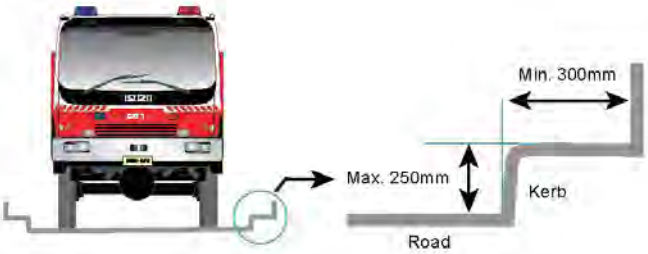
Hydrants and parking bays.

A3.6 Kerb dimensions

All kerbs constructed around access roads should be no higher than 250mm and free of vertical obstructions at least 300mm back from the kerb face to allow clearance for front and rear body overhang.

Figure A3.6

Carriageway kerb clearance dimensions.



A3.7 Services

Hydrant services should be located outside the carriageway and parking bays to permit traffic flow and access. Setup of standpipes within the carriageway may stop traffic flow. Hydrant services shall be located on the side of the road away from the bush fire threat where possible.

A3.8 Local Area Traffic Management (LATM)

The objective of LATM is to regulate traffic an acceptable level of speed and traffic volume within a local area.

Traffic engineers and planners should consider LATM devices when planning for local traffic control and their likely impact on emergency services. LATM devices by their nature are designed to restrict and impede the movement of traffic, especially large vehicles.

Where LATM devices are provided they are to be designed so that they do not impede fire vehicle access.

A3.9 Road types

A3.9.1 Perimeter Roads

Perimeter roads are to be provided with a minimum clear width of 8m. Parking and hydrants are to be provided outside of carriageways. Hydrants are to be located outside of carriageways and parking areas.

Figure A3.9a

Perimeter road widths.

A3.9.2 Non-perimeter Roads

Non-perimeter roads shall be provided with a minimum clear width of 5.5m. Parking is to be provided outside of the carriageway and hydrants are not to be located in carriageways or parking areas.

Figure A3.9b

Non-perimeter road widths.

A3.9.3 Property access

Property access roads are to be a minimum of 4m wide.

Figure A3.9c

Property access road widths.

Appendix H

Draft Bushfire Emergency Management & Evacuation Plan

BUSH FIRE EMERGENCY MANAGEMENT & EVACUATION PLAN

NAME OF FACILITY:

Gunnedah Koala Park

ADDRESS OF FACILITY:

3130 Oxley Highway, Gunnedah

Date:

December 2020

TO BE REVIEWED ANNUALLY

DOCUMENT CONTROL

Version	Date	Prepared by	Reviewed by	Details
A	8/12/2020	Erika Dawson		Draft for client review

CONTENTS

FACILITY DETAILS

Summary

This plan is for: **Gunnedah Koala Park**

Name of Facility

and has been designed to assist management to protect life and property in the event of a bush fire.

This Plan outlines procedures for both sheltering (remaining on-site) and evacuation to enhance the protection of occupants from the threat of a bush fire.

The Primary Action to follow under normal bush fire conditions is to:

Shelter ☐ **Evacuate** ☒

Contact Person:	
Position/Role:	
Phone Number (BH):	Phone Number (AH):
Type of facility:	
Number of buildings:	
Number of employees:	
Number of occupants:	
Number of occupants with support needs:	

Provide description of support needs

Roles & Responsibilities

The following outlines who has the responsibility of implementing the emergency procedures in the event of a bush fire.

Position	Name or Person	Building/Area of responsibility	Mobile phone number
Chief Fire Warden			
Deputy Fire Warden			
Communications Officer			
Area Wardens			

Emergency Contacts

Name of Organisation	Office/Contact	Phone number/website
NSW Rural Fire Service	Fire Control Centre (Liverpool Range Office) Bennet Road, Gunnedah	02 6746 5800
NSW Rural Fire Service	Bush Fire Information Line	1800 679 737 1800 NSW RFS
NSW Rural Fire Service	Website	www.rfs.nsw.gov.au
NSW Fire & Rescue	Gunnedah Fire Station 96 Barber St, Gunnedah	02 6742 2084
NSW Police	Gunnedah Police Station 36 Abbott St, Gunnedah	02 6742 9099
NSW Ambulance	Anzac Parade Gunnedah	02 5711 1401

SHELTERING PROCEDURES

Evaluation of the safety of employees and occupants has determined that it would be safer for ALL persons to shelter in a designated refuge.

The following are the designated refuges allocated within the premises.

Designated Refuges

a	Camping Amenities Building/Bushfire Shelter
b	Wildlife Centre/Hospital

Procedures for sheltering during a bush fire emergency

	Trigger		Action
a	In the event of a Catastrophic Fire Danger Rating	a	The facility is to be closed
b	In the event of an Extreme or Severe Fire Danger Rating	b	All accommodation on site is to be closed. The RFS website is to be monitored and communication to be maintained with Fire & Rescue NSW and the RFS
c	In the event that a bush fire starts in the locality that is not threatening the site	c	The RFS website is to be monitored and communication to be maintained with RFS/Fire & Rescue NSW
d	In the event that a bushfire starts in the locality that could threaten the site	d	Communication with the RFS/Fire & Rescue NSW to determine whether it is safe to evacuate or whether shelter in place is the appropriate action. Follow the instructions of the incident commander.
e	In the event that a bushfire starts in the locality and is threatening the site	e	Shelter in Place and follow the instructions of the incident commander. It is not safe to evacuate the site.

After the bush fire emergency

a	When advised it is safe to return to the site by the incident commander, the Chief Fire Warden is to check the site is safe for return.
b	When the Chief Fire Warden has advised that the site is safe to return, operations to return to normal. Or if the site is not safe to return to operations, the site is to be evacuated.
c	
d	

EVACUATION PROCEDURES

Evaluation of the safety of employees and occupants has determined that it would be safer for ALL persons to evacuate to a designated refuge (off site).

Designated assembly points

1	Wildlife Centre/Hospital drop off bay
2	
3	
4	

Refuge (Primary)

Name of venue (primary):	TBD in consultation with RFS
Address of venue:	
Nearest cross-street:	
Map reference:	
Phone number:	

Transportation arrangements (Primary)

Number of vehicles required	TBD by operator
Name of organisation providing transportation	TBD by operator
Contact phone number:	TBD by operator
Time required to have transportation available:	TBD by operator
Estimated travelling time to destination:	TBD by operator

Refuge (Secondary)

Name of venue (secondary):	TBD in consultation with RFS
Address of venue:	
Nearest cross-street:	
Map reference:	
Phone number:	

Transportation arrangements (Secondary)

Number of vehicles required	TBD by operator
Name of organisation providing transportation	TBD by operator
Contact phone number:	TBD by operator
Time required to have transportation available:	TBD by operator
Estimated travelling time to destination:	TBD by operator

Procedures for evacuation during a bush fire emergency

	Trigger		Action
a	In the event of a Catastrophic Fire Danger Rating	a	The facility is to be closed
b	In the event of an Extreme or Severe Fire Danger Rating	b	All accommodation on site is to be closed. The RFS website is to be monitored and communication to be maintained with Fire & Rescue NSW and the RFS
c	In the event that a bush fire starts in the locality that is not threatening the site	c	The RFS website is to be monitored. Communication with the RFS/Fire & Rescue NSW to determine whether it is safe to evacuate or whether shelter in place is the appropriate action. Follow the instructions of the incident commander.
d	In the event that a bushfire starts in the locality that could threaten the site	d	Communication with the RFS/Fire & Rescue NSW to determine whether it is safe to evacuate or whether shelter in place is the appropriate action. Follow the instructions of the incident commander.

	Trigger		Action
e	In the event that a bushfire starts in the locality and is threatening the site	e	Shelter in Place and follow the instructions of the incident commander. It is not safe to evacuate the site.

After the bush fire emergency

a	When advised it is safe to return to the site by the incident commander, the Chief Fire Warden is to check the site is safe for return.
b	When the Chief Fire Warden has advised that the site is safe to return, operations to return to normal. Or if the site is not safe to return to operations, the site is to be evacuated.
c	
d	

PREPARATION

Before and at the commencement of the Bush Fire Danger Period, we will:

a	Consult with the Fire and Rescue/RFS District Office to revise existing emergency management and evacuation procedures
b	Ensure the site is managed in a low threat/APZ state.
c	Ensure all bushfire protection measures are in good working order and maintained in accordance with BFAR/DA consent specified requirements.
d	

ATTACHMENTS

Occupant/Employee Listings

Contact details for parents/guardians

Site Layout of Premises

Gunnedah Koala Park

Biodiversity Development Assessment Report

Gunnedah LGA NSW
January 2021

AREA
ENVIRONMENTAL & HERITAGE CONSULTANTS

AREA Environmental Consultants & Communication
"'The Old Macquarie Brewery' c.1876, 72 Brisbane Street Dubbo NSW 2830
Ph 0409 852 098
phil@areaenv.com.au

ABN:29 616 529 867
Advanced Regional Environmental Assessments (AREA)

- ✓ Environmental impact assessment, approvals and auditing
- ✓ Preliminary environmental assessment (PEA)
- ✓ Review of environmental factors (REF)
- ✓ Peer review
- ✓ Community engagement
- ✓ Biobanking and biodiversity offsetting assessments
- ✓ Aboriginal heritage assessments and community walkovers
- ✓ Landscape design

AREA Environmental Consultants & Communication acknowledge Traditional Owners of the country on which we work

Document controls

Proponent		Gunnedah Shire Council
Client		Gunnedah Shire Council
Quote number		QU#0244
Document Description		Biodiversity Development Assessment Report: Gunnedah Koala Park 2021
Clients Representative Managing this Document		Lee Hillam. E lee@dunnhillam.com.au
AREA Person(s) Managing this Document		Phil Cameron (PJC)
DOCUMENT STATUS: FINAL		
DRAFT: Series V1.X AREA internal edits	**Date**	**Action**
V1.0	04/12/2020	Draft to PJC – internal edit
V1.1	04/12/2020	Reviewed / certified
DRAFT Series V2.X Client / AREA internal edits	**Date**	**Action**
V2.0 V2.1	04/12/2020 20/01/2021	AREA to Client AREA updated with threatened species search results
FINAL (Draft approved by client)	**Date**	**Action**
V3.0	28/01/2021	Finalised
Prepared for		**Gunnedah Shire Council** E. phillplindfield@infogunnedah.com.au 63 Elgin St, Gunnedah NSW 2380
Prepared by		Genevieve Peel / Environmental Consultant; and Phillip Cameron / Managing Director. **AREA Environmental Consultants & Communication Pty Ltd** ABN:29 616 529 867 "Old Macquarie Brewery c1876, 72 Brisbane Street Dubbo, NSW 2830 GP: E gen@areaenv.com.au PJC: M 0409 852 098 / E phil@areaenv.com.au
Certified by		Phillip Cameron | Managing Director CEnvP, BSc, Ass Dip App Sci, Dip Landscape Design (in prep), Cert III, BAM accredited assessor (BAAS17082)

Executive summary

AREA Environmental Consultants & Communication (AREA) was commissioned by Gunnedah Shire Council (the client) to complete this Biodiversity Development Assessment Report (BDAR). This BDAR documents the assessment of potential and significant environmental impact associated with a proposed Gunnedah Koala Park, which would be located approximately three kilometres west of Gunnedah on the northern side of the Oxley Highway (Figures 1-1 and 1-2).

The proposal will provide a koala hospital with ancillary supporting activities and attractions including:

- koala hospital and educational centre (research, education etc.)
- eucalypt plantation
- exhibition of captive animals – zoo
- gift shop/ticket sales area
- dormitory accommodation for hospital/ zoo volunteers
- restaurant & function area
- on-site spaces for camping and caravans
- mini golf course
- ropes course/ zip lining
- wildlife sanctuary area (walking paths, information displays)
- indigenous history education/ showcase area.

This BDAR has been prepared as part of a Statement of Environmental Effects for the proposal. A full site-based assessment has been undertaken using the Biodiversity Assessment Methodology 2020 (BAM).

This proposal will affect up to 10.79 hectares, of which approximately 6.32 hectares is native vegetation. This includes areas identified as bushfire asset protections zones (APZ's). In most cases the tree and shrub canopy density in the asset protection areas is less than the required Rural Fire Service management thresholds, and creation of these protection zones does not significantly increase the impact to native vegetation.

This BDAR includes an assessment of landscape values in the development site and surrounding areas, the vegetation communities present in the development site and their condition, the known or potential presence of threatened flora or fauna species and populations as well as potential matters of Serious and Irreversible Impact (SAII) listed in NSW under the *Biodiversity Conservation Act 2016* (BC Act) and/or the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The disturbance history in the development site includes modification from past land-uses for mining, rural settlement, and agriculture, as well as areas which had been deposited with soil, building debris and the like. Treed vegetation makes up approximately 26 percent of area within 1500 metres of the development site. The remaining 74 percent is heavily cleared agricultural land. There are no drainage lines in the development site.

One Plant Community Type (PCT) was recorded in the development site based on vegetation assessment plot results and landscape features matched against the VIS classification database: PCT592 *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion.* This PCT is not associated with any threatened Ecological Community.

The vegetation condition was assessed using the site attributes compared with benchmark values. All vegetation zones recorded greater that 25 percent of benchmark values for six or more of 15 attributes. This reflects the sites prior heavy disturbance and subsequent period of unassisted natural regeneration.

The impact to threatened flora and fauna species was informed by targeted surveys for predicted species undertaken in accordance with relevant guidance documents. Predicted species are those which are predicted to occur based on their known presence in the Interim Biogeographic Regionalisation for Australia (IBRA) subregion, the presence of associated PCTs, the size and condition of the vegetation patches on the site and includes listed species identified by the NSW Department of Planning Industry & Environment (DPIE) in the BAM Credit Calculator (BAMCC) as ecosystem credit species or species credit species.

Ecosystem credit species are those that can be reliably predicted based on the habitat surrogates. No survey is required for these as they are assumed to occur. The BAMCC identified the proposal would impact 28 ecosystem credit species, three of which were excluded as habitat constraints are not present in the development site.

Twenty-one species credit species (candidate species) were identified by the BAMCC. These cannot be reliably predicted from the habitat surrogates and their presence is to be assessed through habitat assessment and targeted surveys. These are assumed to occur unless survey effort has been undertaken in accordance with the guidance material proving otherwise.

Threatened species survey effort in the development site included targeted search transects, diurnal hollow observation and bird searches, nocturnal frog survey and nocturnal species call playback in March 2020, as well as seven continuous days ultrasonic bat recording in the adjacent lot in July/August 2019 and baited camera traps in December 2020/January 2021. Seven candidate species were excluded based on habitat or geographic constraints and the above survey effort following requisite guidelines was applied to the remaining candidate species requiring targeted survey. All but two species could be excluded; Koala *Phascolarctos cinereus* (recorded on site) and Masked Owl *Tyto novaehollandiae* (no targeted assessment and assumed to occur).

Ultrasonic bat recording detected Large-eared Pied Bat and Eastern Cave Bat, both of which were predicted to occur by the BAMCC.

As a result of the survey effort applied the BAMCC summary for the proposal is:

- ecosystem credits for PCT592 (32 credits)
- species credits retired for:
    - Koala (11 credits)
    - Masked Owl (11 credits).

Credit classes allocated to the proposal are outlined at the end of this BDAR.

Contents

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TABLES

1 Introduction

1.1 Requirement of assessment under the BAM

This Biodiversity Development Assessment Report (BDAR) has been prepared as the proposal to construct Gunnedah Koala Park will impact native vegetation and exceed the threshold for clearing under section 7.2 (2)(b) *Biodiversity Conservation Regulation 2017*. The minimum lot size (MLS) for the development site is partially 40 hectares and partially 200 hectares under the Gunnedah Local Environmental Plan. Where a development site includes more than one MLS, the smallest MLS will be used to decide the minimum clearing threshold. Therefore, the trigger for a BDAR for this proposal is clearing one hectare or more of native vegetation (Table 1-1).

The total impact of the development site is approximately 10.79 hectares, of which 6.32 hectares is impact to native vegetation. As the threshold is one hectare or more, the proposal triggers assessment by the Biodiversity Assessment Method (BAM).

Table 1-1: Area Clearing Thresholds (section 7.2 *Biodiversity Conservation Regulation 2017*)

Minimum lot size of land	Threshold for clearing
Less than 1 hectare	0.25 hectare or more
Less than 40 hectares but not less than 1 hectare	0.5 hectare or more
Less than 1,000 hectares but not less than 40 hectares	1 hectare or more
1,000 hectares or more	2 hectares or more

AREA Environmental Consultants & Communication (AREA) has been commissioned by Dunn & Hillam (the client) to complete this Biodiversity Development Assessment Report (BDAR) on behalf of Gunnedah Shire Council (the proponent). This BDAR documents the assessment of potential and significant environmental impact associated with establishment of Gunnedah Koala Park and informs the Gunnedah Council determination of the proposal under Part 4 of the *Environmental Planning and Assessment Act 1979*.

This BDAR has been prepared as part of a Statement of Environmental Effects (SEE). A full site-based assessment has been undertaken using the BAM.

The following guidance materials were followed during field assessments:

- Biodiversity Assessment Methodology (DPIE, 2020)
- Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE 2020)
- NSW Survey Guide for Threatened Frogs A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE 2020)
- 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (2018)
- Guide to Surveying Threatened Plants (OEH, 2015)
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004)
- Survey requirements (birds, bats, reptiles, frogs, fish and mammals) for species listed under the EPBC Act.

1.2 Description of the proposed development

Gunnedah Shire LGA is a well-known for its locally important koala population.

The proposal will provide a koala hospital with ancillary supporting activities and attractions including:

- koala hospital and educational centre (research, education etc.)
- eucalypt plantation
- exhibition of captive animals – zoo
- gift shop/ticket sales area
- dormitory accommodation for hospital/ zoo volunteers
- restaurant & function area
- on-site spaces for camping and caravans
- mini golf course
- ropes course/ zip lining
- wildlife sanctuary area (walking paths, information displays)
- indigenous history education/ showcase area.

The park will be publicly owned and leased to a not-for-profit charity that will operate the facility under the management of an established wildlife park operator.

The **development site** for the proposal considered in this BDAR includes all areas in which vegetation will be impacted 100 percent by construction, including buildings, roads, enclosures and fences and the associated construction buffers. It also includes areas identified as asset protections zones (AZP's) from bushfires, which are described in the following section.

The development site covers an area of approximately 10.79 hectares which is broken down as follows:

- 5.64 hectares impacted by construction, 100 per cent removal of vegetation
- 1.01 hectares for inner asset protection area, which requires no more than 15 per cent tree and shrub canopy cover
- 4.14 hectares for outer asset protection area, which requires no more than 30 per cent tree and shrub canopy cover.

In most cases the tree and shrub density in the asset protection area is less than the required NSW Rural Fire Service management thresholds, and creation of these protection zones would not significantly increase the impact to native vegetation.

This BDAR assesses the potential biodiversity impacts from construction of the proposed Gunnedah Koala Park and addresses requirements of the following legislative frameworks:

- *NSW Environmental Planning and Assessment Act 1979* (EP&A Act)
- *NSW Biodiversity Conservation Act 2016* (BC Act)
- N*SW Local Land Services Act 2013* (LLS Act)
- *State Environmental Planning Policy (Vegetation in Non-Rural Areas)* 2017 (Veg SEPP).

1.3 Asset protection zones

An APZ, as described in the NSW Rural Fire Service 'Planning for bushfire protection' document (2019) is a fuel-reduced area surrounding a building or structure. It is located between the building or structure and the bush fire hazard. An APZ provides:

- a buffer zone between a bush fire hazard and an asset
- an area of reduced bush fire fuel that allows for suppression of fire
- an area from which backburning or hazard reduction can be conducted
- an area which allows emergency services access for fire fighters to defend the property.

The **inner protection area** (IPA) is the area closest to the building and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and act as a defendable space. Vegetation within the IPA should be kept to a minimum level, tree cover should be less than 15 per cent at maturity.

An **outer protection area** (OPA) is located between the IPA and the unmanaged vegetation. It is an area where there is maintenance of the understorey and some separation in the canopy. The reduction of fuel in this area aims to decrease the intensity of an approaching fire and restricts the potential for fire spread from crowns; reducing the level of direct flame, radiant heat and ember attack on the IPA. Because of the nature of an OPA, they are only applicable in forest vegetation, tree cover should be less than 30 per cent at maturity.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. The APZ's applicable to the proposal are illustrated in the following section.

1.4 The subject land

The proposed development site is located approximately three kilometres to the west of Gunnedah on the northern side of the Oxley Highway as shown in Figure 1-1. An aerial view of the construction footprint is shown in Figure 1-2. Detail showing the concept location of uses on the site is provided in Figure 1-3, and the asset protection zones relative to the design shown over the top of an aerial view are shown in Figure 1-4.

The development site incorporates the construction footprint and the outer APZ and is located on Lot 328 DP755503 and Lot 329 DP755503 (Figure 1-5), and the mapped land uses are 'Services', 'Grazing native vegetation' and 'Mining' (Figure 1-6).

The development site has a history of disturbance. It is located to the east of the Balcary Park Motorcycle Track and Gunnedah Kart Track and the land has previously been used for a quarry causing it to have been previously disturbed and cleared. Additionally, there has been multiple areas which had been deposited with soil, building debris and the like activities disturbing the site.

Example vegetation in the development site is shown in Plate 1-1 to Plate 1-4. Example vegetation in the inner APZ is shown in Plate 1-5 and Plate 1-6 and example vegetation in the outer APZ is shown in Plate 1-7 and Plate 1-8.

An area of approximately three hectares of disturbed land (mainly from areas which had been deposited with soil, building debris and the like) in and around the development site has recently been remediated under Part 5 EP&A Act approval. Location of the remediated areas are shown in Figure 1-7 and a recent aerial image of the development site is shown in Figure 1-8. In these areas, no native vegetation exists and vegetation maps have been adjusted accordingly. Images of the remediated area are shown in Plate 1-9 and Plate 1-10.

Figure 1-1: Location

Figure 1-2: Aerial view of the construction footprint

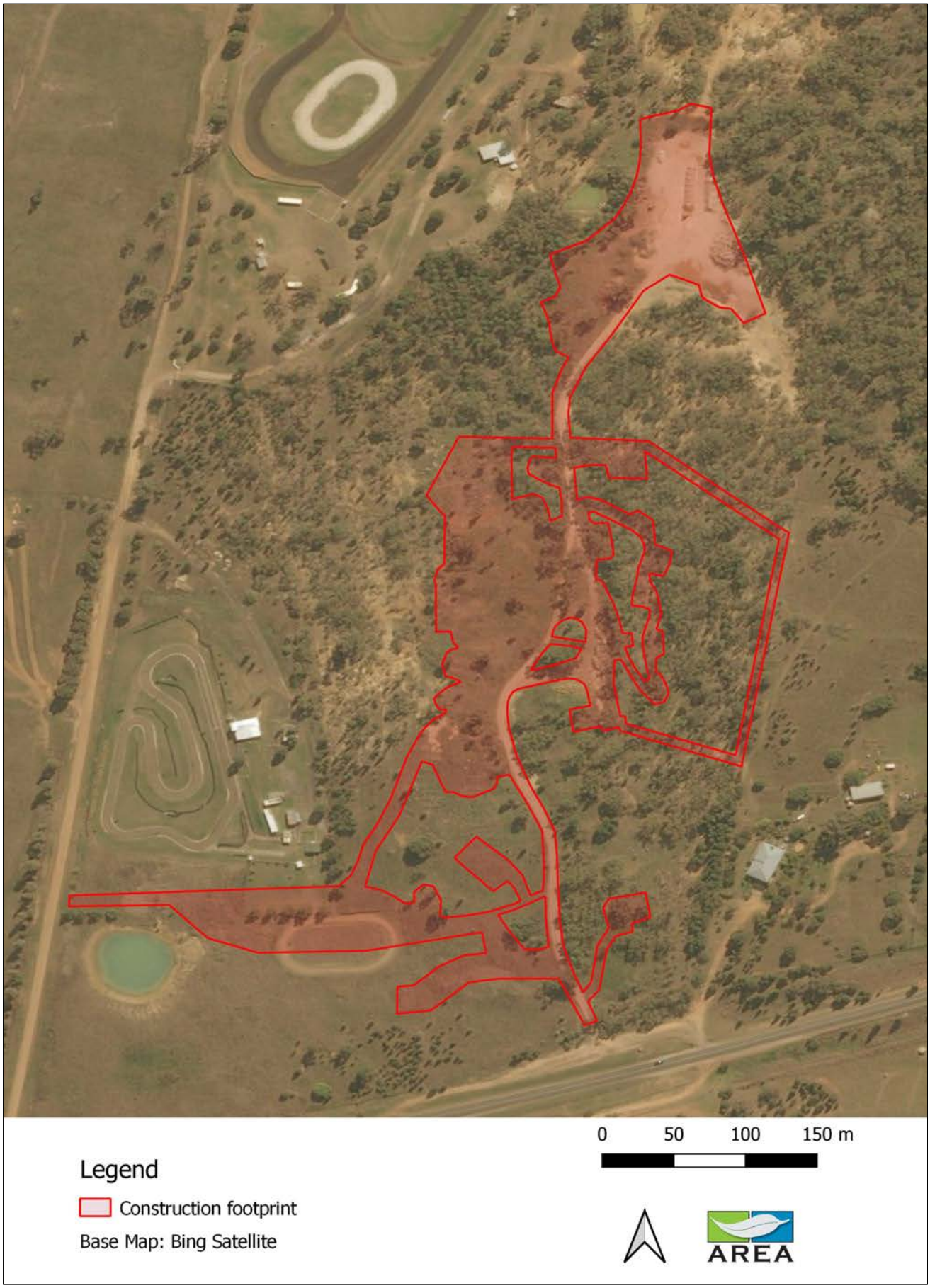


Figure 1-3: Gunnedah Koala Park Site plan (Source: Dunn & Hillam)

Figure 1-4: Asset protection zones relative to the detailed design of the proposal

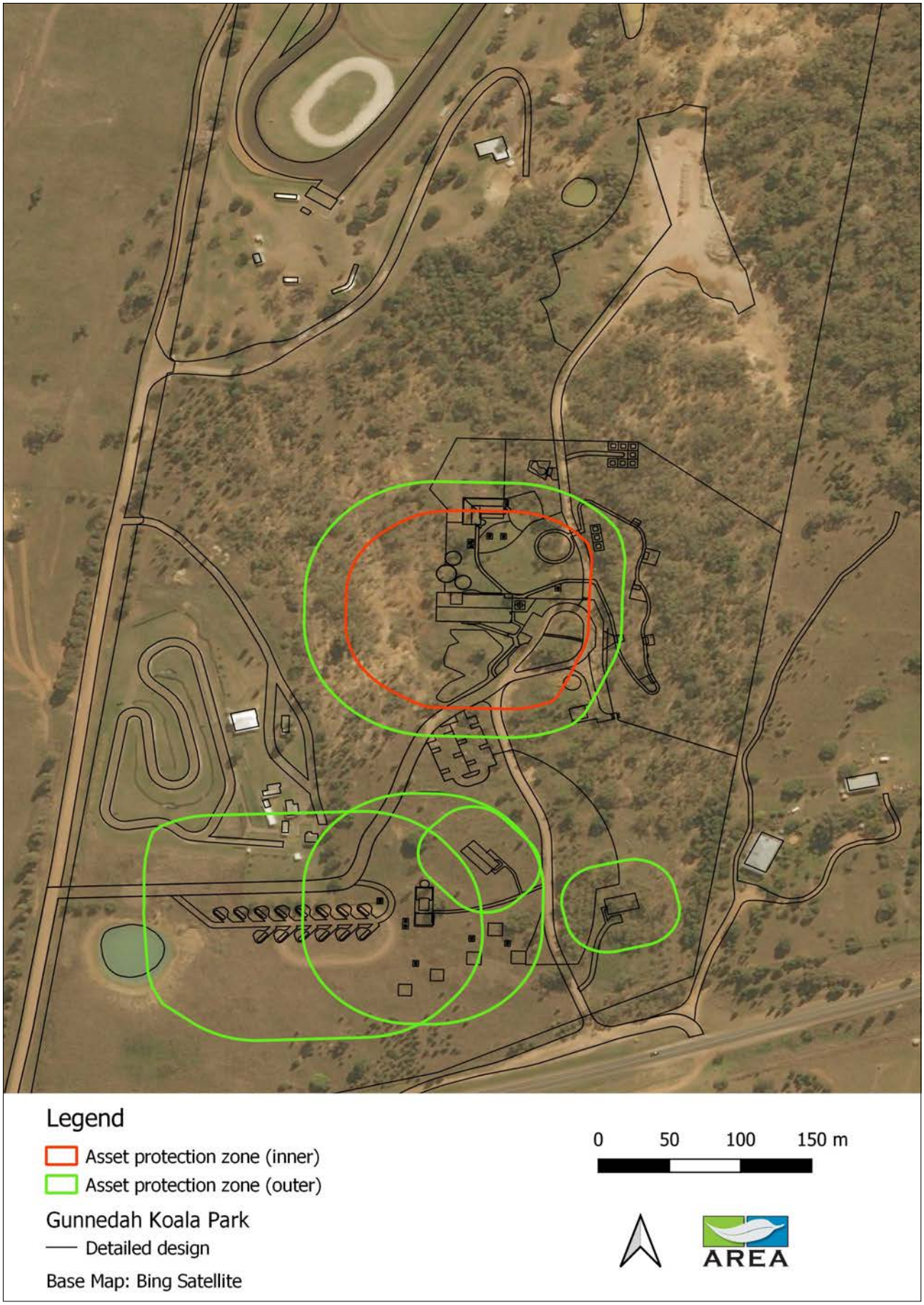


Figure 1-5: The development site and Lot boundaries

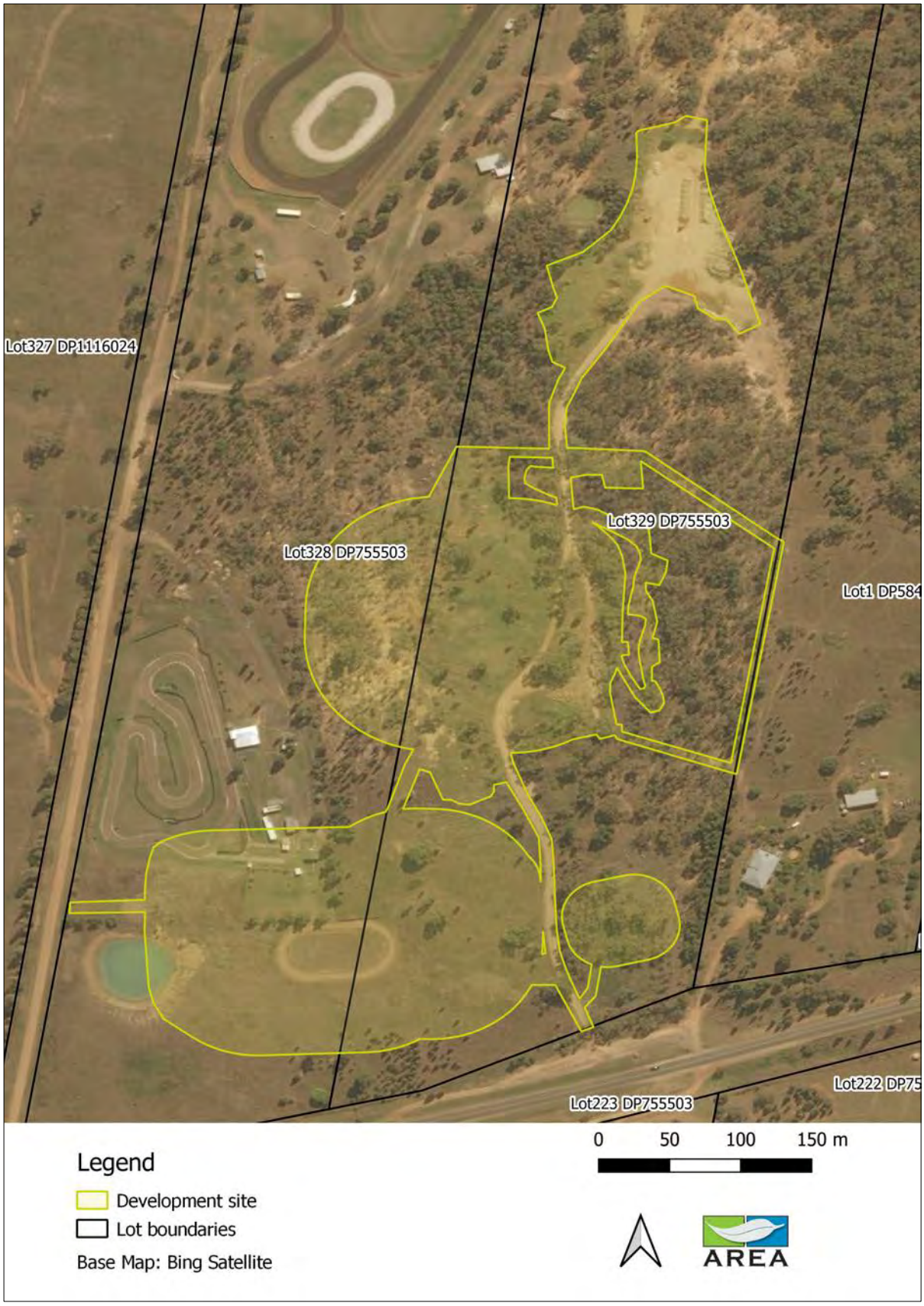


Figure 1-6: Land use in and around the development site

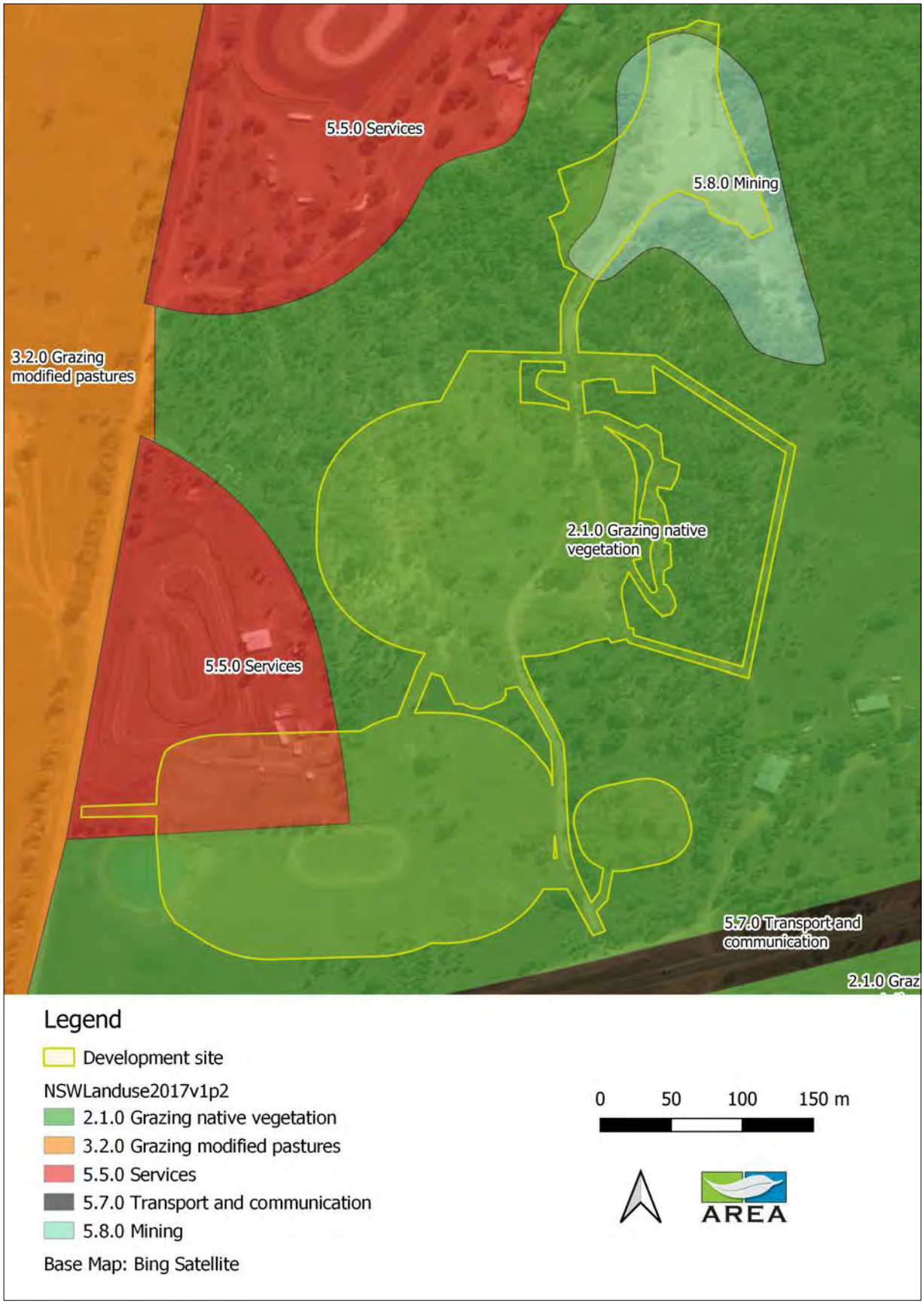


Figure 1-7: Remediated areas relative to the development site

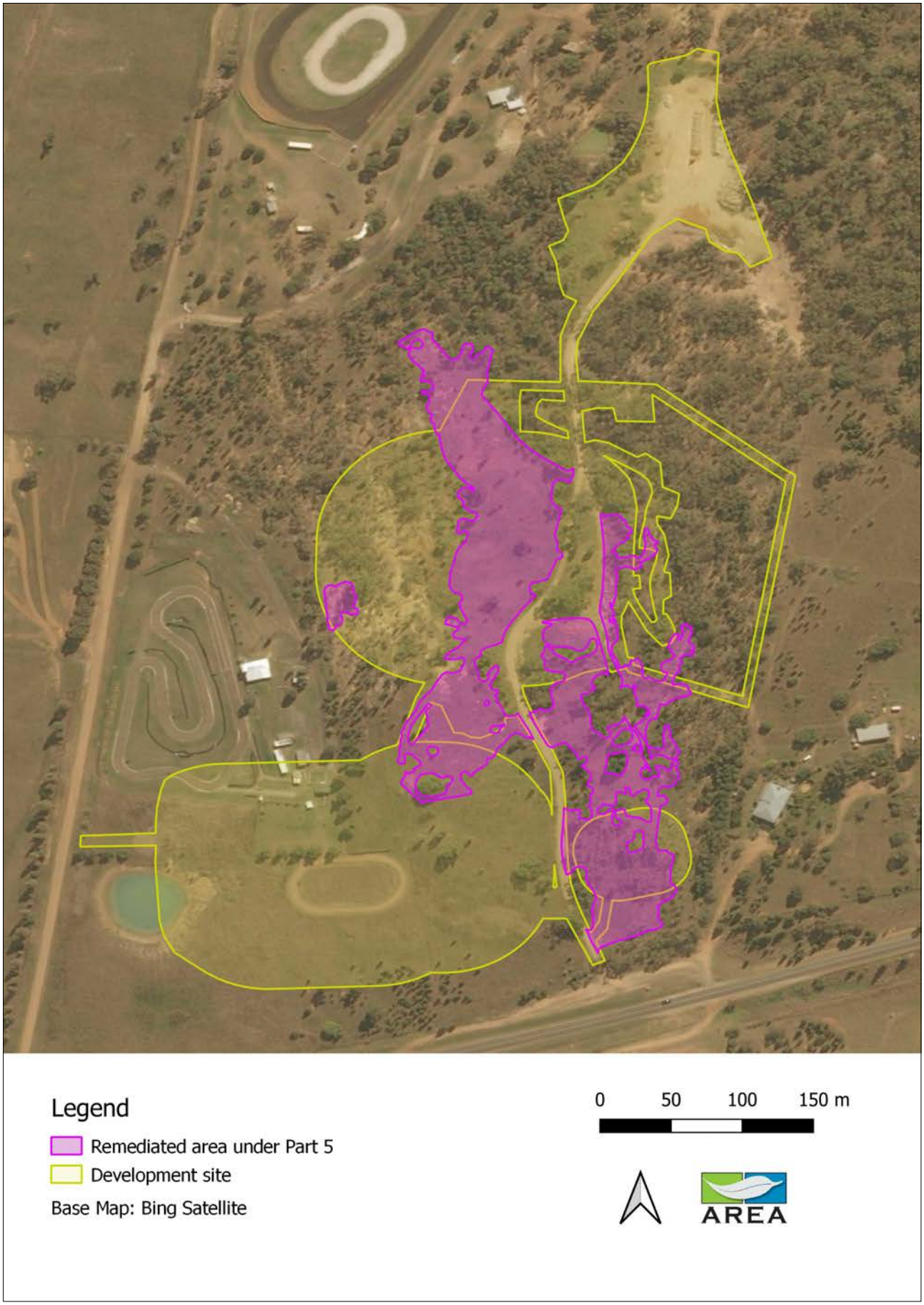


Figure 1-8: Recent aerial image of remediated area and development site (Source: Dunn and Hillam

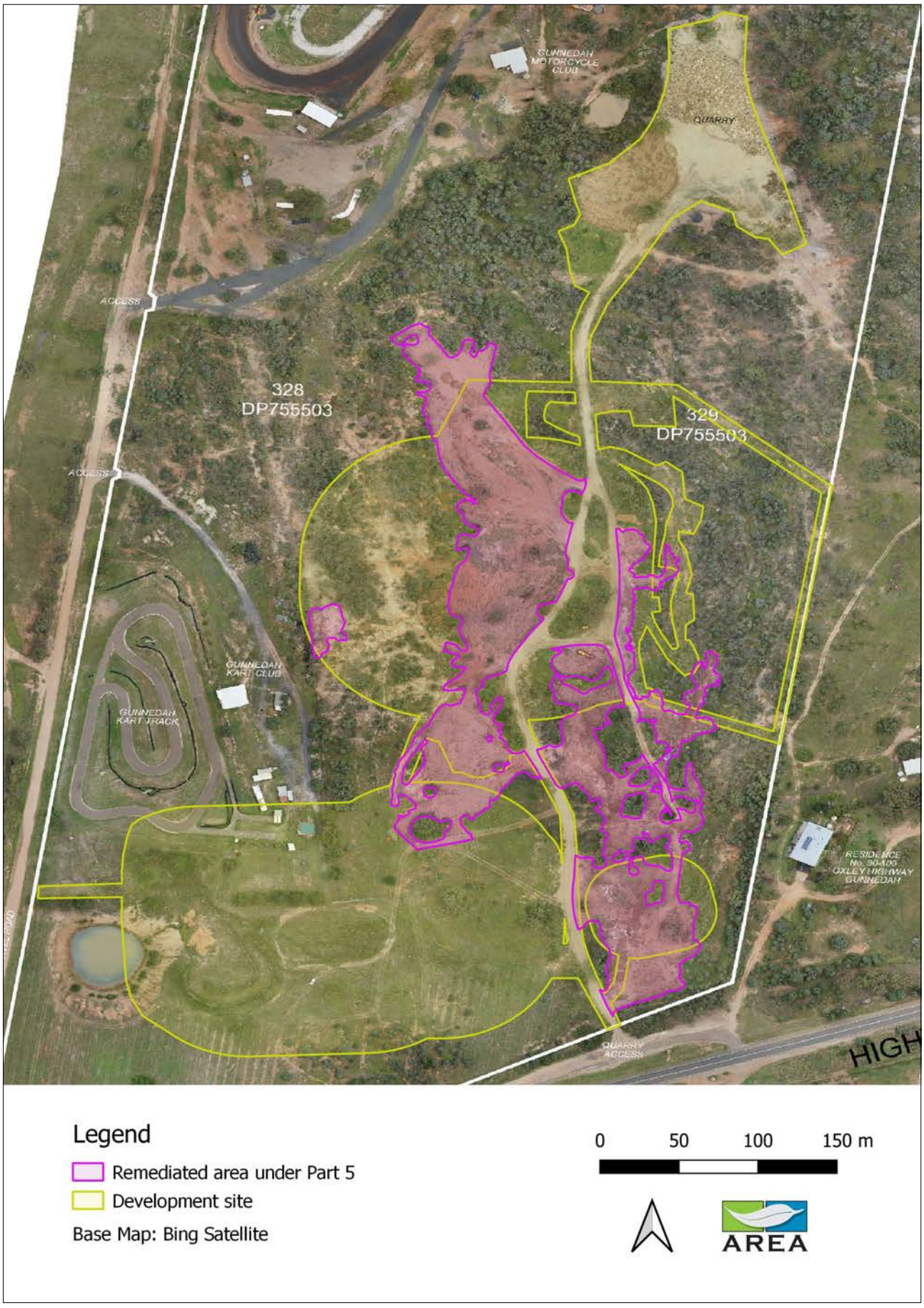


Plate 1-1: Example vegetation at southern extent of the development site

Plate 1-2: Example vegetation in mid-section of development site

Plate 1-3: Existing hardstand area in the upper section of development site (from former quarry)

Plate 1-4: Existing levels of disturbance to vegetation from former quarry in the development site

Plate 1-5: Example vegetation in the inner APZ, facing west from mid section of development site

Plate 1-6: Example vegetation in the inner APZ, facing northwest from the mid section of the development site

Plate 1-7: Example vegetation in the outer APZ, facing west from the mid section of the development site

Plate 1-8: Example vegetation in the outer APZ, facing east from the southwest extent of the development site.

Plate 1-9: Example of rubbish being removed from remediated area

Plate 1-10: Remediated area in south eastern extent of development site

1.5 Personnel contributing to this document

This assessment was carried out by appropriately qualified and experienced ecologists (Table 1-2).

Table 1-2: Summary of AREA project team qualifications

Name	Position	CV Details	Role in this project
Phillip Cameron	Managing Director	• BSc. Major in Biology. Macquarie University • Ass Dip App Sci. University of Queensland • Dip Landscape Design (In prep) • Cert III Captive Animal Management • Certified Environmental Practitioner (EIANZ) and practicing member • NSW OEH BioBanking and Bio-certification Assessor: accreditation number 0117 • **NSW OEH Biodiversity Assessment Method Assessor: accreditation number BAAS17082** • NSW OEH Scientific License: 101087 • NSW DPI Ethics Approval 17/459 (3) • Practicing member of the NSW Ecological Consulting Association	Fieldwork Project management Cartography Report editing and quality assurance / certification
Genevieve Peel	Environmental Consultant	• Bachelor of Science, Environmental (Hons) UNSW • Cert III Captive Animal Management • Cert IV Veterinary Nursing	Report writing
Greg Bible	Environmental Consultant	• BEnvSc University of New England • BSc Honours University of New England • WHS White Card •	Fieldwork
Addy Watson	Principal Environment and Community Consultant	• Grad. Dip. Captive Vertebrate Management, Charles Sturt University • Grad. Cert. Social Impact, University of NSW • B. Env. Sc. University of New England. • **NSW OEH Biodiversity Assessment Method Assessor: accreditation number BAAS19066** • Diploma Project Management	Report editing
Dr Heidi Kolkert	Principal Ecologist	• PhD (Science) University of New England • BSc. (Hons) and Bachelor of Arts University of Tasmania • NSW OEH BioBanking and Bio-certification Assessor TAFE NSW • Practicing member of the NSW Ecological Consulting Association •	Bat call analysis

1.6 Sources of information

Information sources used to inform this BDAR have been provided in the following sections.

1.6.1 Spatial Data

Table 1-3: Spatial data used in this report

GIS layer name	Reference
IBRA bioregions and subregion	NSW data porthole
NSW landscape regions	Mitchell Landscapes V3
Rivers and streams	Six Viewer / SEED WMS topographic layer
Wetlands	Directory of Important Wetlands

Waterways	Waterway NSW Final
Key Fish Habitat	DPI Key Fish Habitat GIS layer
Connectivity of different areas of habitat	BRG_Namoi 4476 veg map and Bing Aerial
Native vegetation extent	BRG_Namoi 4476 veg map and Bing Aerial

1.6.2 Web sites (and links to documents)

Table 1-4: Web sites and links to documents used in this report

Title	Web address
Legislation	
Commonwealth Environment Protection & Biodiversity Conservation Act 1999	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Fisheries Management Act 1994	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
National Parks and Wildlife Act 1974	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Biodiversity Conservation Act 2016	https://www.legislation.nsw.gov.au/~/view/act/2016/63
Water Management Act 2000	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
Local Land Services Act 2013	https://www.legislation.nsw.gov.au/~/view/act/2013/51
Biodiversity	
Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (2020)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/surveying-threatened-plants-and-habitats-nsw-survey-guide-biodiversity-assessment-method-200146.pdf
NSW Survey Guide for Threatened Frogs A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (2020)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/nsw-survey-guide-for-threatened-frogs-200440.pdf
'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (2018)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/species-credit-threatened-bats-survey-guide-180466.pdf
Biodiversity Assessment Methodology (DPIE, 2020)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-2020-200438.pdf
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/draft-threatened-biodiversity-survey-guide.pdf
Survey requirements (birds, bats, reptiles, frogs, fish and mammals) for species listed under the EPBC Act	https://www.environment.gov.au/epbc/policy-statements
BAM Credit Calculator	http://www.environment.nsw.gov.au/biobanking/calculator.htm
Survey requirements (birds, bats, reptiles, frogs, fish and mammals) for species listed under the EPBC Act	http://www.environment.gov.au/topics/environmentprotection/environment-assessments.
Threatened biodiversity profile search	http://www.environment.nsw.gov.au/threatenedspeciesapp/
NSW BioNet	http://www.bionet.nsw.gov.au/
Vegetation Types databases	http://www.environment.nsw.gov.au/biobanking/vegtypedatabase. htm
PlantNET	http://plantnet.rbgsyd.nsw.gov.au/
Online Zoological Collections of Australian Museums	http://www.ozcam.org.au/
Threatened Species Assessment Guideline - The Assessment of Significance (DECCW, 2007)	http://www.environment.nsw.gov.au/resources/threatenedspecies/tsaguide07393.pdf
Significant Impact Guidelines 1.1 - Matters of National Environmental Significance	http://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance
Principles for the use of biodiversity offsets in NSW	http://www.environment.nsw.gov.au/biodivoffsets/oehoffsetprincip .htm

2 Landscape context

2.1 Topography

The development site is on a hilly area (Figure 2-1) which gently rises from the surrounding relatively flat country. Elevation varies from 300 metres to 340 metres AHD across the development site.

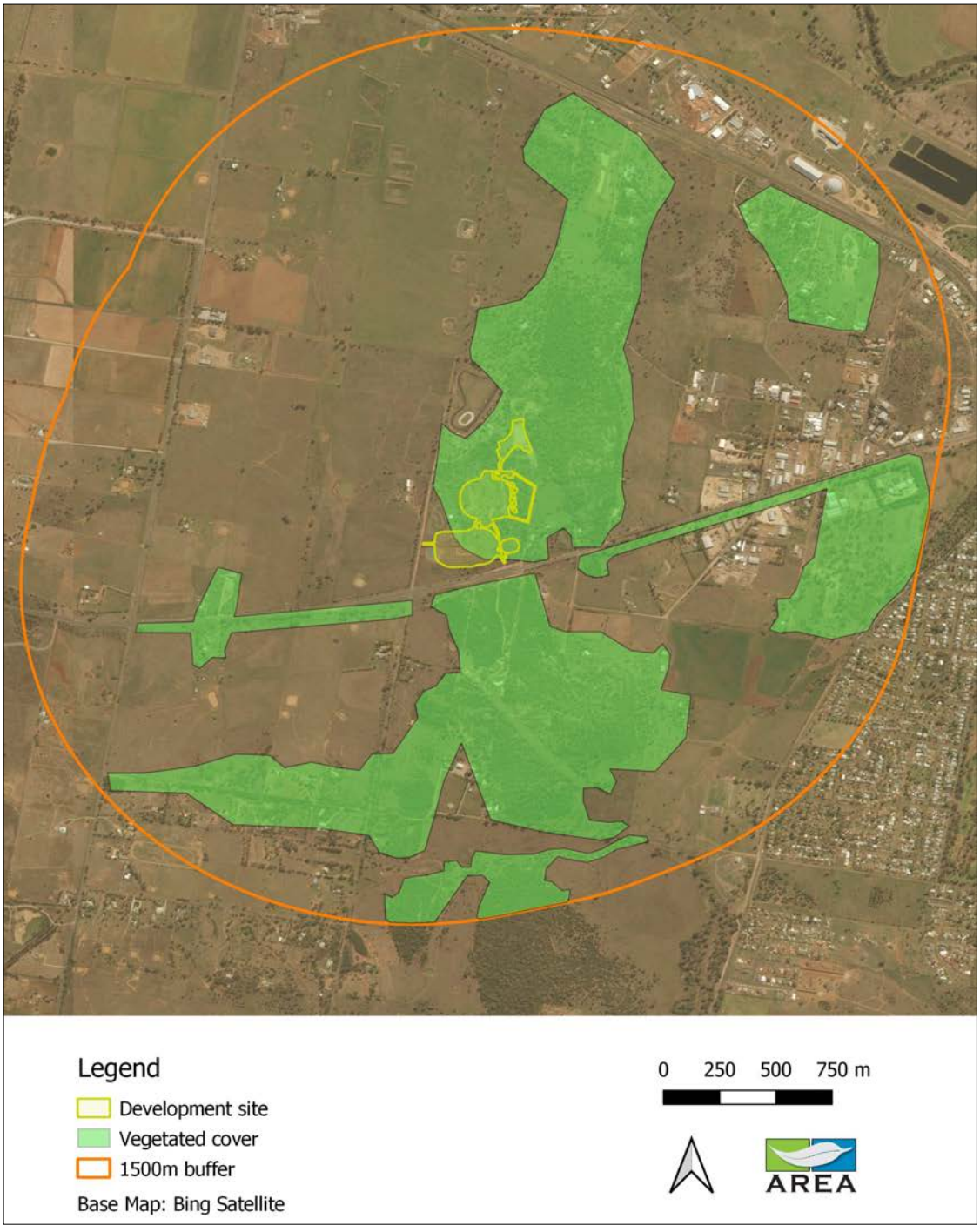
Figure 2-1: Elevation indicating topography in the development site

2.2 Vegetation cover

The development site is within an agricultural region which has been historically cleared and altered. As a result of historical disturbance for agricultural, recreational and quarry activities, the pre-European vegetation composition on the development site has been highly altered and many exotic flora species have become established.

There is still approximately 26 percent of treed native vegetation within 1500 metres of the development site, the remaining 74 percent is highly fragmented (Figure 2-2).

Figure 2-2: Native vegetation within 1500 metres of the development site



2.3 IBRA bioregions and subregions

The development site lies within the Brigalow Belt South Bioregion and the Liverpool Plains Subregion (Figure 2-3).

The Brigalow Belt South Bioregion lies in northern NSW and southern Qld, extending from south of Dubbo in central-western NSW to the mid-Qld coast. The bioregion has a total area of 27,196,933 hectares, of which 5,333,469 hectares (19.61 per cent) fall within NSW), occupying 6.7 per cent of the state.

The bioregion shares its borders with five other bioregions: the Nandewar and North Coast bioregions in the east, the Sydney Basin and South Western Slopes bioregions to the south and the Darling Riverine Plains Bioregion on its western border.

The towns of Baradine, Binnaway, Coonabarabran, Dubbo, Gunnedah, Merriwa, Moree, and Narrabri occur within the bioregion.

Several major rivers flow through the bioregion including the MacIntyre, Gwydir, Namoi, Castlereagh, Goulburn, Talbragar and Macquarie Rivers, their catchments forming an integral part of the Murray-Darling River System. The Liverpool Range in the southeastern corner of the bioregion feeds the headwaters of the Hunter and Namoi Rivers.

The development site is within the Liverpool Plains subregion which is described as follows:

Geology

Quaternary alluvial plains and outwash fans derived from Tertiary basalts. Permian and Triassic quartz sandstones with minor basalt caps.

Characteristic landforms

Undulating hills and sloping plains with alluvial channels and floodplains.

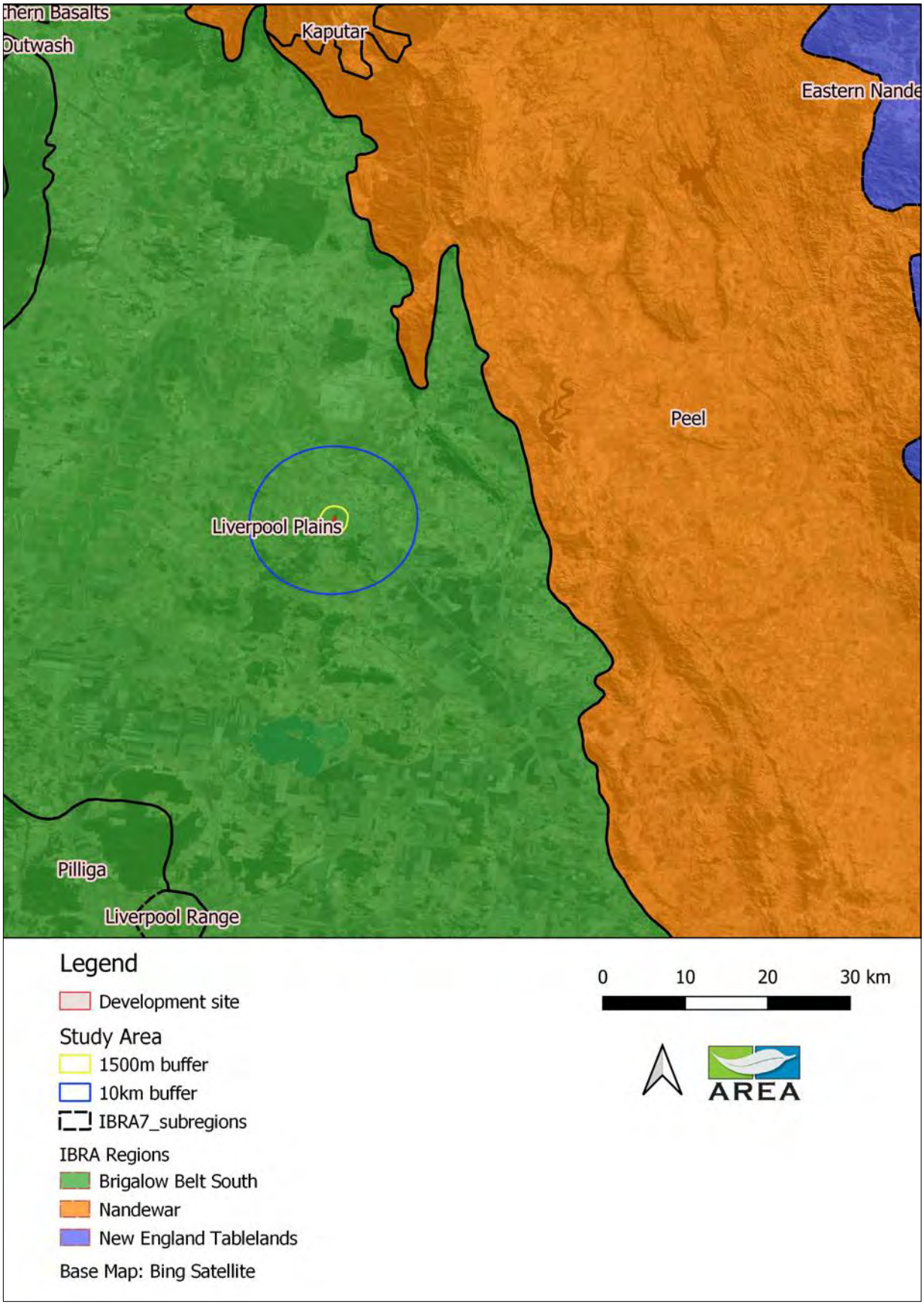
Typical soils

Extensive black earths on low angle slopes. Brown clays, alluvial soils and red or brown texture contrast soils on slopes below sandstone.

Vegetation

Plains grass, panic, windmill grass and blue grass on black earths with occasional white box, yellow box, poplar box and wilga. White box and white cypress pine with rough-barked apple, hill red gum, occasional belah and mulga on texture contrast hillslope soils.

Figure 2-3: IBRA regions



2.4 NSW Landscapes

The development site is mainly within the Breeza Hills Sandstone - Shale Slopes Mitchell Landscapes (Figure 2-4), with the southern tip extending into the Liverpool Alluvial Plains. Mitchell (2002) describes these landscapes as follows:

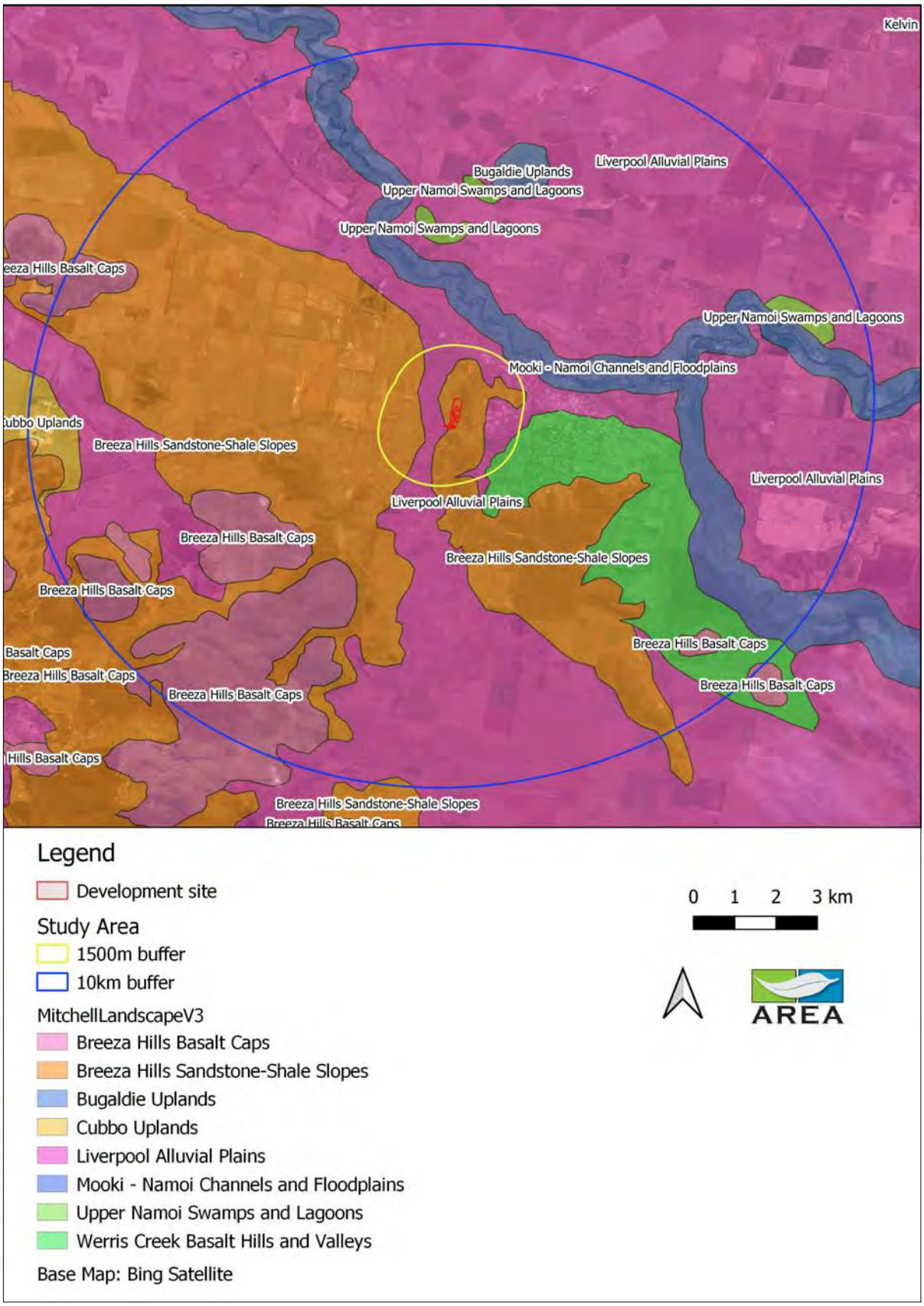
Breeza Hills Sandstone - Shale Slopes

Ridges and stepped low hills on horizontal upper Permian sandstone, conglomerate and coal measures, Triassic quartz and lithic sandstone and Jurassic quartz and lithic sandstone with thin shales. Exhumed landscapes exposed by erosion of Tertiary Liverpool range basalts. General elevation 350 to 680 metres, local relief 120 metres. Yellow and brown earthy sands, red-brown earths on long slopes, yellow harsh texture-contrast soils in streamlines. White box *(Eucalyptus albens*), yellow box *(Eucalyptus melliodora*), tumbledown red gum *(Eucalyptus dealbata*), Blakely's red gum *(Eucalyptus blakelyi*), narrow-leaved ironbark *(Eucalyptus crebra*), white cypress pine (*Callitris glaucophylla*), rosewood (*Alectryon oleifolium*), wilga (*Geijera parviflora*), motherumbah (*Acacia cheelii*) and kurrajong (*Brachychiton populneus*) with grassy understorey. River red gum *(Eucalyptus camaldulensis*) on all streams.

Liverpool Alluvial Plains

Quaternary alluvial plains and outwash fans derived from Tertiary basalts. Permian and Triassic quartz sandstones with minor basalt caps. Undulating hills and sloping plains with alluvial channels and floodplains. General elevation 300 to 350m, local relief <10m. Extensive black earths on low angle slopes. Deep black and brown cracking clays, alluvial soils and red or brown texture-contrast soils on slopes below sandstone. Open grasslands of plains grass (*Austrostipa aristiglumis*), *Panicum* sp., windmill grass (*Chloris truncata*) and blue grass (*Dichanthium sericeum*) on black earths with occasional myall (*Acacia pendula*), white box *(Eucalyptus albens*), yellow box *(Eucalyptus melliodora*), bimble box *(Eucalyptus populnea*) and wilga (*Geijera parviflora*). River red gum *(Eucalyptus camaldulensis*) along streams.

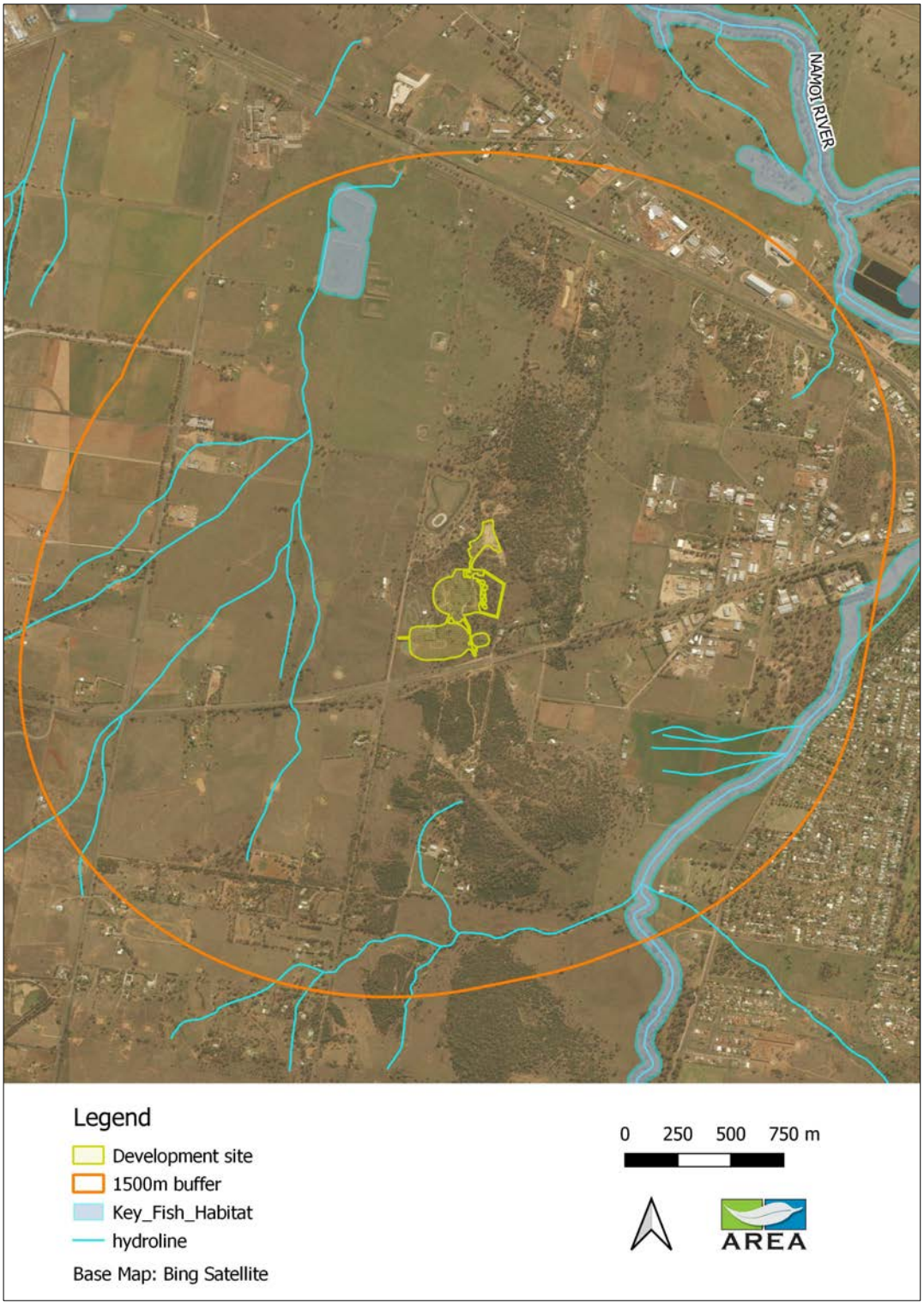
Figure 2-4: Mitchell Landscapes



2.5 Rivers, streams, wetlands

The development site occurs in a relatively arid area with no major waterways occurring within 1500 metres (Figure 2-5). The nearest named waterway is the Namoi River which runs approximately 1.8 kilometres to the northeast of the development site. Two third Strahler order drainage lines are mapped within 1500 metres of the development site, one of which is mapped as Key Fish Habitat (Figure 2-5).

Figure 2-5: Waterways mapped in and around the development site



No wetlands of international importance occur with 10 kilometres of the development site. Two existing dams are mapped, and an additional dam was groundtruthed and mapped adjacent to the development site (Figure 2-6). These dams will not be negatively impacted by the proposal.

Figure 2-6: Dams adjacent to the development site

2.5.1 Groundwater dependent ecosystems

Groundwater plays an important ecological role in directly and indirectly supporting terrestrial and aquatic ecosystems. Groundwater sustains terrestrial and aquatic ecosystems by supporting vegetation and providing discharge to channels, lacustrine and palustrine wetlands, and both the estuarine and marine environment. Aquifer ecosystems are inherently groundwater dependent (DEHP, 2017). Groundwater maps covering the development site are included in Appendix A.

The BoM Aquatic GDE maps no potential interactions within the development site.

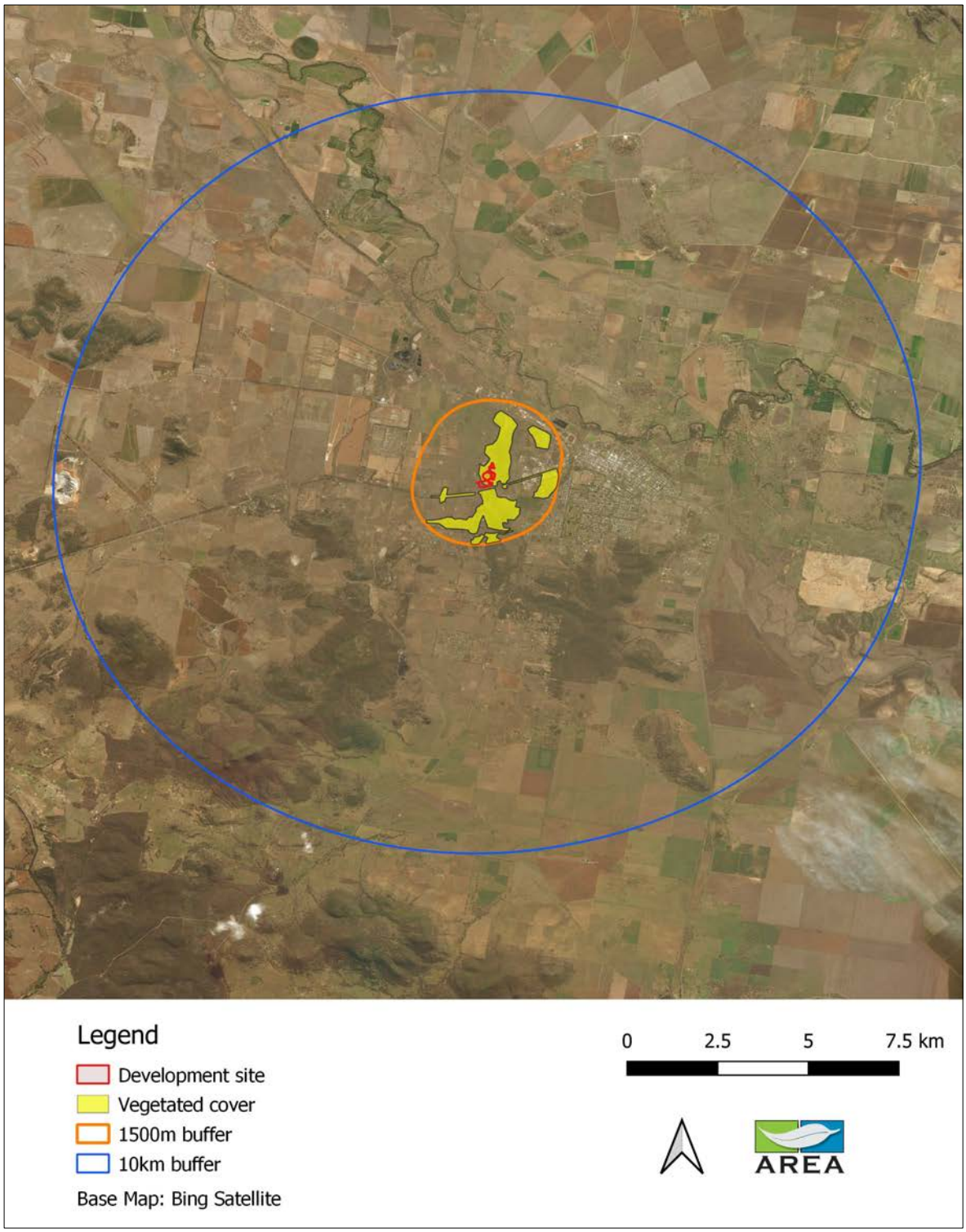
The BoM GDE maps a Low Potential Terrestrial GDE (Regional Study) occurring in the vicinity and in the location of the development site. The terrestrial GDE layer expresses the potential for groundwater and mapped vegetation communities across Australia to interact. It shows the vegetation communities that interact with groundwater from the water table or in the capillary zone. It does not imply an entire mapped ecosystem is using groundwater, but rather groundwater interaction may be occurring somewhere within the mapped ecosystem.

The BoM Subterranean GDE map layer has no data for the development site.

2.6 Habitat connectivity

The vegetation in and around the development site has relatively good connectivity to the area immediately surrounding which loosely connects to large areas south of the development site (Figure 2-7). However, there is poor connectivity to the north and east of the development site as the development site is surrounded by large areas of cleared agricultural land, as well and the presence of the Gunnedah township urban development.

Figure 2-7: Habitat connectivity within 1500 metres and 10 kilometres of the development site



2.7 Soils and geology

The NSW Government SEED portal was accessed on 26 November 2020 to show what geology is mapped in the development site. The NSW seamless geology WMS layer was uploaded onto commercially available GIS software and shows all parts of the development site is Permian sedimentary rocks which are sandstone derived. This geological type is not significant.

The development site is mapped as possessing black vertosols according to the ASRIS Soil Mapp[1]

These are clay-rich soils which are:

- Of uniform texture
- Have potential for strong cracking and slickensides
- Have high agricultural potential with high chemical fertility and water-holding capacity
- Can be difficult to cultivate when wet.

The eSpade website was also accessed on 26 November 2020 to show modelled soil erosion in the development site is moderate(20-500t/ha/yr).

2.8 Karst, caves and other rock features

There are no karst, caves, crevices, cliffs, rocks or other geological features of significance within 1500 metres of the development site. Some rock piles exist in the old quarry within the development site.

2.9 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value mapped within 1500 metres of the development site.

[1] An application (Ap) developed by CSIRO, SCLEP and GRDC

3 Native vegetation

3.1 Survey methods

Phillip Cameron CEnvP, BSc, Dip Landscape Design (in prep), Ass Dip App Sci, Cert III BAM accredited assessor (BAAS17082) / Managing Director of AREA undertook the field assessment for the proposal from 11 to 13 March 2020 following guidance materials listed in Section 1.1 of this BDAR.

Site reconnaissance, BAM plots and targeted flora and fauna searches occurred over the three days. Greg Bible BA BSc. BSc(Hons), AREAs Environment Consultant and Botanist assisted with BAM plots, targeted species flora search transects and field assessment as Stage 1 of their contract (BAM plots and opportunities targeted species searches).

The field assessment to map native vegetation was undertaken to groundtruth map layer - BRG_Namoi, v1p3 PCT4467, aerial imagery and correct any errors. The first day in the field was used assess the development and give the team a chance to broadly indicate what Plant Community Types (PCT's) were likely present and where BAM (2020) plots and further assessment could be located as representative sample sites of the native vegetation likely to be affected by the proposal.

Eight 20x20 metre in 20x50 metre plots following BAM (2020) collectively known as a 'nested plots' were placed in the development site, preferentially in an expected impact footprint (Note: the impact footprint assessed was modified to avoid areas native vegetation so survey effort extends beyond the proposal). The 20x20 metre area measures biodiversity (plant composition or floral biodiversity, hence evidence to identify the PCT and its quality) and the 20x50 metre structure plot, including the 1x1 metre leaf litter plots measure the function of the same area. Function includes an assessment of size classes of trees and tree hollows, which are both indicative of the age of trees assessed, ground logs and the amount of leaf litter. These attributes indicate the quality of habitat present and influences what species of listed fauna or flora can use the vegetation.

AREA's team observed and recorded characteristics of each plot including species composition and abundance for each layer (including upper/canopy, mid-storey/shrub stratum, and groundcover/ orbs and grasses). The number of species and height of all flora observed the percentage groundcover and signs of disturbance were recorded. Field data sheets in Appendix B provide the completed template of data collected (BAM plot sheets). Using this data, PCTs in the development site were identified.

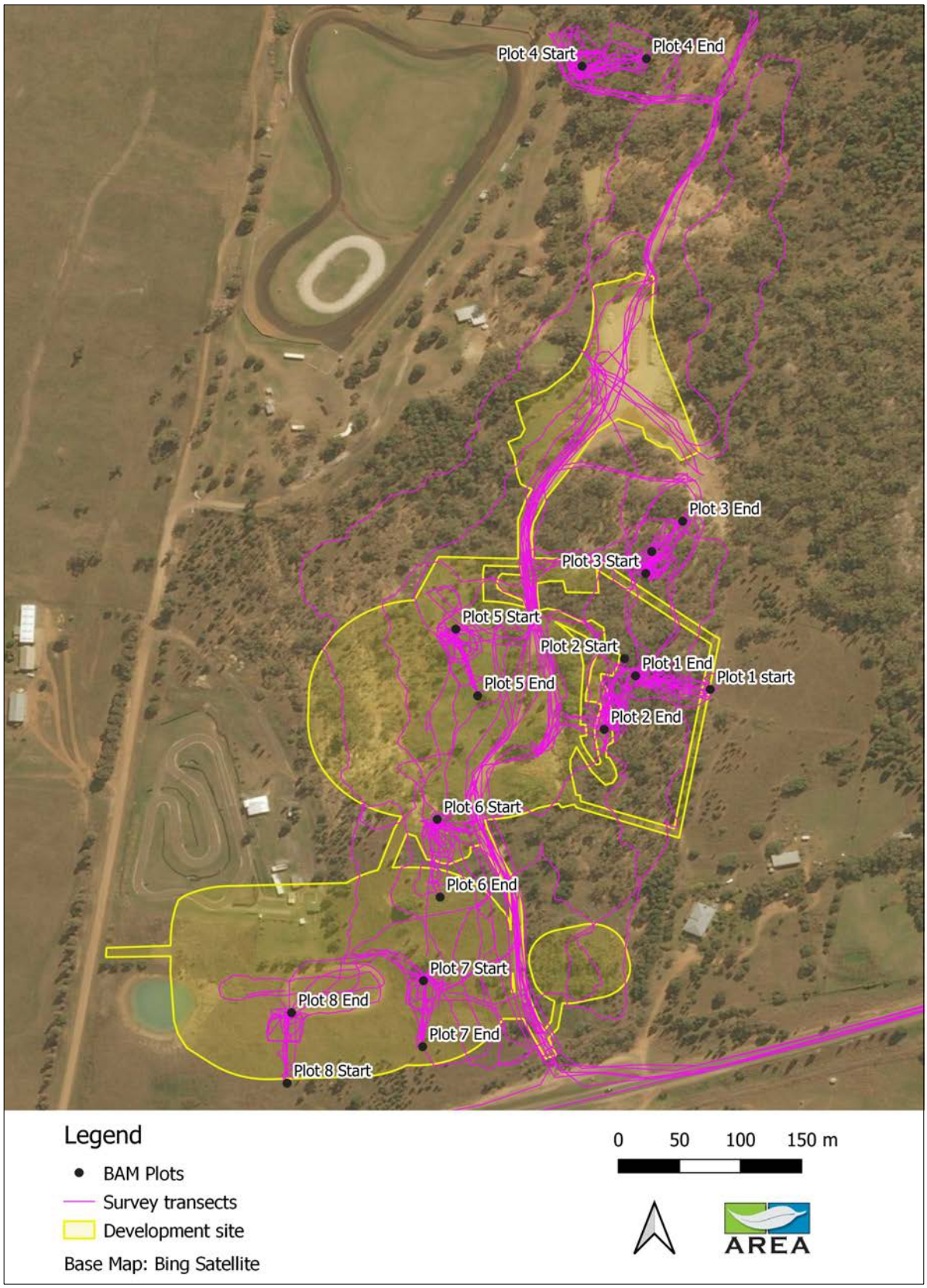
If the presence of a listed threatened species was detected in a plot, relevant NSW or Commonwealth guidelines were employed to find others in or next to the plot to indicate the extent of the local viable population. No threatened flora species were identified in the development site.

BAM (2020) is approved by the NSW government as it is scientifically robust and transparent. BAM (2020) ensures all accredited assessors can assess the same location and with the BAM credit calculator get a same or very similar score. The BAM Credit

Calculator generates a number against a benchmark to indicate quality i.e. a Vegetation Integrity Score of 67 = 67 percent of the benchmark for the described PCT.

Figure 3-1 shows the plot locations and threatened flora species survey effort (of one assessor) in the development site.

Figure 3-1: BAM (2020) survey effort in the development site



After a day of reconnaissance each plot was placed the following day in representative native vegetation. Plot 4 was undertaken at the northern extent of the lot boundary as this

area was a part of the original design, which has since been modified to reduce the impact to native vegetation.

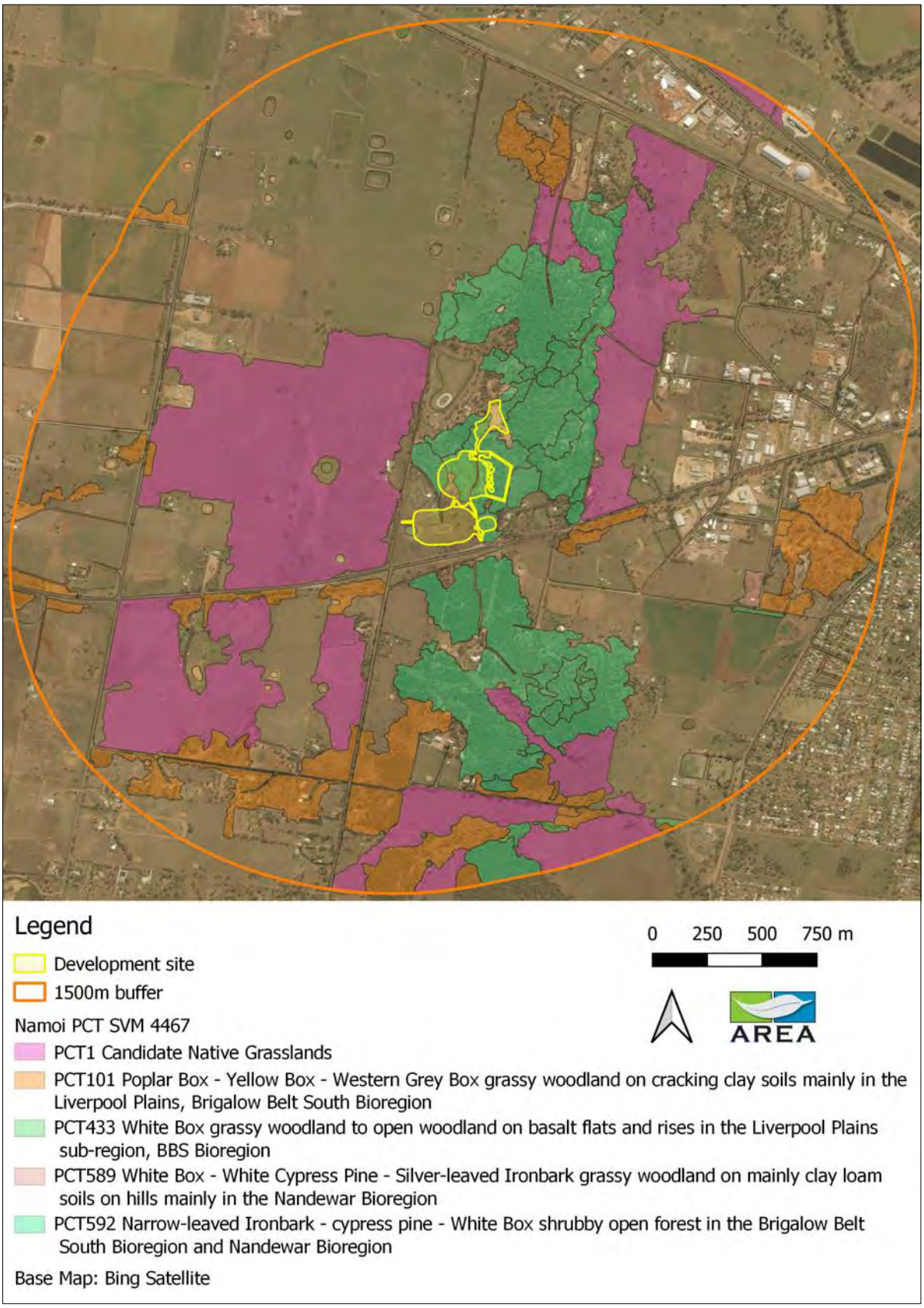
Plot data collected per BAM (2020) was entered into the BAM Calculator. Plot sheets are presented in Appendix B. Plot photos are collated in a table which, due to its size is presented in Appendix C.

3.2 Plant Community Types

The BRGNamoi, v1p3 PCT4467 maps the following PCTs in and adjacent to the development site (Figure 3-2):

- PCT1 *Candidate Native Grasslands*
- PCT101 *Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion*
- PCT592 *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion.*

Figure 3-2: PCT's mapped on SVM 4467 within 1500 metres of the development site



One PCT was confirmed to exist in the development site (Table 3-1): PCT592 *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Table 3-1: PCT's identified in the development site

PCT	PCT Name	Vegetation formation	Vegetation class	Estimate percent cleared in NSW	Extent in development site (hectares)	Associated with TEC
592	Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	52	6.32	No
0	Not Native	N/A	N/A	N/A	4.47	N/A
				Total	**10.79**	

PCT592 is not associated with any threatened ecological communities.

DPIE's online PCT mapping of the development site is shown in Figure 3-3, groundtruthed PCT's confirmed by field survey in the development site are illustrated in Figure 3-4.

Remediated areas have no native vegetation so are not mapped on the PCT map.

Figure 3-3: PCT's mapped on DPIE's BRG Namoi, v1p3 PCT4467

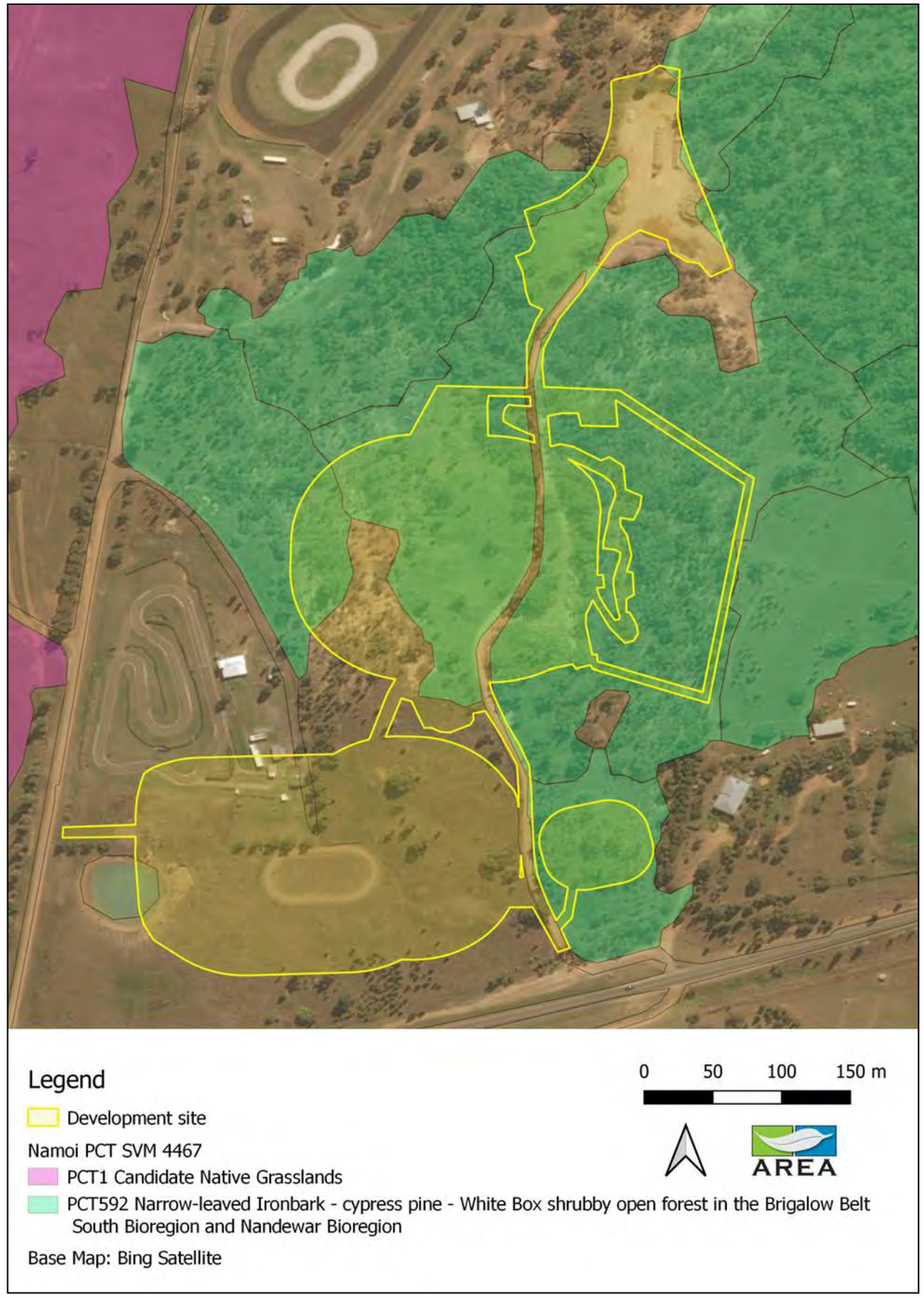
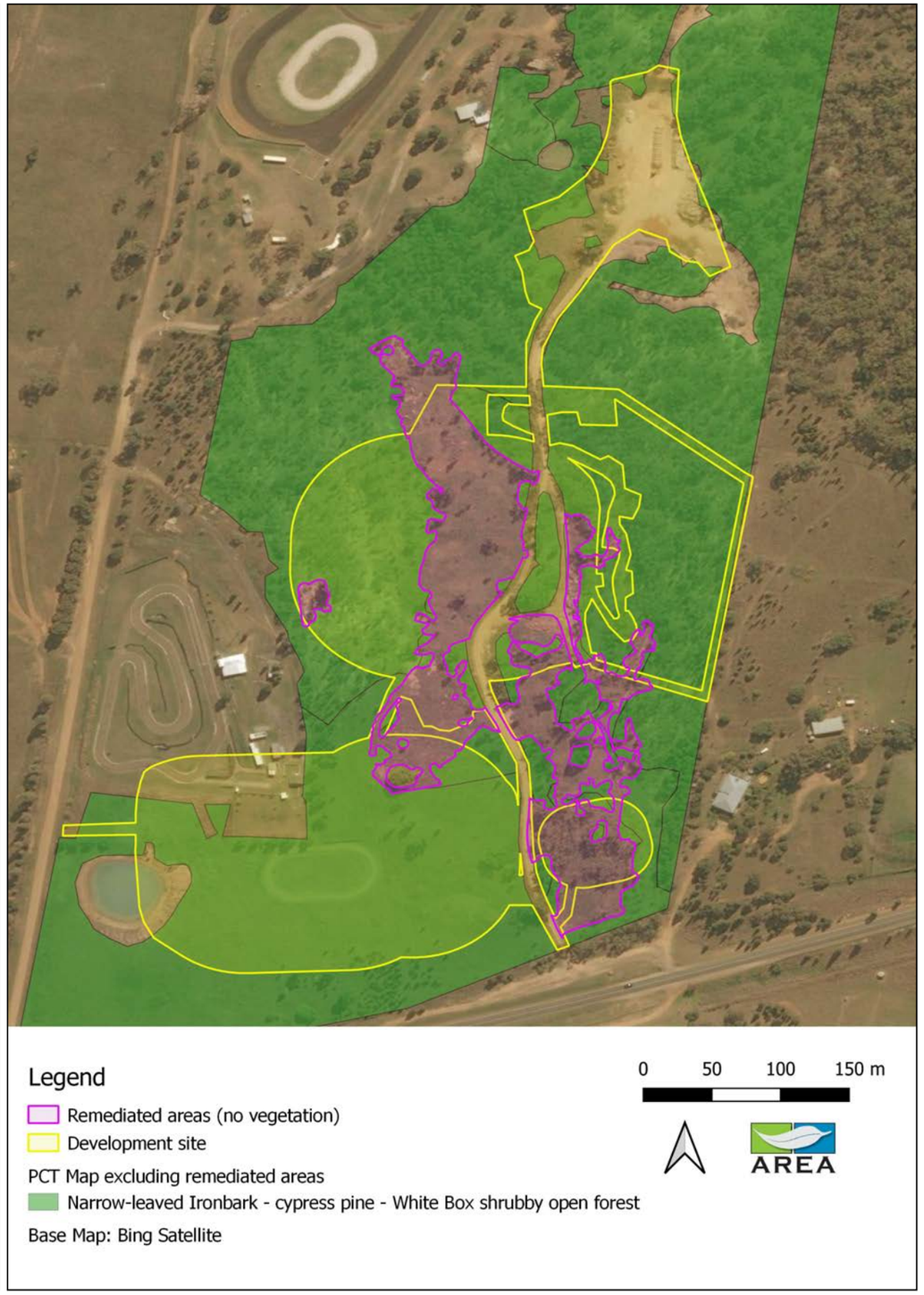


Figure 3-4: PCT's groundtruthed by field survey



Pictures of example vegetation of the PCT's in the development site are shown in Plate 3-1 and Plate 3-2 below:

Plate 3-1: PCT592 in the middle of the development site

Plate 3-2: PCT592 at the southern extent of the development site

3.3 Vegetation zones

Vegetation zones are defined as a 'relatively homogeneous area of native vegetation within a proposal that is the same PCT and broad condition state' (OEH 2014a).

The development site has been stratified into three zones:

Zone 1: PCT592 – Grassy (previously cleared)

Zone 2: PCT592 – Heavily disturbed

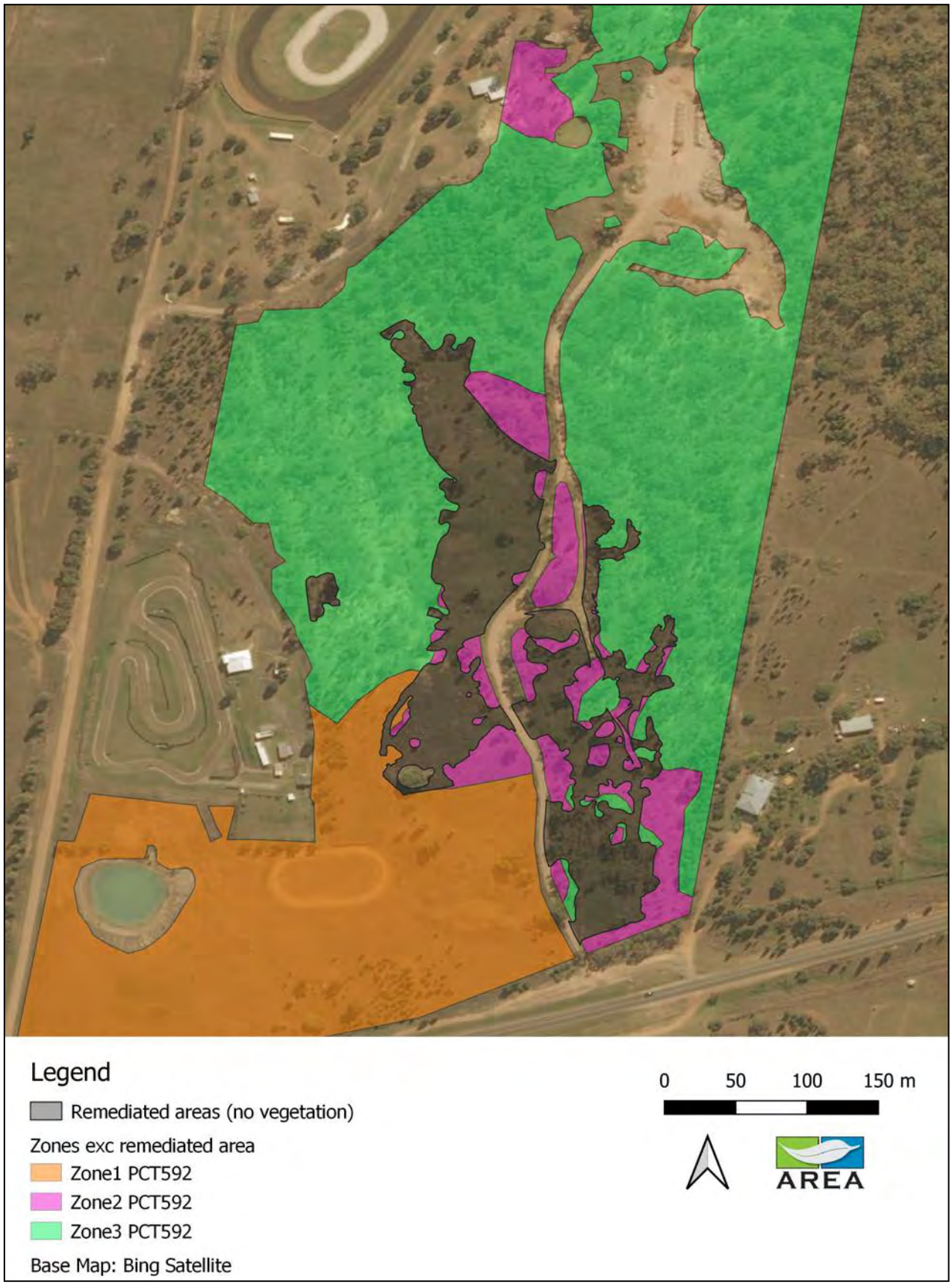
Zone 3: PCT592 – Better quality (with unassisted native regeneration).

Impact to each zone by the development varies i.e., total vegetation removal vs canopy thinning for AZP establishment. This is considered and calculated as different management zones established in the BAMCC.

The extent of each zone is mapped on Figure 3-5. The patch size extends a minimum of approximately 170 hectares through the surrounding vegetation and tree corridors around agricultural paddocks.

No local or other benchmarks were used in the analysis of the vegetation zones.

Figure 3-5: Vegetation zones mapped in and around development site



3.3.1 PCTs in the development site and their benchmarks

To compare plot sheet data collected in each PCT to its respective benchmark, AREA use the following rationale:

- The benchmark values for each PCT were obtained from the VIS Classification website on the BioNet data collection
- The species composition, structure and function scores collected on site and recorded in each of the BAM plot assessed were used to compare to the benchmark for the PCT
- If more than one BAM plot was recorded the scores were averaged
- If the average score matched or above 25 per cent of the benchmark value for the PCT, then the attribute was considered to be within benchmark.

Vegetation plot data from each zone is present in Table 3-2 to Table 3-4 (Plot 4 was not included as it was not in the development site).

The averaged plot data comparison against the benchmark clearly shows the difference in disturbance history in each zone.

Table 3-2: BAM plots measured against PCT benchmarks – Zone 1

PCT592 Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion					
Vegetation Class	Western Slopes Dry Sclerophyll Forest				
IBRA	Brigalow Belt South				
Benchmark Calculation Level	**Benchmark value**	25% of BM	Plot 7	Plot 8	Plot Av
Tree Richness	**5**	1.25	0	0	0
Shrub Richness	**11**	2.75	0	1	0.5
Grass and Grass Like Richness	**8**	2.00	12	8	10
Forb Richness	**8**	2.00	6	4	5
Fern Richness	**1**	0.25	1	1	1
Other Richness	**2**	0.50	0	0	0
Tree Cover	**61**	15.25	0	0	0
Shrub Cover	**28**	7.00	0	0.2	0.1
Grass and Grass Like Cover	**22**	5.50	28.6	57	42.8
Forb Cover	**5**	1.25	8.2	13	10.6
Fern Cover	**0**	0.00	2	1	1.5
Other Cover	**0**	0.00	0	0	0
Total length of fallen logs	**60**	15.00	0	0	0
Litter Cover	**70**	17.50	24.2	5.8	15
Number of Large Trees	**1.0**	0.25	0	0	0
Large Tree Threshold Size	**50**				
Benchmark Confidence	**Composition: High Structure: Moderate Function; Logs: High Litter: High Large Trees: High**		Note: Green fill = within benchmark (i.e. more than 25% of the BM value)		

Table 3-3: BAM plots measured against PCT benchmarks – Zone 2

PCT592 Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion					
Vegetation Class	Western Slopes Dry Sclerophyll Forest				
IBRA	Brigalow Belt South				
Benchmark Calculation Level	**Benchmark value**	25% of BM	Plot 5	Plot 6	Plot Av
Tree Richness	**5**	1.25	1	0	0.5
Shrub Richness	**11**	2.75	0	1	0.5
Grass and Grass Like Richness	**8**	2.00	2	5	3.5
Forb Richness	**8**	2.00	3	4	3.5
Fern Richness	**1**	0.25	0	0	0
Other Richness	**2**	0.50	1	0	0.5
Tree Cover	**61**	15.25	5	0	2.5
Shrub Cover	**28**	7.00	0	0.5	0.25
Grass and Grass Like Cover	**22**	5.50	7	16.1	11.55
Forb Cover	**5**	1.25	1.2	1.7	1.45
Fern Cover	**0**	0.00	0	0	0
Other Cover	**0**	0.00	0.1	0	0.05
Total length of fallen logs	**60**	15.00	4	0	2
Litter Cover	**70**	17.50	3.8	12	7.9
Number of Large Trees	**1.0**	0.25	0	0	0
Large Tree Threshold Size	**50**				
Benchmark Confidence	**Composition: High Structure: Moderate Function; Logs: High Litter: High Large Trees: High**		Note: Green fill = within benchmark (i.e. more than 25% of the BM value)		

Table 3-4: BAM plots measured against PCT benchmarks – Zone 3

PCT592 Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion						
Vegetation Class	Western Slopes Dry Sclerophyll Forest					
IBRA	Brigalow Belt South					
Benchmark Calculation Level	**Benchmark value**	25% of BM	Plot 1	Plot 2	Plot 3	Plot Av
Tree Richness	**5**	1.25	3	2	2	2.3
Shrub Richness	**11**	2.75	8	4	4	5.3
Grass and Grass Like Richness	**8**	2.00	6	5	4	5.0
Forb Richness	**8**	2.00	8	11	8	9.0
Fern Richness	**1**	0.25	2	2	1	1.7
Other Richness	**2**	0.50	0	0	0	0.0
Tree Cover	**61**	15.25	6.1	8	16	10.0
Shrub Cover	**28**	7.00	8.2	5.1	19	10.8
Grass and Grass Like Cover	**22**	5.50	0.8	0.5	1.3	0.9
Forb Cover	**5**	1.25	11.3	1.7	11.8	8.3
Fern Cover	**0**	0.00	5.7	0	0.1	1.9
Other Cover	**0**	0.00	0	0	0	0.0
Total length of fallen logs	**60**	15.00	91	59	37	62.3
Litter Cover	**70**	17.50	40.8	63.2	66.2	56.7
Number of Large Trees	**1.0**	0.25	1	0	0	0.3
Large Tree Threshold Size	**50**					
Benchmark Confidence	**Composition: High Structure: Moderate Function; Logs: High Litter: High Large Trees: High**		Note: Green fill = within benchmark (i.e. more than 25% of the BM value)			

4 Threatened species

The following section addresses the potential presence of threatened flora and fauna species considered in the assessment of impacts and targeted surveys.

4.1 Database searches

A default list of threatened species with potential to occur in the development site was firstly identified using the assessment filtering tool in the BAMCC and was used to inform the field assessment and threatened species assessment. A background review was also conducted to confirm these and possible additional threatened species using the resources shown in Table 4-1.

Table 4-1: Wildlife databases used to identify potentially occurring threatened species

Database / resource	Search area	Date accessed
BAM credit calculator (BAMC)	Brigalow Belt South IBRA Subregion > Liverpool Plains > PCT 592	October 2020
DPIE NSW Atlas of Wildlife (BioNet)	Approximately 10 X10 kilometres centred on the development site	March 2019 and October 2020
Protected Matters Search Tool (DEE)	One kilometre radius around the development site	March 2019 October 2020
DPIE Threatened Species Profile Database (TSPD)	IBRA sub region filtered by PCT vegetation classes	March 2019 October 2020

Threatened species predicted to occur by the DPIE threatened species database search filtered by IBRA subregion and habitat are included in Appendix A (this list incorporates PCT101 as it was present in the northern extent of the lot boundary and was a part of the original design, which has since been modified to reduce the impact to native vegetation).

Threatened species known to occur within 10 kilometres of the development site based on recorded sightings recorded on the DPIE BioNet Species Sightings Database are shown in Table 4-2.

Table 4-2: BioNet Atlas threatened species records within 10 kilometres of the development site

Scientific name	Common name	NSW Status	Comm Status
Aprasia parapulchella	Pink-tailed Legless Lizard	Vulnerable	Vulnerable
Apus pacificus	Fork-tailed Swift		CAMBA, JAMBA, ROKAMBA
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	
Cadellia pentastylis	Ooline	Vulnerable	Vulnerable
Chalinolobus nigrogriseus	Hoary Wattled Bat	Vulnerable	
Chthonicola sagittata	Speckled Warbler	Vulnerable	
Circus assimilis	Spotted Harrier	Vulnerable	
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable	
Daphoenositta chrysoptera	Varied Sittella	Vulnerable	
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Endangered
Digitaria porrecta	Finger Panic Grass	Endangered	
Falco subniger	Black Falcon	Vulnerable	
Gallinago hardwickii	Latham's Snipe		JAMBA, ROKAMBA
Glossopsitta pusilla	Little Lorikeet	Vulnerable	
Grantiella picta	Painted Honeyeater	Vulnerable	Vulnerable
Hamirostra melanosternon	Black-breasted Buzzard	Vulnerable	

Scientific name	Common name	NSW Status	Comm Status
Hieraaetus morphnoides	Little Eagle	Vulnerable	
Hoplocephalus bitorquatus	Pale-headed Snake	Vulnerable	
Lathamus discolor	Swift Parrot	Endangered	Critically Endangered
Lophoictinia isura	Square-tailed Kite	Vulnerable	
Neophema pulchella	Turquoise Parrot	Vulnerable	
Nyctophilus corbeni	Corben's Long-eared Bat	Vulnerable	Vulnerable
Oxyura australis	Blue-billed Duck	Vulnerable	
Petaurus norfolcensis	Squirrel Glider	Vulnerable	
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Vulnerable	
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Vulnerable	
Tyto novaehollandiae	Masked Owl	Vulnerable	
Uvidicolus sphyrurus	Border Thick-tailed Gecko	Vulnerable	Vulnerable
Vespadelus troughtoni	Eastern Cave Bat	Vulnerable	

Gunnedah Shire LGA is a well-known for its local Koala population, consequently there are many Koala BioNet sighting records within 10 kilometres of the development site. BioNet records within 10 kilometres of the development site, excluding Koala, are shown in Figure 4.1. BioNet Koala records only within 10 kilometres of the development site are shown in Figure 4-2.

One BioNet Koala record exists in the southern extent of the development site (in open space near the Gunnedah Kart track) from 2006. BioNet records within 1500 metres are shown more closer in Figure 4-3.

Figure 4-1: BioNet threatened species records (excluding koala) within 10 kilometres of the development site

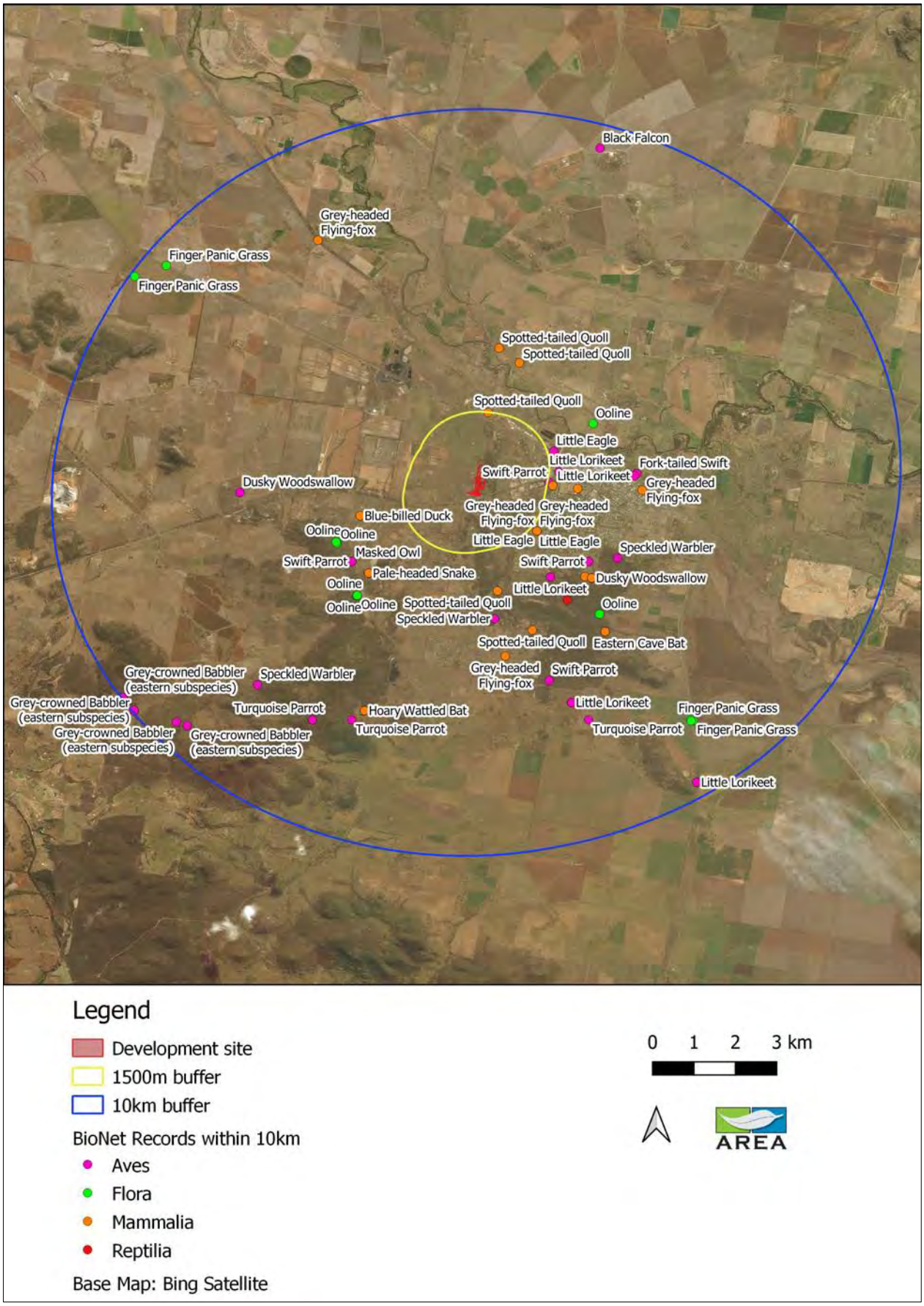


Figure 4-2: BioNet koala records in relation to the development site

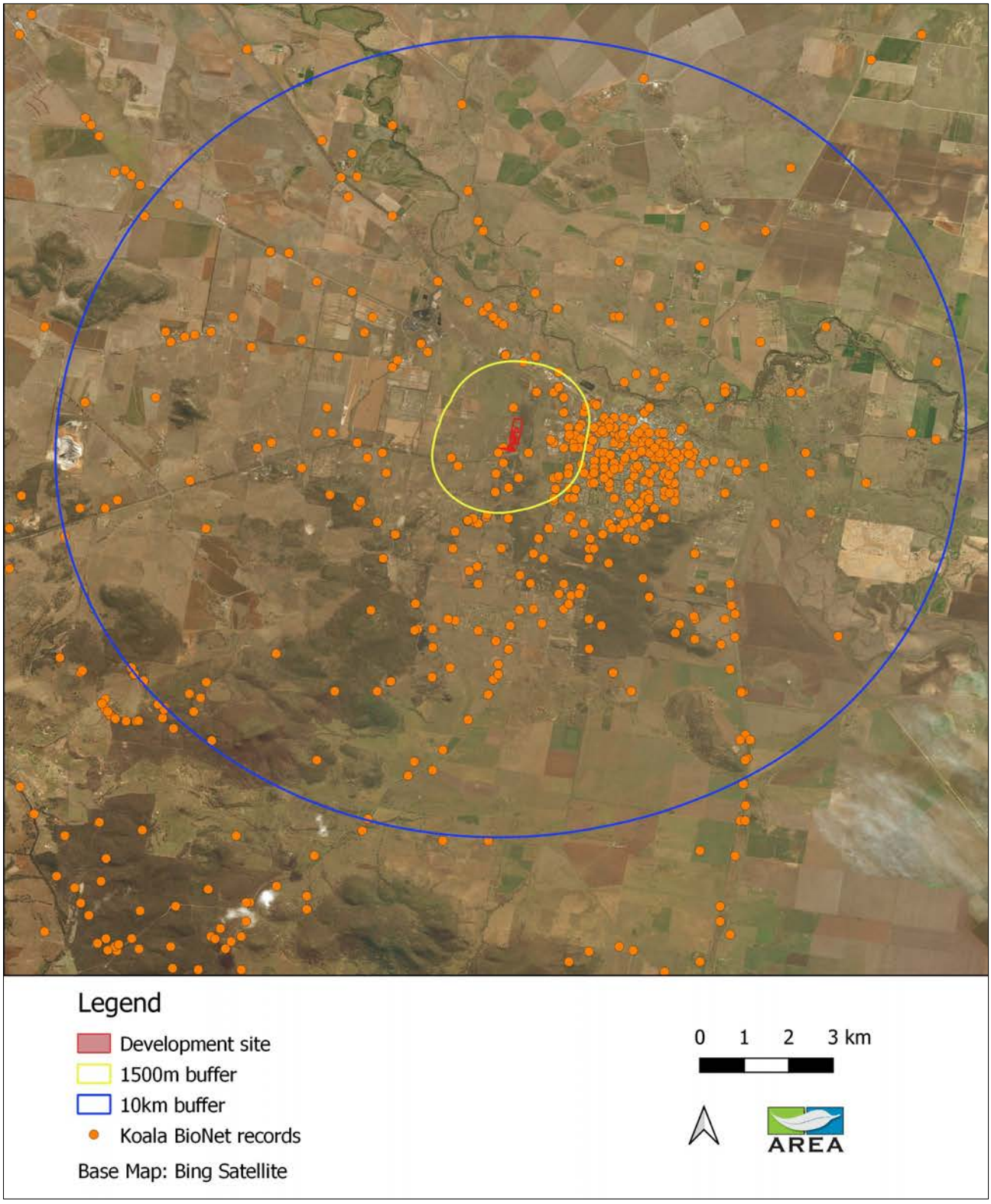
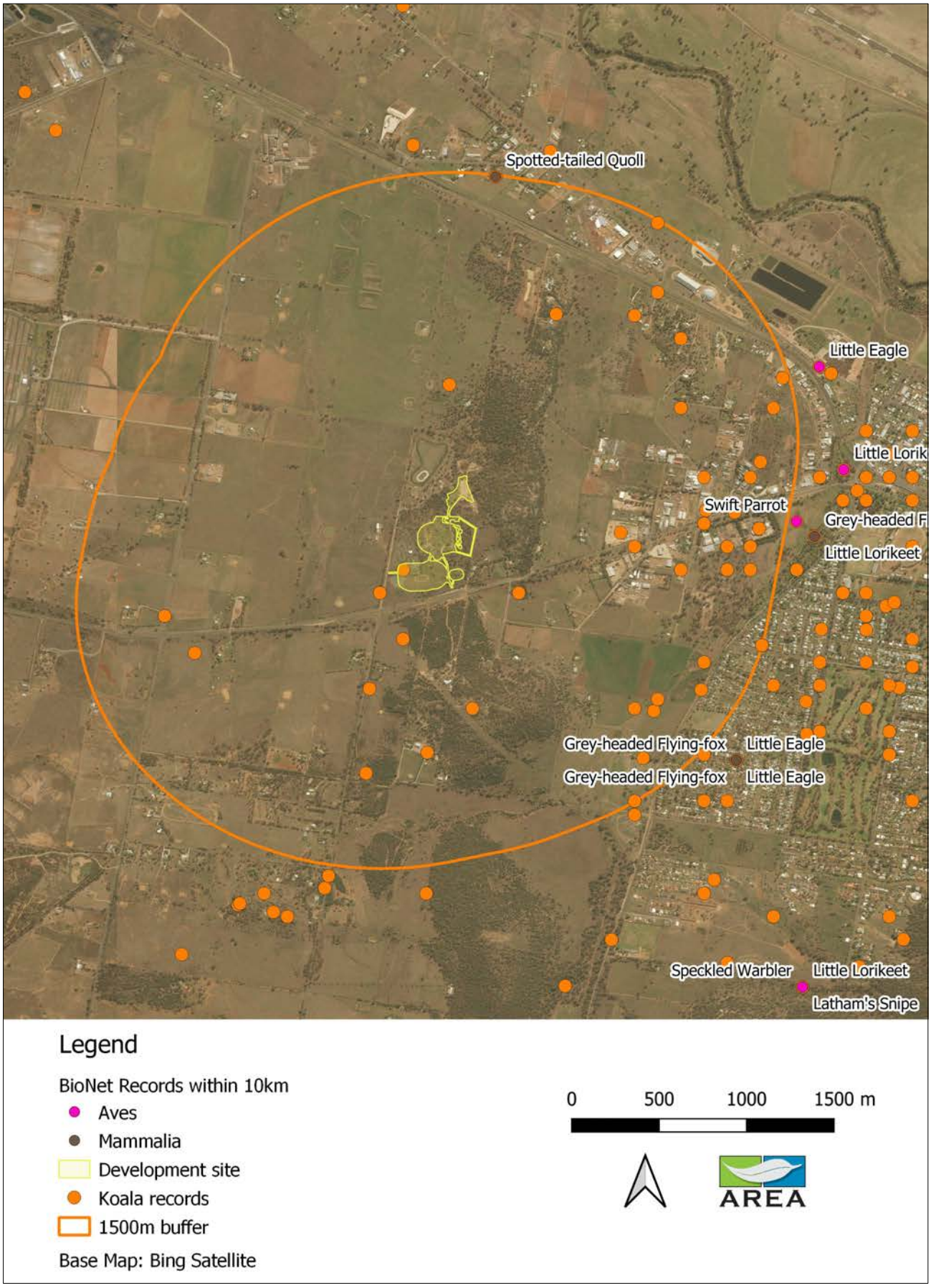


Figure 4-3: BioNet records within 1500m of development site (koala locations in orange, all other species labelled)



4.2 Matters of National Environmental Significance

The Commonwealth Protected Matters Search Tool was used to generate a report on Matters of National Environmental Significance predicted to occur within one-kilometre radius around the development site. This report is included in Appendix A and is summarised in Table 4-3.

Table 4-3: MNES summary

MNES	Result	Comment
World Heritage Properties	None	-
National Heritage Places	None	-
Wetlands of International Importance	3	Three are located more than 900km from the development site.
Great Barrier Marine Park	None	-
Commonwealth Marine Area	None	-
Listed Threatened Ecological Communities	6	Field assessment confirmed none of these communities occur in the development site
Listed Threatened Species	21	Likelihood of occurrence considered (see table below)
Listed Migratory Species	9	Birds that will not be affected by the proposal, likelihood of occurrence considered (see below)
Commonwealth Land	None	-
Commonwealth Heritage Places	None	-
Listed Marine Species	16	The proposal will not impact these species
Whales and other Cetaceans	None	-
Critical Habitats	None	-
Australian Marine Parks	None	-
Commonwealth Reserves Terrestrial	None	-
State and Territory Reserves	None	-
Forest Regional Agreements	None	-
Invasive Species	26	-
Nationally Important Wetlands	None	-
Key Ecological Features (Marine)	None	-

Likelihood of threatened species predicted in the Commonwealth Protected Matters report is considered in Table 4-4.

Table 4-4: Commonwealth Protected Matters report – predicted threatened species

Common name	Scientific name	Commonwealth status	Likelihood of presence in the development site
Birds			
Regent Honeyeater	*Anthochaera phrygia*	Critically Endangered	Addressed under NSW legislation
Australasian Bittern	*Botaurus poiciloptilus*	Endangered	Unlikely – no suitable wetland habitat
Curlew Sandpiper	*Calidris ferruginea*	Critically Endangered	Unlikely – no suitable wetland habitat
Grey Falcon	*Falco hypoleucos*	Vulnerable	Addressed under NSW legislation
Painted Honeyeater	*Grantiella picta*	Vulnerable	Addressed under NSW legislation
White-throated Needletail	*Hirundapus caudacutus*	Vulnerable	Unlikely – rarely comes to rest
Swift Parrot	*Lathamus discolor*	Critically Endangered	Addressed under NSW legislation
Australian Painted Snipe	*Rostratula australis*	Endangered	Unlikely – no suitable wetland habitat
Mammals			
Large-eared Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Addressed under NSW legislation
Spotted-tailed Quoll	*Dasyurus maculatus maculatus* (SE mainland population)	Endangered	Addressed under NSW legislation

Common name	Scientific name	Commonwealth status	Likelihood of presence in the development site
Corben's Long-eared Bat, South-eastern Long-eared Bat	*Nyctophilus corbeni*	Vulnerable	Addressed under NSW legislation
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory	*Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)*	Vulnerable	Addressed under NSW legislation
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable	Unlikely - Not recorded during searches of the development site
Pink-tailed Worm-lizard	*Aprasia parapulchella*	Vulnerable	Unlikely – No suitable rocky habitat
Border Thick-tailed Gecko	*Uvidicolus sphyrurus*	Vulnerable	Addressed under NSW legislation
Plants			
N/A	*Androcalva procumbens*	Vulnerable	Unlikely - Not recorded during searches of the development site
Ooline	*Cadellia pentastylis*	Vulnerable	Unlikely - Not recorded during searches of the development site
bluegrass	*Dichanthium setosum*	Vulnerable	Addressed under NSW legislation
N/A	*Euphrasia arguta*	Critically Endangered	Unlikely - Not recorded during searches of the development site
Slender Darling-pea	*Swainsona murrayana*	Vulnerable	Addressed under NSW legislation
N/A	*Tylophora linearis*	Vulnerable	Addressed under NSW legislation

Two species of Commonwealth listed fauna or flora are known to occur within 1500 metres of the development site: Koala (*Phascolarctos cinereus*) and Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) (Figure 4-1). Neither species was observed during survey, although tell tail signs of koala were detected (Section 4.4).

Both species are further considered in the BAM calculations for the proposal.

4.3 Migratory species

Nine migratory species (all birds) listed under the EPBC Act may potentially occur within the development site. (EPBC Act Protected Matters Report). None were recorded during survey.

4.4 Field survey

4.4.1 Survey for habitat constraints and microhabitat

The vegetation in the development site can provide habitat for a wide range of terrestrial fauna. Trees were inspected for hollows, fallen logs, rocks, crevices and shrubby habitat were observed, and the area was checked for infrastructure which may provide artificial habitat for microbats and other fauna species. Three dams exist adjacent to the development site, however all three lack aquatic vegetation and habitat.

4.4.2 Targeted threatened species survey

Phillip Cameron BAM accredited assessor (BAAS17082) / Managing Director of AREA completed field assessment from 11 to 13 March 2020. Ecologist Greg Bible from AREA assisted in targeted flora and fauna surveys. The Stage 1 assessment focussed on BAM plots and targeted assessment which could occur at the time, but additional work was undertaken to consider threatened species in other suitable seasons for their detection.

The targeted threatened species assessment focused on listed species predicted to occur in PCT592 following all requisite guidelines to detect these species in the development site. Threatened species searches were undertaken as per the threatened species survey guidelines.

To identify environmental constraints for the proposal, the following survey effort was completed in March 2020:

- a reconnoitre of the proposal to refine the proposed field methods
- species credit species search transects throughout the development site (Figure 4-5)
- diurnal observation of hollows in and around the development site
- bird searches
- call playback (nocturnal) three nights and nocturnal frog surveys
- opportunistic observation.

In December 2020 to January 2021 ten camera traps were set up in PCT592 following DPIE guidelines (per BioNet data Collection) for surveying. These traps were left in position for four weeks, with the cameras checked and the lures rebaited with honey after two weeks. Traps were positioned on trees with hollows on alluvial soils and as high as possible in the tree.

Anabat bat echolocation call recordings over three nights from two separate locations, from a previous study adjacent to the development site (within 300-600 metres) recorded in July 2019 were considered relevant to the proposal. See location of recording devices in Figure 4-4. Results are discussed in the following section.

Where assessment was not sufficient to confirm the absence of species, the species was assumed to be present.

Figure 4-4: Fauna monitoring points

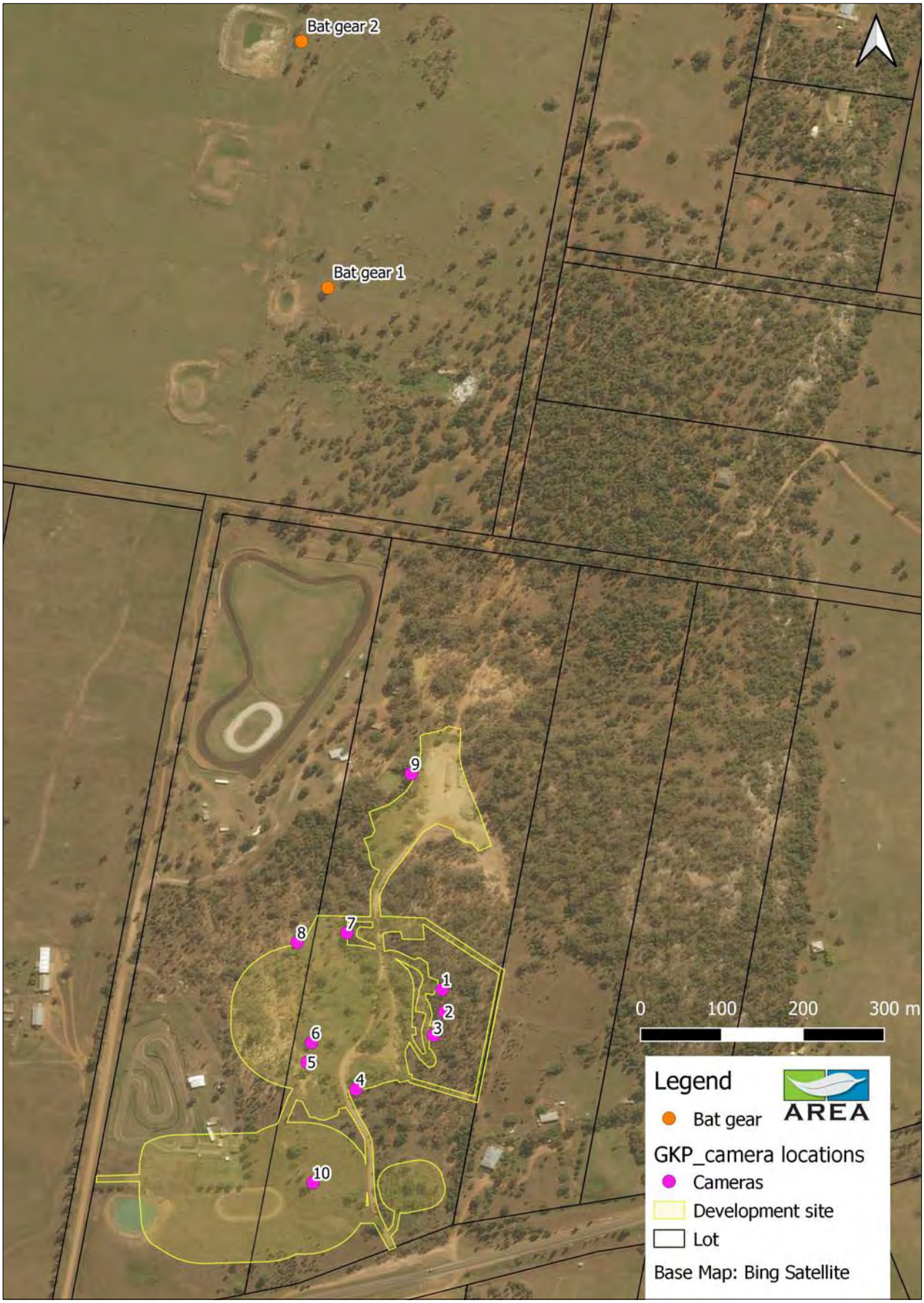
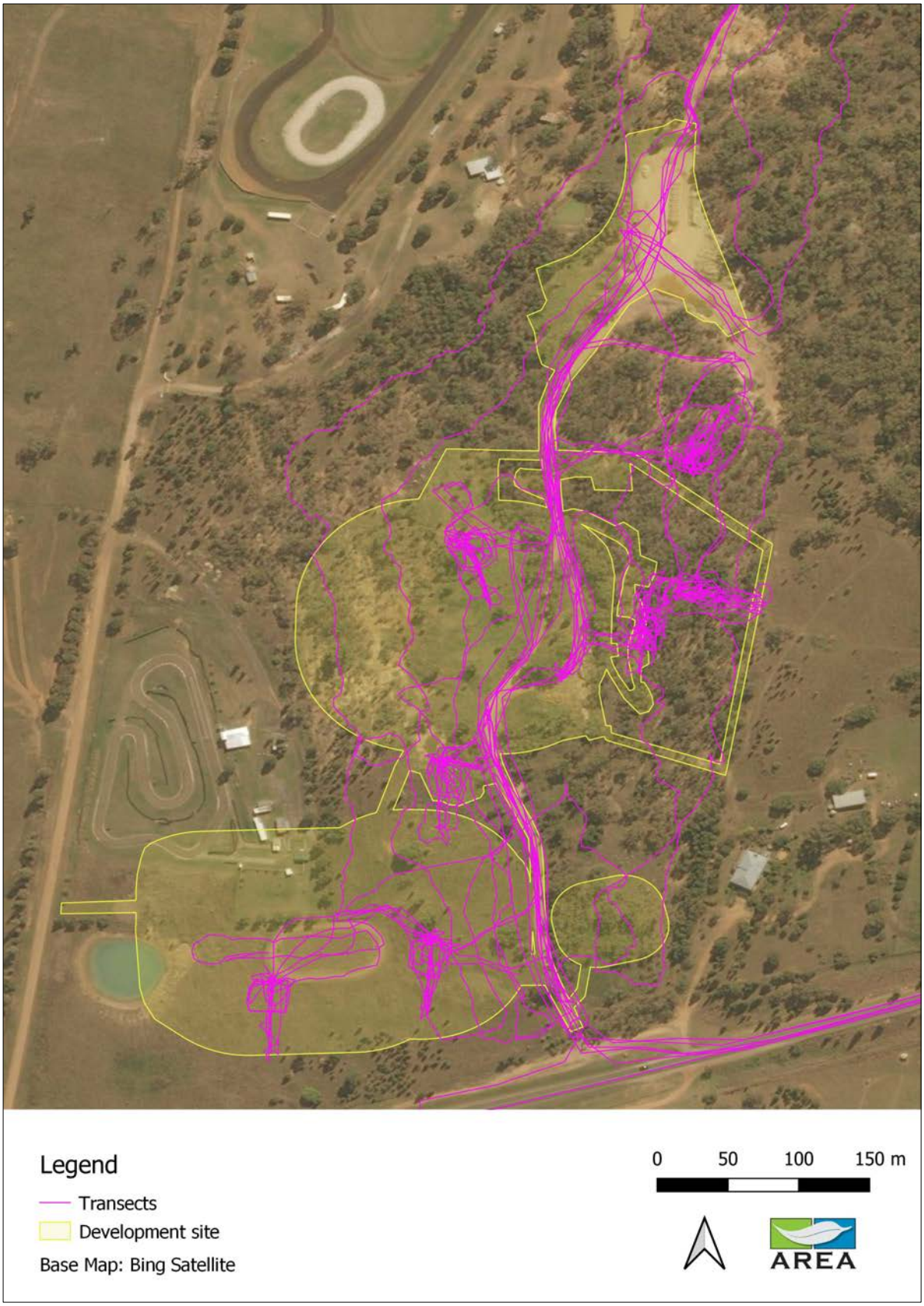


Figure 4-5: Threatened species search transects (one assessor)



4.4.3 Threatened species detected

No threatened species sighted during survey, however signs of koala presence, in the form of old scats and tree scratches were detected in the mid-section of the development site (Plate 4-1 and Plate 4-2, Figure 4-6). Koala are included as both Ecosystem and Candidate credit species.

Plate 4-1: Koala scat discovered during survey

Plate 4-2: Tree scratches detected during survey

Figure 4-6: Location of koala signs detected during survey

4.4.4 Insectivorous Bat Survey

The assessment of bats followed '*Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method 2018*.

Anabat bat echolocation call recordings over three nights (per DPIE guidelines) were assessed by AREA's bat expert Dr Heidi Kolkert. See results in Table 4-5.

Table 4-5: Bat threatened species positively recorded

Date	Species recorded	Common Name	Status *
30/07/2019	*Chalinolbus gouldi*	Gould's wattled bat	Not listed
	flat pulses @25khz (likely Ozimops planiceps possible C dwyeri)*	Southern free-tailed bat or Large-eared Pied Bat	Not listed Vulnerable BC & EPBC Act
	Vespadelus vulturnus	Little forest bat	Not listed
	Scotorepens balstoni	Western broad-nosed bat	Not listed
31/07/2019	*Chalinolbus gouldi* or *Scotorepens balsonti*	Gould's wattled bat or Western broad-nosed bat	Not listed
01/08/2019	*Ozimops planiceps*	Southern free-tailed bat	Not listed
	Ozimops petersi	Inland free-tailed bat	Not listed
	flat pulses @25khz (likely Ozimops planiceps possible C dwyeri)*	Southern free-tailed bat or Large-eared Pied Bat	Not listed Vulnerable BC & EPBC Act
	Scotorepens balstoni	Inland broad-nosed bat	Not listed
	Vespadelus troughtoni *	Eastern Cave Bat	Vulnerable BC Act
	Vespadelus vulturnus	Little forest bat	Not listed
	Chalinolobus morio	Chocolate wattled bat	Not listed
	Chalinolbus gouldi or *Scotorepens balstoni*	Gould's wattled bat or Western broad-nosed bat	Not listed

*Listed under BC Act or EPBC Act

The possible presence of two listed bat species was indicated by bat echolocation call analysis. Large-eared Pied Bat *Chalinolobus dwyeri* is a state and commonwealth listed threatened species and was also predicted by the EPBC ACT Protected Matters Report. Eastern Cave Bat *Vespadelus troughtoni* is a state listed threatened species and has been recorded within 10 kilometres of the development site.

Chalinolobus dwyeri and *Vespadelus troughtoni* are both cave dwelling bat species and both species are considered as candidate species in Section 4.6.

4.5 Ecosystem credit species

Ecosystem credit species (predicted species) are predicted to occur based on their known presence or predicted presence in the IBRA subregion, the known association with PCTs and the size and condition of the vegetation patches on the site, as determined by the BAMCC. Ecosystem credit species may be excluded from this list where they require particular habitat or geographic features (as prescribed by the BAMCC) which are not present.

4.5.1 List of ecosystem credit species derived

The BAMC assessment tool identified 28 threatened species (Table 4-6) reliably predicted to use habitat present in the development site. Three of the species (Table 4-7) can be excluded because they are outside the geographical limitations or the required habitat constraints are not present.

Ecosystem credits apply to the remaining 25 species. No surveys are required to confirm presence of these species.

Table 4-6: Ecosystem credit species list

Scientific Name	Common Name	Habitat constraints and/or geographic limitations	Sensitivity to gain class	BC status	EPBC status
Anthochaera phrygia	Regent Honeyeater (Foraging)	-	High Sensitivity to Potential Gain	CE	CE
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	Moderate Sensitivity to Potential Gain	V	-
Calyptorhynchus lathami	Glossy Black-Cockatoo (Foraging)	Presence of Allocasuarina and casuarina species	High Sensitivity to Potential Gain	V	-
Chalinolobus picatus	Little Pied Bat	-	High Sensitivity to Potential Gain	V	-
Chthonicola sagittata	Speckled Warbler	-	High Sensitivity to Potential Gain	V	-
Circus assimilis	Spotted Harrier	-	Moderate Sensitivity to Potential Gain	V	-
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	-	High Sensitivity to Potential Gain	V	-
Daphoenositta chrysoptera	Varied Sittella	-	Moderate Sensitivity to Potential Gain	V	-
Dasyurus maculatus	Spotted-tailed Quoll	-	High Sensitivity to Potential Gain	V	E
Glossopsitta pusilla	Little Lorikeet	-	High Sensitivity to Potential Gain	V	-
Grantiella picta	Painted Honeyeater	Mistletoes present at a density of greater than five mistletoes per hectare	Moderate Sensitivity to Potential Gain	V	V
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	High Sensitivity to Potential Gain	V	-
Hieraaetus morphnoides	Little Eagle (Foraging)	-	Moderate Sensitivity to Potential Gain	V	-
Lathamus discolor	Swift Parrot (Foraging)	-	Moderate Sensitivity to Potential Gain	E	CE
Lophoictinia isura	Square-tailed Kite (Foraging)	-	Moderate Sensitivity to Potential Gain	V	-
Macropus dorsalis	Black-striped Wallaby	North of Gunnedah	High Sensitivity to Potential Gain	E	-
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	-	Moderate Sensitivity to Potential Gain	V	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	-	Moderate Sensitivity to Potential Gain	V	-
Neophema pulchella	Turquoise Parrot	-	High Sensitivity to Potential Gain	V	-

Scientific Name	Common Name	Habitat constraints and/or geographic limitations	Sensitivity to gain class	BC status	EPBC status
Ninox connivens	Barking Owl (Foraging)	-	High Sensitivity to Potential Gain	V	-
Nyctophilus corbeni	Corben's Long-eared Bat	-	High Sensitivity to Potential Gain	V	V
Petroica boodang	Scarlet Robin	-	Moderate Sensitivity to Potential Gain	V	-
Petroica phoenicea	Flame Robin	-	Moderate Sensitivity to Potential Gain	V	-
Phascolarctos cinereus	Koala (Foraging)	-	High Sensitivity to Potential Gain	V	V
Pseudomys pilligaensis	Pilliga Mouse	-	High Sensitivity to Potential Gain	V	V
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	High Sensitivity to Potential Gain	V	-
Stagonopleura guttata	Diamond Firetail	-	Moderate Sensitivity to Potential Gain	V	-
Tyto novaehollandiae	Masked Owl (Foraging)	-	High Sensitivity to Potential Gain	V	-

4.5.2 Justification for exclusion of ecosystem credit species

The following three species (Table 4-7) can be excluded because the required habitat constraints are not present.

Table 4-7: Excluded Ecosystem credit species (predicted species)

Scientific Name	Common Name	Habitat constraints	Geographic limitations	Justification for exclusion
Calyptorhynchus lathami	Glossy Black-Cockatoo (Foraging)	Presence of Allocasuarina and casuarina species	-	No presence of Allocasuarina and casuarina species recorded in PCT592 in the development site.
Grantiella picta	Painted Honeyeater	Mistletoes present at a density of greater than five mistletoes per hectare	-	Mistletoes are not present at required density in the development site.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	-	No suitable waterbodies exist within 1km of the development site – only three small dams.

4.6 Candidate species credit species

Species credit species (candidate species) are those that cannot be reliably predicted from the habitat surrogates and their presence is to be assessed through habitat assessment and targeted surveys. When candidate species have habitat constraints within the development site, they require further consideration. When a candidate species is known to occur or assumed to occur, they require offsetting. The full list of 21 candidate species is provided in Table 4-8.

Table 4-8: Candidate species list (full list)

Species	Common Name	Habitat constraints	Geographic limitations	Sensitivity to gain class	BC status	EPBC status
Anthochaera phrygia	Regent Honeyeater (Breeding)	Areas as mapped	-	High Sensitivity to Potential Gain	CE	CE
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground	-	High Sensitivity to Potential Gain	V	NA
Cercartetus nanus	Eastern Pygmy-possum	-	-	High Sensitivity to Potential Gain	V	NA
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs; Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	-	Very High Sensitivity to Potential Gain	V	V
Cyperus conicus	Cyperus conicus	-	-	High Sensitivity to Potential Gain	E	NA
Dichanthium setosum	Bluegrass	-	-	High Sensitivity to Potential Gain	V	V
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	-	High Sensitivity to Potential Gain	V	NA
Hieraaetus morphnoides	Little Eagle (Breeding)	Other; Nest trees – live (occasionally dead) large old trees within vegetation	-	Moderate Sensitivity to Potential Gain	V	NA
Hoplocephalus bitorquatus	Pale-headed Snake	-	-	High	V	NA
Lathamus discolor	Swift Parrot (Breeding)	As per mapped area	-	High	V	NA
Lophoictinia isura	Square-tailed Kite (Breeding)	Nest trees	-	High	V	NA
Ninox connivens	Barking Owl (breeding)	Hollow bearing trees; Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground	-	High	V	NA
Phascolarctos cinereus	Koala (Breeding)	Areas identified via survey as important habitat (see comments))	-	High	V	V
Petaurus norfolcensis	Squirrel Glider	-	-	High	V	NA
Phascogale tapoatafa	Brush-tailed Phascogale	-	-	High	V	NA

Species	Common Name	Habitat constraints	Geographic limitations	Sensitivity to gain class	BC status	EPBC status
Polygala linariifolia	Native Milkwort	-	-	High	E	NA
Pomaderris queenslandica	Scant Pomaderris	-	-	High	E	NA
Tylophora linearis	Tylophora linearis	-	-	High	V	E
Tyto novaehollandiae	Masked Owl (Breeding)	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter	-	High	V	NA
Uvidicolus sphyrurus	Border Thick-tailed Gecko	-	-	High	V	V
Vespadelus troughtoni	Eastern Cave Bat	-	-	Very High	V	NA

V – Vulnerable; E – Endangered; NA – Not listed

4.6.1 Justification for exclusion and inclusion of species credit species

The above list of species credit species was assessed to identify if habitat constraints for species are present; if habitat constraints are not present the species can be excluded from further survey. Seven of the 21 identified species credit species were excluded from further assessment (Table 4-9). Fourteen candidate species require further assessment.

Table 4-9: Justification of exclusion of candidate species credit species

Species	Common Name	Habitat constraints	Justification
Anthochaera phrygia	Regent Honeyeater (Breeding)	Areas as mapped	Excluded based on habitat constraints: Development site is not mapped as important habitat
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs; Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	Excluded based on habitat constraints: no caves or cliffs within 2km of development site
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Excluded based on habitat constraints: no suitable waterways within 1km
Hieraaetus morphnoides	Little Eagle (Breeding)	Other; Nest trees – live (occasionally dead) large old trees within vegetation	Excluded based on habitat constraints: no large old trees within the vegetation
Lathamus discolor	Swift Parrot (Breeding)	As per mapped area	Excluded based on habitat constraints: Development site is not mapped as important habitat
Lophoictinia isura	Square-tailed Kite (Breeding)	Nest trees	Excluded based on habitat constraints: no nest trees within the vegetation
Vespadelus troughtoni	Eastern Cave Bat	Caves: Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds.	Excluded based on habitat constraints: no caves or cliffs within 2km of development site

4.6.2 Description of targeted threatened species surveys

A further 12 species credit species listed in were excluded based on results of targeted survey (Table 4-10).

Table 4-10: Species excluded by additional survey

Species	Survey effort
Glossy Black-Cockatoo (Breeding) *Calyptorhynchus lathami*	Targeted survey occurred in March 2020 during which signs of breeding and trees were considered for nest tree / hollow suitability ((i) at least 8 m above the ground; and (ii) in stems with a diameter of at least 30 cm; and (iii) hollow diameter is at least 15 cm; and (iv) stem angle is at least 45 degrees, and may be near-vertical or vertical.). No birds, evidence of nesting or suitable nest trees were located.
Cyperus conicus	Assessment followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (2020). Search transects walk across the development site in March 2020. Species not recorded
Eastern Pygmy-possum *Cercartetus nanus*	The targeted searches followed the BioNet Data Collection survey requirements for the species. Ten motion sensing cameras were positioned facing lures baited with honey within PCT592. As required by the survey guidelines for this species, these cameras were in position for four weeks in December 2020/January 2021, with rebaiting and camera battery check after two weeks. Species not recorded.
Bluegrass *Dichanthium setosum*	Assessment followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (2020). Search transects walk across the development site in March 2020. Species not recorded
Pale-headed Snake *Hoplocephalus bitorquatus*	The targeted searches followed *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft* (DEC, 2004). Spotlighting was conducted over three nights in the development site. The development site is not near a drainage line and does not possess river red gums. Species was not recorded.
Barking Owl (breeding) *Ninox connivens*	Call back completed at development site (March) and associated with a separate assessment in the adjacent lot (July / August). Species not recorded
Squirrel Glider *Petaurus norfolcensis*	The targeted searches followed the BioNet Data Collection survey requirements for the species. Ten motion sensing cameras were positioned facing lures baited with honey within PCT592. As required by the survey guidelines for this species, these cameras were in position for four weeks in December 2020/January 2021, with rebaiting and camera battery check after two weeks. Species not recorded.
Brush-tailed Phascogale *Phascogale tapoatafa*	The targeted searches followed the BioNet Data Collection survey requirements for the species. Ten motion sensing cameras were positioned facing lures baited with honey within PCT592. As required by the survey guidelines for this species, these cameras were in position for four weeks in December 2020/January 2021, with rebaiting and camera battery check after two weeks. Species not recorded.
Native Milkwort *Polygala linariifolia*	Assessment followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (2020). Search transects walk across the development site in March 2020. Species not recorded
Scant Pomaderris *Pomaderris queenslandica*	Assessment followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (2020). Search transects walk across the development site in March 2020. Species not recorded
Tylophora linearis	Assessment followed *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (2020). Search transects walk across the development site in March 2020. Species not recorded

Species	Survey effort
Border Thick-tailed Gecko *Uvidicolus sphyrurus*	Survey of the development site confirmed suitable habitat as described in the Threatened Biodiversity Data Collection, is not present. Specifically, a) rocky slopes and outcrops are not present, b) elevation is less than 450 – 1000m, c) groundcover is dominated by dense exotic flora, d) historic grazing

4.6.3 Species credit species

The following two species credit species could not be excluded and are, or are assumed to be, present:

Table 4-11: Included candidate species in the BAMC

Species	Common Name
Phascolarctos cinereus	Koala (Breeding)
Tyto novaehollandiae	Masked Owl (Breeding)

PCT592 in Zone 2 and 3 contains trees and shrubs which may be used by these species for habitat, feeding or breeding.

The biodiversity risk weighting for these species is based on the combination of two components: sensitivity to loss score and sensitivity to potential gain score using the criteria listed in Appendix F of BAM (2020). Sensitivity to potential gain considers the ability of a species to respond to improvements in habitat condition at an offset site.

Risk weighting for species listed as affected by the proposal and individual species habitat polygons as requested by BAM has been provided in the following chapters.

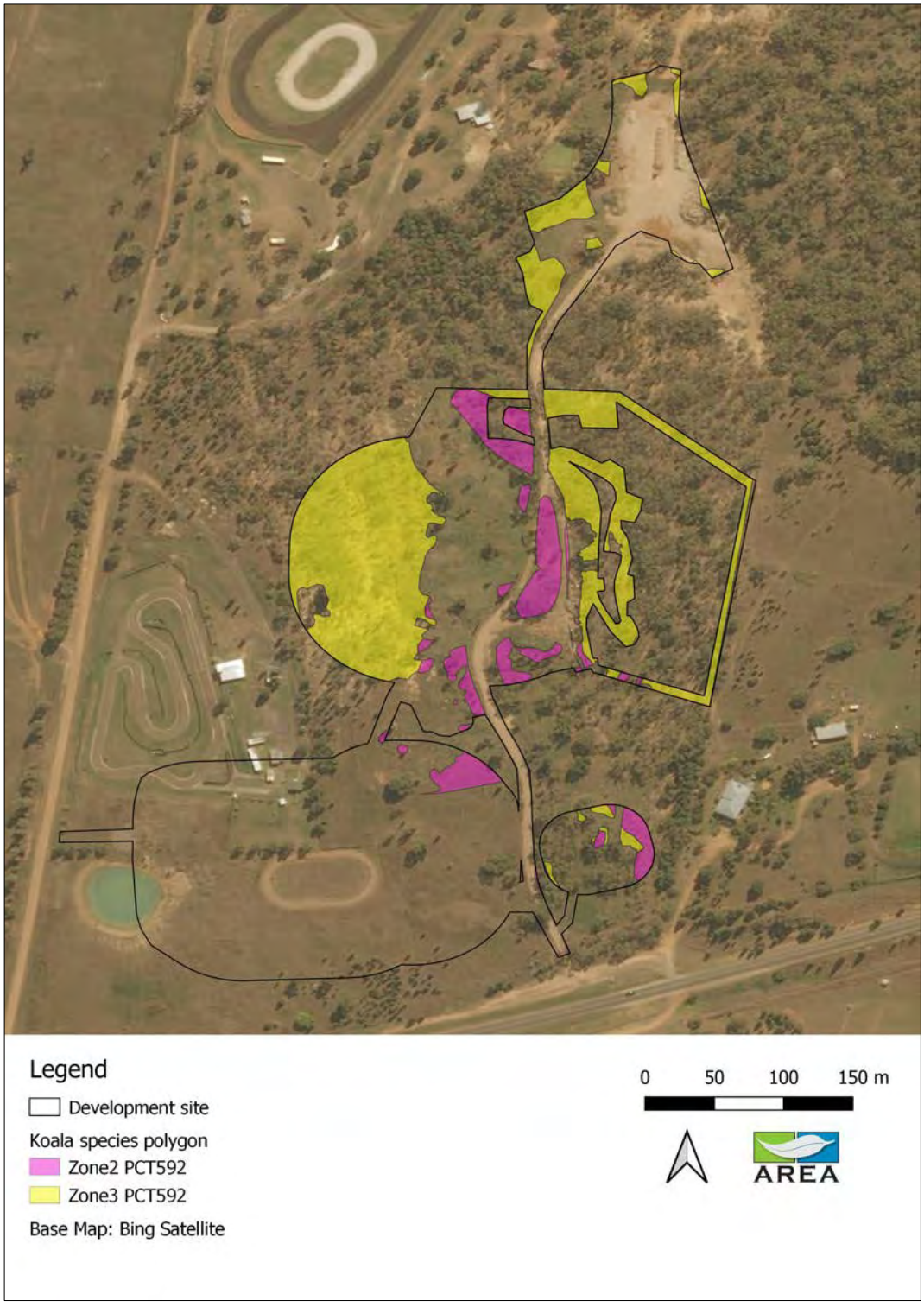
The total polygon area for each species equates to approximately 3.09 hectares each and includes Zone 2 and 3 of PCT592.

4.6.4 Koala Phascolarctos cinereus

Table 4-12: Sensitivity to Potential Gain for Koala *Phascolarctos cinereus* (source BAM Calculator)

Scientific name	Common name	Biodiversity risk	Sensitivity to gain	Biodiversity risk weighting
Phascolarctos cinereus	Koala	High	High Sensitivity to Potential Gain	2

Figure 4-7: Species polygon for Koala *Phascolarctos cinereus*

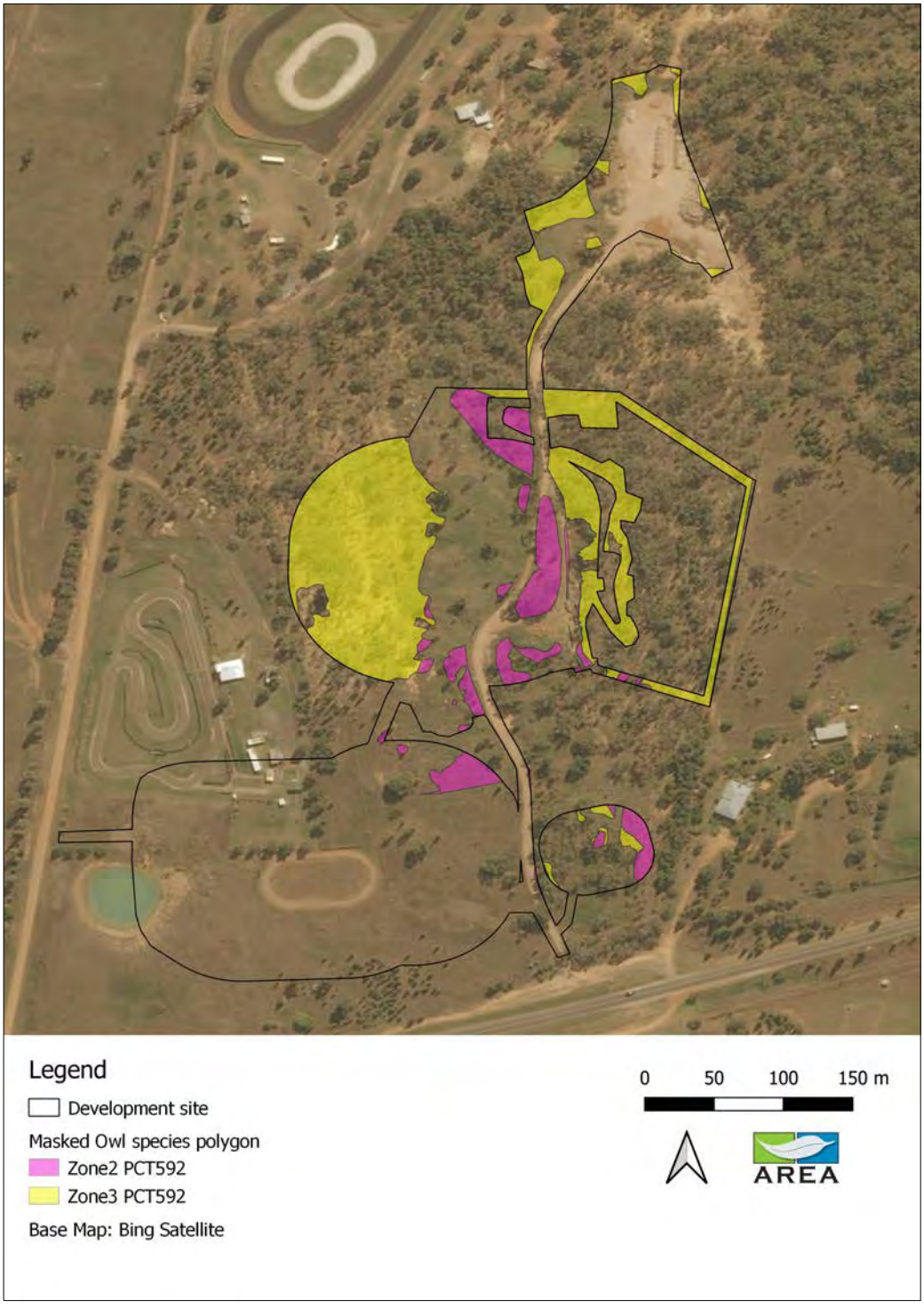


4.6.5 Masked Owl *Tyto novaehollandiae*

Table 4-13: Sensitivity to Potential Gain for Masked Owl *Tyto novaehollandiae* (source BAM Calculator)

Scientific name	Common name	Biodiversity risk	Sensitivity to gain	Biodiversity risk weighting
Tyto novaehollandiae	Masked Owl	High	High Sensitivity to Potential Gain	2

Figure 4-8: Species polygon for Masked Owl *Tyto novaehollandiae*



4.7 State Environmental Planning Policy

The State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2019 came into force on 1 March 2020 and was amended on 7 October 2020.

The SEPP (Koala Habitat Protection) 2019 applies to the proposal. A separate Koala Assessment Report (KAR) has been prepared to satisfy SEPP requirements.

5 Assessment of impacts

5.1 Serious and irreversible impacts

There are no Serious and Irreversible Impact (SAII) candidate identified by the BAMC.

5.2 Prescribed impact

The prescribed impacts which may be associated with the proposal are discussed below.

Table 5-1: Prescribed impacts relevant to the development site

Feature	Present	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of the BAR where prescribed impact is addressed
Karst, caves, crevices, cliffs or other geologically significant feature	☒ Yes / ☐ No	The old quarry within the development site contains some rocky area with small to medium rocks and crevices.	Disturbance to habitat for crevice dependent species	No candidate species identified	See mitigation measures, Section 5.4
Rocks	☒ Yes / ☐ No	The old quarry within the development site contains some rocky area with small to medium rocks and crevices.	Disturbance to habitat for rock dependent species	No candidate species identified	See mitigation measures, Section 5.4
Human-made structure	☐ Yes / ☒ No	N/A	No human-made structures will be impacted	N/A	N/A
Non-native vegetation	☐ Yes / ☒ No	N/A	There are some weeds in the development site and hardstand areas of no vegetation, but no significant areas of non-native vegetation will be impacted	N/A	N/A
Habitat Connectivity	☐ Yes / ☒ No	N/A	There are no known wildlife corridors which will be impacted. The vegetation in the development site has been historically highly disturbed. There is little connected native vegetation to the west of the development site and the remaining vegetation will stay relatively connected to the surrounding vegetation as the proposal aims to utilise and enhance existing vegetation.	N/A	N/A

Feature	Present	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of the BAR where prescribed impact is addressed
Hydrological process sustaining/interacting with rivers, streams or wetlands	☐ Yes / ☒ No	N/A	No hydrological processes interacting with waterways will be impacted. The proposal will result in minor changes to surface drainage and topography through excavation and construction.	N/A	N/A
Wind farm development	☐ Yes / ☒ No	N/A	No wind farm proposed on site	N/A	N/A
Vehicle Strike	☒ Yes / ☐ No	The construction of the koala park will result in increased vehicle movements in the area	Potential for vehicle strike to occur on access roads.	No candidate species identified	See mitigation measures, Section 5.4

5.3 Avoid and minimise impacts

The proponent has changed the design to reduce impact to native vegetation by excluding a boundary fence included in the original design which would have increased the impact to native vegetation.

In most cases the tree and shrub density in the APZ's is less than the required Rural Fire Service management thresholds, and creation of these protection zones does not significantly increase the impact to native vegetation.

Where possible, the design of the proposal utilises existing disturbed and remediated areas which are either mapped as Not Native or areas which had low VI scores.

5.4 Mitigation and management of impacts

A list of recommended mitigation measures is summarised in Table 5-2. These are designed to provide guidance on recommended measures to further avoid and mitigate impact to biodiversity.

Table 5-2: Recommended mitigation measures

Item	Timing	Recommended mitigation measures
Site personnel induction	Pre-construction	Ensure all construction staff working on the proposal are inducted on: • Site environmental procedures (i.e. vegetation management, sediment and erosion control, protective fencing, noxious weeds, hygiene protocols, ethical procedures for handling fauna displaced on the site) • What to do in case of environmental emergency (chemical spills, fire, injured fauna) • Key contacts in case of environmental emergency • How to reduce the risk of vehicle strike to fauna.
Site planning	Pre-construction	• Locate temporary infrastructure (set down areas, access tracks etc.) in cleared areas (existing access tracks, existing magazine) away from vegetation to minimise vegetation removal and indirect effects.
Identification of clearing limits	Pre-construction	• Accurately and clearly mark out the limits of clearing (where appropriate) and the vegetation to be retained outside of the development site. • Regular inspections should be undertaken to ensure all retained vegetation/fauna habitat is clearly marked and that fencing is in place, where appropriate. • Only clear each stage of the proposal as required so that vegetation will be retained in the buffer area until future stages commence.
Protection of fauna during clearing of vegetation, rock removal and crevice disturbance	Pre-construction and during clearing works	• Avoid clearing native vegetation in Spring. • Implement staged habitat removal to allow fauna to vacate if present. Habitat trees should be felled carefully using equipment that allows habitat trees to be lowered to the ground with minimal impact and hollows inspected. Respond to (e.g. rescue, relocate) fauna detected during the clearing process (refer to Fauna Handling and Rescue Procedure in Appendix A) • Salvage and relocate tree hollows from trees cleared as part of the proposal. Salvaging and relocating hollows and large wooden debris can increase the biodiversity and habitat values: o Lengths of tree trunk or branches containing hollows, particularly large established hollows, should not be woodchipped and instead should be placed in an area of native vegetation outside the clearing area. o Depending on the equipment and budget available, tree trunks can be trimmed, transported and positioned in an alternate location (the

Item	Timing	Recommended mitigation measures
		entire tree does not need to be relocated – just the section containing the hollow, and as much length as feasible). o Salvaged hollows can be placed on the ground or if equipment is available, longer tree trunk lengths can be rested against a tree so the salvaged hollow is off the ground.
Loss of hollow bearing trees	Pre-and during construction	• The pre-clearing work is recommended above to salvage and relocate tree hollows affected by the proposal. This process will also address other threatened species mitigation requirements for potentially occurring hollows dwelling microbat species. • Spotter/catcher presence is recommended during removal of hollow bearing trees
Management of erosion and sediment control	Pre-and during construction	• Provide sediment and erosion controls to manage exposed soil surfaces and stockpiles to prevent sediment discharge into vegetation and fauna habitat. • Clearly identify stockpile and storage locations and provide erosion and sediment controls around stockpiles.
Weed management	Pre-and during construction	• Ensure that any machinery arriving on site be inspected for any foreign soil or plant matter/weed material and be washed down before entering the site. • Weeds should be controlled within the work area according to the requirements of the *Biosecurity Act 2016* • Any significant weeds which are identified as part of the proposal must be disposed of appropriately.
Vehicle Strike	Operation	• Low speed limits in place • Install warning signs of known wildlife crossings • Reporting requirements for any incidents of vehicle strikes • Ensure staff are inducted on how to reduce risk to fauna from vehicle strike
Revegetation and landscaping	Operation	• Minor landscaping around may be required. Where this occurs, there are two options 1) either allow the area to naturally regenerate or 2) to plant species. Natural regeneration in arid areas is typically more successful than planting vegetation. • If planting is chosen, then all species planted for any purpose should be consistent with those Plant Community Types described in this report. • Shrubby vegetation layers can be planted on the project boundaries to screen and provide habitat.
Monitor and review	All stages	• A review of mitigation measures (including a checklist) should be developed to ensure that all measures proposed have been undertaken. • Review of the impact of this proposal to the native vegetation would be useful to justify continuation of the activity, and to inform future applications of this nature. • Adaptive management is recommended to be able to respond to changing circumstances.

6 Biodiversity credit summary

As the proposal seeks approval under Part 4 of the NSW EPA&A Act the need for offsetting has been considered. The BAMC has been used to determine the offsetting requirements for the proposal. BAMC outputs area provided in Appendix D. Biodiversity Offsetting for impact to PCT592, as well as two species credit species is triggered by this proposal, see below.

6.1 Vegetation scores

Table 6-1: Current vegetation integrity scores

Zone	BAM item number	Area (ha)	Composition condition score	Structure condition score	Function condition score	Vegetation integrity (VI) score
1	1	3.23	43.9	23.3	11	22.4
2	2	0.67	22.7	13	0.8	6.2
3	3	2.42	69	15.6	73.7	43

6.2 Credits required

Table 6-2: Ecosystem credit summary from BAMC

Zone	BAM item number	Matter requiring offsetting	Number of credits
1	1	PCT592	9
2	2	PCT592	0
3	3	PCT592	23
		Total	**32**

Table 6-3: Species credit summary from BAMCC

Species	Common Name	Number of credits
Phascolarctos cinereus	Koala (Breeding)	11
Tyto novaehollandiae	Masked Owl (Breeding)	11
	Total	**22**

6.3 Credit classes

Credit classes allocated to the proposal are outlined below.

6.3.1 Ecosystem credit classes

Ecosystem credit summary

PCT	TEC	Area	HBT Cr	No HBT Cr	Credits
592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	Not a TEC	6.3	23	9	32

Credit classes for PCT592

Like-for-like options

Class	Trading group	Zone	HBT	Credits	IBRA region
Western Slopes Dry Sclerophyll Forests This includes PCT's: 54, 110, 217, 255, 273, 287, 330, 333, 341, 343, 346, 348, 358, 403, 455, 456, 472, 577, 581, 592, 617, 673, 676, 713, 940, 956, 1277, 1279, 1313, 1316, 1381, 1610, 1661, 1668, 1709	Western Slopes Dry Sclerophyll Forests - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status).	Zone 1 - Grassy	No	9	Liverpool Plains , Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Western Slopes Dry Sclerophyll Forests This includes PCT's: 54, 110, 217, 255, 273, 287, 330, 333, 341, 343, 346, 348, 358, 403, 455, 456, 472, 577, 581, 592, 617, 673, 676, 713, 940, 956, 1277, 1279, 1313, 1316, 1381, 1610, 1661, 1668, 1709	Western Slopes Dry Sclerophyll Forests - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status).	Zone 2 – Heavily disturbed	No	0	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Western Slopes Dry Sclerophyll Forests This includes PCT's: 54, 110, 217, 255, 273, 287, 330, 333, 341, 343, 346, 348, 358, 403, 455, 456, 472, 577, 581, 592, 617, 673, 676, 713, 940, 956, 1277, 1279, 1313, 1316, 1381, 1610, 1661, 1668, 1709	Western Slopes Dry Sclerophyll Forests - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status).	Zone 3 – Better quality	Yes	23	Liverpool Plains , Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species credit classes

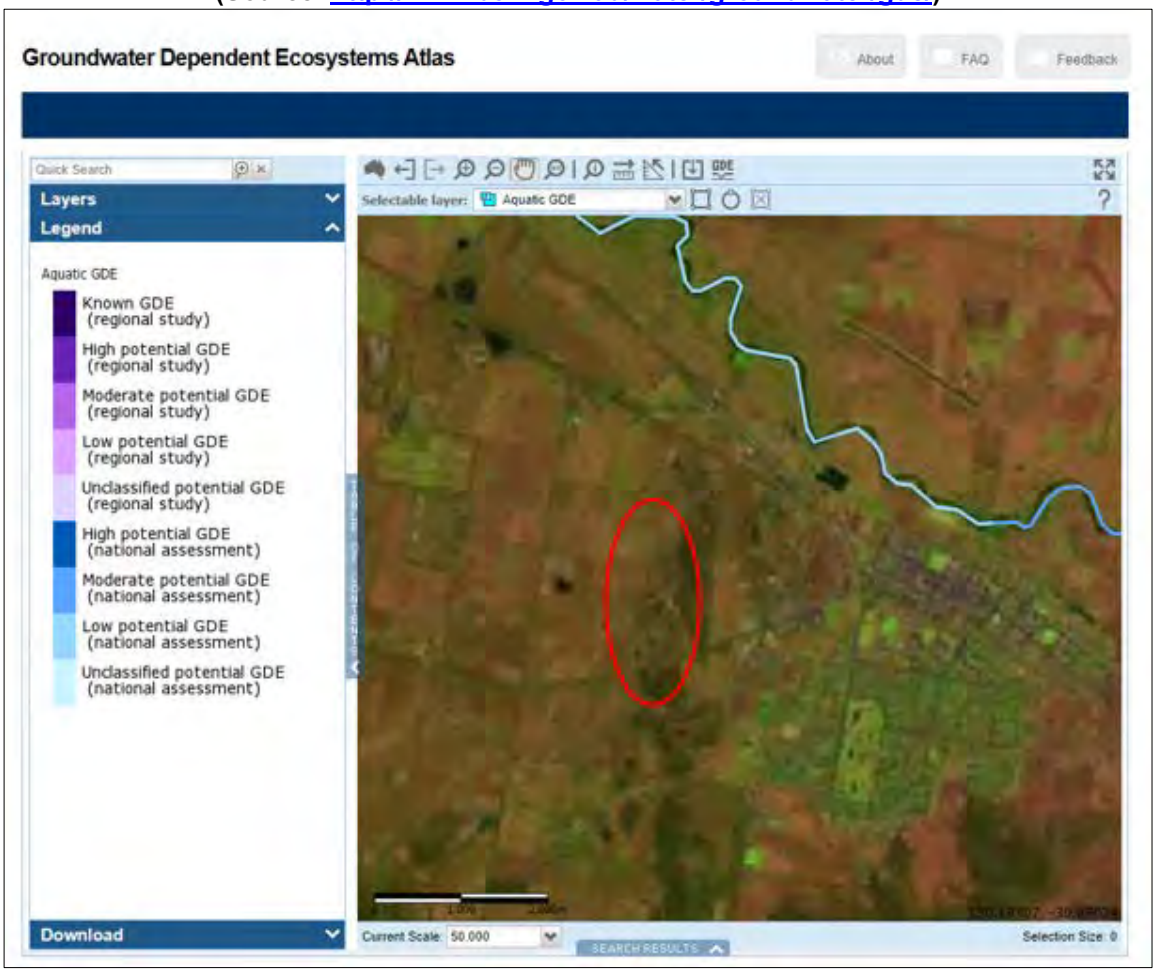
Like for like options

Species	Common Name	IBRA Region
Phascolarctos cinereus	Koala (Breeding)	Any in NSW
Tyto novaehollandiae	Masked Owl (Breeding)	Any in NSW

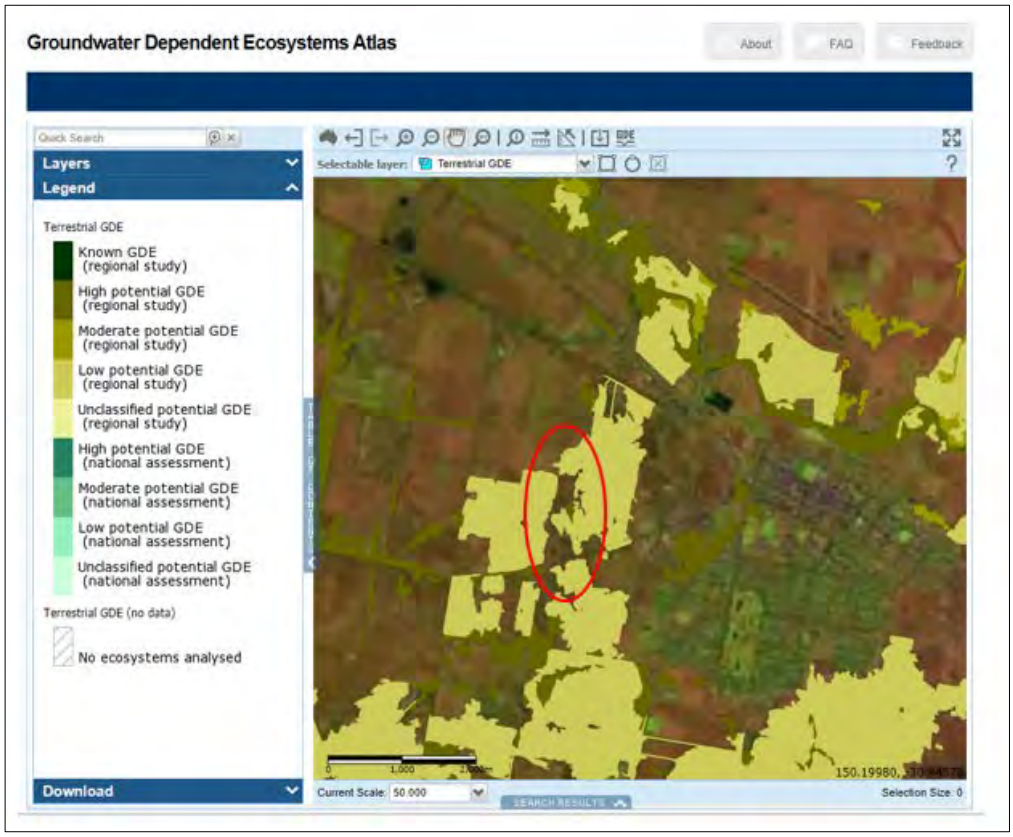
Appendix A – Database search

Groundwater Dependent Ecosystems

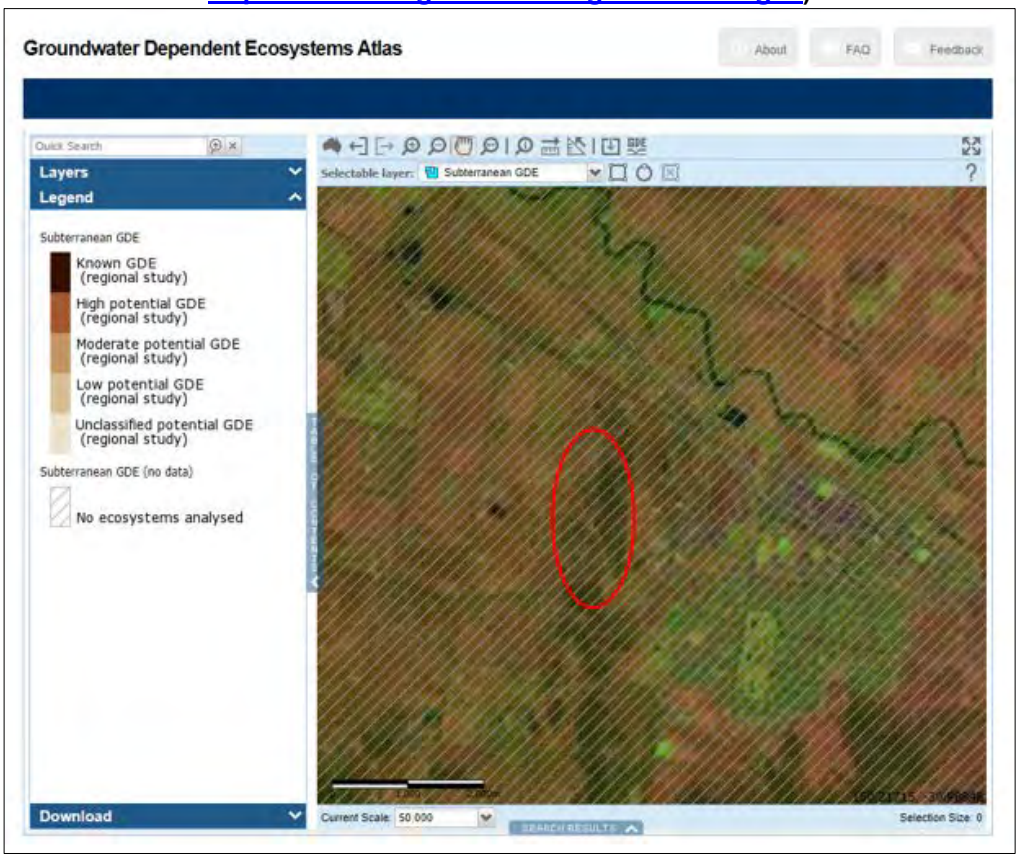
Aquatic GDE (Red line represents approximate location of the Development site)
(Source: http://www.bom.gov.au/water/groundwater/gde/)



Terrestrial GDE (Red line represent approximate location of the development site) (Source: http://www.bom.gov.au/water/groundwater/gde/)



Subterranean GDE (Red line represent approximate location of the development site) (Source: http://www.bom.gov.au/water/groundwater/gde)



IBRA search results

IBRA Threatened Species Search:
Liverpool Plains IBRA sub-region filtered by Brigalow Clay Plain Woodlands and Western Slopes Dry Sclerophyll Forest

Scientific name	Common name	NSW status	Comm status	Occurrence
Bird				
Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Critically Endangered	Known
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable		Known
Burhinus grallarius	Bush Stone-curlew	Endangered		Known
Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable		Known
Chthonicola sagittata	Speckled Warbler	Vulnerable		Known
Circus assimilis	Spotted Harrier	Vulnerable		Known
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable		Known
Daphoenositta chrysoptera	Varied Sittella	Vulnerable		Known
Glossopsitta pusilla	Little Lorikeet	Vulnerable		Known
Grantiella picta	Painted Honeyeater	Vulnerable	Vulnerable	Known
Hieraaetus morphnoides	Little Eagle	Vulnerable		Known
Lathamus discolor	Swift Parrot	Endangered	Critically Endangered	Known
Leipoa ocellata	Malleefowl	Endangered	Vulnerable	Predicted
Lophoictinia isura	Square-tailed Kite	Vulnerable		Known
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Vulnerable		Known
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Vulnerable		Known
Neophema pulchella	Turquoise Parrot	Vulnerable		Known
Ninox connivens	Barking Owl	Vulnerable		Known
Ninox strenua	Powerful Owl	Vulnerable		Predicted
Petroica boodang	Scarlet Robin	Vulnerable		Known
Petroica phoenicea	Flame Robin	Vulnerable		Known
Polytelis swainsonii	Superb Parrot	Vulnerable	Vulnerable	Known
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Vulnerable		Known
Stagonopleura guttata	Diamond Firetail	Vulnerable		Known
Tyto novaehollandiae	Masked Owl	Vulnerable		Known
Mammal				
Aepyprymnus rufescens	Rufous Bettong	Vulnerable		Predicted
Cercartetus nanus	Eastern Pygmy-possum	Vulnerable		Known
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable	Known
Chalinolobus picatus	Little Pied Bat	Vulnerable		Known
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Endangered	Known
Macropus dorsalis	Black-striped Wallaby	Endangered		Known
Nyctophilus corbeni	Corben's Long-eared Bat	Vulnerable	Vulnerable	Known
Petaurus australis	Yellow-bellied Glider	Vulnerable		Predicted
Petaurus norfolcensis	Squirrel Glider	Vulnerable		Known
Petrogale penicillata	Brush-tailed Rock-wallaby	Endangered	Vulnerable	Known
Phascogale tapoatafa	Brush-tailed Phascogale	Vulnerable		Predicted
Phascolarctos cinereus	Koala	Vulnerable	Vulnerable	Known
Pseudomys pilligaensis	Pilliga Mouse	Vulnerable	Vulnerable	Predicted
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable	Known
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Vulnerable		Known
Vespadelus troughtoni	Eastern Cave Bat	Vulnerable		Known
Plant				
Cyperus conicus	Cyperus conicus	Endangered		Predicted
Dichanthium setosum	Bluegrass	Vulnerable	Vulnerable	Known
Lepidium aschersonii	Spiny Peppercress	Vulnerable	Vulnerable	Known
Philotheca ericifolia	Philotheca ericifolia	Not listed		Predicted

Scientific name	Common name	NSW status	Comm status	Occurrence
Polygala linariifolia	Native Milkwort	Endangered		Known
Pomaderris queenslandica	Scant Pomaderris	Endangered		Known
Thesium australe	Austral Toadflax	Vulnerable	Vulnerable	Known
Tylophora linearis	Tylophora linearis	Vulnerable	Endangered	Known
Reptile				
Hoplocephalus bitorquatus	Pale-headed Snake	Vulnerable		Known
Uvidicolus sphyrurus	Border Thick-tailed Gecko	Vulnerable	Vulnerable	Predicted
Threatened Ecological Community				
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Endangered Ecological Community	Endangered	Known
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Critically Endangered Ecological Community	Critically Endangered	Known

EPBC Act Protected Matters Report

See following pages (to be attached with FINAL)

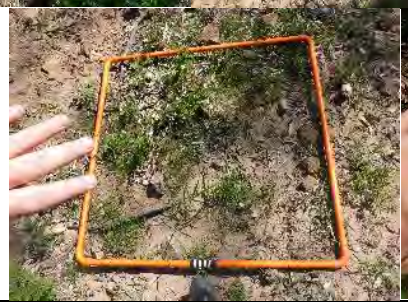
Appendix B – BAM plot sheets

See following pages (to be attached with FINAL)

Appendix C – BAM plot photos

See following pages

Plot	Zone	PCT ID	Pictures
1	3	592	      

Plot	Zone	PCT ID	Pictures
2	3	592	      

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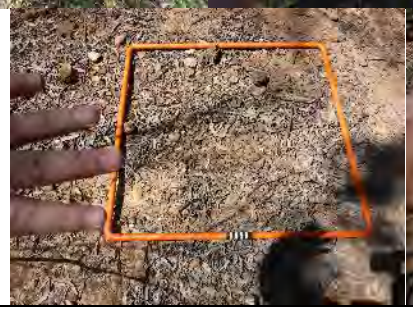
3	3	592	      

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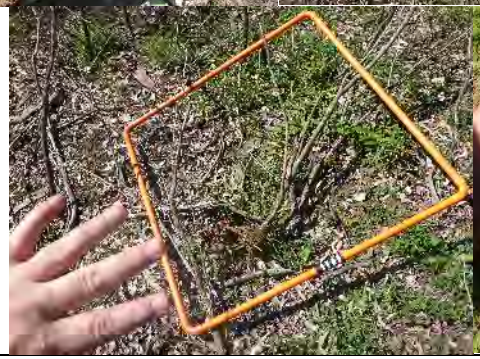
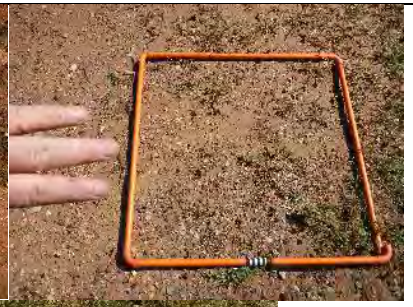
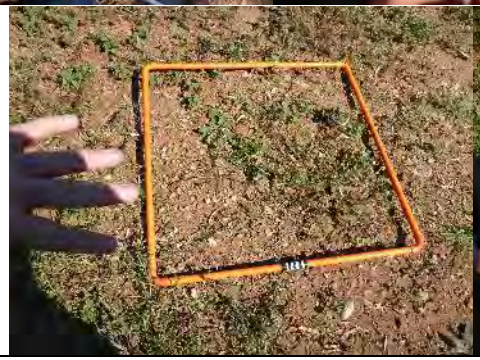
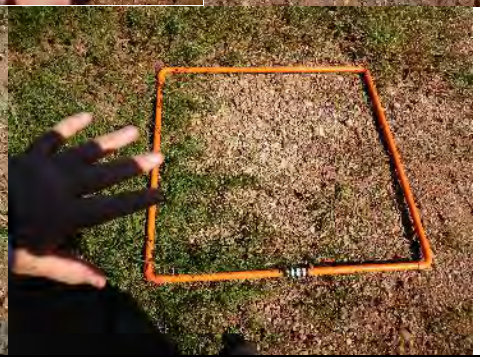
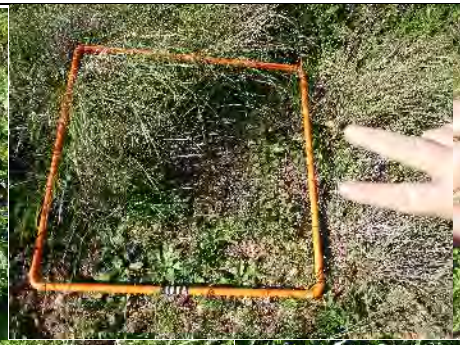
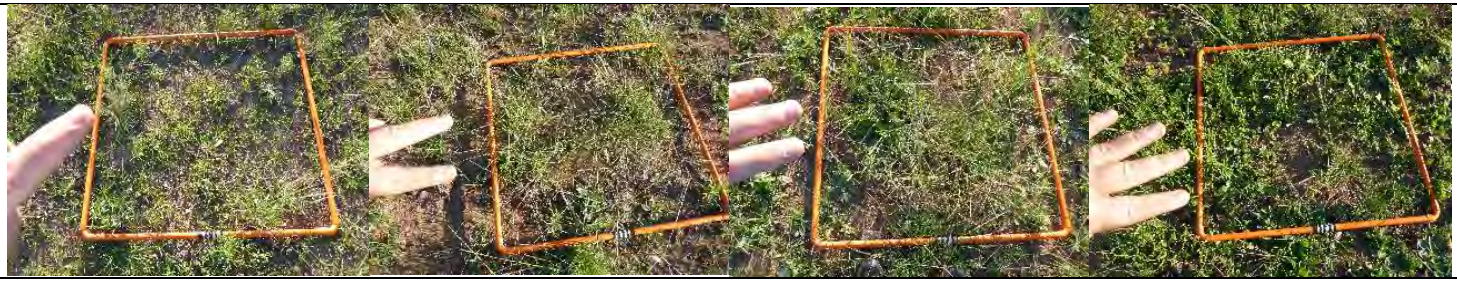
4	4	101	      

Plot	Zone	PCT ID	Pictures
5	2	592	      

Plot	Zone	PCT ID	Pictures
6	2	592	      

Plot	Zone	PCT ID	Pictures
7	1	592	   

Plot	Zone	PCT ID	Pictures
8	1	592	  

Appendix D – BAM reports

Appendix E – Fauna Handling and Rescue Procedure

Purpose

This procedure explains the actions to be taken if an animal or eggs are discovered on the site that require handling or rescue during vegetation and soil clearance and ongoing construction activities. The procedure relates primarily to injured shocked and juvenile individuals but also applies to nocturnal fauna or slow-moving species that may not be capable of moving away from mobile plant and equipment.

Scope

This procedure is applicable to all native and introduced species that are found on the site. Attendee construction staff and contractors will attend a project induction, which will include a section on fauna.

Procedure

In the event wildlife (including shocked, juvenile animals or eggs) are discovered on the site during vegetation and soil clearance and ongoing construction activities the following steps shall be taken:

1. STOP ALL WORK in the vicinity of the fauna and immediately notify the work supervisor, who will then notify a member of the Environmental/ management team.

2. If required, contact project ecologist to obtain positive identification of the subject species.

3. Preferably allow fauna to leave the area without intervention.

4. If immediately available, use a licensed fauna ecologist or wildlife carer with specific animal handling experience to carry out any fauna handling.

5. To minimise stress to native fauna and remove the risk of further injury an appropriately competent person shall:

    a. If time permits call ecologist or fauna rescue for advice.

    b. Attempt to herd animal into adjoining forest, outside construction area.

    c. If capture is necessary cover larger animals with a towel or blanket and place in a large cardboard box and/or cotton/calico bag

    d. Place smaller animals in a cotton/calico bag tied at the top

    e. Keep the animal in a quiet, warm, ventilated and dark place away from noisy construction activities.

    f. Aquatic fauna are to be placed in plastic aquaria or a moistened plastic bag. Frogs will be transported in moistened plastic bags (1 frog/bag) with a small amount of leaf litter. Handling and translocation of frogs shall be in accordance with the Hygiene Protocol for the Control of Disease in Frogs (DECC 2008)

6. Bats should only be handled by appropriately trained and vaccinated person.

Appendix F – Glossary of terms from BAM (2020)

BAM definitions and acronyms used in this document

Definitions

Accredited person: has the same meaning as in the BC Act, referred to in the BAM as 'assessor'.
Ancillary rules: has the same meaning as set out in clause 6.5 of the BC Regulation.
Annual probability of decline in vegetation and habitat condition: an estimate of the average probability of decline of each attribute through clearing, stochastic factors or ongoing degrading actions (firewood removal, weed invasion, livestock grazing).
Areas of geological significance: geological features such as karst, caves, crevices, cliffs.
Assessment area surrounding the subject land: the area of land in the 1500m buffer zone around a Development Site, or land to be biodiversity certified or a biodiversity stewardship site, that is determined in accordance with Subsection 4.3.2.
Assessor: the person accredited under the BC Act referred to in Subsection 2.1.2 and who has been engaged by the proponent.
Averted loss: the gain in vegetation and habitat condition that arises from managing the proposed land as an offset compared to the probable future vegetation condition if the land was to be left unmanaged (see *Annual probability of decline*).
Avoid: measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity. Refer to the BAM for operational guidance.
BAM: the Biodiversity Assessment Method.
BC Act: the Biodiversity Conservation Act 2016.
BC Regulation: the Biodiversity Conservation Regulation 2017.
Benchmark data: for a PCT, vegetation class or vegetation formation benchmark data is contained in the BioNet Vegetation Classification. A local reference site may also be used to establish benchmark data for a PCT that may be used in a BAM assessment.
Benchmarks: the quantitative measures that represent the 'best-attainable' condition, which acknowledges that native vegetation within the contemporary landscape has been subject to both natural and human-induced disturbance. Benchmarks are defined for specified variables for each PCT. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, is not subject to high frequency burning, and has evidence of recruitment of native species.
Biodiversity certification: has the same meaning as in the BC Act.
Biodiversity Certification Assessment Report (BCAR): has the same meaning as in the BC Act.
Biodiversity credit report: the report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a Development Site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity Development Assessment Report (BDAR): has the same meaning as in the BC Act.
Biodiversity offsets: management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development.
Biodiversity Stewardship Agreement: has the same meaning as in the BC Act.
Biodiversity Stewardship Assessment Report (BSAR): the report that must be prepared in accordance with the BAM and submitted as part of an application for a biodiversity stewardship agreement.
Biodiversity values: has the same meaning as clause 1.5(2) of the BC Act.
Biodiversity values map: is established according to clause 7.3 of the BC Regulation. Development within an area identified on the map requires assessment using the BAM.
BioNet Atlas: the DPIE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish.
BioNet Vegetation Classification: the master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by DPIE and available at www.environment.nsw.gov.au/research/Visclassification.htm.
Broad condition state: areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Certified more appropriate local data: has the same meaning as set out in Subsection 2.2.2.
Change in vegetation integrity score for a biodiversity stewardship site: the difference (gain) between the estimated vegetation integrity score without management at a biodiversity stewardship site and the predicted future vegetation integrity score with management at a biodiversity stewardship site, calculated in accordance with Equation 28.
Class of biodiversity credit: as defined in Section 11.3.
Clearing site: the site proposed to be cleared of native vegetation where approval is sought under Part 5A of the *Local Land Services Act 2013* or the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*.
Clonal species: flora species that propagate asexually at a site or have a limited degree of sexual reproduction, either within or between sites. Modes of asexual reproduction will include vegetative reproduction such as by rhizomes, root suckers or bulb replication.
Connectivity: the measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator: the computer program that provides decision support to assessors and proponents by applying the BAM, in particular by using the data required to be entered and the equations in Appendix 6 and Appendix 9 to calculate the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Critically endangered ecological community (CEEC): an ecological community specified as critically endangered in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).
Crown cover: the vertical projection of the periphery of tree crowns within a designated area.
Derived vegetation: PCTs that have changed to an alternative stable state as a consequence of land management practices since European settlement. Derived communities can have one or more structural components of the vegetation entirely removed or severely reduced (e.g. over-storey of grassy woodland) or have developed new structural components where they were previously absent (e.g. shrubby mid-storey in an open woodland system).
Development footprint: the area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials. The term *Development Footprint* is also taken to include clearing footprint except where the reference is to a small area development or a major project development.

Development Site: an area of land that is subject to a proposed development that is under the EP&A Act. The term *Development Site* is also taken to include clearing site except where the reference is to a small area development or a major project development.
Ecosystem credits: a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a Development Site and the gain in biodiversity values at a biodiversity stewardship site.
Endangered ecological community (EEC): an ecological community specified as endangered in Schedule 2 of the BC Act, or listed under the EPBC Act.
Environment Agency Head: has the same meaning as in the BC Act.
EP&A Act: the NSW Environmental Planning and Assessment Act 1979.
EPBC Act: the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
Ephemeral flora species: flora species where the abundance of the species above ground fluctuates in response to the plant life history in combination with environmental conditions and/or disturbance regimes. Fluctuations in abundance may be short-term (seasonal) or long-term (yearly to decadal). Many ephemeral species persist underground through unfavorable conditions via soil seed banks or dormant vegetative organs (bulbs, tubers, rootstocks).
Estuarine area: a semi-enclosed body of water having an open or intermittently open connection with the ocean, in which water levels do not vary with the ocean tide (when closed to the sea) or vary in a predictable, periodic way in response to the ocean tide at the entrance (when open to the sea).
Expert: a person who has the relevant experience and/or qualifications to provide expert opinion in relation to the biodiversity values to which an expert report relates.
Foliage cover: the percentage of a plot area that would be covered by a vertical projection of the foliage and branches and trunk of a plant, or plants or a growth form group. Foliage cover can also be referred to as percent foliage cover.
Gain: the gain in biodiversity values at a biodiversity stewardship site, over time from undertaking management actions at a biodiversity stewardship site. Gain in biodiversity values is the basis for creating biodiversity credits at the biodiversity stewardship site.
Grassland: native vegetation classified in the vegetation formation 'Grasslands' in Keith (2004)[2]. Grasslands are generally dominated by large perennial tussock grasses, lack of woody plants, the presence of broad-leaved herbs in inter-tussock spaces, and their ecological association with fertile, heavy clay soils on flat topography in regions with low to moderate rainfall.
Growth form: the form that is characteristic of a particular flora species at maturity. Growth forms are set out in Appendix 4.
Habitat: an area or areas occupied, or periodically or occasionally occupied, by a species or ecological community, including any biotic or abiotic component.
Habitat component: the component of habitat that is used by a threatened species for either breeding, foraging or shelter.
Habitat surrogates: measures of habitat that predict the occurrence of threatened species and communities: IBRA subregion, PCT, percent vegetation cover and vegetation condition.
Herbfield: native vegetation which predominantly does not contain an over-storey or mid- storey and where the ground cover is dominated by non-grass species.
High threat exotic plant cover: plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species. Also referred to as high threat weeds.
Hollow bearing tree: a living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground. Trees must be examined from all angles.
IBRA region: a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system[3], which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.
IBRA subregion: a subregion of a bioregion identified under the IBRA system.
Impact assessment: an assessment of the impact or likely impact of a development on biodiversity values which is prepared in accordance with the BAM.
Impacts on biodiversity values: loss in biodiversity values from direct or indirect impacts of development in accordance with Chapters 8, 1 and 10.
Important wetland means:
(a) a wetland that is listed in the Directory of Important Wetlands of Australia
(DIWA) from time to time, and
(b) for the purposes of all paragraphs except 4.2.1.6 the actual location on the
ground that corresponds to a SEPP 14 Coastal wetland
(c) for the purposes of Paragraph 4.2.1.6:
(i) a SEPP 14 Coastal Wetland, and
(ii) the actual location on the ground that corresponds to a SEPP 14 Coastal
Wetland.
Individual: in relation to organisms, a single, mature organism that is a threatened species, or any additional threatened species listed under Part 13 of the EPBC Act.
Intact vegetation: vegetation where all tree, shrub, grass and/or forb structural growth form groups expected for a plant community type are present.
Intrinsic rate of increase (*ir*): an estimate of the rate of gain for an attribute at a biodiversity stewardship site from actions undertaken as part of the management plan. The intrinsic rate of increase is specified for an attribute according to the formation of the PCT being assessed (see Appendix 8).
Landscape attributes: in relation to a Development Site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site.
Large tree benchmark: is the largest stem size class for a PCT as determined by the benchmark for the PCT.
Life cycle: the series of stages of reproduction, growth, development, aging and death of an organism.
Life form: the form that is characteristic of a particular species at maturity. In the BAM, life form has the same meaning as growth form for flora species.
Linear shaped development: development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length.
Litter cover: the percentage ground cover of all plant material that has detached from a living plant, including leaves, seeds, twigs, branchlets and branches (<10cm in diameter).
Local population: the population that occurs in the study area. In cases where multiple populations occur in the Development Site or a population occupies part of the Development Site, impacts on each subpopulation must be assessed separately.
Local wetland: any wetland that is not identified as an important wetland (refer to definition of *Important wetland*).
Loss of biodiversity: the loss of biodiversity values from a Development site, native vegetation clearing site or land where biodiversity certification is conferred.
Major project: State Significant Development and State Significant Infrastructure.

Minimise: a process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of development on biodiversity values.
Mitchell landscape: landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Multiple fragmentation impact development: developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines.
Native ground cover: all native vegetation below 1m in height, including all such species native to NSW (i.e. not confined to species indigenous to the area).
Native ground cover (grasses): native ground cover composed specifically of native grasses. **Native ground cover (other):** native ground cover composed specifically of non-woody
native vegetation (vascular plants only) <1m in height that is not grass (e.g. herbs, ferns).
Native ground cover (shrubs): native ground cover composed specifically of native woody vegetation <1m in height.
Native mid-storey cover: all vegetation between the over-storey stratum and a height of 1m (typically tall shrubs, under-storey trees and tree regeneration) and including all species native to NSW (i.e. native species not local to the area can contribute to mid-storey structure).
Native over-storey cover: the tallest woody stratum present (including emergent) above 1m and including all species native to NSW (i.e. native species not local to the area can contribute to over-storey structure). In a woodland community, the over-storey stratum is the tree layer, and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum.
Native plant species richness: the number of different native vascular plant species that are characteristic of a PCT.
Native vegetation: has the same meaning as in section 1.6 of the BC Act.
Native vegetation cover: the percentage of native vegetation cover on the subject land and the surrounding buffer area. Cover estimates are based on the cover of native woody and
non-woody vegetation relative to the approximate benchmarks for the PCT, taking into
account vegetation condition and extent. Native over-storey vegetation is used to determine
the percent cover in woody vegetation types, and native ground cover is used to assess cover in non-woody vegetation types.
Number of trees with hollows: a count of the number of living and dead trees that are hollow bearing.
Offset rules: are those established by the BC Regulation.
Onsite measures: measures and strategies that are taken or are proposed to be taken at a Development site to avoid and minimise the direct and indirect impacts of the development on biodiversity values.
Operational Manual: the Operational Manual published from time to time by DPIE, which is a guide to assist assessors when using the BAM.
Patch size: an area of intact native vegetation that:
a) occurs on the Development site or biodiversity stewardship site, and
b) includes native vegetation that has a gap of less than 100m from the next area of
moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).
Patch size may extend onto adjoining land that is not part of the Development site or biodiversity stewardship site.
PCT classification system: the system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification.
Percent cleared value: the percentage of a PCT that has been cleared as a proportion of its pre-1750 extent, as identified in the BioNet Vegetation Classification.
Plant community type (PCT): a NSW plant community type identified using the PCT classification system.
Plot: an area within a vegetation zone in which site attributes are assessed.
Population: a group of organisms, all of the same species, occupying a particular area.
Probability of reaching benchmark: the probability of a specific attribute or growth form group reaching benchmark conditions in the vegetation zone at the end of the management timeframe.
Proponent: a person who intends to apply for consent or approval to carry out development, clearing, biodiversity certification or for approval for infrastructure.
Reference sites: the relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration: the proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5cm within a vegetation zone.
Residual impact: an impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits: the retirement of biodiversity credits from a biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer: an area of land determined according to Appendix 3.
Risk of extinction: the likelihood that the local population or CEEC or EEC will become extinct either in the short term or in the long term as a result of direct or indirect impacts on the viability of that population or CEEC or EEC.
SEPP 14 Coastal wetland: a wetland to which *State Environmental Planning Policy No 14 – Coastal Wetlands* applies or an area that is identified as a coastal wetland within the meaning of the term *coastal wetlands and littoral rainforests area* for the purposes of *Coastal Management Act 2016*.
Site attributes: the matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development: a development other than a linear shaped development, or a multiple fragmentation impact development.
Site context: the value given to landscape attributes of a Development Site or biodiversity stewardship site after an assessment undertaken in accordance with Section 4.3.
Species credit species: are threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.
Species credits: the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
State Significant Development: has the meaning given by Division 4.1 of Part 4 of the EP&A Act.
State Significant Infrastructure: has the meaning given by Part 5.1 of the EP&A Act. **Stream order:** has the same meaning as in Appendix 3.

Subject land: is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a Development Site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threat status class: the extent to which a species or ecological community is threatened with extinction, or the extent to which a PCT is estimated to have been cleared (see *Percent cleared value*).
Threatened Biodiversity Data Collection: part of the BioNet database, published by DPIE and accessible from the BioNet website at www.bionet.nsw.gov.au.
Threatened ecological community (TEC): means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act.
Threatened species: critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.
Threatened species survey: a targeted survey for threatened species undertaken in accordance with Section 6.5.
Threatened species survey guidelines: survey methods or guidelines published by DPIE from time to time at www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/surveys-and-assessments.
Total length of fallen logs: the total length of logs present in a vegetation zone that are at least 10cm in diameter and at least 0.5m long.
Transect: a line or narrow belt along which environmental data is collected.
Upland Swamp Policy: the document entitled *Addendum to NSW Biodiversity Offsets Policy for Major Projects: Upland swamps impacted by longwall mining subsidence* as in force on the day when the BAM is published until such time as the Environment Agency Head publishes any further document for the purpose of it being adopted by the BAM as the Upland Swamp Policy.
Vegetation Benchmarks Database: a database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by DPIE and is part of the BioNet Vegetation Classification. It is available at www.environment.nsw.gov.au/research/Visclassification.htm.
Vegetation class: a level of classification of vegetation communities defined in Keith (2004)[4]. There are 99 vegetation classes in NSW.
Vegetation formation: a broad level of vegetation classification as defined in Keith (2004)[4]. There are 16 vegetation formations and sub-formations in NSW.
Vegetation integrity: the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.
Vegetation integrity score: the quantitative measure of vegetation condition calculated in accordance with Equation 15 or Equation 16.
Vegetation zone: a relatively homogenous area of native vegetation on a Development Site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Viability: the capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.
Vulnerable ecological community (VEC): an ecological community specified as vulnerable in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.
Wetland: an area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water (see also *Important wetland* and *Local wetland*).
Woody native vegetation: native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

Acronyms

Acronym	Definition
BAR	Biodiversity Assessment Report
BAMC	Biodiversity Assessment Method Credit Calculator
BASSR	Biodiversity Steward Site Assessment Report
BOM	Bureau of Meteorology
BC Act	Biodiversity Conservation Act 2016
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
DAWE	Department of Agriculture, Water and the Environment
DPIE	Department of Planning, Industry and Environment
DPI	Department of Primary industries
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC	Environment Protection and Biodiversity Conservation Act 1999
FBA	Framework of Biodiversity Assessment
GDE	Groundwater dependent ecosystems
GIS	Geographic information system
GPS	Global positioning system
IBRA	Interim Biogeographic Regionalisation for Australia
KTP	Key threatening process
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NP&W Act	National Parks and Wildlife Act 1974
NPWS	National Parks and Wildlife Services
NSW	New South Wales
OEH	Office of Environment and Heritage (Now DPIE)
PCT	Plant Community Types
PMST	Protected Matters Search Tool
SAT	Scat Assessment Technique
SEARS	Secretary's Environmental Assessment Requirement
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TAFE	Technical and Further Education Institute
TEC	Threatened Ecological Community
TSPD	Threatened Species Profile Database
VEC	Vulnerable Ecological Community
VIS	Vegetation Information System
WIRES	Wildlife Information, Rescue and Education Services