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Biodiversity Development Assessment Report for the proposed Augusta Street warehouse and distribution centre in Huntingwood

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Prepared for:
The Trustee for Huntingwood Property Trust

Document Control

Version	Date	Author	Details
1	10 July 2023	Dr AnneMarie Clements, Dr Anne Baumann, Tony Rodd, Joelan Sawyer, Pauline Dever.	BDAR for area subject to the proposal.
2	11 September 2023	As above	BDAR for area subject to the proposal. The revision was in response to Test of Adequacy comments from DPE dated 2 August 2023.
3	22 March 2024	Dr AnneMarie Clements, Dr Anne Baumann, Tony Rodd, Pauline Dever, Tim Harding	BDAR in response to the reviews by the Authorities.

Photograph on front cover: Looking east across the historically cleared farm land towards Prospect Highway, east of the site. Photograph by Tony Rodd taken on 29 April 2022.

Summary

This Biodiversity Development Assessment Report (BDAR) has been commissioned by The Trustee for Huntingwood Property Trust in accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs), and in support of the State Significant Development Application (SSD - 36138263) for the proposed Augusta Street warehouse and distribution centre.

The approximately 26.64 ha site is a 260 m wide strip of land bounded by major highways to the north, south and east. It was once productive farmland dating back to early colonial settlement. It is located in Augusta Street, Huntingwood in the Blacktown City Local Government Area. It is zoned IN1 – General Industrial under the Blacktown Local Environmental Plan 2015 and controlled by the Huntingwood Precinct Development Control Plan.

The Huntingwood Precinct Development Control Plan refers to onsite conservation areas within two mapped "riparian corridors". These riparian corridors are mapped as Category 2 – terrestrial and aquatic habitat under this DCP. This categorisation differs from that in the NRAR guidelines under the NSW *Water Management Act 2016*, which classifies the Blacktown Creek in the east as a 1st Order watercourse and the drainage line in the swale in the west as un-classified.

This BDAR assesses the impacts and biodiversity offset requirements of the proposal.

Proposal description

The proposal consists of:

- construction and operation of a warehouse and distribution centre; and
- associated protection, enhancement and management of the DCP Riparian Corridors of south to north flowing drainage lines onsite (Blacktown Creek in the east and in the swale in the west).

The proposal results in a total of approximately 8.74 ha of conservation, including two riparian corridors, stormwater management basins, and native landscape planting within the site and in the setbacks. This proposal is the restoration of 8.74 ha for conservation, that is a 370% increase from 2.37 ha of native vegetation.

Reason why a BDAR has been prepared

A BDAR is required for the proposal as Section 9 of the SEARs requires the preparation of a BDAR, as neither a waiver has been granted, nor is the site on biodiversity certified land.

Measures to avoid and minimise

To avoid and minimise impacts on the native vegetation and potential habitats, the proposal has been located in accordance with Huntingwood Precinct DCP, with:

- the Employment Lands mainly on the historically cleared former farming land;
- employment related carparking under the Electricity Easement; and
- conservation works to conserve and enhance native vegetation along riparian corridors and along site boundaries as well as native landscape plantings.

Plant Community Types (PCTs)

Nine BAM plots were surveyed (7 onsite and 2 offsite on adjoining land). The vegetation was sampled in 2021, 2022 and 2023. The native vegetation in all parts of the site has been modified and disturbed by historic agricultural land use, former dwellings with associated gardens, and industrial land uses in the west. The greater

part of the site is dominated by non-native vegetation, consisting of weedy paddocks with occasional scattered groups of native trees. Only four local native tree species were recorded by the arborist (*Acacia* sp., *Eucalyptus moluccana, Eucalyptus tereticornis* and *Melaleuca linariifolia)* with the remaining being exotic or non-local native.

For the 381 local native canopy trees recorded by the arborist onsite (178 *Eucalyptus moluccana* and 203 *E. tereticornis*) heath rating ranged from Dead, Very poor, Poor, Fair to Good). The percentage of trees in Good health was higher for *E. moluccana* (70%) than *E. tereticornis* (53%).

The drainage lines onsite, Blacktown Creek in the east and the swale in the west, are dominated by exotic weeds, although with emergent eucalypts surviving along the swale in the west. The riparian zone of Blacktown Creek is treeless and swampy. The creek water was concealed beneath a broad swathe of wetland plants, both exotic and native-cosmopolitan, and with adjoining belts of blackberries.

The best fit match for the native vegetation onsite was *PCT 3319 - Cumberland Shale Hills Woodland*, with two vegetation zones assigned as 2.03 ha *PCT 3319 – Degraded* and 0.34 ha *PCT 3319 – Less degraded.*

The remaining 24.27 of the 26.64 ha site is mapped as “predominantly exotic vegetation or hardstand” with 3.69 ha associated with the industrial building in the west and 20.58 ha of predominantly exotic vegetation.

Threatened ecological communities (TECs) and *EPBC Act* listed ecological communities (ECs).

The associated TECs for *PCT 3319 - Cumberland Shale Hills Woodland* are:

- *Cumberland Plain Woodland in the Sydney Basin Bioregion* (Part) - Critically Endangered Ecological Community under the *BC Act;* and
- *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (Part) - Critically Endangered under the *EPBC Act.*

From comparisons with the Final Determination, the vegetation onsite mapped as PCT 3319 met the criteria for *Cumberland Plain Woodland in the Sydney Basin Bioregion* under the *BC Act.* None of the vegetation onsite met the condition thresholds for the Commonwealth listed EC under the *EPBC Act.*

Threatened species

Of the threatened species generated by the BAM Calculator, there were:

- twenty three (23) Predicted species considered to possibly utilise the site; and
- eight (8) Candidate species considered to possibly utilise the site.

The eight species considered possibly utilise the site were searched for onsite. The fauna detected during surveys included domestic cats wandering the site, European red foxes and their scats in the culverts, and black rats swarming through the exotic weeds. No Candidate species were recorded nor considered likely to occur on this site.

Impacts including direct, indirect, prescribed, and serious and irreversible impacts (SAII)

The proposal results in the clearing of 0.71 ha of native vegetation, namely:

- 0.64 ha of the 2.03 ha of *PCT 3319 – Degraded;* and

- 0.07 ha of the 0.34 ha of *PCT 3319 – Less degraded.*

Impacts to vegetation integrity

Vegetation zone	Management Zone	Area (ha)	VI Score	Change in VI Score	Total VI loss
PCT 0 - Predominantly exotic grassland	Cleared	20.58	7.6	-7.6	-7.6
PCT 3319_Degraded	cleared	0.64	0	-27.1	-8.3
	retained	1.39	27.4	0.4	
PCT 3319_Less degraded	cleared	0.07	0	-59.2	-12.2
	retained	0.27	59.3	0	

There are no prescribed impacts nor likely potential Serious and Irreversible Impacts (SAIIs) for the proposal.

Mitigation measures

The proposed mitigation measures include implementing a site specific Vegetation Management Plan (VMP) for protection, enhancement and management of riparian corridors to provide terrestrial and aquatic habitats in line with the Huntingwood Precinct DCP.

The VMP is directed to increasing natural resilience by reducing the existing threats by removing extensive dumping / soil disturbance and dense weedy understorey beneath the eucalypt canopy trees, as well as creating fauna habitat such as open water bodies.

Final offset requirements

Impacts that require an offset - ecosystem credits

Vegetation zone	PCT name	TEC / EC	Impact Area (ha)	Number of Ecosystem credits required
PCT 0	Predominantly exotic grassland	N/A	20.58	0
PCT 3319 – degraded	*PCT 3319 Cumberland Shale Hills Woodland*	CPW	0.64 of 2.03 ha	11
PCT 3319 – less degraded	*PCT 3319 Cumberland Shale Hills Woodland*	CPW	0.07 of 0.34 ha	3

CPW = Cumberland Plain Woodland in the Sydney Basin Bioregion (*BC Act*)

Impacts that require an offset – species credits

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of species credits required
N/A	N/A	0	0

Recommendations

A site specific Vegetation Management Plan (VMP) has been prepared for the highly degraded Riparian Corridors, which are identified in the Huntingwood Precinct DCP as terrestrial and aquatic habitat.

The site is connected to offsite Prospect Nature Reserve and Timbertop Reserve, via the culverts under the Motorways. Currently, the main native component onsite is restricted to canopy trees in a Riparian Corridor, with natural regeneration suppressed by a dense weedy understorey and by dumped building rubble.

Given the existing drainage, water quality issues and dumpings, it is recommended that working with the engineers, and the construction team and their machinery be an essential component of the planning and implementation of the VMP.

As Black Rat is prolific onsite, reduction in their numbers prior to conservation works is recommended. Control of the main predators (feral cat, rat and fox) should be undertaken by a specialist fauna spotter and catcher.

The extent of proposed corridor engineering works provides opportunities to create habitat for threatened species including Green and Golden Bell Frog and Southern Myotis. It is recommended that the VMP be implemented in consultation with specialist ecologists.

In consultation with Council there are opportunities to enter into a works-in-kind arrangement, including:

- planting of local native trees in the RE1 - Public Recreation zoned land north of the Great Western Highway to complement bush regeneration being undertaken downstream along Blacktown Creek as well as enhancing the mapped Important Habitat Area for the Swift Parrot in Timbertop Reserve; and
- planting of local native trees in the residential land north of the Great Western Highway to reduce the heat island effects on the local residents.

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The proposal

1e. Updated Masterplan (PACE Architects, Dwg no. 220207-DA-001, Issue E, Dated 20.02.24)
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2. Advice from Government Authorities:
   - email from NRAR on 3 July 2022; and
   - email from BAM Support Team on 13 May 2022.

3. Detail survey plans (Land Partners Sheets 1 to 5, dated 02/06/2022)

4. Figures 13 and 14 from the Huntingwood Precinct DCP

5. Photographic record.
6. BAM input data and number and cover of exotic species.
7. Huntingwood frog survey outcomes and habitat suitability for microbats with recommendations for habitat restoration for threatened fauna (Grant Webster and Jayden Walsh 2022).

7a. Application to become an Expert, lodged December 2023

8. Targeted survey for the Cumberland Plain Land Snail (*Meridolum corneovirens* (Pfeiffer, 1851)) at Augusta Street, Huntingwood (Dr Stephanie Clark 2022)
9. Additional microbat survey on 27 February 2024 (Kane Durrant of Wild Conservation 2024).
10. Comparison of the recorded data with the Final Determination and Listing Advice.
11. Reports generated by the online BAM calculator.
12. Likelihood tables for Predicted species and Candidate species.
13. Applying the *Guidance to assist a decision-maker to determine a serious and irreversible impact* for the proposed Augusta Street warehouse and distribution centre in Huntingwood.

13a PCT 3319 Profile

Declarations

i. Certification under clause 6.15 *Biodiversity Conservation Act 2016*

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 Biodiversity certification assessment report of the Biodiversity Conservation Act 2016 (BC Act).

Signature:



Date: 22 March 2024

Dr AnneMarie Clements

BAM Assessor Accreditation no: BAAS17088

This BDAR has been prepared to meet the requirements of BAM 2020.

iii. Conflict of interest

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature:



Date: 22 March 2024

Dr AnneMarie Clements

BAM Assessor Accreditation no: BAAS17088

iii. Details and experience of author/s and contributors

Name	Position	Tasks performed include	Relevant qualifications
Dr AnneMarie Clements	Ecologist	- report preparation - field survey, including BAM Plots - supervising survey - checking figures - review of data - cross checking specimens - cross-checking photo records and data recorded - BAM-C analysis	MSc, PhD, Ecology Specialists Certified Environmental Practitioner under the EIANZ: CEnvP Registration Number E200001.
Dr Anne Baumann	Ecologist	- reviewing existing data - report preparation - document review - checking figures - checking data	PhD, BScAg, Cert IV Conservation and Land Management. Dip. Arboriculture
Tony Rodd	Botanist	- field survey, including BAM Plots - detail observations - report preparation - data review - double checking mapping - targeted threatened flora surveys	BSc, Specialist botanist with many years of experience
Joelan Sawyer	Ecologist	- report preparation - figure preparation, GIS - field survey, including BAM Plots - BAM-C data entry and analysis with AC - targeted threatened flora surveys	BSc
Pauline Dever	Ecologist	- data entry - research - figure preparation - field survey - report preparation	B Environment, Dip. Conservation and Land Management.
Tim Harding	Ecologist	- mapping	BSc with ecology major.

Glossary and Definitions

AHD	Australian Height Datum
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	Biodiversity Conservation Act 2016 (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BCC	Blacktown City Council
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
CBD	Central Business District
CEEC	critically endangered ecological community
DBH	diameter at breast height over bark
DCP	Development Control Plan
DPE	Department of Planning and Environment
DPIE	Department of Planning Industry and Environment
EC	ecological community listed under the EPBC Act
EHG	Environment and Heritage Group (part of the NSW Department of Climate Change, Energy, the Environment and Water)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EEC	endangered ecological community
GWH	Great Western Highway
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS Act	Local Land Services Act 2013 (NSW)
MNES	matters of national environmental significance
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NSW	New South Wales
NSW EPA	NSW Environment Protection Authority
OEH	Office of Environment and Heritage
PCT	plant community type
RAP	Remediation Action Plan
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
SSDA	State Significant Development Application

TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
VIS	Vegetation Integrity Score
VMP	Vegetation Management Plan

Definitions:

Clearing of native vegetation is defined in the *BC Act* as:

> ***native vegetation*** *and* ***clearing*** *native vegetation have the same meanings as in Part 5A of the Local Land Services Act 2013.*
> *Note—Under that Part of that Act, the clearing of dead or non-native plants on certain vulnerable land is taken to be the clearing of native vegetation.*

Local Land Services Act 2013 defines 'native vegetation' and 'clearing' of native vegetation as follows:

> ***60B Meaning of "native vegetation"***
>
> *(1) For the purposes of this Part, native vegetation means any of the following types of plants native to New South Wales—*
>
> *(a) trees (including any sapling or shrub or any scrub),*
>
> *(b) understorey plants,*
>
> *(c) groundcover (being any type of herbaceous vegetation),*
>
> *(d) plants occurring in a wetland.*
>
> *(2) A plant is native to New South Wales if it was established in New South Wales before European settlement. The regulations may authorise conclusive presumptions to be made of the species of plants native to New South Wales by adopting any relevant classification in an official database of plants that is publicly accessible.*
>
> *(3) For the purposes of this Part, native vegetation extends to a plant that is dead or that is not native to New South Wales if—*
>
> *(a) the plant is situated on land that is shown on the native vegetation regulatory map as category 2-vulnerable regulated land, and*
>
> *(b) it would be native vegetation for the purposes of this Part if it were native to New South Wales.*
>
> *(4) For the purposes of this Part, native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). A declaration under section 14.7 of the* Biodiversity Conservation Act 2016 *that specified vegetation is or is not marine vegetation also has effect for the purposes of this Part.*

> ***60C Meaning of "clearing" native vegetation***
>
> For the purposes of this Part, clearing native vegetation means any one or more of the following—
>
> (a) cutting down, felling, uprooting, thinning or otherwise removing native vegetation,
>
> (b) killing, destroying, poisoning, ringbarking or burning native vegetation.

Part A Preamble and background to the proposal

A1.0 Introduction

This Biodiversity Development Assessment Report (BDAR) has been commissioned by The Trustee for Huntingwood Property Trust in accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs) issued on 2 August 2022. The BDAR is prepared for the State Significant Development Application (SSDA) (SSD – 36138263) of the proposed Augusta Street warehouse and distribution centre and associated protection, enhancement and management of riparian corridors as specified in the Huntingwood Precinct Development Control Plan (DCP).

The proposal is on the 26.64 ha site in Augusta Street, Huntingwood in the Blacktown City Local Government Area (LGA) (location on Figures 1a-1 to 1d-2, the proposal on Figures 1e, 1f).

The SEARs specify that:

> ***9. Biodiversity***
> *Assess any biodiversity impacts associated with the development in accordance with the Biodiversity Conservation Act 2016 and the Biodiversity Assessment Method 2020, including the preparation of a Biodiversity Development Assessment Report (BDAR), unless a waiver is granted, or the site is on biodiversity certified land.*

Neither a waiver has been granted, nor is the site on biodiversity certified land, hence a BDAR has been prepared.

Version 3 of the BDAR is in response to the review comments from the Authorities, namely:

Regulatory Authority	Abbreviation	Date of response
Blacktown City Council	BCC	17 November 2023
NSW Department of Planning and Environment	DPE	21 November 2023
Environment and Heritage Group	EHG	6 November 2023
NSW Environment Protection Authority	NSW EPA	6 November 2023

Biodiversity matters raised have been addressed in the BDAR Version 3 as follows:

Biodiversity matters raised	Addressed in BDAR Version 3
BCC	
24. The proposal is inconsistent with controls within the Huntingwood Precinct DCP 2011 (as amended 2020).	
a. In particular, reference should be drawn to the objectives and controls around setbacks, biodiversity and riparian corridors and the conservation areas identified in Figure 4 of the Huntingwood Precinct DCP.	See Section A3.1.3
b. In particular, sediment basins 2 & 3, a stormwater management basin, proposed	Temporary sediment basins and stormwater management basins are addressed by Costin

Biodiversity matters raised	Addressed in BDAR Version 3
access tracks for endeavour energy at the eastern end and car parking at the western end, currently sit within the 20 m landscape setback areas from the Great Western Highway and the M4 motorway. These should be relocated outside of the landscape setback areas.	Roe (2024). Within the Electricity Easement the access track is reinforced turf for vehicle access and car parking is turf cells, addressed in the Landscape Strategy by Habit8 (2024)
c. The landscape setback from Flushcombe Rd is currently less than the 7.5 m stipulated in the DCP.	Masterplan Issue E - Landscape setback from Flushcombe Road is 5 m and from corner of Flushcombe Road and Augusta Street is 7.5 m (see Response to Submission, URBIS 2024)
d. Per the DCP, when measured from the top of the bank on either side of the creek, development consent shall not be granted, except for development associated with protection, enhancement and management of riparian corridors, on land within the Precinct that is within 20m + 10m (buffer) of Category 2 Corridors. Figure 4 of the Huntingwood DCP shows both of the riparian corridors on site within the proposal Lots are classified as Category 2. The proposal therefore needs to remove all hardstand areas, storage, acoustic walls and the like from the riparian corridor areas.	See Section A3.1.3. The proposal is a development associated with protection, enhancement and management of riparian corridors. Constraints to Riparian Corridor in the drainage swale in the west include: - contaminated waste, see Remediation Action Plan (JBS&G 2024). The waste emplacement is being retained and capped in situ. No trees are growing nor recommended to be planted in the emplacement area.
25. In terms of mitigation measures, the EIS, BDAR and Mitigation Measures document provided propose that a Conservation and Vegetation and Construction Management Plan be developed as Conditions of consent. Council does not support this, maintaining that these designs and plans need to form part of the development application.	Vegetation Management Plan (VMP) forms part of the response.
e. The reason for this is that the creek lines are important conservation areas within the Huntingwood Precinct DCP and the ability to construct and manage them for conservation with this proposal will form an important part of the assessment to support state government refusal or consent to it.	See VMP.
f. The DCP also stipulates that Flora and Fauna Management Plans are to accompany all DAs within the Huntingwood precinct inclusive of: i. mechanism for enduring protection and maintenance of conservation areas and riparian corridors under private ownership; ii. management tasks to maintain or improve biodiversity values (with reference to Recovering Bushland on the Cumberland	See VMP.

Biodiversity matters raised	**Addressed in BDAR Version 3**
Plain – Best Practice Guidelines for the Management and Restoration of Bushland, Department of Environment and Climate Change 2005); iii. public access; iv. noxious and environmental weed control; v. revegetation plans and protocols; and vi. monitoring and reporting programs.	
26. The BDAR recommends that in preference to purchase of Biodiversity Credits, any residual impacts should be offset by conservation works on the adjoining and nearby land. This is not supported by Council. It does not apply to SSD and Council has a program of improvement works already in place for the nearby areas identified. All offset credits as calculated in the BDAR should be retired as Conditions of Consent.	Noted: Clause 7.13 of the Biodiversity Conservation Act 2016 applies to Development other than State significant development or infrastructure. Hence, funding conservation in the local area does not apply for State Significant Development. Figure 1a-3 illustrates the limited extent of existing habitat onsite and nearby. It is recommended in consultation with Council to enter into a works-in-kind arrangement for local conservation gain nearby for the benefit of the local community and the native fauna and flora (see Section C12.0).
DPE	
The Biodiversity Development Assessment Report (BDAR) prepared by Anne Clements & Associates Pty Limited is requested to be updated to provide further assessment on the potential indirect impacts of the development on potential fauna species with consideration to noise, traffic and light pollution.	Section C8.2 has been updated. Indirect impacts now includes consideration of noise and traffic. Light pollution was previously addressed.
The BDAR should be updated to provide detailed information on the extent and processes involved with the targeted site surveying undertaken to demonstrate the site surveying was done in accordance with the 'Surveying threatened plants and their habitats' (DPIE 2020b).	See Section B2.3.3
Furthermore, the BDAR does not identify the limitations of the surveying undertaken. The BDAR should be updated to include a discussion of site surveying limitations.	See Section B2.3.3.
The department notes the BDAR recommends a or Vegetation Management Plan (VMP) be developed in conjunction with a Construction Environmental Management Plan for the ongoing management of conservation areas. The Department requests the preparation of a draft VMP or an outline of proposed mitigation and management measures to	See VMP

Biodiversity matters raised	Addressed in BDAR Version 3
demonstrate vegetation can be appropriately managed and conserved for the life of the development.	
EHG	
•Figure 7b-2 of the BDAR shows the development footprint. It is assumed all vegetation mapped outside the footprint has been included in the calculation of the vegetation to be 'retained'. However, the proposed Bioretention basin occurs in an area mapped as retained. It is unlikely that the structure and floristics of PCT 3319 could be maintained in the long term if this is to be a Bioretention basin. If vegetation in this area is to be impacted, either directly or indirectly, it should be included in the calculation of areas to be cleared.	See development footprint (Figures 1e, 7b) and the proposed civil works (Costin Roe 2024)
•Section C12.0 of the BDAR recommends that in preference to credit purchase, that conservation works on adjoining lands should occur. This is not in accordance with the Biodiversity Offset Scheme (BOS), which requires conservation works on lands to be secured through a Biodiversity Stewardship Agreement. Also, the BDAR refers to Section 7.13(4) of the Biodiversity Conservation Act 2016 to justify this recommendation. However, as acknowledged by the BDAR, Section 7.13(4) relates to development 'other than' State Significant Developments, so it is unclear why this was included.	As stated above: Clause 7.13 of the Biodiversity Conservation Act 2016 applies to Development other than State significant development or infrastructure. In the BDAR, it is pointed out there are conservation opportunities nearby for the benefit of the local community (Section C12.0).
•Section A3.2.2 discusses the triggers for the BOS being the Biodiversity Values Map and the area threshold, however these aren't relevant to this project as it is an SSD. A BDAR must be prepared for all SSDs, unless a waiver is granted.	Noted in Section A3.2.2 and clarified in the Summary.
•The BDAR states that *Grevillea robusta* should not be considered a native tree species for the purposes of the BDAR. However, as this species is native to NSW it must be considered as native vegetation. Despite this, it can be considered in the BDAR as a planted native species.	In the BDAR, *Grevillea robusta* is a 'widely cultivated native species' found outside its accepted natural range (see response from the BAM Support team in Appendix 2). See Section A3.2.6 *Grevillea robusta* is considered an environmental weed including in Hunts Creek Reserve (approximately 10 km NE of the site).
• The BDAR is missing some mapped landscape features, as required by BAM 3.1.3. These include:	
- Figure 1a-1 shows mapped watercourses, but the BAM requires mapping of stream	Figure 1a-1 shows watercourses from LPI Clip 'n' Ship. Appendix 2 includes email from

Biodiversity matters raised	Addressed in BDAR Version 3
order.	NRAR confirming stream order.
- There is no mapping of habitat connectivity.	The extent of habitat connectivity and vegetation is shown on Figure 1a-3. The culverts under the motorways provide connectivity (discussion in Section B3.1.1).
- The maps of vegetation zones should include planted vegetation, as all areas of native vegetation must be mapped, including areas of planted native vegetation.	Colonisation from seed spread from the planted non-local native *Grevillea robusta* are in the vegetation zone mapped as "predominantly exotic vegetation or hardstand". Section B4.2.2 further describes the vegetation zones.
From page 61 onwards the site address in the header is listed as '8 Augusta Place, Mollymook' instead of 'Augusta Street, Huntingwood'.	Noted and changed.
According to the areas mapped in Figure 1a-3, the percent native vegetation cover has not included areas of planted veg (see BAM definition of native vegetation cover).	See Section B4.2.2 further describes vegetation zones.
Section B4.3 of the BDAR states that from using the Plot to PCT tool, three plots (2, 4 and 7) met the floristic match threshold for PCT 3319, but that one of these plots (plot 2) also met the threshold for PCT 3320, so all vegetation on site was mapped as PCT 3319. It is noted that from the data, it appears that the vegetation in Plot 2 more closely aligns with PCT 3320 than PCT 3319, as the figure for the distance to centroid is lower. In addition, Plot 2 is located at the edge of the site (i.e., it is not physically located between Plots 4 and 7). Therefore, it is not clear why this patch of vegetation in the east of the site was not mapped as PCT 3320.	All three Plots 2, 4, and 7 with matches (<0.695 centroid values) in the Plot to PCT tool are on upper sections of the site on rolling hills. Given the degraded state of the vegetation and similarity of the two PCTs, the best match is more likely to be PCT 3319 *Cumberland Shale Hills Woodland* than PCT 3320 *Cumberland Shale Plains Woodland* due to the hilly topography onsite.
According to Table 1, some native species were identified in most of the quadrats mapped as exotic vegetation zone. The BDAR should include some description of this zone. The BDAR states these zones were 'predominantly exotic' but it is not clear what percentage of exotics would need to be present to class these areas as exotic. The BDAR should also justify why they were classed as exotic instead of derived native grassland. Section B4.2.2 describes the percent of exotics but these data are percent of total numbers of species, not percent cover.	Section B4.2.2 **'**Biodiversity Survey' has been updated to include percent covers of exotic, native and perennial understorey species.
The BDAR should include a map of the 'patch' that was used to assess the patch size.	Patch size is defined in Section 4.3.2 of BAM DPE 2020. Extent of native vegetation is shown on Figures 1a-3. Details of connectivity are in Section B3.1.1 of the BDAR.

Biodiversity matters raised	**Addressed in BDAR Version 3**
The BDAR refers to Appendix 8 as an 'expert report' but it is not an expert report as the expert has not been authorised as such by DPE. Therefore, the entries in the BAM-C which state that the species was excluded because of the expert report, are incorrect.	See Appendix 7a in this BDAR. Application made for Grant Webster to be approved as a BAM species expert (attached).
Appendix 8 states that a habitat suitability assessment was undertaken for Southern Myotis, which is not in accordance with the "Species credit' threatened bats and their habitats" survey guide, which requires use of harp traps and mist nets.	Section B2.3.3, Appendix 9 additional microbat searches, including in the culverts. No evidence of microbats found. Only fauna detected onsite were domestic cats wandering the site, European red foxes and their scat in the culverts, and black rats swarming through the exotic weeds.
The BDAR states that the Southern Myotis is moderately likely to use roosting habitat on site. Therefore, in accordance with BAM section 5.2.4.3, a species polygon should be prepared.	
There is little information on the targeted surveys that were undertaken. Section B2.3.2 states that the site was 'carefully walked over' but there is no detail on location or effort, or whether the survey was undertaken in accordance with the "Surveying threatened plants and their habitats" guidance.	See Section B2.3.3
In accordance with BioNet, the survey requirements for *Pimelea spicata* are that surveys should occur four weeks after at least a 30mm rainfall event. There is no reference to this requirement or information on whether this was done.	See Section B3.3.
There is no discussion of limitations of the survey.	See Section B2.3.3
Appendix 7 concludes that breeding habitat for Eastern Bent-wing Bat and Little Bent-wing Bat is unlikely to be on site as the 2020 surveys did not record an adequate number of individuals, but it is not clear from the information provided that the surveys in 2020 were undertaken in accordance with the "Species credit' threatened bats and their habitats" survey guide.	Appendix 7 in Version 2 was Clark (2022). Appendix 8 in Version 2 was Webster and Walsh 2022). Appendix 6 was the likelihood table for predicted species and Candidate species. Appendix 12 in this BDAR (version 3). In response to: *- Large Bent-winged Bat (Breeding)* - [formerly Eastern Bent-wing Bat] ***Unlikely**, no roosting habitat onsite*, but there are culverts under the motorway. Changed to ***Possible*** in Version 3. *- Little Bent-winged Bat (Breeding) -* ***Unlikely** no maternity colonies onsite. Only five nursery sites /maternity colonies known in Australia.* The 2020 surveys are those of Ecoplanning (2020) with: *Targeted survey for the threatened microbat species included the use of two ultrasonic*

Biodiversity matters raised	Addressed in BDAR Version 3
	detectors over 9 nights (8-17 April 2020). The total survey effort of 18 nights meets the survey requirements specified in "Species credit' threatened bats and their habitats" (OEH 2018b). The detectors were set to record before sunset and stop after dawn and in a position that maximised the likelihood of recording bats in accordance with (OEH 2018b). On 27 February 2024, cracks and crevices in the culverts were searched for microbats. No evidence of bat activity detected in culvert nor onsite (Durrant 2024 in Appendix 9 in Version 3).
There is no information on the sensitivity class of species.	Appendix 12 has been updated to include Sensitivity to Gain Class.
The discussion of prescribed impacts should have included consideration of the use of planted and non-native vegetation as foraging and roosting habitat.	See Sections B6.0, B7.2, C8.3.
The consideration of serious and irreversible impacts has not addressed the required criteria in section 9.1.1 of the BAM.	See Section 9.0. Appendix 13 applies the *Guidance to assist a decision-maker to determine a serious and irreversible impact.* It was concluded that the proposal, with its Conservation Areas, is unlikely to result in a Serious and Irreversible impact on Cumberland Plain Woodland TEC.
The BDAR includes information on the credit requirement, but according to section C10.1.1, the calculated number of credits for the proposal is an estimate only, which has been calculated as a proportion of the number of credits required for the submitted proposal. This does not meet BAM requirements. The data for the proposal must be entered into the BAM-C, and the BDAR should state the number of credits that the BAM-C calculates.	Calculator re-run and submitted.
The BDAR has been reviewed without access to the case in the BAM-C. To allow EHG to view the case, the assessor must add EHG as a case party (consent authority member) in the parent case and then 'submit to consent authority'. In this matter, the relevant EHG team is 'Greater Sydney – Compliance and Regulation'.	Submitted on the portal.
The BDAR has also been reviewed without access to the spatial data. The spatial data should be saved in the parent case in the BAM-C.	Spatial data available on request.

This report has been prepared in accordance with the Biodiversity Assessment Methodology (BAM) (DPIE 2020) under the supervision of an accredited BAM assessor (CVs of the authors involved in Appendix 1). The assessor's details are:

Assessor name: Dr AnneMarie Clements
BAM Assessor number: 0129
NSW BAM Accreditation: BAAS17088
Ecology Specialists Certified Environmental Practitioner under the Environmental Institute of Australia and New Zealand CEnvP Program: CEnvP Registration Number E200001.

A2.0 The Proposal

The proposed SSDA is with associated protection, enhancement and management of riparian corridors as specified in the Huntingwood Precinct Development Control Plan (see Masterplan Rev. E, dated 20.02.24, Figure 1e). The Vegetation Management Plan (VMP) for the Riparian Corridors is directed to provide terrestrial and aquatic habitat. The proposed SSDA seeks approval to redevelop the site to accommodate a warehouse and distribution centre use inclusive of the following:

- site establishment works, including tree removal, minor excavation / bulk earthworks;
- construction and operation of four (4) new warehouse buildings comprising a multi-level warehouse building on the eastern portion of the site and three single storey warehouse buildings on the western portion of the site. The warehouse buildings will include ancillary office space and indicative warehouse fit out works including warehouse racking;
- the warehouse and distribution tenancies are proposed to be operated 24 hours per day, 7 days per week;
- other associated works including landscaping, at-grade car parking and general site improvements;
- business and building identification signage including wayfinding signage;
- vehicle access provided via Augusta Street and a new proposed access from the Great Western Highway; and
- lot consolidation of properties.

The proposed conservation works result in 8.74 ha of conservation (Figure 1f), with:

- the two Riparian Corridors;
- open stormwater management basin within Conservation Area C, providing additional wetland habitat;
- landscape planting within the car parking in the south of the site. The landscaping potential in the 20 m landscape set back from the M4 motorway is limited due to the Electricity Authority landscape restrictions in the Electricity Easement;
- the 20 m landscape set back from the Great Western Highway. During the construction phase, an open stormwater management basin and post construction, a bioretention basin providing additional wetland habitat; and
- the conservation works are supplemented by conserving and enhancing existing native vegetation along the site boundaries and extensive re-establishment.

A3.0 Biodiversity related legislation

A3.1 Blacktown Council plans and mapping

A3.1.1 Blacktown Local Environment Plan (LEP) 2015

Zoning - The approximately 260 m wide site is zoned IN1 – General Industrial and bounded by the major highways to the north, south and east, zoned SP2 –

Infrastructure (Figures 1a-2, 1b-2, 2a). The biodiversity objectives associated with the zonings on adjoining land are the following:

Land use and location	**Zoning**	**Biodiversity related objectives**
The site	IN1– General Industrial	• *To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.* • *To minimise adverse impacts on the natural environment.* *Permitted without consent* *Nil*
Major highways to the north, south and east	SP2 – Infrastructure	No biodiversity related objective. Objectives include: • *To prevent development that is not compatible with or that may detract from the provision of infrastructure.* Permitted without consent **Environmental protection works**; Flood mitigation works
North of Great western Highway		
Mown strip with some trees adjoining the highway	RE1 – Public Recreation	• *To protect and enhance the natural environment for recreational purposes.* *Permitted without consent* ***Environmental protection works**; Roads*
Residential further to the north	R2 – Low Density Residential;	• *To enable other land uses that provide facilities or services to meet the day to day needs of residents.* (Assumed tree planting is permitted under this objective to minimise heat island effects) *Permitted without consent* *Home occupations*
Within Timbertop Reserve		
Blacktown Creek	W1 - Natural Waterways	• *To protect the ecological and scenic values of natural waterways.* • *To prevent development that would have an adverse effect on the natural values of waterways in this zone.* • *To provide for sustainable fishing industries and recreational fishing.* • *To enable works associated with the rehabilitation of land towards its natural state.* *Permitted without consent* ***Environmental protection works***
Mainly to the east of the creek	RE1 and C2 – Environmental Conservation	Objective of C2 zoning • *To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.* • *To prevent development that could destroy, damage or otherwise have an adverse effect on those values.* • *To provide for passive recreational activities that are compatible with the land's environmental constraints.*

Land use and location	Zoning	Biodiversity related objectives
		Permitted without consent ***Environmental protection works***
South of the Western Motorway (M4)		
Raging Waters Sydney (formerly Wet n Wild Sydney)	Not on zoning map	N/A
Skyline Drive-in	Not on zoning map	N/A
Prospect Nature Reserve further south	Not on zoning map	N/A

Lot size – There is no Lot Size mapped for the site (Figure 2b). The smallest lot is 2,004 m^2 (0.2 ha) (Lot 163 DP8716) (Figure 1a-2).

Terrestrial Biodiversity – There is no Terrestrial Biodiversity mapped on the site. The nearest mapping to the site is in Timbertop Reserve to the north of the Great Western Highway (Figure 2c). Clause 7.2 of the LEP applies to Timbertop Reserve, with the objectives of:

7.2 Terrestrial biodiversity

(1) The objective of this clause is to maintain terrestrial biodiversity by—

(a) protecting native fauna and flora, and

(b) protecting the ecological processes necessary for their continued existence, and

(c) encouraging the conservation and recovery of native fauna and flora and their habitats.

A3.1.2 Blacktown Development Control Plan 2015

The proposal has been designed to address the controls within the Blacktown Development Control Plan (DCP).

Part A is the Introduction and General Guidelines. It includes definition of terms, including:

> ***Adjoining land*** *means land which abuts an Application site or is separated from it only by a pathway, driveway or similar thoroughfare.*

Section 3.5 points out "*What types of impacts are of concern*", namely:

(a) The views to and the view from the land
(b) Overshadowing
(c) Privacy
(d) Noise, odour or any other potential polluting emission
(e) The visual quality of the development in relation to the streetscape
(f) The scale or bulk of the proposed development
(g) The siting of the proposed development in relation to site boundaries
(h) The proposed hours of use for the development
(i) Light spillage or reflection
(j) Means of access to or provision of parking on the proposed development site
(k) The amount of traffic likely to be generated by the proposed development
(l) Drainage
(m) The social and economic impacts of the proposal.

Section 4 relates to *Environmental protection*, pointing out:

> *Council, as well as developers, has a responsibility to ensure that development is undertaken in a manner which will enhance the existing environment or at least minimise any likely adverse environmental impacts.*

This section includes:

- *areas requiring filling;*
- *tree preservation with Legal provisions for the preservation of trees are in force under Blacktown LEP 2015 (refer Clauses 5.9 and 5.9AA)*
- *heritage*
- *pollution control; and*
- *noise reduction*

Under tree preservation:

> *A prescribed tree for the purpose of Clause 5.9 of Blacktown LEP 2015 is:*
> *(a) A perennial plant with a self-supporting stem which:*
> - *Has a height of more than 3 metres; and/or*
> - *Has a trunk diameter of more than 200mm or more measured 1.0 metre above ground level.*

[Note: Clause 5.9 of Blacktown LEP 2015 - Current version for 26 April 2023 to date (accessed 27 June 2023] is no longer related to Tree Preservation].

Appendix 1 of the DCP lists the "*Recommended tree species. Council encourages the use of Australian native species*". None of the listed trees in the table entitled *Australian native tree species – evergreen trees* are native to western Sydney, but are from environments such as rainforest, scrub near sea, along watercourses, with the possible exception of *Glochidion ferdinandi,* a widespread tree in coastal districts (further details on PlantNET, the online website of the Royal Botanic Gardens Sydney).

Section 5 deals with Roads, including:

- arterial roads, such as the Great Western Highway;
- pedestrian pathways linking destinations such as open space, schools, shops and bus stops;
- land adjoining arterial and sub-arterial roads zoned SP2 Infrastructure (Classified Road) and SP2 (Local Road).

Section 6 deals with Car parking.

Section 7 deals with Services such as water, sewerage, electricity, telephony, gas and postal services.

Section 8 is Special consideration including solar access, Crime prevention through environmental design, retaining walls and ground reshaping.

Section 9 relates to Development on flood prone land, based on the NSW Government's Flood Prone Land Policy, and Section 10 to Local overland flooding – major drainage and local runoff.

Part E of the DCP is *Development in the Industrial Zones*.
In Section 4.2 Landscaping, it states:

Objectives in respect to landscaping in the industrial and B5 zones are as follows:

(a) To encourage a high standard of environmental quality of individual developments, whilst enhancing the general streetscape and amenity of the area by providing high standard landscaping

(b) To minimise loss of vegetation during the land development process by incorporating as many existing trees as possible within landscaped setbacks

(c) To ensure that vegetation removed as part of the land development process is replaced by suitable indigenous species.

Landscaping proposals should generally be in accordance with the following requirements:

(a) Every effort should be made to preserve existing trees and any associated native understorey in accordance with the provisions of Clause 5.9 of Blacktown LEP 2015 (Preservation of Trees or Vegetation)

(b) All setback areas are to be landscaped and maintained incorporating as many existing trees as possible. Undeveloped areas are to be stabilised to prevent soil erosion. Landscaping may be required around the perimeter of undeveloped areas

(c) Car parking areas are to be suitably treated with landscaping to soften the appearance of the areas and to provide shade for parked cars. At a minimum standard one tree should be planted every 10 metres and be at a minimum height of 1m at the time of planting. Trees should be planted to achieve 50% shading of the carpark at ten year maturity. Appendix 1 provides a list of the tree species recommended by Council, with native species favoured. Undeveloped areas are to be stabilised to prevent soil erosion

(d) All landscaped areas are to be separated from vehicular areas by means of a kerb, dwarf wall or other effective physical barrier, however full fencing of landscaped areas is not encouraged

(e) Earth mounding (where on-site detention of drainage is not required) may be used within the setback area. Embankments that are not finished with rockeries or walls should not be steeper than 1:4 gradient in order to enable vegetation to be grown and maintained

(f) All irrigation systems shall be automatic and designed to meet specific site requirements. Minimisation of water consumption should also be a consideration in the design of irrigation systems. Reliance on irrigation systems for the survival of chosen plant species is not encouraged.

All landscaping is to be completed to Council's satisfaction prior to occupation of the development. Details of the works, including proposed plant species, are to be provided in the landscaping plans submitted with the DA.

A3.1.3 Huntingwood Precinct Development Control Plan 2011 (amended 2020)

The Huntingwood Precinct DCP applies to the site. This plan is informed by Chapter 2 Western Sydney Employment Area of the SEPP (Industry and Employment) 2021.

In the Huntingwood Precinct DCP, it is stated that:

The aim of the WSEA SEPP is to protect and enhance the Western Sydney Employment Area (WSEA) for employment purposes, with reference to the following particular aims: including [**emphasis** added for biodiversity related aims]:

- *To promote economic development and the creation of employment in the WSEA by providing for development including major warehousing,*

distribution, freight transport, industrial, high technology and research facilities.

- *To rezone land for employment or **environmental conservation purposes**.*
- ***To conserve and rehabilitate areas that have a high biodiversity or heritage or cultural value, in particular areas of remnant vegetation.***

Figure 4 of the Huntingwood Precinct DCP (see Figure 2d in this BDAR) shows the Precinct development framework. On the site, there are mapped Conservation Areas, Employment Lands and Electricity Easements. Riparian Corridors are shown as dotted lines on the outer edges of the Conservation Areas.

Section 6.1 **Biodiversity** of the Huntingwood Precinct DCP includes biodiversity related objectives and controls (pages 39, 40). The objectives are:

> **(a)** *Conserve and improve areas of high biological value, in particular to protect:*
>
> *(i) the 2 critically endangered ecological communities – Cumberland Plain Woodland and River-Flat Eucalypt Forest on Coastal Flood Plains;*
>
> *(ii) potential habitats for the threatened Cumberland Plain Land Snail;*
>
> *(iii) habitat for 3 threatened species of microchiropteran bats and potentially 3 additional threatened species;*
>
> *(iv) potential habitat for the threatened plant Pimelea spicata; and*
>
> *(v) riparian zones that contribute maintaining ecological functions and connectivity in the locality.*
>
> ***(b)** Retain, and where possible, enhance connectivity along riparian corridors between conservation areas and adjacent remnant vegetation.*
>
> ***(c)** Promote ecologically sustainable development of the Precinct and ensure adequate protection of the conservation areas through the use of appropriate buffer zones.*

The **biodiversity related controls** include (a), (d), (e) and (i):

Control (a) refers to conservation mapping.

> ***(a)** Conservation areas shown in Figure 4* [Figure 2d of this BDAR] *are designated to protect and maintain the biodiversity values of the Precinct which is informed by Figure 13 and Figure 14* [shown in Appendix 4 of this BDAR].
> ...

Figure 13 is the mapped vegetation conservation significance and Figure 14 is the mapped Biodiversity Values on the site. Both of these mappings are from the 2007 Huntingwood East SEPP 59 Bushfire Assessment by Parsons Brinckerhoff.

Most of the site is unmapped on both Figures 13 and 14 with mapped areas being the following:

Location of mapped area	Mapped on Figure 13	Mapped on Figure 14
a patch in NE corner	Other remnant vegetation	Other areas of biodiversity value
a patch in south adjoining M4 Motorway	Other remnant vegetation	Other areas of biodiversity value (except adjoining Blacktown Creek)
Along Blacktown Creek	Not mapped	High biodiversity value

Location of mapped area	Mapped on Figure 13	Mapped on Figure 14
Adjoining the drainage line in the west	Other remnant vegetation	High biodiversity value
Bordering the area adjoining the drainage line	Other remnant vegetation	Other areas of biodiversity value
a patch in the NW	Other remnant vegetation	Other areas of biodiversity value

Control (d) refers to setbacks for other areas of biodiversity value, outside of the designated conservation areas:

> *(d) .. these should be endeavoured for retention as far as practicable as part of the overall development of the Precinct for employment purpose.* ***These habitats may be able to be retained in areas such as setbacks, along property boundaries and within easements.*** [emphasis added].

Siting and Setbacks are referred to further in Section 10.2 of the Precinct DCP**,** where it is stated that:

> *A key element in maintaining visual character is the visibility and appearance of development when viewed from the public domain. The streetscape is one of the interfaces of development with the street.*

The objectives of Section 10.2 include:

> (*a) Define the building envelope within each allotment by specifying minimum setbacks.*
>
> *...*
>
> *(f) Provide landscape buffers and setbacks to major arterial roads.*
>
> *(g) To maximise retention of existing vegetation within setback areas.*

The Section 10.2 Siting and Setbacks controls include:

> (a) **Buildings** are to be set back by:
>
> *(I) 20m from the Great Western Highway, M4 Motorway corridor and Prospect Highway;*
>
> *(ii) 10m from Reservoir Road;*
>
> *(iii) 7.5m from other roads in the Precinct of which all is to be used for landscaping; and*
>
> *(iv) 5m for a secondary setback on a corner allotment.*
>
> *...*
>
> *(g)* ***All setback areas must be landscaped and maintained in accordance with the Landscape Controls outlined in this Plan.***

Control (e) refers to **riparian corridors in terms of the *Water Management Act 2000***:

> *(e) Drainage lines and the associated riparian corridors within the Precinct have been included in the designated conservation areas. In locations where development is proposed within 40 metres of a watercourse, a permit is required from the Department of Water and Energy under the* Water Management Act 2000.

The only watercourse on the site under the *Water Management Act 2000* is Blacktown Creek in the east, and NOT the drainage swale in the west (discussed in Section A.3.2.5).

Riparian Corridors are assessed in the DCP (page 38) and described as:

> *5 drainage lines were identified within the Precinct. All 5 drainage lines were* ***generally small (less than 1.5 m wide), ephemeral, and flow in a northerly direction.***
>
> *The 2 drainage lines west of Reservoir Road feed into Eastern Creek and* ***the remaining drainage lines feed into the Blacktown Creek.***
>
> *The largest drainage line in the Precinct is the main (eastern) tributary of the drainage lines west of Reservoir Road* [offsite]. …
>
> *3 of the remaining 4 drainage lines within Precinct also had some remnant native vegetation and would provide useful basic habitat and preserve the natural features of a watercourse and area therefore classified as a Category 2 - Terrestrial and aquatic habitat.* [two mapped onsite]
>
> ***A small reach of the drainage line between Reservoir Road and Flushcombe Road*** **[offsite] ...**

There are five blue lines shown on Figures 13 and 14 of the Huntingwood Precinct DCP, with no legend for the blue lines.

From the text above, two *Category 2 - Terrestrial and aquatic habitat* drainage lines are identified onsite, namely:

- Blacktown Creek in the east; and
- the drainage swale in the west.

Note: In terms of watercourses under the *Water Management Act 2000* (see Figure 1b-1 and NRAR advice in Appendix 2):

- the site is crossed by Blacktown Creek, a 1st order watercourse; and
- the drainage swale in the west is not a mapped watercourse.

Control (i) refers to buffers from the top of bank and the allowance of stormwater management works including detention basins within the specified buffer areas:

> *(i) When measured from the top of the bank on either side of the creek, development consent shall not be granted, except for development associated with protection, enhancement and management of riparian corridors, on land within the Precinct that is within:*
>
> *(i) 40m + 10m (buffer) of Category 1 Corridors*
>
> *(ii) 20m + 10m (buffer) of Category 2 Corridors*
>
> *(iii) 10m + 5m (buffer) of Category 3 Corridors*
>
> *Stormwater management works including detention basins are permitted within the buffer areas specified above.*

The top of bank was assessed by Greg Oxley of LandPartners Surveyors and Planners (see survey plans 74904.002.5.1 and 74904.002.2.3 in Appendix 3), namely:

> *The first one is 74904.002.5.1 which is a survey of the western watercourse through the site. The bank is identifiable. Whether it has been affected by construction by the M4 is a guess. Within the M4 corridor is a large culvert*

> *(pipe diameter 1800mm) that discharges into this water course - possibly could have been affected by any works undertaken when constructing the M4.*
>
> *The second plan 74904.002.2.3 is for the eastern water course through the site. There is no defined bank and some of it has been affected by filling/dumping of materials over the years.*
>
> *The plan that Council refers to from the DCP is very misleading because it is clear that it has not been validated by ground truthing. The Council plan is not spatially correct. It is not a zone boundary so it should not have any legal implications in moving it to reflect what is actually on site.*
>
> *It is more like a "wish list" of where a waterway should go.*

In conclusion, the swale in the west carries stormwater from the M4 Motorway. It is not a natural watercourse and lacks a natural top of bank. The flow location of the drainage water is dependent on the location of constructed culverts.

The DCP categorisation of the drainage lines onsite appears to be a wish list.

A3.2 Relevant State Biodiversity Legislation

A3.2.1 *NSW Environment Planning and Assessment Act 1979*

The development is a Part 4 Development.

A3.2.2 *Biodiversity Conservation Act 2016*

Part 7 of the *Biodiversity Conservation Act 2016* (BC Act) applies to:

> *(a) an application for development consent under Part 4 of the Environmental Planning and Assessment Act 1979 for State significant development, ...*

A BDAR is required for this State significant proposal as Section 9 of the SEARs for the proposal requires the preparation of a BDAR, as neither a waiver has been granted, nor is the site on biodiversity certified land.

The Biodiversity Offset Scheme (BOS) is administered under the *BC Act.* The *Biodiversity Conservation Regulation 2017* sets out threshold levels for when the BOS will be triggered. The threshold has two elements:

- whether the amount of native vegetation being cleared exceeds an area threshold; and
- whether the impacts occur on an area mapped on the Biodiversity Values Map.

The BOS is triggered as:

- The amount of native vegetation required to be cleared for the proposal (0.71 ha) exceeds the BOS threshold of 0.25 ha for a <1 ha site (smallest lot size being 0.2 ha); and
- Impacts from the proposal occur on an area mapped on the Biodiversity Values Map.

The definition of native vegetation and clearing are provided in the Glossary at the front of this report.

A3.2.3 Local Land Services Act 2013

This Act applies to rural areas of the State and not to the site.

A3.2.4 Rural Fires Act 1997

The site is partly mapped on the Bush Fire Prone Lands Map (Figure 2f), as:

- Vegetation buffer to Vegetation Category 1 land on Timbertop Reserve north of the Great Western Highway.

A3.2.5 NSW *Water Management Act 2000* (*WM Act*)

There are controls for waterfront land under the *WM Act,* detailed in the *Guidelines for controlled activities on waterfront land - Riparian Corridors* (2018) prepared by the water regulator, NRAR. It is stated in the *Guidelines*:

> *The NRAR seeks to ensure effective, efficient, transparent and accountable compliance and enforcement measures through the natural resources management legislation and, in doing so, maintain public confidence in the enforcement of natural resources management legislation. …*
>
> *Controlled activities carried out in, on, or under waterfront land are regulated by the Water Management Act 2000 (WM Act). The NRAR administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. ...*
>
> *The riparian corridor consists of:*
>
> - *the channel which comprises the bed and banks of the watercourse (to the highest bank) and*
> - *the vegetated riparian zone (VRZ) adjoining the channel.*
>
> *The NRAR recommends a VRZ width based on watercourse order as classified under the Strahler System of ordering watercourses and using Hydroline Spatial Data which is published on the department's website . The width of the VRZ should be measured from the top of the highest bank on both sides of the watercourse ...*

The site is crossed by Blacktown Creek, a south to north flowing mapped 1st Order watercourse with a recommended 10 m wide Vegetation Riparian Zone (NRAR 2018, email from NRAR dated October 2021, see Figures 1a-1, 1b-1).

Blacktown Creek is downstream of the controlled stormwater discharge basins from the Western Motorway (visible on LiDAR, Figure 1d-1) and detention systems on the Raging Waters Sydney (formerly known as Wet n Wild) site to the south of the M4 Motorway.

In the west, there is a drainage swale from controlled stormwater discharge basins from the M4 Motorway flowing to the north under the Great Western Highway. It is not a mapped watercourse (see Figures 1a-1, 1b-1, 1b-2, email from NRAR on 3 July 2022 in Appendix 2).

Controls for 1st Order watercourses

Table 1 of the *Guidelines* (NRAR 2018), provides recommended riparian corridor widths and VRZs. For a 1st Order watercourse, the width of the VRZ is 10 m each side of the watercourse and the total riparian corridor width is 20 m + channel width.

The Riparian Corridor Matrix provided in Table 2 of the *Guidelines* enables applicants to identify certain works and activities that can occur on waterfront land and in riparian corridors under the *WM Act*.

Under the Matrix, for a 1st Order stream, any road crossings are permitted as part of a controlled activity approval (see updated version of Table 2 below from NRAR – emailed on 18 August 2022).

Stream order	Vegetated Riparian Zone (VRZ)	RC off-setting for non RC uses	Cycleways and paths	Detention basins		Stormwater outlet structures and essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1st	10m	•	•	•	•	•	•	•		
2nd	20m	•	•	•	•	•		•		
3rd	30m	•	•	•		•			•	•
4th +	40m	•	•	•		•			•	•

However, it is also pointed out in the *Guidelines* that:

> .. ***Applicants are still required to comply with other relevant government legislation, such as threatened species,*** *flood planning levels and fisheries guidelines.* [Emphasis added].

A3.2.6 *Biosecurity Act 2015*, High Threat Weeds and Environmental Weeds

The *Biosecurity Act 2015* replaced the *Noxious Weeds Act 1993.* Existing local control authorities continue to have functions in relation to weed control.
A list of Priority weeds for the Greater Sydney region is given on NSW WeedWise website (*https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=21*) and includes these species recorded onsite.

In addition to the Priority weeds there are exotic species listed as High Threat Weeds (HTW) under the *BC Act:*

Species	Listed as Priority weeds	Duty	HTW	Recorded onsite and nearby
Anredera cordifolia	Yes	Prohibition on certain dealings	Yes	ACA Plots 4, 5, 8, 9
Asparagus aethiopicus	Yes	Prohibition on certain dealings	Yes	ACA Plots 4, 5, 8, 9, Spot A
Asparagus asparagoides	Yes	Prohibition on certain dealings	Yes	ACA Plots 2, 4, 5, 7, 9, Spots A, C, E EP Q1, 2, 7
Asparagus plumosus	Yes	Prohibition on certain dealings	Yes	EP Plots 1, 2, Spots F, H
Bidens pilosa	No	-	Yes	ACA Plot 2, 3, 4, 7, 9, Spots A, E, L, M EP Plots 1, 2, 4, 5
Bidens subalternans	No	-	Yes	ACA Plot 2 EP Plot 7

Species	Listed as Priority weeds	Duty	HTW	Recorded onsite and nearby
Briza subaristata	No	-	Yes	ACA Plot 1 Spots C, D EM Plots 4, 5
Cardiospermum grandiflorum	No	-	Yes	ACA Plot 5
Cenchrus clandestinus	No	-	Yes	ACA Plots 1, 3, 8 Spots B, H, J, L, M EP Plots 1, 2, 3, 4, 5, 7
Cestrum parqui	Yes	Regional Recommended Measure	Yes	ACA Spots F, H EP Plots 6,7
Cortaderia species	Yes	Regional Recommended Measure	Yes	*Cortaderia selloana* ACA Plot 8
Cotoneaster glaucophyllus	No	-	Yes	ACA Plot 9
Cyperus eragrostis	No	-	Yes	ACA Spot H EP Plot 7
Ehrharta erecta	No	-	Yes	ACA Plot 2, 4, 5, 7, 8, 9 Spot A, EP Plot 2
Eragrostis curvula	No	-	Yes	ACA Plots 1, 2, 7, 9 Spots A, B, C, D, I, L EP Plots 1, 2, 4
Lantana camara	Yes	Prohibition on certain dealings	Yes	ACA Plots 2, 3, 5, 7, 8, 9, Spots C, E, J, L, M EP Q1, 2
Olea europaea subsp. *cuspidata*	Yes	Regional Recommended Measure	Yes	ACA Plots 1, 2, 3, 4, 8, 9, Spots A, C, D, J, L, M EP Plots 1, 2, 7
Opuntia monacantha	Yes	Prohibition on certain dealings	Yes	*Opuntia monacantha* ACA Plot 8
Rubus fruticosus	Yes	Prohibition on certain dealings	Yes	*Rubus anglocandicans* ACA Plot 6, Spots D, F, G, M EP Plots 6, 7
Senecio madagascariensis	Yes	Prohibition on certain dealings	Yes	ACA Plots 2, 4, 7, 9, Spots A, B, C, D, G, I EP Plots 1, 2, 3, 4, 5

Note: EP = Ecoplanning (2020), ACA = Anne Clements & Associates survey used in the BDAR.

In addition to the listed Priority weeds and HTWs, there are environmental weeds, (Weeds of Australia (https://keyserver.lucidcentral.org/weeds/data/media/Html/grevillea_robusta.htm, accessed 18 March 2024), such as:

Silky oak (Grevillea robusta) is regarded as an environmental weed in New South Wales and as a minor environmental weed or potential environmental weed in Victoria. This species grows naturally in sub-tropical rainforests and in wet sclerophyll forests on the coast and inland ranges north of the Coffs Harbour district in New South Wales. It is widely cultivated as a garden ornamental and street tree in Australia and has escaped cultivation and become invasive outside its natural range.

Silky oak (Grevillea robusta) is currently of particular concern throughout the wider Sydney and Blue Mountains region in central New South Wales. For example, it is mentioned as a common environmental weed at Hunts Creek in western Sydney and has become naturalised in Lane Cove National Park in northern Sydney. It is also a known weed in the lower Blue Mountains and is one of three native plants that are problem weed species in the Shoalhaven Shire, to the south of Sydney

A3.3 State Environmental Planning Policies (SEPPs)

A3.3.1 State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 2 (Vegetation in non-rural areas) aims to protect the biodiversity values and preserve the amenity of trees and other vegetation in non-rural areas of the State. This SEPP applies to the Blacktown LGA and land Zoned IN1 General Industrial.

Chapter 3 - Koala Habitat Protection 2020
Koala SEPP 2020 does not apply to the site as it only applies to land zoned RU1, RU2 and RU3 in specified LGAs of which Blacktown is not listed.

Chapter 4 - Koala Habitat Protection 2021
This chapter does not apply to Blacktown LGA.

Part B Stage 1 Biodiversity Assessment

B1.0 Site location

The site is located approximately 34 km west of the Sydney CBD and approximately 1 km north of Prospect Nature Reserve and approximately 3.3 km south of the Blacktown commercial centre in the Blacktown Local Government Area (LGA). The site is in Cumberland IBRA subregion of the Sydney Basin Bioregion (Figures 1a-1 to 1c-2).

The site is an approximately 260 m wide strip of land bounded by:

- two major east-west roads: Great Western Highway in the north and the western Motorway (M4) in the south;
- north-south Prospect Highway in the east; and
- flushcombe Road to the west.

The 26.642 ha site comprises multiple parcels of land varying in size, from:

- 2,004 m2 (0.2 ha) on Lot 163 DP8716; to
- 43,360 m2 (4.3 ha) on Lot 51 DP1144623.

The elevation of the site ranges from approximately 85 m AHD on the top of the hill west of Blacktown Creek and approximately 90 m AHD on the eastern boundary, to less than 70 m AHD along Blacktown Creek close to the northern boundary (Figures 1b-2, 1d-2).

B1.1 The Proposal and the subject land

Details of the proposal are provided in Section A2.0.

Subject land is defined in the BAM as:

> *land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal.*

The subject land is the entirety of the 26.642 ha site (Figure 1a-2).

B1.2 Documents relied on

Reports relevant to the proposal

Canopy Consulting (2023) *Industrial Estate Huntingwood – Tree Species Map.* Dated September 2023.

Clark SA (2022) *Targeted survey for the Cumberland Plain Land Snail* (Meridolum corneovirens *(Pfeiffer, 1851)) at Augusta Street, Huntingwood.* Prepared for Anne Clements & Associates Pty Limited. Dated 24 October 2022.

Costin Roe Consulting Pty Ltd (2024) *Civil works package.* Proposed Warehouse Distribution, Augusta Street, Huntingwood East NSW 2148. Dated 19 March 2024.

Durrant K (2024) *Microbat Survey at Augusta Street Warehouse Site Blacktown.* Prepared for Anne Clements and Associates Pty Ltd. Wild Conservation Pty Ltd Report. Dated 5 March 2024.

Habit8 Landscape Architects & Urbanism (2024) *Landscape Concept Plan. Huntingwood Logistics Estate, Augusta St, Huntingwood East, NSW.* Dated 14 March 2024. Client: The Trustee for Huntingwood Property Trust.

JBS&G Australia Pty Ltd (2023) *Detailed Site Investigation Huntingwood East Augusta Street, Blacktown NSW.* Prepared for The Trustee for Huntingwood Property Trust. Report 62742/144011. Dated 22 August 2023.

JBS&G Australia Pty Ltd (2024) *Remediation Action Plan Huntingwood East Augusta Street, Blacktown NSW*. Prepared for The Trustee for Huntingwood Property Trust. Report 62742/146178. Dated 20 February 2024.

Pells Sullivan Meynink (PSM) (2023) *Augusta St, Huntingwood East* Results of Geotechnical Investigation. Client: Letter to The Trustee for Huntingwood Property Trust. Dated 29 June 2022.

URBIS (2024) Responses to Submission Report. Prepared for The Trustee for Huntingwood Property Trust. Dated 22 March 2024.

Webster G and Walsh J (2022) Huntingwood frog survey outcomes and habitat suitability for microbats with recommendations for habitat restoration for threatened fauna. Prepared for Anne Clements & Associates Pty Limited. Dated 24 August 2022.

Previous onsite survey

Ecoplanning (2020) *Biodiversity Development Assessment Report, Augusta Street, Huntingwood, State Significant Development Application.* Prepared for EMKC Australia C/O Air Trunk – Final dated 6 August 2020.

Literature considered

Bannerman SM and Hazelton PA (1990) *Soil landscapes of the Penrith 1:100000 Sheet.* Soil Conservation Service of New South Wales.

Benson DH and Howell J (1990) *Taken for Granted: the bushland of Sydney and its suburbs.* Kangaroo Press Pty Ltd. Kenthurst NSW.

Benson D and McDougall L (1996) Ecology of Sydney plant species Part 4: Docotyledon family Fabaceae. *Cunninghamia.* Vol 4(4) 553-752.

Clements A., Simmonds A., Hazelton P., Inwood C., Woolcock C., Markovina A-L. and O'Sullivan P. (2010) Construction of an Environmentally Sustainable Development on a Modified Coastal Sand Mined and Landfill Site—Part 2. Re-Establishing the Natural Ecosystems on the Reconstructed Beach Dunes. *Sustainability 2*(3), 717-741.

Department of Planning and Environment (DPE) (2022) *The Cumberland Plain Conservation Plan. A conservation plan for Western Sydney to 2056.* Published by NSW Department of Planning and Environment. Dated August 2022.

Department of Planning, Industry and Environment (DPIE) (2020) *Biodiversity Assessment Method* (BAM). Dated October 2020.

Department of Planning, Industry and Environment (DPIE) (2020b) *Surveying threatened plants and their habitats.* Dated April 2020.

Division of National Mapping (1986) *Climate. Atlas of Australian Resources. Third Series. Volume 4.* Division of National Mapping, Canberra.

Goreski V. (2020) *The ecology and conservation of the largefooted myotis (*Myotis macropus*) in an urban environment.* PhD thesis. Queensland University of Technology.

Harden GJ (1990-93, 2002) *Flora of New South Wales.* Volumes 1 to 4. University of New South Wales Press, Kensington.

Harden GJ and Murray LJ (2000) Supplement to Flora of New South Wales. Volume 1. University of New South Wales Press, Kensington.

Hazelton P. and Clements A. (2009) Construction of an Environmentally Sustainable Development on a Modified Coastal Sand Mined and Landfill Site – Part 1. Planning and Implementation. *Sustainability*. 2009; 1(2):319-334.

Hazelton P and Clements A (2011) Historic and Environmental Significance of Ecological Communities in NSW, Australia. *International Journal of Heritage and Sustainable Development.* 1(1), 72-83. ISSN: 1647-4112.

Mitchell PB (2002) *Descriptions for NSW (Mitchell) Landscapes.* Published by Department of Planning, Industry and Environment.

Natural Resources Access Regulator (NRAR) (2018) *Guidelines for controlled activities on waterfront land—Riparian corridors. NSW* Department of Industry | INT19/15607|. Dated May 2018.

NSW Government (2022) *Biodiversity Values Map and Threshold Report.* Dated 31 May 2022.

Tozer M (2003) The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8(1), 1-75.

Maps

Central Mapping Authority of New South Wales (1982) 1:25 000 topographic map Springwood 9030-IV-S 2nd Edition.

Online Maps and data include from:

Biodiversity Values Map and Threshold Tool

Bureau of Meteorology

Elvis - Elevation and Depth - Foundation Spatial Data

Historical, Aerial and Satellite Imagery - Spatial Services

NearMap aerial photographs

NSW FloraOnline - PlantNET

DP&E Website including BioNET

Blacktown City Council's website

Seed Portal – NSW Government

B2.0 Methods related to environmental setting

B2.1 Site context methods

B2.1.1 Landscape features methods

Landscape features were assessed using:

- topographic maps, and aerial photographs from the Seed Portal – NSW Government website;
- Nearmap aerial photographs on subscription;
- the Sydney 1 Metre DEM LiDAR dated May 2011 from Spatial Services, ELVIS;
- Geology and soil mapping from the Seed Portal – NSW Government website;
- Geotechnical assessment; and
- Field inspections, onsite surveys and photographic records.

B2.2 Native vegetation, TECs and vegetation integrity methods

A review of existing vegetation mapping and previous reports / surveys has been undertaken.

B2.2.1 Review of existing vegetation mapping

Office of Environment and Heritage (OEH) (2016) mapped most of the site as cleared (Figure 4a) except for patches of:

- *PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion;* and
- *PCT 850 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion*:

The areas mapped as PCT 849 and PCT 850 are similar to those mapped on the BV map (Figure 2e).

NSW State Vegetation Type Map (DPE 2022) maps all of the onsite OEH (2016) patches as *PCT 3320 Cumberland Shale Plains Woodland* (Figure 4b).

The polygons in the OEH and the DPE mapping are of similar shape to each other and to those of Figure 13 from the Huntingwood Precinct DCP (in Appendix 4), namely:

Location of mapped patches	Mapped on Figure 13 of the Huntingwood Precinct DCP	Mapped by OEH 2016	Mapped by DPE 2022
In the NW corner	Other Remnant Vegetation	PCT 849	PCT 3320
Along drainage swale	Other Remnant Vegetation	PCT849.	PCT 3320
Along the southern boundary near the M4 Motorway	Other Remnant Vegetation	PCT 849	PCT 3320
In the NE corner	Other Remnant Vegetation	PCT 850;	PCT 3320

B2.2.2 Review of previous surveys

Ecoplanning (2020) carried out a BDAR for a previous development application on part of the site. The area was surveyed on 8 April 2020 with data recorded in 7 BAM Plots 1 to 7 using the Biodiversity Assessment Method (BAM) (OEH 2017 cited in Ecoplanning 2020).

A total of 100 (36 native, 61 exotic and 3 non-local native) flora species were recorded in the 7 BAM Plots (data from Appendix B of Ecoplanning 2020 included in Table 1 and sampling locations are shown on Figure 6a of this BDAR).

For Ecoplanning's (2020) Plot 7, two "native tree" species are entered into the calculator but neither are native to the specified *PCT 849 Grey Box – Forest Red Gum grassy woodland of the Cumberland Plain, Sydney Bioregion (mixed native and exotic).* These "native trees" were:

- *Eucalyptus robusta* - the most widespread and abundant tree species of the Endangered Ecological Community *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;* and
- *Grevillea robusta* - a widely cultivated species, native to the NSW North Coast IBRA Bioregion, with its accepted southern limit in the wild being near Coffs Harbour.

From advice from the BOS helpdesk team (Appendix 2):

an assessor should consider if:

- *the planted native vegetation accounts for a minor component of the existing remnant native vegetation; and*
- *A PCT can be assigned for the purposes of a standard BAM assessment.*

Both *Eucalyptus robusta* and *Grevillea robusta* are likely to have been planted as part of a garden and should not have been considered a native tree species for the purposes of the BAM assessment. The subsequent natural colonisation of *Grevillea robusta* (observed onsite during the ACA surveys and recorded by the arborist as height classes of <5 m, 5-10 m) should also not be considered a native tree species for the purposes of the BDAR.

Clements *et al.* (2021) carried out a biodiversity survey as part of the due diligence, focusing on potential biodiversity constraints on land identified in the DCP as Employment Lands and the potential biodiversity opportunities on the Conservation Areas.

A total of 102 (34 native, 68 exotic and non-local natives) species were recorded on 26 October 2021 by Dr AnneMarie Clements and Tony Rodd from one BAM Plot ACA-1 and patches A to K on the site, with the species reflecting its past history as productive farm land (see sampling locations over current and 1956 aerial photographs, Figures 1930-1956, 6a).

The most widespread species recorded onsite were the exotic pasture grasses *Paspalum dilatatum* (Paspalum), *Cenchrus clandestinus* (Kikuyu Grass) and *Lolium perenne* (Perennial Ryegrass).

Associated with the former house site were garden plantings, including *Grevillea robusta,* which is growing outside its accepted natural range, (this species is native to

the NSW North Coast IBRA Bioregion). *Grevillea robusta* has colonised parts of both the Employment Land and Conservation Areas.

The native species onsite were sparse, with:

- native trees restricted to the drainage swale in the west, patches adjoining the M4 Motorway in the south and isolated remnant eucalypt woodland patches in the paddocks and around industrial operations along Flushcombe Road;
- patches of *Bursaria spinosa* along a former fence line;
- a native legume *Daviesia genistifolia* which despite probably more than 150 years of agricultural land use, appeared to have germinated from the soil seed bank of the former market garden area (recorded at Spot D on Figure 6a). *Daviesia genistifolia* has a hard-coated seed which is long-lived in the soil seed bank (Benson and McDougall 1996); and
- native grasses from wind-blown seed, including in the cracks of the bituminised road (recorded at Spot B on Figure 6a).

Along Blacktown Creek (Spot H on Figure 6a):

- the wetter patches have been colonised by *Typha domingensis* (Narrow-leaved Cumbungi), described on PlantNET as a robust emergent aquatic perennial that grows in swamps, channels and drains;
- the damp ground beside the creek has been colonised by the exotic *Juncus acutus* (Sharp Rush), described on PlantNET as a serious weed because of its abundant seed production and viciously sharp tips, which makes control difficult; and
- the less inundated land supports dense stands of the exotic weed *Rubus anglocandicans* (Blackberry) which extends in abundance to parts of the adjacent hill slopes.

B2.2.3 Onsite survey methods

The vegetation was sampled in nine BAM plots on 26 October 2021, 10, 30 March 2022, 20 January 2023 and 14 June 2023 by Dr AnneMarie Clements, Tony Rodd, Joelan Sawyer and Pauline Dever using the BAM techniques (details in DPIE 2020) (sampling locations on Figure 6a).

In addition to the BAM techniques:

- to calculate the percentage covers of species present in the 0.04 ha floristic quadrat of the BAM plots, the covers recorded in four 10 m x 10 m contiguous subquadrats were averaged and the average rounded to a value acceptable in BAM (Table 1);
- to describe vegetation structure in the sampled vegetation, the numbers of individuals and maximum heights for species $\geq$ 2 m tall were recorded in the floristic quadrats (Table 2); and
- supplementary data were recorded in Patches A–M, with species present and height of canopy trees as part of the due diligence survey in 2021.

All sampling locations were photographed with additional general photographs also taken (Appendix 5). GPS coordinates were recorded at regular intervals along the transects using a hand-held Garmin GPS map 78 at the time of survey. The GPS coordinates (for the plots given in Appendix 6), in conjunction with ground features, were used to plot the sampling locations.

Nomenclature is consistent with Harden (1990-1993, 2002), Harden and Murray (2000) and subsequent taxonomic changes as published in *Telopea*, the Sydney Royal Botanic Gardens' journal of systematic botany, and in other Australian taxonomic literature. The Royal Botanic Gardens' PlantNET website (plantnet.rbgsyd.nsw.gov.au) incorporating Flora Online is the major source for updated taxonomy.

Vegetation integrity is a quantitative measure of the composition, structure and function of the vegetation; as well as the presence of high threat weeds and hollow bearing trees. This is obtained from the BAM plot data (see input data for the BAM Calculator in Appendix 6).

As it is an historic farming site, the survey targeted areas with potential for native species occurrence, especially around the base of native trees and along old fence lines.

As part of the survey, targeted searches were undertaken for threatened flora species, including *Acacia pubescens, Marsdenia viridiflorus, Pimelea spicata, Pultenea parviflora and Pterostylis saxicola.*

Our group has extensive experience recording these threatened species in other nearby sites. Note: Biodiversity *objective* of the Huntingwood Precinct DCP is to:

> (a) *Conserve and improve areas of high biological value, in particular:*
> *(iv) to protect:*a *potential habitat for the threatened plant* Pimelea spicata*.*

B2.3 Threatened species survey methods

B2.3.1 Review of existing information

Ecosystem credit species and Species credit species were generated from the on-line BAM Calculator. In the BAM (DPIE 2020), the difference between Ecosystem credit species and Species credit species are described:

In Section 5.1.1 *Species that can be predicted by habitat surrogates (ecosystem credit species)*

> ***Ecosystem credit species*** *are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. The TBDC identifies the threatened species assessed for ecosystem credits.* ***A targeted survey is not required to identify or confirm the presence of ecosystem credit species.***

In Section 5.1.2 *Species that cannot be predicted by habitat surrogates (species credit species)*

> ***Species credit species*** *are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. These species are identified in the TBDC* [Threatened Biodiversity Data Collection]. *A targeted survey or an expert report is required to confirm the presence of these species on the subject land. Alternatively, for a development, activity, clearing or biodiversity certification proposal only, the proponent may elect to assume the species is present.*

An assessment of habitat suitability for threatened species known or predicted to occur on the site has been conducted through the use of the BAM Credit Calculator and supported by Threatened species profile information provided in BioNet and the Threatened Biodiversity Data Collection (TBDC), and recorded habitat features onsite.

The existing vegetation mapping and the BioNet records of threatened species were used to inform which species and their likely habitats may be present on the site.

Previous surveys and searches for threatened flora species and habitat assessment have been conducted on the site by Ecoplanning (2020), as well as numerous surveys by our group, Anne Clements & Associates, onsite and nearby. Our recordings include offsite nearby records of *Acacia pubscens, Grevillea subsp. juniperum, Marsdenia viridiflora subsp, Viridiflora, Pimelea spicata* and *Pultenaea parviflora*.

Ecoplanning (2020) detected a total of seven microchiropteran bat species from calls within and near the subject land, including three species listed as vulnerable under the *Biodiversity Conservation Act 2016* (Little Bent-winged Bat, Large Bent-winged Bat, Eastern Coastal Free-tailed Bat).

In the Ecoplanning's 2020 BDAR, it was assumed that the site provided habitat for the frog *Litoria aurea* (Green and Golden Bell Frog) and *Myotis macropus* (Southern Myotis) and credits were assigned to these two species. No expert report nor site specific survey had been undertaken for either of the species.

B2.3.2 Habitat constraints assessment

The habitat component assessed included:

- coarse woody debris

- rock outcrops and bush rock;
- caves, crevices and overhangs;
- culverts, bridges, mine shafts, or abandoned structures;
- nectar/lerp-bearing trees;
- nectar-bearing shrubs;
- koala Feed Trees;
- large stick nests;
- sap and gum sources;
- she-oak fruit (Glossy Black Cockatoo feed);
- seed-bearing trees and shrubs;
- soft-fruit-bearing trees;
- dense shrubbery and leaf litter;
- tree hollows;
- decorticating bark;
- wetlands, soaks and streams;
- open water bodies; and
- estuarine, beach, mudflats, and rocky foreshores.

B2.3.3 Field surveys

Targeted surveys were required for the following species, with:

Threatened species	Search dates	Person involved in the search
Pimelea spicata (Spiked Rice flower)	8, 17 April 2020, 26 October 2021, 10, 30 March 2022, 20 January 2023, 14 June 2023	Dr AnneMarie Clements, Tony Rodd, Joelan Sawyer and Pauline Dever. (2020 searches by EcoPlanning)
Green and Golden Bell Frog (*Litoria aurea*) and associated Southern Myotis (*Myotis macropus*) (details in Appendix 7)	7, 8, 14 February and 9 March 2022.	Jayden Walsh, accompanied by Joelan Sawyer on one of these nights as instructed by Grant Webster (application for BAM expert lodged copy in appendix 7a).
Cumberland Snail (*Meridolum corneovirens*) (details in Appendix 8)	9 August 2022.	Dr Stephanie Clark.
Microbats (details in Appendix 9)	27 February 2024.	Principal Ecologist Kane Durrant and three qualified Fauna Spotter Catchers of Wild Conservation.

Threatened flora species – The main limitation to the targeted surveys was dense weed growth including 0.5 m tall *Eragrostis curvula* (African Love Grass) and the monostands of *Rubus anglocandicans* (Blackberry) as a consequence of historic intense agriculture with major soil disturbance over approximately 200 years.

The suitable habitat was restricted to less disturbed and/or insitu soils, including:

- approximately 2 m from bases of the isolated paddock trees; and
- approximately 1-2 m either side of the old paddock fence lines.

Pimelea spicata had some potential of persisting on this former farmland, but limited to areas with natural soils. *Pimelea spicata* is known to occur in mown cemeteries with natural soils.

Surveying threatened plants and their habitats (DPIE 2020b) specify in Section 3.2 (page 4) that:

> *Additional advice on surveying for particular species is also shown on the information page of the BAM-C via the 'Species with specific survey requirements' spreadsheet.*

In the Threatened Biodiversity Collection Database (TBCD), survey can be carried out in any month. From the spreadsheet and the TBCD, it specifies for *Pimelea spicata* that:

- *Use flowers to locate and identify as species is inconspicuous.*
- *Flowering is unpredictable and rain dependent. Survey 4 weeks after at least a 30 mm rainfall event. In drier times plants are often not visible above ground unless soils remain moist.*
- *Multiple surveys may be required. Survey at least 3 times, each at least a month apart unless found.*

There were repeated onsite surveys for *Pimelea spicata* during favourable conditions (at least 30 mm rainfall in four weeks prior to survey) from BOM climate data online, namely:

Time of survey	Rainfall in month of survey	Monthly rainfall prior to survey		
		1 month	2 months	3 months
8, 17 April 2020	42 mm	113 mm	460 mm	36 mm
26 October 2021	70 mm	24 mm	61 mm	17 mm
10, 30 March 2022	513 mm	290 mm*	123 mm*	96 mm
20 January 2023	133 mm	14 mm	37 mm	187 mm
14 June 2023	13 mm	23 mm	76 mm	39 mm

From recording and monitoring *Pimelea spicata* for more than 5 years at Minto, our group developed techniques for detecting individuals including new germinants and small drought stress plants (less than 10 mm in height). Small individuals during one monitoring time were capable of sprawling to up to 500 mm diameter patches in favourable conditions and then "shrink" to tiny plants during extended periods of low rainfall. It is an inconspicuous small opposite leaved forb, which somewhat resembles (non-flowering) overwintering stage of *Hypericum perforatum* (St Johns Wort). From experience, it is more readily detected by its characteristic opposite leaves (often slightly blue in colour) than by its inconspicuous small pink flowers.

The limited area of potential habitat onsite for *Pimelea spicata* were adequately searched.

Snails

As this heavily weed infested site had a little potential for Cumberland Snail (*Meridolum corneovirens*). the targeted search concentrated in vegetation patches in the eastern and western sections and around the southern reach of Blacktown Creek (near where it flows north of the M4 Motorway). Logs and non-natural debris such as old pieces of tin, bricks and dumping were turned where possible and leaf litter accumulations around the base of eucalypts were searched.

On day of snail survey (9 August 2022) it was cloudy, around 20°C and light rain (Clark 2022) see also appendix 8.

The microbat Southern Myotis (*Myotis macropus*)

The main limitation on this site for the Southern Myotis bat appears to be the lack of open waterbodies. The site currently lacks any form of elongated pools (open waterbodies) in the riparian corridor.

This specialist trawling bat *Myotis macropus* can be found roosting in concrete culverts under roads (Goreski 2020), with a preference for:

> *culverts >1.2 m in height, and while a preference for box culverts was detected, both design types (box and pipe) were occupied. This specialist species is able to persist in urban landscapes, provided roosts are available and elongate pools, riparian corridors and open green space are maintained within urban planning and design.*

Searches for microbats

The site was searched for bats and their habitats by fauna ecologist Kane Durrant and two qualified spotter catchers of Wild Conservation on 27 February 2024 (details in Appendix 9).

Search methods for culverts included:

- first assessed for their viability as a roost site in terms of flight access, proximity to open water and safety from predators;
- walked on foot and each crack and crevice was searched by torchlight for Microbats, as well as evidence such as scratch marks and faeces; and
- an anabat recorder, Echo Meter Touch 2, was deployed at the entrance of each culvert to record frequencies.

Search methods for paddocks and creeklines, included:

- searching in a random meander pattern through the extensive paddocks; and
- searching from south to north along the creek lines by three persons using sight, torch and mobile anabat recorder, Echo Meter Touch 2.

B3.0 Site context

B3.1 Assessment area

B3.1.1 Landscape features

Native vegetation cover and connectivity have been assessed in accordance with Sections 3.2 and 3.1.3 of the Biodiversity Assessment Method (BAM) (DPIE 2020).

The extent of native vegetation cover is calculated within the assessment area (which includes the 2.37 ha on the subject land and a 1500 m buffer surrounding the outside edge of the boundary of the subject land) using the Nearmap aerial photographs and the most recent vegetation mapping (DPE 2022) (Figure 1a-3).

	Area	Before the proposal		After the proposal (proposed clearing, not including proposed conservation works)	
		Approximate area of canopy vegetation	**% canopy vegetation cover**	**Approximate area of canopy vegetation**	**% canopy vegetation cover**
On site	26.6 ha	2.37 ha (2.03 + 0.34)	9% (Class 0-10%)	1.85 ha (1.58 + 0.27)	7% (Class 0-10%)
Within 1.5 km buffer	961 ha	197 ha	20.5% (Class >10-30%)	196.5 ha	20.4% (Class >10-30%)

The landscape features are summarised as follows:

Landscape features	**For the proposal**
Percent native vegetation cover in the assessment area	Before the proposal (Figure 1a-3) Onsite, cover class 0-10% Within 1.5 km buffer, cover class >10-30% After the proposal (Figure 7b) Onsite, Cover class 0-10% Within 1.5 km buffer, cover class >10-30%
IBRA bioregion and subregions	The site is in the Cumberland subregion of the Sydney Basin Bioregion (Figure 1c-1).
Rivers and streams	The site is crossed by Blacktown Creek, a south to north flowing mapped 1st Order watercourse (Figures 1b-1, 1b-2).
Wetlands within, adjacent to and downstream of the site	Prospect Dam is located approximately 1 km south of the site (Figures 1a-1, 1b-1).
Connectivity of different areas of habitat *	Connectivity (less than 100 m separation) (Figure 1a-3) includes: - from the northeast corner across the Great Western Highway (GWH), and then west parallel to the GWH joining to Timbertop Reserve; - north to south along the drainage swale: • to vegetation south of the M4 Motorway and joining to the Prospect Nature Reserve; • to east to west narrow strip of vegetation in the northern road of the M4 Motorway and joining to Prospect Nature Reserve; • to the narrow strip of vegetation to the west adjoining the GWH and then joining to the vegetation west of Flushcombe Road and then across the GWH to the narrow strip of vegetation adjoining the northern side of the GWH and then across the GWH to Robert Brown Reserve. In addition to above ground connectivity, there are culverts under the M4 Motorway and the Great Western Highway that provide potential habitat and connectivity for native fauna, but also for movement of feral pests such as cats, foxes and rats.

Landscape features	For the proposal
Karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features	Karst, caves, crevices, cliffs are not features of soil landscapes on Wianamata Shale geology. The soil hazards associated with Blacktown soil landscape are moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage (Figures 3a, 3b).
Areas of outstanding biodiversity value occurring on the subject land and assessment area	There are no areas of outstanding Biodiversity Value occurring on the subject land.
Any additional landscape features identified in any SEARs for the proposal	Secretary's Environmental Assessment Requirements (SEARs) have been issued for the proposal. No additional landscape features have been identified in the SEARs.
NSW (Mitchell) landscape on which the subject land occurs	The soil is on Cumberland Plain Mitchell (2002) Landscape (Figure 1c-2).

Note: NSW (Mitchell 2002) landscape mapping is primarily a 1:250 000 scale geomorphic map.

B3.2 Geology, soil landscaping

The soils onsite are clays derived from the Bringelly Shale Formation of the Wianamatta Group (Figures 3a, 3b).

These clay soils were widely used for agriculture to feed the early colony of Sydney (Benson and Howell 1990, Hazelton and Clements 2011).

The site on the soil landscape of the Penrith 1:100 000 map is mapped as Blacktown (Figure 3b), which is described in Bannerman and Hazelton (1990) as:

	Blacktown
Landscape	• Gently undulating rises on the Wianamatta Group shales; • Local relief to 30 m; • Slopes <5%; • Broad rounded crests and ridges with gently inclined slopes.
Soils	• Shallow to moderately deep (<100 cm) hardsetting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines.
Limitations	• Moderately reactive highly plastic subsoil; • Low soil fertility; • poor soil drainage.

B3.2.1 Geotechnical findings

Pells Sullivan Meynink (PSM) (2023) carried out field investigation (PSM letter dated 29 June 2023) on:

- 17, 18, 21, 25 February 2022 with 12 boreholes drilled (BH01 to BH12); and
- 23 May 2022 with an addition five boreholes drilled (BH13 to BH17).

The inferred geotechnical units encountered at the test locations were the following:

- shallow topsoil – clay to silty clay trace / with gravel;
- 0.1 to 0.3 m existing fill – clay to clay with gravel. Some debris from demolition eg tiles, bricks and glass bottles observed at localised areas;
- 0 to 1.8 m natural soil - – clay to clay trace gravel;
- 1.2 to 3.5 m Bedrock A – shale; and
- 5.7 to 7.6 Bedrock B – shale.

The soil chemistry from the laboratory testing were the following:

- pH in the range of 5.0 to 8.2;
- electrical conductivity ranged from 43 to 685 microSiemens/cm;
- concentration of chlorides ranged from <50 to 830 mg/kg; and
- …

At 17 bore holes:

- salinity varied from non-saline to moderately saline;
- sodicity ranged from non-sodic to highly sodic. Sodicity provides a measure of the likely dispersion on wetting and to shrink/swell properties of a soil.

B3.2.2 Contamination report

Contamination on the 26.64 ha site was investigated by JBS&G Australia Pty Ltd (2023) and a Remediation Action Plan (RAP) prepared by JBS&G Australia Pty Ltd (2024) in relation to future commercial/industrial land use, including the identification of site management/remediation requirements to support development of the site.

It was found that there was stockpiled material onsite including:

> *clays and sands with building rubble including PVC pipe, plastic sheeting, bricks, tile fragments, concrete fragments, plasterboard, timber, slagand ash, and fragments of ACM.*
>
> *Fill material was predominately in the western and eastern portion of the site, in the vicinity of former buildings …*

In the RAP, it is recommended that the existing fill to the NW of the drainage swale be capped and retained in situ.

B3.2.3 Observations in the swale to the west

Stockpiles were observed onsite. During the biodiversity survey, building rubble was recorded in the drainage swale to the west, including:

- Plot 8 with ground-hollows and low mounds, some containing rubble that appeared to originate from demolition of a brick house; and
- Plot 9 with rubbish dumped throughout this area.

B3.3 Climate

The site is located in the rainshadow area to the west of Sydney's Central Business District within 700 to 800 mm rainfall isohytes (Division of National Mapping 1986).

Climate affects the survival of existing vegetation and proposed landscaping on the site. Since the 1990's, the climatic pattern is extended periods of low rainfall separated by periods of high rainfall events. This pattern has been observed at nearby meteorological stations, including Prospect Reservoir (station 67019, opened 1887, accessed 29 November 2023 from BOM climate data online).

The extended periods of low rainfall are likely to cause drought-stress, and in periods of high rainfall, saturated soils and increased erosion risks.

B3.4 Flooding

The pre-development risk of 1:100 year flooding is shown on Figure 3c. There appears to be no existing flooding risk to the proposed development areas on the site.

B4.0 Native vegetation, threatened ecological communities and vegetation integrity

B4.1 Changes to land use and native vegetation extent

With urban expansion, the agricultural activities on the site have decreased and now have ceased. The land use changes have included (see historical aerial photographs in Figures 1930-1956 to 2002-2012), by:

- 1930, extensive farming activities with canopy vegetation along the drainage swale in the west of the site and nearby;
- 1956, farming activities with understorey clearing along the drainage swale in the west and a dam offsite to the north of the site;
- 1965, clearing of the drainage swale south of Augusta Street and the high voltage pylons installed in the south of the site;
- 1970, the Great Western Highway built along the northern boundary, agriculture decreasing east of Blacktown Creek onsite, but intensifying west of the creek;
- 1986, market gardens having ceased onsite;
- 1991, the Western Motorway (M4) being built to the south of the site; and
- 2012, Raging Waters (Wet n Wild) construction commenced to the south of the site and all remaining farm houses onsite have been demolished.

Garden plantings associated with buildings on the former agricultural (see historical aerial photographs in Figures 1930-1956 to 2002-2012), by:

- 1930, east of drainage swale in west on hilltop; houses / sheds with minor tree planting, and in west house with approximately seven trees;
- 1956, east of drainage swale on the hilltop; expansion houses / sheds with minor tree planting and hedging with intensive cropping, and in the east expansion of house / sheds with increase in height of the seven planted trees and additional tree planting with intensive cropping and an orchard;
- 1965, houses / sheds located west of the drainage swale with no obvious tree plantings, agriculture intensified east of the drainage line with most of the former tree plantings removed, hedge retained around one of the buildings and minor fence row plantings, and in east building reduced with retention of some of the planted trees;
- 1970, expansion of buildings in south-west, intensive agriculture east of the drainage swale with few trees, and in east similar to 1965 with growth of planted trees;
- 1978, treeless in south-west, east of drainage swale growth and possible addition of planted trees associated with the buildings, and in east building reduced to scattered sheds and planted trees reduced in number with a new house surrounded by a hedge established offsite to the south-west;
- 1986, treeless in south-west, east of drainage swale market gardens having ceased onsite, houses / sheds reduced and fire scar south of the houses /sheds; and in east, buildings removed with house surrounded by a hedge retained offsite to the south-west;

- 1991, vegetation cleared in north-west with minor retention of native vegetation, south-west cleared with building and no trees, east of the drainage swale building reduced and minor growth of planted trees, and in east no buildings retained, with hedge of former house site retained offsite to the south-west;
- 1998 and 2002, south-west and north-west as in 1991, east of the drainage swale similar to 1991, and in the east no buildings and decline of planted trees and offsite hedge; and
- 2012, all remaining farm houses onsite have been demolished and expansion of planted trees.

The landform onsite has been modified as a result of the past land uses (see landform on Figures 1d-1, 1d-2), including:

- in the east, two rectangular levelled sloping areas approximately 200 m long and approximately 50 m wide;
- a soil mound (probably from an excavated agricultural dam) potentially intruding into Blacktown Creek;
- an approximately 20 m x 20 m levelled area close to the drainage line in the southwest, with a grassed soil mound adjoining it upslope; and
- irregular mounds associated with the telephone tower on the former agricultural land.

B4.2 Biodiversity findings onsite

B4.2.1 Arborist's survey

Canopy Consulting (2023) assessed a total of 565 trees or groups of trees onsite (Note: trees under the Blacktown DCP are defined as at least 3 m in height, and/or a trunk diameter of at least 200 mm measured 1.0 m above ground level).

Of the 28 species identified by the arborist, there were only 4 local native species (*Acacia* sp., *Eucalyptus moluccana, Eucalyptus tereticornis, Melaleuca linariifolia*). The remaining 24 species recorded were either exotic (12 species) or non-local native (12 species) (planted and/or naturalised onsite).

The most frequently recorded trees were the local native canopy trees *Eucalyptus moluccana* (178 trees) and *E. tereticornis* (203 trees), followed by non-local native tree *Grevillea robusta* (39 trees) (distribution on site shown on Figures 6d-1, 6d-2).

From height class data, 76% (290) of the 381 (178+203) local native canopy trees are more than 10 m tall. The dense weedy understorey appears to have suppressed natural regeneration from eucalypt seed-showers, with less than 5 m height and 24% of these native trees in the 5-10 m height range with only 1.3% (5 trees) in the <5 m height range.

For the 39 *Grevillea robusta,* there were eight trees with > 10 m height (trees 76, 298, 299, 324, 333, 334, 336, 337). Of these eight trees , there were only three trees with > 30 cm DBH (trees 299, 324, 332) [Note tree 317 had a height 9 m and DBH of 34 cm]. Most of the 39 trees appeared to have self-seeded from a small number of planted *Grevillea robusta* parent trees (see Figure 6d-1).

The three larger trees of *Grevillea robusta* were close to the former house site and may have been part of the planting associated with the gardens (the three potential parent trees are visible on historical 2002, 1998, 1991,1986 and possibly 1978) aerial

photographs (Figures 1978–1986,1991-1998, (2002-2012, parent trees identified on Figure 6d-1),

Similarly for the other garden plantings, based on the recorded tree heights there appears to have been self-seeding from *Araucaria columnaris* (widely planted and native to New Caledenia), *Erythrina crista-galli* (widely planted native to south America), *Jacaranda mimosifolia* (widely planted, native of Argentina and Bolivia), *Ligustrum lucidum* (widely historically planted for hedging, native to China and Japan).

Species recorded, number of trees and height classes

Exotic/ non-local	Species	Number of trees recorded	Height class			
			<5 m	5-9 m	10-19 m	20-29 m
	Acacia sp.	3 (incl. a group of 10)	2 (incl group)	1		
*	*Araucaria columnaris*	4		3	1	
#	*Archontophoenix cunninghamiana*	2			2	
#	*Callistemon citrinus*	1	1			
#	*Callistemon viminalis*	1		1		
*	*Cotoneaster* sp.	1	1			
*	*Cupressus sempervirens*	2		2		
	Dead tree	51	1	11	30	9
*	*Erythrina crista-galli*	12		6	6	
*	*Erythrina* X *sykesii*	5	1	4		
#	*Eucalyptus camaldulensis* var. *obtusa*	2			1	1
#	*Eucalyptus microcorys*	1			1	
	Eucalyptus moluccana	178	4	43	79	52
#	*Eucalyptus robusta*	1			1	
	Eucalyptus tereticornis	203	1	43	124	35
#	*Ficus macrophylla*	1		1		
#	*Grevillea robusta*	39	7	24	8	
*	*Jacaranda mimosifolia*	2	1	1		
*	*Ligustrum lucidum*	16	4	12		
*	*Liquidambar styraciflua*	2		2		
#	*Livistona australis*	2		2		
#	*Lophostemon confertus*	2		2		
	Melaleuca linariifolia	3		2	1	
#	*Melia azedarach*	3	1	2		
*	*Olea europaea*	18	5	13		
*	*Pinus radiata*	2		1	1	
*	*Pistacia chinensis*	3	1	2		
*	*Prunus* sp.	1	1			
*	*Syagrus romanzoffiana*	2		2		
	Unknown species	2	2			
	Total	**565**				

Note: * = exotic, # = non-local native

Of the 381 local native canopy trees (178 *Eucalyptus moluccana* and 203 *E. tereticornis*) heath rating ranged from Dead, Very poor, Poor, Fair to Good. The percentage of trees in Good health was higher for *E. moluccana* (70%) than *E. tereticornis* (53%).

Overall, only 61% of the local native canopy species (231 of the 381 trees) were in Good health.

Native canopy tree species	Height	Number of trees	Dead	Very poor	Poor	Fair	Good	% good of total
Eucalyptus moluccana	<5 m	4				1	3	75%
	5-9	43				12	31	72%
	10-19	79				24	55	70%
	20-29	52			2	15	35	67%
	Total	**178**	**0**	**0**	**2**	**52**	**124**	**70%**
Eucalyptus tereticornis	<5 m	1				1		0%
	5-9	43		1	1	24	17	40%
	10-19	124	1	1	6	48	68	55%
	20-29	35	1	1	0	11	22	63%
	Total	**203**	**2**	**3**	**7**	**84**	**107**	**53%**
Overall native canopy trees	**Total**	**381**	**2**	**3**	**9**	**136**	**231**	**61%**

B4.2.2 Biodiversity Survey

Two Vegetation types were recorded onsite (Figure 6c):

Vegetation mapped as	Area on site	Sampled in ACA Plots	Sampled in EP Plots
PCT 3319	2.37 ha	ACA Plots 4, 5, 7, 8, 9 with ACA Plot 2 mainly offsite to the east.	EP Plots 1, 2.
Predominantly exotic or hardstand	24.27 ha	ACA Plots 1, 3, 6	EP Plots 3, 4, 5, 6, 7
Total area	26.642 ha		

PCT 3319 *Cumberland Shale Hills Woodland*

Approximately 10% of the site supports degraded PCT 3319, located:

- in the NW corner;
- in the NE corner;
- along the southern boundary near the M4 Motorway; and
- along the drainage swale in the west.

The composition of vegetation and covers recorded in the plots reflects the historical land use. The cover by native canopy trees, *Eucalyptus moluccana* and *E. tereticornis*, was a major component of the native cover recorded in the Plots, namely:

Plot	Location	Number of species (% cover) recorded					% native to total (% native cover to total cover)
		Total	Native	Native trees	Exotic	Non-local native	
Ecoplanning (2020)							
Plot 1	In the south close to M4 Motorway	38 (73%)	18 (52%)	2 (38%)	20 (20%)	0	47 (72%)
Plot 2	In the south close to M4 Motorway	34 (74%)	16 (33%)	2 (7%)	18 (40%)	0	47 (45%)
ACA survey							
ACA-2	NE corner mainly offsite	51 (78%)	32 (57%)	2 (26%)	19 (22%)	0	63 (73%)
ACA-4	Swale in east	40 (118%)	17 (56%)	2 (29%)	22 (62%)	1 (0.1%)	43 (53%)
ACA-5	Swale in east	17 (90%)	5 (11%)	2 (10.5%)	12 (79%)	0	29 (13%)
ACA-7	NW corner	47 (115%)	30 (68%)	1 (50%)	16 (47%)	1 (0.1%)	64 (59%)
ACA-8	Swale in east	27 (52%)	8 (19%)	2 (15%)	17 (30%)	1 (0.1%)	36 (36%)
ACA-9	Swale in east	44 (75%)	16 (41%)	2 (9%)	27 (33%)	1 (0.1%)	36 (55%)

Predominantly exotic vegetation or hardstand

Approximately 90% of the 26.64 ha site is mapped as cleared/unmapped, shown on the following figures in the BDAR:

- Biodiversity Value Map with approximately 3 ha mapped (Figure 2e);
- Vegetation mapping by OEH (2016) and DPE(2022) (Figures 4a, 4b);
- Vegetation conservation significance assessment classes (Figure 13 in Huntingwood Precinct DCP in Appendix 4 of the BDAR); and
- Vegetation mapping based on recorded data (Figure 7a).

This mapping unit includes the former farming land, the swampy depression associated with Blacktown Creek and the hardstands of the industrial land.

Along fence lines and in the depression, the High Threat weed *Rubus anglocandicans* showed vigorous growth in response to the fertile agricultural soils.

On the former farming land (sampled in ACA Plots 1, 3 and EP Plots 3 to 5), there were occasional clusters of paddock trees including sparse local native canopy species and a general absence of native shrubs, except 0.1% cover recorded by the weedy native *Pittosporum undulatum* along a fence line. The distribution of trees on the farmland was identified by Canopy Consulting (2023) (Figure 6d-1). [Note: the cluster of the north coast species *Grevillea robusta* in the west of the farmland appears to be spread from planted individuals associated with the former farm houses].

The native understorey cover was low with 1.3% and 2% recorded in the ACA Plots 1, 3. The understorey was dominated by exotic pasture grasses including *Cenchrus clandestina, Paspalum dilatum* with *Eragrostis curvula.*

Along Blacktown Creek (sampled in EP Plots 6, ACA Plot 6) was a treeless swampy depression colonised by wind-blown seeds of cosmopolitan *Typha* sp. and the exotic rush *Juncus acutus* along the margins. Blackberry *Rubus anglocandicans* formed impenetrable thickets on the upper sections and extending into the swamp.

B4.2.3 Observations

Vegetation and fauna habitat on the site

Vegetation in all parts of the site has been greatly modified and disturbed, by historic agricultural use, by former house sites and their surrounding gardens, and by spreading of excavation waste (which in some parts forms large mounds), with:

- the greater part of the site is weedy paddocks with occasional scattered groups of trees;
- at the Flushcombe Road end, there were several lots occupied by businesses and residences;
- the drainage lines onsite, Blacktown Creek in the east and the swale in the west, are dominated by exotic weeds, although with emergent eucalypts surviving along the swale in the west;
- the riparian zone of Blacktown Creek is treeless and swampy and the creek water concealed beneath a broad swathe of wetland plants, both exotic and native-cosmopolitan, and with adjoining belts of blackberries; and
- the source of the water in the drainage lines along the swale in the west is from stormwater pond(s) south of the M4 Motorway and in Blacktown Creek from treated water from the Wet n Wild and untreated water from stormwater ponds south of the M4 Motorway.

BAM Plot 1

This plot sampled the degraded pasture on eroding clay soil, on the level ridgetop midway between the two creeklines. The plot was oriented north-south with its floristic quadrat close to the southern verge of the eastward continuation of Augusta Street. Trees and shrubs were absent from the whole plot, with exotic grasses accounting for close to 100 per cent of the vegetation cover. Most abundant was *Paspalum dilatatum*, followed (in descending order) by *Briza subaristata, Lolium perenne, Avena barbata, Cenchrus clandestinus* and *Eragrostis curvula.* Of broad-leaved weeds there was a moderate diversity but small cover; they included *Cirsium vulgare, Hypericum perforatum, Hypochaeris radicata, Plantago lanceolata, Sonchus oleracea* and *Vicia tetrasperma.*

Only 6 species of native plants were recorded, nearly all contributing very small cover. They included the grasses *Aristida ramosa, Dichelachne micrantha* and *Themeda triandra,* the latter mainly in a patch beside Augusta Street; the graminoids *Dianella longifolia* and *Lomandra filiformis;* and the small herb *Wahlenbergia gracilis.*

BAM Plot 2

This plot sampled a relatively intact patch of woodland in the far north-east, of which only a minor part was within the site's boundary as designated, but which is arguably the least disturbed remnant of native vegetation available in the vicinity. Its floristic composition can thus be assumed to reflect the pre-clearing composition on

topographically similar parts of the site. The patch lies in a shallow gully falling to the north and containing a small ephemeral creek. The tree canopy in and around the plot's floristic quadrat was dominated by *Eucalyptus tereticornis* and E. moluccana, neither with trees more than about 15 m tall or 0.3 m diameter, indicative of regrowth of the woodland within the last 50 years or as little as 25 years. The understorey was dominated by the shrubs, mainly *Acacia fimbriata* (up to 7 m tall) with lesser numbers of *A. implexa* and *A. falcata*; also *Bursaria spinosa*, though sparse. Smaller native shrubs were absent, but native grasses and graminoids were surprisingly diverse: species recorded were (grasses) *Aristida ramosa, A. vagans, Dichelachne micrantha, Digitaria diffusa, D. parviflora, Microlaena stipoides* (c. 5% cover), *Paspalidium distans, Rytidosperma racemosum, Themeda triandra* and (graminoids) *Arthropodium milleflorum, Caesia parviflora, Cyperus gracilis, Dianella longifolia, Fimbristylis dichotoma, Lomandra filiformis* and *Tricoryne elatior.* Native dicots in the groundlayer included *Dichondra repens* (extensive mats in places), *Einadia hastata, Glycine clandestina, G. tabacina, Grona varians, Oxalis perennans, Phyllanthus virgatus, Senecio hispidulus* and *Wahlenbergia gracilis.*

Exotics were well represented though hardly to the exclusion of natives. The only one of tree size was *Olea europaea* subsp. *cuspidata,* with one 4 metres high, the rest juveniles. *Lantana camara* was widely scattered through the quadrat but lacking vigour. The main weedy grass was *Eragrostis curvula,* forming quite dense patches in some parts. In openings among the trees *Paspalum dilatatum w*as common, as well as *Paspalum notatum*, a far more recent invader in the Sydney region. *Asparagus asparagoides* was present in many parts, with lesser occurrences of *A. officinalis. Sida rhombifolia* was abundant in some of the openings. Some of the more common annual and biennial weeds were recorded, such as *Bidens* spp. and *Sonchus oleraceus.*

BAM Plot 3

This plot sampled the area of pasture land with scattered groups of regenerating trees on the low ridge between Blacktown Creek and the site's north-east corner. The ridge crest there falls gently to the north. At the time of this survey there had been good rains earlier in the month and the grass was tall and thick. The grass cover consisted entirely of exotic species, dominated by *Cenchrus clandestinus* with *Paspalum dilatatum* and *Chloris gayana* as minor components. Broadleaved exotics were scattered sparsely through the grass, including *Sida rhombifolia, Foeniculum vulgare, Bidens pilosa* and *Cirsium vulgare.*

In the tree and shrub layers again only exotics were recorded in the floristic quadrat, except for two trees of *Eucalyptus moluccana* forming a small group; one of the eucalypts was a mature tree approximately 25 m tall and 0.5 m DBH, with plants of the native mistletoe *Amyema pendula* on its branches. Sheltered by the eucalypts were the exotics *Olea europaea* subsp. *cuspidata,Lycium ferocissimum, Lantana camara* and *Araujia sericifera.*

An additional native shrub observed in the 'tail' of the plot was *Acacia falcata,* as several plants approximately 2 m tall in the tall grass.

BAM Plot 4

This plot sampled a patch of moderately dense degraded woodland on the northern boundary about 40 m east of the unnamed western creek. It was positioned on a gentle slope to the west, adjoining the batter of the Great Western Highway. It was at the edge of the pasture land that extends westward onto the low ridgeline and appeared to consist of regenerating trees (both native and exotic), with some grassy openings among the trees.

The native canopy consisted of *Eucalyptus tereticornis* up to about 25 m tall and a smaller number of *E. moluccana*, to 20 m. Part of the 20 m x 20 m floristic quadrat had a dense subcanopy of the exotics *Olea europaea* subsp. *cuspidata, Ligustrum sinense* and *L. sinense*, blocking light to the soil. In the more open part there were several mature shrubs of *Bursaria spinosa* up to 4 m tall.

In the groundlayer there were significant occurrences of native species: the grasses *Aristida ramosa, Bothriochloa macra, Cynodon dactylon, Microlaena stipoides* and *Sporobolus creber* – all with small cover except *Microlaena* which was moderately profuse in parts – graminoids *Carex inversa, Cyperus gracilis, Lomandra filiformis*; and forbs *Asperula conferta, Dichondra repens, Geranium solanderi, Glycine clandestina, G. tabacina* and *Wahlenbergia gracilis.* Of the forbs *Dichondra repens* and *Glycine tabacina* were the only ones contributing significant cover, and only in the less shaded parts.

Exotics dominated the cover in both subcanopy (see above) and groundlayer. In the openings the grasses *Chloris gayana, Paspalum dilatatum, P. notatum, Sporobolus africanus;* forbs *Bidens pilosa, Conyza sumatrensis, Gomphocarpus fruticosus, Plantago lanceolata, Senecio madagascariensis, Sida rhombifolia, Tradescantia fluminensis and Verbena bonariensis.* Exotic climbers and scramblers were moderately abundant, including *Anredera cordifolia, Araujia sericifera*, *Asparagus aethiopicus, A. asparagoides* and *Lantana camara.* The shrub *Lycium ferocissimum* was also present in parts.

BAM Plot 5

This plot sampled the riparian zone of the sluggish drainage that flows from south to north across the west of the site. The creek was heavily shaded by trees, with tall eucalypts emergent above a dense subcanopy of exotics. *Eucalyptus moluccana* predominated, up to 25 m tall, with *E. tereticornis* uncommon and smaller (at least within the floristic quadrat). The dominant exotic tree in the subcanopy was *Erythrina crista-galli*, at up to 13 m tall; additional exotic small trees were *Ligustrum lucidum, L. sinense* and *Olea europaea* subsp. *cuspidata* – all of them abundant. There was also a native palm *Livistona australis*, though only as a few young plants (doubtfully a local native in western Sydney and probably spread from cultivation). The native shrub *Bursaria spinosa* was present but rare in the plot, with a few weak specimens; it is intolerant of deep shade.

The only native groundlayer plant was the grass *Microlaena stipoides*, though sparse. Apart from the trees already mentioned, exotic climbers and scrambling shrubs were common, *Lantana camara* the most abundant but *Anredera cordifolia* and *Cardiospermum grandiflorum* both quite frequent. The shade tolerant exotic grass *Ehrharta erecta* and the exotic forb *Tradescantia fluminensis* were among the very few groundlayer plants recorded.

BAM Plot 6

This plot sampled the swampy bed and banks of Blacktown Creek in the treeless central depression. If lobes of the adjacent better drained paddock soil were excluded (not surveyed) the vegetation structure and floristics were very simple. Dominating most of the centre was the tall native aquatic *Typha domingensis*, with cover up to 90%. Towards the margins there were narrower belts of the aquatic sedge *Bolboschoenus caldwellii.* The exotic rush *Juncus acutus* was also prominent, forming rows of large spiny tussocks along the margins. The common blackberry *Rubus anglocandicans* grew in large patches along banks of the swamp, with some patches extending well into the swamp.

BAM Plot 7

This plot sampled a narrow strip of remnant woodland on the verge of Flushcombe Road outside the western fenceline. The road runs in a shallow cutting, at most about 1.5 m deep, with an earth batter rising to a level top that, judging from the soil profile, was part of the original land surface. The batter exposed decomposed shale and mottled subsoil characteristic of the Wianamatta Shale geology (see photograph in Appendix 5). The narrowness of the verge necessitated the use of a 100 m x 10 m plot configuration, with the 40 m x 10 m floristic quadrat at its north end. Inside the security fence was an industrial premises (Red Lea Chickens vehicle workshop, not accessible at time of survey) with a large shed around which were some scattered remnant trees in slashed long grass. On the road verge there was denser tree cover of approximately 50% and an apparently unmanaged understorey with many natives persisting plus some taller woody weeds and exotic grasses, these dense in parts.

The only eucalypt recorded was *Eucalyptus moluccana* with cover of approximately 50%. The trees were up to about 27 m tall and 0.4 m DBH, in a still vigorous stage of growth; age was estimated at 30 to 40 years. Some trees supported the native mistletoe *Amyema miquelii*. The native shrub *Bursaria spinosa* was present as a single plant 2 m tall; the only other native shrub was *Dillwynia sieberi* with several young plants recorded. Of exotic shrubs only a few sparse plants of *Lantana camara* were present. Native groundlayer plants were quite diverse with 26 species recorded, including: grasses *Bothriochloa macra, Chloris ventricosa, Cynodon dactylon, Entolasia marginata, Eriochloa pseudoacrotricha, Microlaena stipoides, Rytidosperma racemosa, Paspalidium distans, Paspalum orbiculare, Rytidosperma racemosum* and *Sporobolus creber*; the graminoid (sedge) *Cyperus gracilis;* forbs/subshrubs *Brunoniella australis, Calotis lappulacea, Dichondra repens, Einadia hastata, E. nutans, E. polygonoides, E. trigonos, Eremophila debilis, Euphorbia drummondii, Hardenbergia violacea, Oxalis perennans, Phyllanthus virgatus* and *Vittadinia cuneata.* Some of these groundlayer plants were found only on the denuded subsoil of the road cutting.

The exotic grasses *Eragrostis curvula, Paspalum dilatatum, Chloris gayana,* and *Ehrharta erecta* dominated the less shaded parts of the plot above the cutting: in particular *Eragrostis curvula* made up to 70% cover in some patches. The most abundant broad-leaved weeds were *Plantago lanceolata* and *Sida rhombifolia. Asparagus asparagoides* was widely scattered through the plot.

BAM Plot 8

This plot sampled a patch of vegetation, appearing densely wooded on aerial imagery, at the foot of the slope on the east side of the drainage swale with water flowing north from under Augusta Street to exit the site in a culvert beneath the Great Western Highway. The plot commenced within the angle of two old chainlink fences, probably on the west and south boundaries of Lot 219 DP457024, and extended north paralleling the western fence. The 20 m x 20 m floristic quadrat extended about 5 m across the fence into the next lot on the west.

The ground in this plot was greatly disturbed, with ground-hollows and low mounds, some containing rubble that appeared to originate from demolition of a brick house.

The plot was dominated by quite tall eucalypts, with several mature *Eucalyptus moluccana* up about 25 m tall and up to 0.8 m trunk diameter. Most trees of *E. teretifolia* appeared to be much younger and concentrated in the lower flat area on both sides of the fenceline. Beneath the canopy trees there was very little native understorey, with no native subcanopy trees or shrubs. Of native groundlayer plants

only 5 species were recorded with the only ones with appreciable cover being the grass *Oplismenus aemulus* and the forb *Dichondra repens.*

Exotic plants dominated the understorey. The subcanopy layer was dominated by *Olea europaea* subsp. *cuspidata* and the privets *Ligustrum lucidum* and *L. sinense*, all 3–4 m tall. Conspicuous among these were several plants of the tree prickly pear cactus *Opuntia monacantha* up to 3 m tall. *Lantana camara* and *Senna pendula* were also quite abundant and there was one clump of the tall invasive grass *Cortaderia selloana.* The climber *Anredera cordifolia* was abundant along the fenceline and on some smaller trees. In the groundlayer the weed grasses *Cenchrus clandestinus, Chloris gayana* and *Ehrharta erecta* contributed most of the cover. There were a few common dicot weeds, the most abundant being *Bidens pilosa.*

BAM Plot 9

This plot sampled the degraded vegetation between Plot 4 and Plot 8 to the east of the swale. The canopy was disturbed with a large grassy opening with only scattered understorey species present. Rubbish has been dumped throughout this area.

The native canopy consisted of *Eucalyptus tereticornis* and *E. moluccana* up to about 18 m tall with some eucalypt regeneration recorded. The understorey included sparse covers by the native species *Pittosporum undulatum* and *Bursaria spinosa*, and high covers of exotic species *Ligustrum sinense, Lantana camara, Ligustrum lucidum* and *Olea europaea* subsp. *cuspidata.*

Of the 12 native groundcover species recorded, the grasses, *Cynodon dactylon* dominating with up to 40% cover and low cover by *Microlaena stipoides* and *Rytidosperma racemosum,* the graminoids *Carex inversa, Juncus usitatus* and *Lomandra filiformis* subsp*. filiformis,* and forbs/subshrub *Dichondra repens, Einadia nutans* subsp*. linifolia, Euchiton sphaericus, Geranium solanderi, Plectranthus parviflorus* and *Glycine tabacina.*

The groundcover was dominated by exotic grasses, especially *Ehrharta erecta* with the scattered cover of *Paspalum dilatatum, Sporobolus africanus, Setaria parviflora* and *Eragrostis curvula.* The exotic shrub C*otoneaster glaucophyllus* and the exotic forbs including *Aster subulatus, Cirsium vulgare, Conyza sumatrensis, Hypochaeris radicata, Modiola caroliniana, Plantago lanceolata, Senecio pterophorus, Sida rhombifolia, Solanum americanum, Verbena bonariensis* and *Vicia tetrasperma* were also recorded. The High threat weeds recorded were *Anredera cordifolia, Asparagus aethiopicus, Asparagus asparagoides, Bidens pilosa, Senecio madagascariensis* and *Senna pendula* var. *glabrata.*

B4.3 Most likely Plant Community Types (PCTs) on the site

The online *Plot to PCT Assignment Tool* was used to determine the most likely PCTs for the vegetation recorded in Plots 1 to 9.

It is stated on the Department of Planning and Environment website (accessed 3 May 2023) that:

> *The tool provides a standardised repeatable method for identifying quantitative PCTs using the floristic survey methods required under the NSW Biodiversity Assessment Method (BAM).*
>
> ...
>
> *The Tool uses the species and cover-abundance score data in the uploaded data matrix to compare each site with the floristic assemblages of each of the 1,067 quantitative Approved PCTs of the coast and tablelands bioregions. These*

quantitative PCTs are each defined by a specific group of existing classified reference sites (also known as PCT member plots). The Tool applies an algorithm that generates a measure of the floristic difference between each uploaded site and the central value or 'centroid' of the reference sites that define each PCT. This measure is called the 'distance to centroid', a value that ranges between 0 and 1 and is based on the Bray-Curtis dissimilarity index.

An uploaded site with floristic data very similar to a PCT's centroid definition will have a low distance to centroid value for that PCT, indicating a strong match. Weaker matching results have higher distance to centroid values (closer to 1), or higher dissimilarity. The Tool identifies and displays the 10 PCTs with the lowest distance values for each uploaded site, as these have the strongest match to the species assemblage of the site(s).

Distance to centroid values of 0.695 or less … indicate the site meets the floristic match threshold for that PCT. This threshold value is an important metric for deciding on the best-fitting PCT.

The Plot to PCT Assignment Tool User Guide provides explanation for a weak floristic PCT match (high distance to centroid). This can indicate high levels of disturbance, high weed occurrence, or low number and cover by native species (Section 7.2 *Understanding centroid match results* of the Plot to PCT Assignment Tool User Guide), namely :

One common driver of high distance to centroid values is sites that have lower native species richness than is typical for the PCT. Common examples are disturbed sites where some elements of the expected floristic assemblage are no longer present. ... Sites where only a partial floristic inventory has been completed can also result in weaker PCT matches

From applying the online tool to the data recorded in the ACA Plots 1 to 9, the best four PCT floristic matches are the following (centroid values of 0.695 or less are shaded green in the table below). [It should be noted that there was a high percentage of exotic species recorded in the plots and for the Plot to PCT tool only native species are entered], namely:

Plot	PCT Match 1	Distance to centroid1	PCT Match 2	Distance to centroid2	PCT Match 3	Distance to centroid3	PCT Match 4	Distance to centroid4	PCT Match5	Distance to centroid5
1	3877	0.822	3320	0.842	3350	0.848	3406	0.849	3372	0.855
2	3320	0.605	3319	0.648	3329	0.698	3328	0.713	4025	0.714
3	4121	0.884	3512	0.920	3314	0.939	3489	0.939	3319	0.942
4	3336	0.631	3319	0.637	3320	0.684	3396	0.697	4023	0.706
5	4125	0.854	4025	0.863	3319	0.873	4142	0.877	4068	0.878
6	4065	0.867	4094	0.922	3966	0.947	3975	0.955	3976	0.956
7	3319	0.680	3485	0.688	3431	0.695	4023	0.705	3397	0.712
8	3319	0.836	4023	0.842	3264	0.861	3318	0.862	3316	0.863
9	4088	0.741	4023	0.764	3319	0.778	4089	0.783	3320	0.797

Only three plots (Plots 2, 4, 7) have the floristic threshold met (centroid value of 0.695 or less) for the following 5 PCTs (PCT 3319, 3320, 3336, 3431, 3485):

Plot	PCTs where floristic threshold was met (from strongest to weakest based on the distance to centroid value)
1	none
2	3320, 3319
3	none
4	3336, 3319
5	none
6	none
7	3319, 3485, 3431
8	none
9	none

Of these five PCTs, only two PCTs occur in the Cumberland IBRA Subregion of the Sydney Basin Bioregion, namely, PCT 3319 and PCT 3320:

PCT	PCT name	IBRA Subregion
3319	Cumberland Shale Hills Woodland	**Cumberland**, Burragorang
3320	Cumberland Shale Plains Woodland	**Cumberland**, Wollemi, Yengo
3336	Hunter Range Basalt Peaks Red Gum-Velvet Wattle Forest	Yengo
3431	Central Hunter Ironbark Grassy Woodland	Liverpool Range; Ellerston; Upper Hunter; Hunter; Kerrabee
3485	Central Hunter Slaty Gum Grassy Forest	Hunter;Kerrabee

The descriptions of the two best matched PCTs 3319 and PCT 3320 are as follows :

Description from the online PCT profile (Vegetation Classification public application)
PCT 3319 Cumberland Shale Hills Woodland A tall to very tall sclerophyll woodland to open forest with a mid-stratum of soft-leaved shrubs and small trees with a grassy ground cover that is extensive on rises and upper slopes of hills south from Cecil Hills, in the south-western part of the Cumberland Plain to the west of Sydney. It is most extensive in Campbelltown, Camden and Wollondilly local government areas. The canopy commonly includes Eucalyptus moluccana and Eucalyptus tereticornis, with a sparse shrub to small tree layer which very frequently includes Bursaria spinosa and at least one species of Acacia, of which Acacia implexa is most frequent. The presence of Acacia implexa helps distinguish this PCT from PCT 3320, which has a similar assemblage and structure. The mid-dense ground layer typically includes forbs, grasses and twiners. Dichondra repens is almost always present and Microlaena stipoides, Desmodium varians, Brunoniella australis and Aristida ramosa are very frequent. This PCT typically occurs in a warm, moist climate between 90-300 metres asl. It has been heavily cleared and now occurs in small remnants with varying levels of disturbance within a rural landscape. The canopy in these remnants often comprises immature cohorts of trees that have regenerated after thinning or clearing. The distribution of this PCT overlaps with PCT 3320 between Cecil Hills and the Nepean River, in which area of overlap PCT 3319 typically occurs on higher elevation hills and ridges. This PCT grades into PCT 3318 on lower protected slopes in the more dissected hills around Cecil Hills and the Razorback Range, and into PCT 3321 near the interface with the sandstone plateaus on the edge of the Cumberland Plain. PCT 3318 includes shrubs, ferns and vines typical of sheltered habitats that are rare in this PCT. Ironbark eucalypts are very frequent and Eucalyptus punctata is common in the canopy of

Description from the online PCT profile (Vegetation Classification public application)
PCT 3321, and Eucalyptus moluccana and Eucalyptus tereticornis are both rare. **TEC list** Listed BC Act: Critically Endangered Ecological Community: Cumberland Plain Woodland in the Sydney Basin Bioregion (Part); Listed EPBC Act: Critically Endangered: Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Part).
PCT 3320 Cumberland Shale Plains Woodland A tall sclerophyll open forest to woodland with a sparse mid-stratum of soft-leaved shrubs and small trees with a grassy ground cover on the undulating shale plains of western Sydney. The canopy very frequently includes Eucalyptus tereticornis and Eucalyptus moluccana, with ironbarks (Eucalyptus crebra and Eucalyptus fibrosa) occasionally present however prominent in localised areas. The sparse shrub to small tree layer very frequently includes Bursaria spinosa and one or more species of Acacia, of which Acacia parramattensis, Acacia decurrens and Acacia falcata are the most frequent and abundant. Presence of these Acacia species helps to distinguish this PCT from PCT 3319 which typically includes Acacia implexa. The mid-dense ground layer typically includes grasses, forbs, twiners and a hardy fern. Microlaena stipoides is almost always present and Themeda triandra, Dichondra repens, Brunoniella australis, Cheilanthes sieberi subsp. sieberi, Desmodium varians, Aristida vagans and Glycine tabacina are very frequent. This is the most widespread PCT on the Cumberland Plain, occupying much of the plain between Bankstown and the Hawkesbury and Nepean rivers. It typically occurs in a warm, moist climate below 120 metres asl however can occur up to 200 metres asl on the undulating terrain between Douglas Park and Campbelltown to the east of the Nepean River. While widespread, this PCT primarily occurs in small, often disturbed patches within a rural or urban matrix. In the hilly country to the west of the Nepean River, this PCT is replaced by PCT 3319. On thinner shales above sandstone around the periphery of the Cumberland Plain, it grades into PCT 3321. Ironbarks are very frequent and Eucalyptus punctata is common in the canopy of PCT 3321, and Eucalyptus moluccana and Eucalyptus tereticornis are both rare. **TEC list** Listed BC Act: Endangered Ecological Community: Shale Gravel Transition Forest in the Sydney Basin Bioregion (Part); Listed BC Act: Critically Endangered Ecological Community: Cumberland Plain Woodland in the Sydney Basin Bioregion (Part); Listed EPBC Act: Critically Endangered: Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Part).

All three Plots 2, 4, 7 with matches (<0.695 centroid value) in the Plot to PCT tool are on upper sections of the site on rolling hills. Given the degraded state of the vegetation, and similarity of the two PCTs 3319 and 3320, the best match is more likely to be *PCT 3319 Cumberland Shale Hills Woodland* than *PCT 3320 Cumberland Shale Plains Woodland* due to the topography.

B4.4 Threatened ecological communities (TECs)

There are listed TECs associated with the best match PCT 3319 namely:

PCT	Associated TEC
PCT 3319 - Cumberland Shale Hills Woodland	*Listed BC Act: Critically Endangered Ecological Community: Cumberland Plain Woodland in the Sydney Basin Bioregion (Part);* *Listed EPBC Act: Critically Endangered: Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Part).*

It was found from a comparison of the recorded data in Plots 4, 5, 7, 8, 9 with the Final Determination and Conservation Advice (Appendix 10), that:

Cumberland Plain Woodland in the Sydney Basin Bioregion under the *BC Act:*

- there were limited areas of semi-intact vegetation adjoining the site meeting the criteria for *Cumberland Plain Woodland in the Sydney Basin Bioregion,* being mainly offsite to the north-east adjoining Prospect Highway (sampled in Plot 2) and on the road verge of Flushcombe Road to the north-west (sampled in Plot 7).
- at least part of the approximately 2 ha of vegetation with regrowth native canopy trees in the western drainage swale meets the criteria for highly degraded *Cumberland Plain Woodland* (sampled in Plots 4, 5, 8, 9);
- part of the vegetation in the western drainage swale is growing on dumped building material, especially in Plots 8, 9;
- there was dense woody weed occurrence widespread in the western drainage swale; and
- following more than 150 years of intensive agriculture, none of the paddock meets the criteria for *Cumberland Plain Woodland*.

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest under the *EPBC Act:*

- the condition thresholds were not met for vegetation onsite, nor for the road reserve (sampled in Plot 7); and
- the patch sampled in Plot 2, mainly offsite to the northeast adjoining the Prospect Highway, appears to satisfy the thresholds.

B4.5 Vegetation Zones

Two Vegetation Zones within the best fit PCT 3319 are mapped onsite. The remainder of the site is mapped as *predominantly exotic or hardstand* associated with the former agricultural use or more recently industrial use (Figures 6c, 7a).

Vegetation Zones	Area on site	Sampled in ACA Plots
PCT 3319 - Degraded	2.03	Plots 4, 5, 8, 9
PCT 3319 – Less degraded	0.34	Plots 2 (mainly offsite), Plot 7
Predominantly exotic or hardstand	24.27 ha	Plots 1, 3, 6
Total area	26.642 ha	

B4.6 Vegetation integrity (vegetation condition)

B4.6.1 Vegetation integrity of individual survey plots

Using the data recorded in the ACA Plots 1 to 9, the Vegetation Integrity Scores (VIS) for each of the plots are as follows:

Assumed PCT	Sampled in	Vegetation mapped as	Composition condition score	Structure condition score	Function condition score	Current vegetation integrity score
PCT 3319	Plot 1	Predominantly exotic grassland	12.7	0	14.9	1.3
	Plot 2*	Less degraded	80.4	40.8	45	52.9

Assumed PCT	Sampled in	Vegetation mapped as	Composition condition score	Structure condition score	Function condition score	Current vegetation integrity score
	Plot 3	Predominantly exotic grassland	2.3	15.4	24.3	9.5
	Plot 4	Degraded	38.8	40.4	68.9	47.6
	Plot 5	Degraded	6.5	3.3	79.5	11.9
	Plot 6	Predominantly exotic grassland	1.5	42.1	0	4
	Plot 7**	Less degraded	72	46.7	74.5	63
	Plot 8	Degraded	10.8	7.9	61.7	17.4
	Plot 9	Degraded	34	25.4	71.7	39.6

* includes area offsite to the east
** on the verge of Flushcombe Road outside the western fenceline

Despite the likelihood of the site's vegetation to have been PCT 3319 prior to colonisation, now, after 150 - 200 years of agricultural use:

- the mapped exotic grassland has a very low VIS of <10 (Plots 1, 3 with canopy trees);
- the vegetation adjoining Blacktown Creek has a VIS of 4 (Plot 6);
- the areas with native canopy associated with the swale in the west (Plots 4, 5. 8, 9) had variable VIS's ranging from 11.9 to 47.6;
- the roadside vegetation in the north-west (Plot 7) had canopy and had the highest VIS of 63; and
- the offsite vegetation in the east (Plot 2) had a native canopy and a VIS of 52.9.

B4.6.2 Vegetation integrity scores of vegetation zones

For the three Vegetation Zones, the calculated Vegetation Integrity Scores (VIS) are as follows:

Vegetation Zone	Sampled in	Composition condition score	Structure condition score	Function condition score	Current vegetation integrity score
PCT 3319 – degraded	Plots 4, 5, 8, 9	17.4	13	87.7	27.1
PCT 3319 – less degraded	Plots 2, 7	76.6	49.6	54.7	59.2
PCT 0 – Predominantly exotic	Plots 1, 3 and 6	2.4	27.7	6.6	7.6

B4.7 Management Zones

For the Vegetation Zones '*PCT 3319 – degraded*', '*PCT 3319 – less degraded*', there are two Management Zones for the proposal (to be cleared or to be retained) (Figures 6b, 7b).

Vegetation Zone	Area (ha)	Management Zones (submitted proposal)	
		To be cleared	To be retained
PCT 3319- degraded	2.03	0.64	1.39
PCT 3319- less degraded	0.34	0.07	0.27
	Total	**0.71**	**1.66**

The remaining area of predominantly exotic vegetation or hardstand is 24.27 ha, with:

- 20.58 ha as predominantly exotic grassland; and
- 3.69 ha west of the drainage swale associated with the industrial and residential buildings.

B5.0 Habitat suitability for threatened species

Potential habitat was systematically assessed onsite as follows:

<table>
<tr><th>Habitat component</th><th>Site values recorded</th></tr>
<tr><td>Coarse woody debris</td><td>Small logs and debris material were identified in only four of the BAM Plots in the site. Course woody debris is an important component of the structure of forests and woodlands and provides refuge habitat for ground-dwelling fauna.

The extent of fallen log length recorded in the 0.1 ha BAM Plots 1 to 9 varied, with:
• highest recorded in Plot 9 (27 m); and
• 0 m lengths recorded in Plot 1, 2, 6, 7, 8.
[Logs are woody material greater than 10 cm in diameter].

<table>
<tr><th></th><th>Length of fallen logs</th></tr>
<tr><td>Onsite</td><td></td></tr>
<tr><td>Plot 1</td><td>0 m</td></tr>
<tr><td>Plot 3</td><td>6 m</td></tr>
<tr><td>Plot 4</td><td>5 m</td></tr>
<tr><td>Plot 5</td><td>91 m</td></tr>
<tr><td>Plot 6</td><td>0 m</td></tr>
<tr><td>Plot 8</td><td>0 m</td></tr>
<tr><td>Plot 9</td><td>27 m</td></tr>
<tr><td>Offsite</td><td></td></tr>
<tr><td>Plot 2</td><td>0 m</td></tr>
<tr><td>Plot 7</td><td>0 m</td></tr>
</table>
</td></tr>
<tr><td>Rock outcrops and bush rock</td><td>Absent.</td></tr>
<tr><td>Caves, crevices and overhangs</td><td>Absent.</td></tr>
<tr><td>Culverts, bridges, mine shafts, or abandoned structures</td><td>Culvert under M4 draining road runoff from basins south of motorway. Collapsed culvert under Augusta Street. Culverts searched in February and March 2022 (details in Appendix 7).</td></tr>
<tr><td>Nectar/lerp-bearing Trees</td><td>Nectar-bearing trees recorded on the site included Acacia</td></tr>
</table>

<table>
<tr><th>Habitat component</th><th>Site values recorded</th></tr>
<tr><td></td><td>parramattensis, Eucalyptus moluccana, Eucalyptus tereticornis, Grevillea robusta and Ligustrum spp.</td></tr>
<tr><td>Nectar-bearing shrubs</td><td>Acacia spp. and Bursaria spinosa were recorded within the site.</td></tr>
<tr><td>Koala Feed Trees</td><td>The Koala use trees for the Central Coast Koala Management Area (Schedule 2 of Koala SEPP 2021) recorded onsite were the local native canopy trees Eucalyptus moluccana, Eucalyptus tereticornis and a non-local planted Eucalyptus robusta.</td></tr>
<tr><td>Large stick nests</td><td>No large stick nests observed onsite.</td></tr>
<tr><td>Sap and gum sources</td><td>Native sap and gum source trees recorded onsite including Acacia spp., Eucalyptus spp.</td></tr>
<tr><td>She-oak fruit (Glossy Black Cockatoo feed)</td><td>No Allocasuarina spp. nor Casuarina spp. present onsite.</td></tr>
<tr><td>Seed-bearing trees and shrubs</td><td>Seed-bearing Acacia spp. recorded onsite.</td></tr>
<tr><td>Soft-fruit-bearing trees</td><td>Soft-fruit-bearing trees recorded onsite include Pittosporum undulatum and exotic species Ligustrum spp. and Olea europaea subsp. cuspidata.</td></tr>
<tr><td>Dense shrubbery and leaf litter</td><td>Shrubbery and leaf litter recorded on the site. The extent of litter cover recorded varied from 0% in Plots 3, 6 to over 40% in Plots 2, 4, 5, 7, 9.
<table>
<tr><th></th><th>Litter cover</th></tr>
<tr><td>Onsite</td><td></td></tr>
<tr><td>Plot 1</td><td>37.6%</td></tr>
<tr><td>Plot 3</td><td>0%</td></tr>
<tr><td>Plot 4</td><td>51%</td></tr>
<tr><td>Plot 5</td><td>53%</td></tr>
<tr><td>Plot 6</td><td>0%</td></tr>
<tr><td>Plot 8</td><td>10%</td></tr>
<tr><td>Plot 9</td><td>42%</td></tr>
<tr><td>Offsite</td><td></td></tr>
<tr><td>Plot 2</td><td>44%</td></tr>
<tr><td>Plot 7</td><td>47</td></tr>
</table></td></tr>
<tr><td>Tree hollows</td><td>Tree hollows may provide nesting habitat for native birds, possums and microbats. Only one hollow bearing tree was recorded onsite in BAM Plot 3.</td></tr>
<tr><td>Decorticating bark</td><td>Half-bark Eucalypts may provide decorticating bark habitat within the site. This may be an important resource for arboreal fauna that feed on insects which shelter in decorticating bark. Microbat species also roost in this habitat. The eucalypt recorded with decorticating bark include:
- Eucalyptus tereticornis (bark smooth, white or grey, shedding in large plates or flakes).</td></tr>
<tr><td>Wetlands, soaks and streams</td><td>Wetlands, soaks and streams may offer important habitat for birds and frogs. Onsite Blacktown Creek and drainage swale. Frogs were recorded in Blacktown Creek during the February / March 2022 survey (details in Appendix 7).</td></tr>
<tr><td>Open water bodies</td><td>Absent.</td></tr>
<tr><td>Estuarine, beach, mudflats, and rocky foreshores</td><td>Absent.</td></tr>
</table>

It was concluded that habitat constraints for threatened species onsite were high due to historic land uses, associated disturbances and absence of open waterbodies and rock outcrops.

The site is part of an historic productive farm dating back to the early colony with farming reduced by the construction of the Great Western Highway by 1970, and by the M4 Motorway in the early 1990s. The onsite houses and sheds were abandoned by 2012 (see historic aerial photographs Figures 1930 to 2012). The paddocks have been extensively and repeatedly cleared for intensive agriculture.

Topsoil disturbance and landform modification is widespread including for the ploughed paddocks, industrial use in the west and soil scalping east of Blacktown Creek (the landform patterns visible on historic aerial photographs and on the LiDAR, Figure 1d-2).

In the gullies along Blacktown Creek in the east and the swale in the west, landform has been modified by infilling and dumping. Building rubble is widespread in the swale in the west, probably from demolished houses and sheds that have been pushed into the swale. Dense weeds have grown over this dumped material.

No trees have colonised Blacktown Creek but in the swale in the west there are local native trees persisting with limited regeneration.

B5.1 Identification of threatened species for assessments

The likelihood of the Ecosystem credit species and Candidate species credit species generated from the on-line BAM Calculator (using the uploaded BioNET data) were assessed using the species profile information, habitat onsite and recorded data (see BAM Calculator reports in Appendix 11, Likelihood tables in Appendix 12, BioNet nearby records on Figure 5a to 5d).

B5.1.1 Predicted species (ecosystem credit species)

Predicted species are threatened species reliably predicted to utilise PCT 3319 ecosystem. No surveys are required for these species. Ecosystem credits apply to these species.

In terms of the ecosystem credits species (Predicted Species), 26 threatened fauna species were generated by the BAM calculator with 23 considered as possible to utilise the site. Three (3) species are excluded from further assessment for the following reasons (further details in the Likelihood table in Appendix 12), namely:

Common Name	Scientific Name	Reason for exclusion
Black-necked Stork	*Ephippiorhynchus asiaticus*	The site is not floodplain wetlands, sandplain wetland nor estuary.
Eastern Osprey (foraging)	*Pandion cristatus*	No open water onsite.
South Eastern Glossy Black-Cockatoo	*Calyptorhynchus lathami lathami*	No *Allocasuarina littoralis* nor *A. torulosa* recorded onsite.

B5.1.2 Presence of Candidate species credit species

Of the 29 Candidate species credit species generated by the BAM Calculator, eight candidate species were considered possible. Twenty one (21) species were excluded from further assessment (further details in the Likelihood table in Appendix 12):

The eight species considered possible were searched for onsite, with the following results:

Threatened species	**Findings**
Flora species	Searches carried out on 20 January 2023, 10, 30 March, April, 14 June, 26 October 2021 focusing on areas with at least some potential for native species.
Acacia pubescens	No individuals were recorded.
Grevillea juniperina subsp. *juniperina*	No individuals were recorded.
Marsdenia viridiflora R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas.	No individuals were recorded.
Pimelea spicata	No individuals were recorded.
Pultenaea parviflora	No individuals were recorded.
Fauna	
Green and Golden Bell Frog (*Litoria aurea*)	Nocturnal aural-visual spotlighting as well as diurnal habitat searches on four separate nights over February and March 2022 for 2-3 hours per night by Jayden Walsh, exceeding the survey effort required according to the NSW Guidelines. In the targeted survey, there was a lack of suitable habitat, in the form of open and pooling water. It is unlikely that this species would utilise the site (Appendix 7).
Cumberland Plain Land Snail (*Meridolum corneovirens*)	Targeted search on 9 August 2022 by Dr Stephanie Clark. No evidence of *Meridolum corneovirens* was found, what little potential suitable habitat present is heavily weed infested and no other species of snails or slugs were found (Appendix 8).
Microbats	Targeted searches and anabat recordings were conducted by Kane Durrant and two qualified spotter-catchers on 27 February 2024 (details in Appendix 9). No Microbat calls were detected during the dusk or night hours of survey, nor was there any evidence of their presence found. The culverts were mostly inaccessible and not suitable for Microbats to fly into as most culverts were fully obscured by exotic weed species. The thickets of brambles were so impenetrable that the culverts could not be seen by the investigating team. Despite the culvert inaccessibility, each crack and crevice was searched by torchlight, as well as evidence such as scratch marks and faeces. No evidence of microbats was found in paddocks or along creeklines. The only fauna detected during the bat surveys were feral cats wandering the site, European red foxes and their scats in the culverts, and black rats swarming through the exotic weeds.

B5.2 Area or count, and location of suitable habitat for a species credit species (species polygon)

There was potential habitat onsite for 23 of the 26 predicted threatened species including winter flowering eucalypts for Swift Parrot and Grey-headed Flying-fox.

There were no threatened candidate species (species credit species) recorded onsite, hence no species polygons mapped.

B6.0 Identifying prescribed impacts

None of these prescribed impact features are likely to be exacerbated by the proposal. The site is currently highly degraded. Connectivity with surrounding vegetation is currently fragmented and further limited by the surrounding 6-lane highways.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐Yes / **x No**	N/A	N/A
Human-made structures	**x Yes** / No☐ but limited	Drainage culverts under the M4 Motorway and the Great Western Highway. The culvert under Augusta Street was small and unlikely to be readily utilised.	Culverts were searched and no evidence of microbat use found. Higher likelihood for threatened species following conservation works. Currently occupied by predators.
Planted and non-native vegetation	**x Yes /** ☐No	The garden plantings associated with the former farm houses includes listed weed species *Ligustrum* spp.*, Olea europaea* subsp*. cuspidata, Rubus* spp. and environmental weeds such as *Grevillea robusta.*	Colonisation of the site by the former plantings pose a risk to native vegetation onsite. Threatened species such as Grey-headed Flying Fox may utilise the fruits as food resource and nectar. However the fruits also provide readily available food resource for predators.
Habitat connectivity	**x Yes /** ☐No	The former farming site is highly degraded or absent of native vegetation. Connectivity with surrounding vegetation is currently fragmented and further limited by the surrounding highways. The culverts under the motorways provide some potential connectivity.	There is some potential for ecosystem species to fly between vegetated areas within the site and offsite vegetation. Above ground connectivity is limited due to 6-lane highways surrounding the site on 3 sides. Culverts are currently obscured by dense weed growth and no evidence of utilisation by native species.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Waterbodies, water quality and hydrological processes	**x Yes /** ☐No	Drainage lines onsite, Blacktown Creek in the east and the swale in the west, are dominated by exotic weeds, although with emergent eucalypts surviving along the swale in the west; The riparian zone of Blacktown Creek is treeless and swampy and the creek water concealed beneath a broad swathe of wetland plants, both exotic and native-cosmopolitan, and with adjoining belts of blackberries; and The source of the water in the drainage lines along the swale in the west is from stormwater pond(s) south of the M4 Motorway and in Blacktown Creek from treated water from the Wet n Wild and untreated water from stormwater ponds south of the M4 Motorway.	Currently no threatened species utilising the waterbodies onsite due to the lack of open waterbodies. Higher likelihood for threatened species following conservation works.
Wind turbine strikes (wind farm development only)	☐Yes / **X No**	N/A	N/A
Vehicle strikes	**X Yes** / ☐No	Existing high risk for Vehicle strike due to 6-lane highways surrounding the site on 3 sides. The proposal increases traffic movements onsite.	Currently potential for ecosystem species onsite to be affected by vehicle strike.

Part C Stage 2: Impact assessment

C7.0 Avoid and minimise impacts

The design of the proposal is in response to the Huntingwood Precinct DCP which is informed by Chapter 2 Western Sydney Employment Area of the State Environmental Planning Policy (Industry and Employment) 2021 (I & E SEPP). The aim of Chapter 2 of the I & E SEPP includes:

- *to rezone land for employment or environmental conservation purposes;* and
- *to conserve and rehabilitate areas that have a high biodiversity or heritage or cultural value, in particular areas of remnant vegetation.*

In the Huntingwood Precinct DCP, the framework specifies the land use locations (Figure 2d) of:

- employment Lands;
- electricity Easements;
- riparian Corridors; and
- conservation Areas.

All of these landuses have been clearly identified on the site.

C7.1 Avoid and minimise direct and indirect impacts

C7.1.1 Project location

To avoid and minimise impacts on the native vegetation and potential habitats, the proposal has been located in accordance with Huntingwood Precinct DCP (Figures 1f and 2d) with:

- employment Lands on the historically cleared former farming land;
- employment related carparking under the Electricity Easement; and
- conservation areas in the 'Riparian corridors' (Blacktown Creek in the east and the drainage swale in the west).

In addition, conservation areas are:

- between the car parking in the Electricity Easement and the M4 motorway; and
- in the set back from the Great Western Highway.

C7.1.2 Project design

The project has been designed to achieve a conservation gain in the landscaping strategy (Figure 1f), with:

Strategy (see Figure 1f)	**Approximate area**
Area for conservation	
Conservation setback from roads	1.72
Conservation plantings	2.27
Conservation Planting (bioretention basins)	1.09
Sub Total - Conservation associated with drainage lines (excl. area under Electricity Easement)	**5.08**
Conservation (under Electricity Easement)	3.66

Strategy (see Figure 1f)	Approximate area
Total area for conservation	**8.74 ha**
Additional Landscape Area (not included in Area for conservation) (These areas provide some potential habitat, especially arboreal and avifauna)	
Entry feature plantings	0.19
Carpark and Office Planting	0.36
Turf Cell (Permeable Paving)	0.87
Total Landscape Area	**9.61**

C7.2 Avoid and minimise prescribed impacts

None of these prescribed impact features are likely to be exacerbated by the proposal. The site is currently highly degraded, fragmented and surrounded by the 6-lane highways.

The human-made structures are large drainage culverts (> 1.2 m diameter) under the M4 Motorway and the Great Western Highway. Culverts were searched and no evidence of microbat use found. Currently the culverts are occupied by feral predators. There is higher likelihood for threatened species utilising the culverts following conservation works. The onsite culvert under Augusta Street is small and unlikely to be utilised (Goreski 2020).

There are no threatened entities likely to be reliant on the non local native vegetation and garden plantings associated with the former farm houses. The plantings include listed weed species *Ligustrum* spp., *Olea europaea* subsp*. cuspidata, Rubus* species and environmental weeds such as *Grevillea robusta.* Colonisation of the site by the former plantings poses a risk to native vegetation onsite, as well as the fruits of plantings provide readily available food resources for predators.

The project has been designed to maintain and enhance existing connectivity and enhance existing degraded habitat associated with the former farm house gardens through conserving, enhancing and re-establishing native vegetation onsite within the proposed conservation areas.

C7.3 Other measures considered

No other measures for avoidance and minimisation were considered.

C7.4 Summary of measures to avoid and minimise impacts

The measures used to avoid and minimise direct, indirect and prescribed impacts are as follows (see details of other environmentally sustainable developments in Hazelton and Clements 2009, Clements *et al.* 2010):

Action	Outcome	Timing	Responsibility
Appoint an experienced Restoration Ecologist	Qualified persons to prepare a site specific Conservation / Vegetation	Prior to commencement of works onsite.	The project manager and/or land owner.

Action	Outcome	Timing	Responsibility
and Construction Manager to design, supervise and implement works.	Management Plan developed in conjunction with the Construction Management Plan for efficient operations onsite.		
Prepare induction / tool box program and its implementation for conservation awareness.	All onsite workers to be aware of the conservation significance of the assets onsite.	Prior to, during and post construction works.	Restoration ecologist and Construction Manager.
Identify the conservation assets including soils, biomass, local native seed.	Minimise “waste” going to land fill. Maximise chance of restoring the native ecosystems onsite.	Prior to commencement of works onsite.	Restoration ecologist and Construction Manager.
Ensure efficient re-use of conservation assets onsite.	Maximising use of biological active soil and plant material in the conservation areas for conserving and enhancing habitats onsite.	During construction works.	Restoration ecologist and Construction Manager.
Ensuring sufficient local native tubestock are available for the project.	Conserving and enhancing local native habitats onsite.	Prior to and during construction works.	Restoration ecologist.
Implementing conservation actions and associated monitoring and corrective actions.	A successful ecologically sustainable development.	Prior to, during and post construction works.	The entire team.

C8.0 Impact Assessment

C8.1 Residual direct impacts

After steps have been taken to avoid and minimise impacts, the residual direct impacts include:

Summary of residual direct impacts

Direct impact	BC Status	EPBC Status	SAII Entity	Project phase / timing of impact	Extent
Removal of potential habitat associated with PCT3319 (TEC = *Cumberland Plain Woodland in the Sydney Bioregion*)	Critically endangered	N/A	Yes	During construction	0.71 ha

C8.1.1 Change in vegetation integrity score

The change in vegetation integrity for residual direct impacts on native vegetation are as follows.

The “future” vegetation integrity score was calculated. (Note: The recorded cover by High Threat Weeds (HTW) was high in the native vegetation. The future cover by HTW for the retained native vegetation was entered as 5% in the BAM Calculator. This proposed reduction in HTW cover is assumed following the conservation works).

Current Vegetation Integrity Score

Vegetation Zone	Sampled in	Composition condition score	Structure condition score	Function condition score	Current vegetation integrity score
PCT 0 – Predominantly exotic	Plots 1, 3 and 6	2.4	27.7	6.6	7.6
PCT 3319 – Degraded	Plots 4, 5, 8, 9	17.4	13	87.7	27.1
PCT 3319 – Less Degraded	Plots 2, 7	76.6	49.6	54.7	59.2

Impacts to vegetation integrity after development

Vegetation zone	Management Zone	Area (ha)	VI Score	Change in VI Score	Total VI loss
PCT 0 - Predominantly exotic grassland	Cleared	20.58	7.6	-7.6	-7.6
PCT 3319_Degraded	cleared	0.64	0	-27.1	-8.3
	retained	1.39	27.4	0.4	
PCT 3319_Less degraded	cleared	0.07	0	-59.2	-12.2
	retained	0.27	59.3	0	

C8.2 Indirect impacts

In Section 8.2 of the BAM, it is specified (DPIE 2020);
The assessor must describe and assess the indirect impacts of the proposal on TECs/PCTs and/or threatened species and their habitat, ***beyond the development footprint,*** *including but not limited to:*

Potential Indirect impacts include:	Related to the proposal onsite
a. inadvertent impacts on adjacent habitat or vegetation	The existing habitat onsite is limited and separated from adjacent habitat by surrounding major highways to the north, south and east and Flushcombe Road to the west.
b. reduced viability of adjacent habitat due to edge effects	
c. reduced viability of adjacent habitat due to noise, dust or light spill	**Noise** is likely from the industrial development in both the construction and its operation phases. There are existing major noise issues currently from the surrounding 6 lane highways and possible high frequency noise impacts from the mobile phone tower. **Dust** impacts may occur onsite during construction but are unlikely to impact adjacent habitat due to its separation by the surrounding major highways.

Potential Indirect impacts include:	Related to the proposal onsite
	Dust control measures during construction are consistent with safe work practices. **Increased light spillage** from the industrial development poses a risk to native nocturnal fauna in the proposed Conservation Areas onsite and offsite in Council reserves including Timbertop Reserve to the north of the Great Western Highway. There are currently existing major light issues from the surrounding 6 lane highways. Timbertop Reserve and Prospect Nature Reserve are likely to be dark spaces, however unlikely to be affected by the proposal due to the light spillage from Great Western Highway and M4 Motorway.
d. transport of weeds and pathogens from the site to adjacent vegetation	The site is heavily degraded and weeds pose a risk beyond the development footprint. The proposal is to decrease the weed occurrence on site, to be included in the VMP, hence minimise the potential indirect risk.
e. increased risk of starvation or exposure, and loss of shade or shelter	The site is separated from adjacent habitat by surrounding major highways to the north, south and east and Flushcombe Road to the west.
f. loss of breeding habitat	
g. trampling of threatened flora species	
h. inhibition of nitrogen fixation and increased soil salinity	N/A
i. fertiliser drift	N/A
j. rubbish dumping	Existing major rubbish dumping on site. Formalising usage on the site is likely to reduce risk of rubbish dumping on adjoining lands.
k. wood collection	N/A
l. removal and disturbance of rocks, including bush rock	N/A
m. increase in predators	The site is separated from adjacent habitat by surrounding major highways to the north, south and east and Flushcombe Road to the west. Predators moving from the site are likely to be controlled.
n. increase in pest animal populations	Pest control may be required during the removal of fill to minimise the risk of pests moving to adjoining lands.
o. changed fire regimes	N/A Incidents of fire are limited due to the extent of clearing and being surrounded by the major highways.
p. disturbance to specialist breeding and foraging habitat (e.g. beach nesting for shorebirds).	Important Habitat Area for the Swift Parrot is mapped to the north in Timbertop Reserve (Figure 5e). This is separated from the site by the Great Western Highway.
In addition:	**Traffic -** There is likely to be an increased volume of

Potential Indirect impacts include:	Related to the proposal onsite
indirect impact of traffic	traffic entering and leaving the site, from Augusta Street, Flushcombe Road and the Great Western Highway, and increased hours experiencing traffic. Potential vehicle strike has been considered in the assessment of prescribed impacts. This is currently impacting the habitat onsite due to the surrounding highways. The proposal may increase the risk of vehicle strike to fauna in nearby roadside habitat.

It should be noted that the threatened entity Cumberland Land Snail (*Meridolum corneovirens*) recorded nearby was found by Dr Stephanie Clark, the snail expert, to have little suitable habitat onsite (see Appendix 8).

Similarly there are no threatened species, such as Southern Myotis and Green and Golden Bell Frog, utilising the site due to the lack of open waterbodies (suitable habitat) (see Appendix 7). Post conservation works, there may be a higher likelihood for threatened species due to reconstructed habitat.

Summary of residual indirect impacts

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase / timing of impact	Likelihood and consequences
Transfer of weed and pathogens	Potential habitat of threatened fauna species	Within the conservation and landscape area	Depends on pedestrian usage of conservation areas and roadsides.	The life of the project	The life of the project	Possible decrease in occurrence of native species habitat
Water quality	Potential habitat including for Green and Golden Bell Frog and Southern Myotis	Drainage lines	At times of rainfall events sufficient for stormwater flow to the site.	The life of the project	The life of the project	Possible decrease in occurrence of native species habitat
Increased light spillage to Conservation Areas	Bats and nocturnal fauna	Depends on light intensity and direction.	Depends on usage.	Evening when lights are turned on	Post construction .	Depends on lighting design
Noise	Native and other fauna species	Development footprint Telstra tower site noise	During construction and operation hours Constant	Construction and operation phases The life of the project	The life of the project	Possible decrease in occurrence of native species
Traffic	Native and other fauna species	Access roads and Internal roads	Increased volume of traffic entering and leaving the site	The life of the project	The life of the project	May increase the risk of vehicle strike to fauna in nearby roadside habitat.

C8.3 Prescribed impacts

There are no likely residual prescribed impacts as the project has been designed to:

- maintain and enhance existing connectivity;
- enhance existing degraded habitat associated with the former farm house gardens; through
- conserving, enhancing and re-establishing native vegetation onsite within the proposed conservation areas.

None of these prescribed impact features identified are likely to be exacerbated by the proposal. The site is currently highly degraded, fragmented and surrounded the 6-lane highways on three sides.

C8.4 Mitigating residual impacts – management measures and implementation

The following table outlines details of the proposed mitigation and management measures.

Note: A site specific Vegetation Management Plan (VMP) will be implemented in conjunction with the Construction Manager.

Summary of proposed mitigation and management measures for residual impacts

Mitigation measure	Method technique	Timing	Frequency	Responsibility	Likely efficacy (including risk of failure)	MNES (where relevant)
Appoint an experienced Restoration Ecologist and Construction Manager to design, supervise and implement works in accordance with a Vegetation Management Plan (VMP).	The VMP involves restoration of riparian habitats which requires inputs from the Stormwater Engineers in conjunction with the Frog expert.	Prior to works onsite	Once	The project manager and/or land owner.	Risk of failure unlikely	N/A
Conservation awareness of all persons onsite and the awareness of the No-Go Areas.	Prepare and implement induction / tool box program	Prior to and during works onsite.	Induction prior to entry to the site. Weekly toolbox talks	Restoration Ecologist and Construction Manager	Risk of failure unlikely, provided that there is adherence No-Go Areas.	N/A
Clearly identify No-Go areas onsite and on plan	Clearly identified with orange mesh fence or similar as required by the Restoration Ecologist and / or Construction Manager.	As required during construction	As required	Restoration Ecologist and Construction Manager	Risk of failure unlikely, provided that there is adherence No-Go Areas.	N/A
Ensure efficient re-use of conservation assets onsite from areas being cleared.	Industry best practice for ecologically sustainable developments.	During construction	During construction	Restoration Ecologist and Construction Manager	Risk of failure unlikely, provided adequate supervision	N/A
Ensure hygiene protocols in place	Implementation of standard hygiene	During construction	Daily	Restoration Ecologist and	Risk of failure unlikely, provided adequate	N/A

Mitigation measure	Method technique	Timing	Frequency	Responsibility	Likely efficacy (including risk of failure)	MNES (where relevant)
	protocols, such as clean vehicles, clean shoes, and healthy nursery stock.			Construction Manager	supervision and compliance with hygiene protocols by all persons onsite.	
Pre-clearance fauna survey and relocation of native fauna to areas of retained vegetation.	Use of experienced wildlife spotter / catcher.	Prior to commencement of any clearing / earthworks.	As advised by the wildlife expert	Restoration Ecologist	Risk of failure unlikely provided adequate advice and supervision.	N/A
Implement monitoring and corrective actions.	Monitoring reports as specified in the VMP	Prior to, during and post construction works.	Month 1; Month 3; Month 6; and then 12 monthly.	Restoration Ecologist and Construction Manager	Risk of failure unlikely provided adequate advice and supervision	N/A

C9.0 Serious and irreversible impacts

C9.1 Assessment for Serious and irreversible impacts

There is approximately 10% (2.37 ha) of the 26.64 ha site supporting Cumberland Plain Woodland. The proposal results in the loss of 0.71 ha of 2.37 ha of degraded Cumberland Plain Woodland. The proposal is to restore 8.74 ha of Cumberland Plain Woodland onsite, including controlling feral pests.

Historically the native vegetation on the site was cleared for once productive farmland dating back to early colonial settlement, and more recently for industrial land use in the west. The farmland is now abandoned and bounded by major 6-laned highways to the north, south and east.

The pattern of clearing on this site is typical of the native vegetation in Western Sydney cleared for agriculture and more intensive land uses (see the Cumberland Plain Conservation Plan (DPE 2022)).

The estimate of contemporary (Nov. 1998) and pre-European extent of Cumberland Plain Woodland is as follows (Tozer 2003, page 15):

Assemblage	Pre-European extent (ha)	1997 Extent (ha) +/- range	1997 Extent (%) +/- range
Cumberland Plain Woodland	125 449	11 054 +/- 1 564 ha	8.8 +/- 1.2 %

The contemporary(1998) percent of Pre-European extent of CPW is 8.8 +/- 1.2% (Tozer 2003). This is relatively consistent with 81.74% of Pre-European extent being cleared (given in BioNet PCT 3319 profile in Appendix 13a).

The historic clearing in Western Sydney has resulted in extensive fragmentation of the remaining native vegetation, reduced connectivity and overall loss of ecological resilience. DPE (2022) points out that:

> *Ecological restoration can play a critical role in improving connectivity between remnant habitat patches, expanding the remnants and replacing some areas of over-cleared vegetation communities. This is particularly important for a fragmented landscape such as the CPCP Area and for over-cleared vegetation types such Cumberland Plain Woodland.*

This proposal is the restoration of 8.74 ha for conservation, that is a 370% increase from 2.37 ha.

From applying the *Guidance to assist a decision-maker to determine a serious and irreversible impact* the proposal, with its Conservation Areas, is unlikely to result in a Serious and Irreversible impact (see details in Appendix 13).

The proposal is unlikely to contribute significantly to the risk of extinction of the *Cumberland Plain Woodland* Ecological Community in NSW.

C10.0 Impact Summary

C10.1 Determine an offset requirement for impacts

C10.1.1 Impacts on native vegetation and TECs or Ecs (ecosystem credits)

From Section 9.2.1 of the BAM (DPIE 2020) an offset is not needed for impacts on native vegetation if the vegetation integrity score is below:

a. 15, where the PCT is representative of an EEC or a CEEC
b. 17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits)
or represents a vulnerable ecological community; or
c. 20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

The Vegetation Integrity Score for Predominantly exotic grassland was calculated to be 7.6, which is below 15. The number of ecosystem credits required to offset its loss was calculated to be 0 (zero).

For the Vegetation Zones identified onsite, the current Vegetation Integrity Score (VIS) was as follows:

Vegetation Zone	TEC	Impact area (ha)	Entity at risk of an SAII?	Current Vegetation integrity score	Offset required?
PCT 3319 – Degraded	CPW	0.64 of 2.03	No	27.1	Yes
PCT 3319 – Less Degraded	CPW	0.07 of 0.34	No	59.2	Yes

CPW = Cumberland Plain Woodland in the Sydney Basin Bioregion

For the proposal, an offset is required for *PCT 3319 Cumberland Shale Hills Woodland* with the number of ecosystem credits required as follows:

Vegetation zone	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required for proposal
PCT 3319 – degraded	CPW	0.64	27.1	0	-27.1	2.5	11
PCT 3319 – less degraded	CPW	0.07	59.2	0	-59.2	2.5	3
						Total	**14**

C10.1.2 Impacts on threatened species and their habitat (species credits)

No candidate species were identified nor considered likely.

Impacts that require an offset – species credits are as follows.

BC Act status	**EPBC Act status**	**Loss of habitat** (ha) or individuals	**Biodiversity risk weighting**	**Number of species credits required**
Common name: N/A				
N/A	N/A	N/A	N/A	0
			Total credits	0

C11.0 Biodiversity credit report

C11.1 Ecosystem credits

From the BAM Calculator reports (appendix 11), the Ecosystem credit class and matching credit profiles are as follows:

Ecosystem credits	**Attributes shared with matching credits**					
	PCT vegetation class	**PCT vegetation formation**	**Assoc. TEC**	**Offset trading group**	**Hollow bearing trees present ?**	**IBRA subregion (in which proposal is located)**
14	Coastal Valley Grassy Woodlands	Grassy Woodlands	CPW	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	No	Cumberland

CPW = Cumberland Plain Woodland in the Sydney Basin Bioregion

C11.2 Species credits

From the BAM Calculator reports (appendix 11), the Species credit class and matching credit profile is as follows:

Species credit	**Attributes shared with matching credits**				
	Name of threatened species	**Kingdom**	**BC Act status**	**EPBC Act status**	**IBRA region**
0	N/A	N/A	N/A	N/A	N/A

C12.0 Recommendations

The Riparian Corridors onsite form connections to significant offsite conservation areas (Prospect Nature Reserve and Timbertop Reserve) via the culverts under the

Motorways to the north and south. A site specific Vegetation Management Plan (VMP) has been prepared for the highly degraded Riparian Corridors, which are identified in the Huntingwood Precinct DCP as terrestrial and aquatic habitat.

Currently, the main native component is restricted to canopy trees in a swale down slope of former farming paddocks. The natural regeneration of these native canopy trees is suppressed by a dense weedy understorey and by dumped building rubble.

Given the existing drainage, water quality issues and dumpings, it is recommended that working with the engineers, and the construction team and their machinery be an essential component of the planning and implementation of the VMP.

As Black Rat is prolific in dumped rubbish and dense weed cover, reduction in their numbers prior to commencement of conservation works is advisable. To minimise risk of native species by-kill, live trapping using one way traps is likely to be the most humane way of reducing the existing population. Feral cat control is challenging. It is recommended that control of the main predators (feral cat, rat and fox) is undertaken by a specialist fauna spotter and catcher.

Any native fauna species encountered are to be relocated to a safe location. No Cumberland Land Snail nor microbats are considered likely to be present due to the high number of predators [Note: rats eat snails, and cats eat anything that moves].

In consultation with Council there are opportunities to enter into a works-in-kind arrangement, including:

- planting of local native trees in the RE1 - Public Recreation zoned land north of the Great Western Highway to complement bush regeneration being undertaken downstream along Blacktown Creek as well as enhancing the mapped Important Habitat Area for the Swift Parrot in Timbertop Reserve; and
- planting of local native trees in the residential land north of the Great Western Highway to reduce the heat island effects on the local residents.

Figures



Figure 1a-1.
Site boundary and mapped watercourses overlaid on the Nearmap aerial photograph dated 21 August 2022

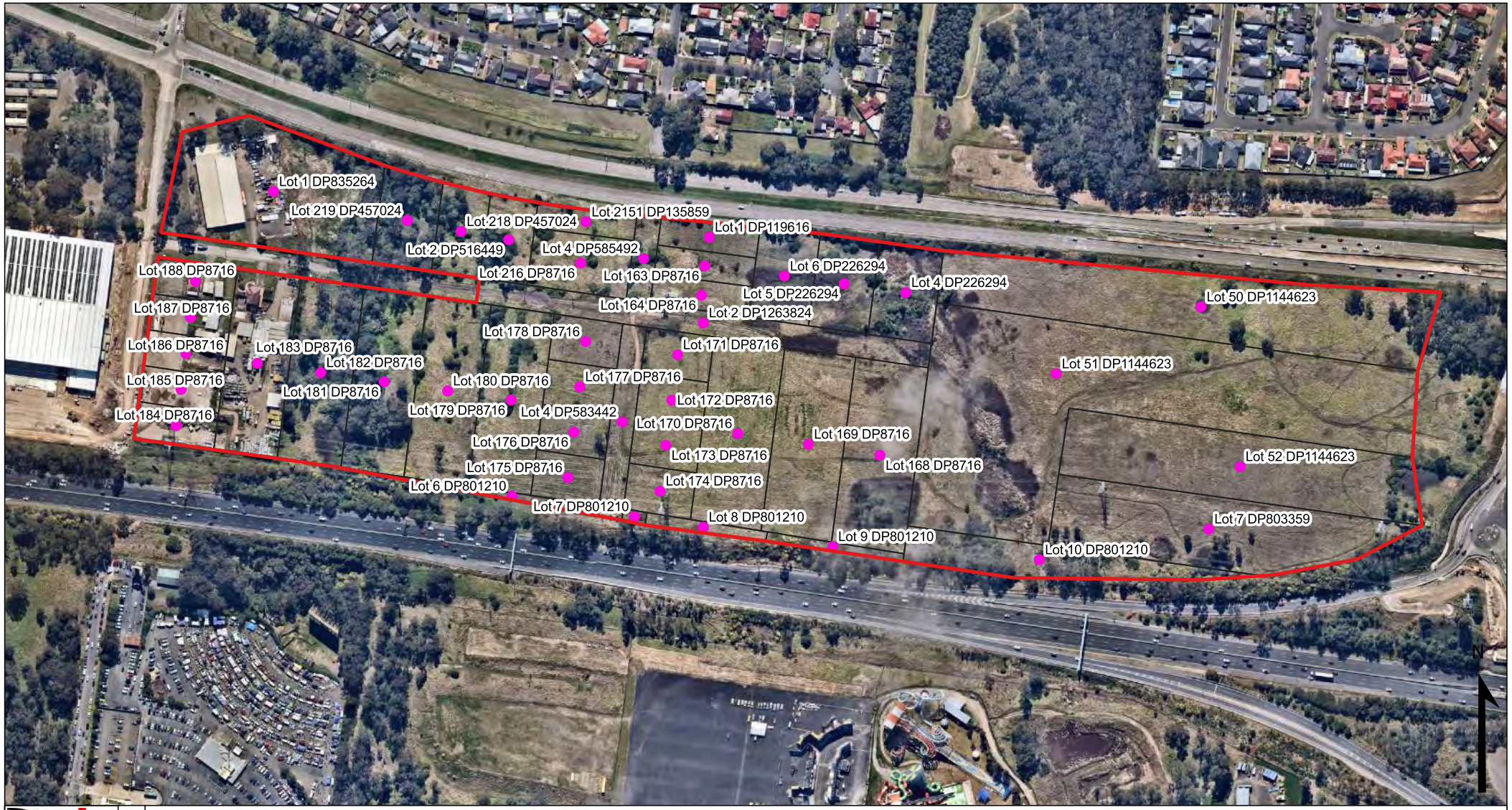


Figure 1a-2.
Site and lot boundaries overlaid on the Nearmap aerial photograph dated 21 August 2022 - close up



Figure 1a-3.
Native vegetation within 1.5 km buffer

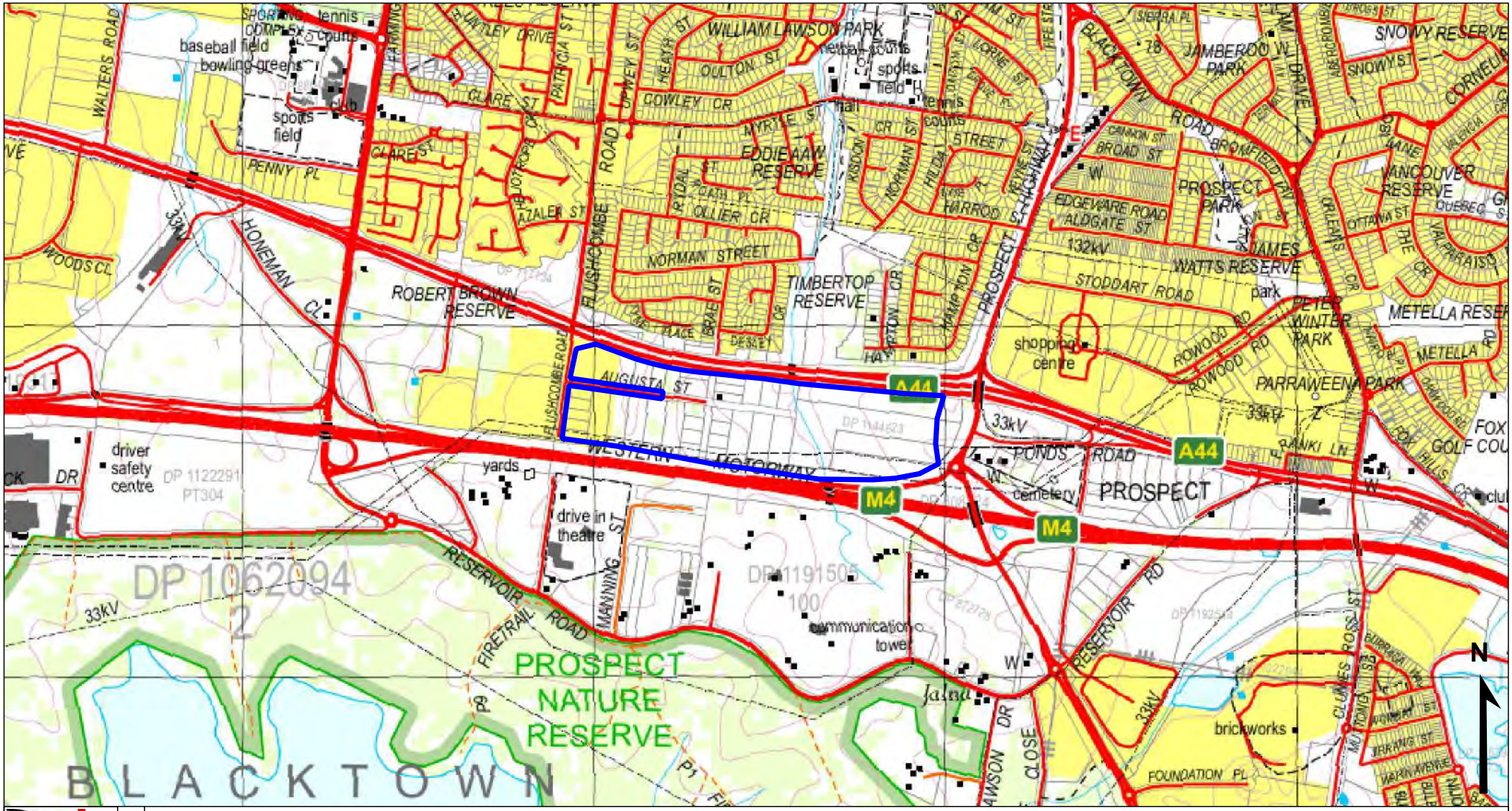
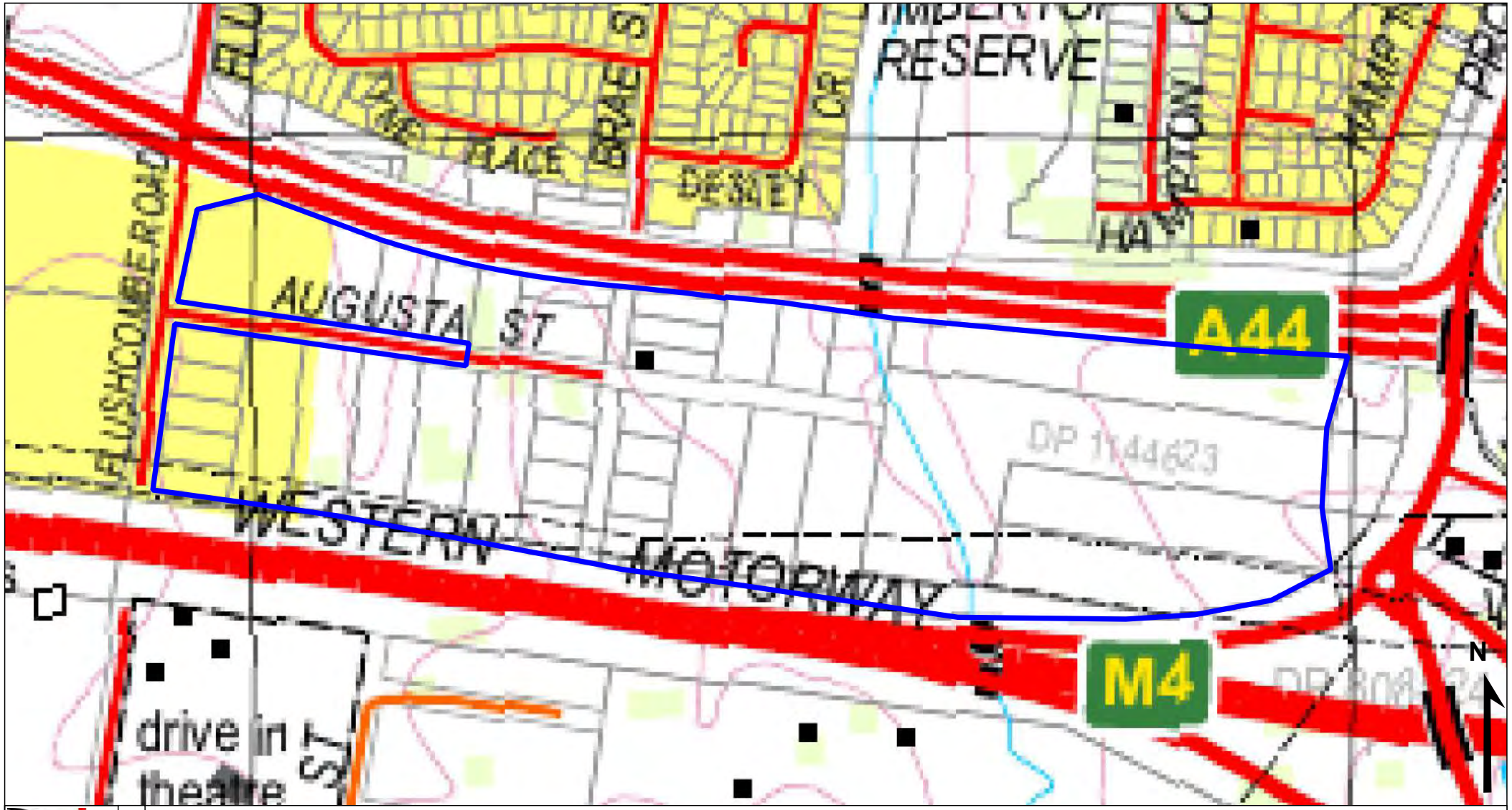


Figure 1b-1.
Site boundary overlaid on the E-topo Prospect topographic map sheet 9030-2N



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Environmental and Botanical Consultants

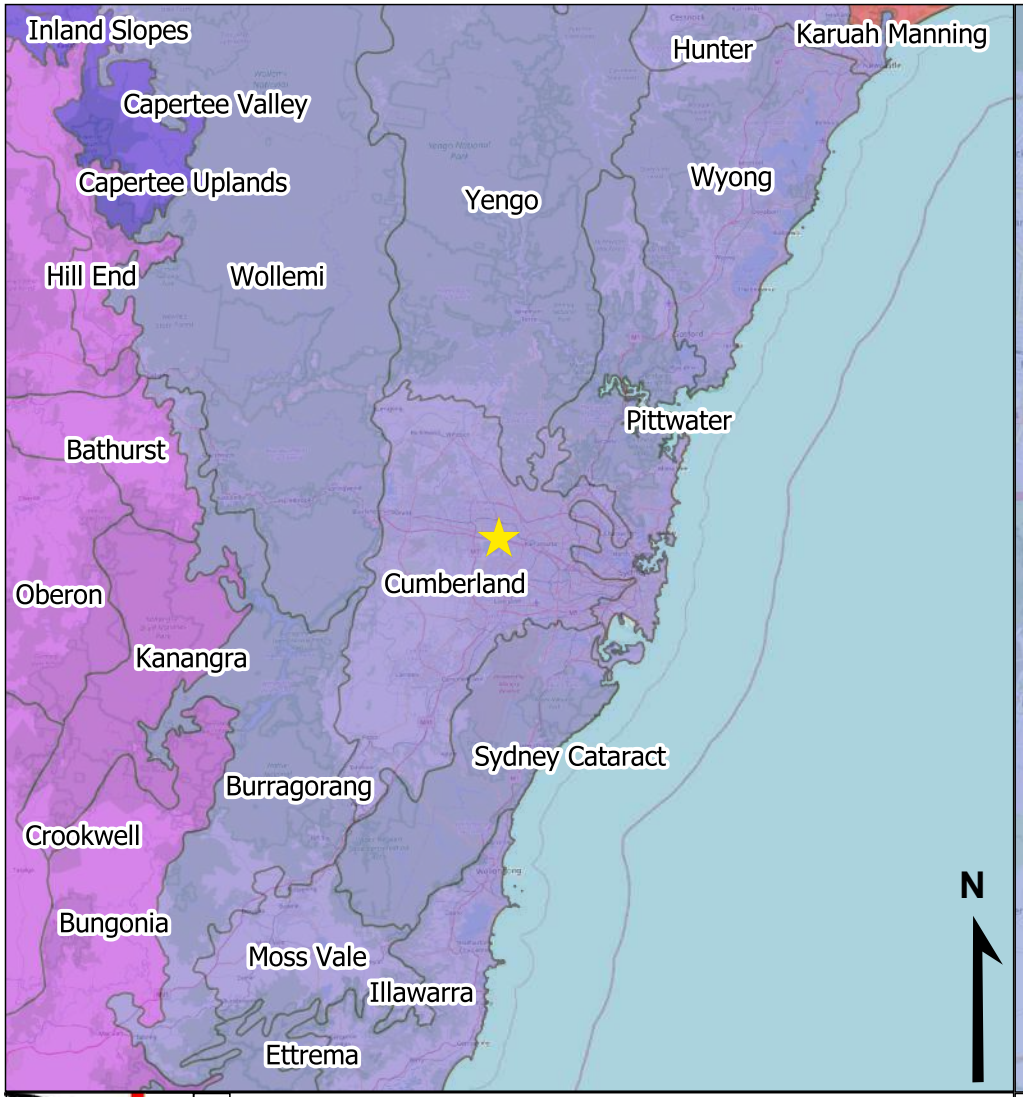
Date created: 17-03-2022

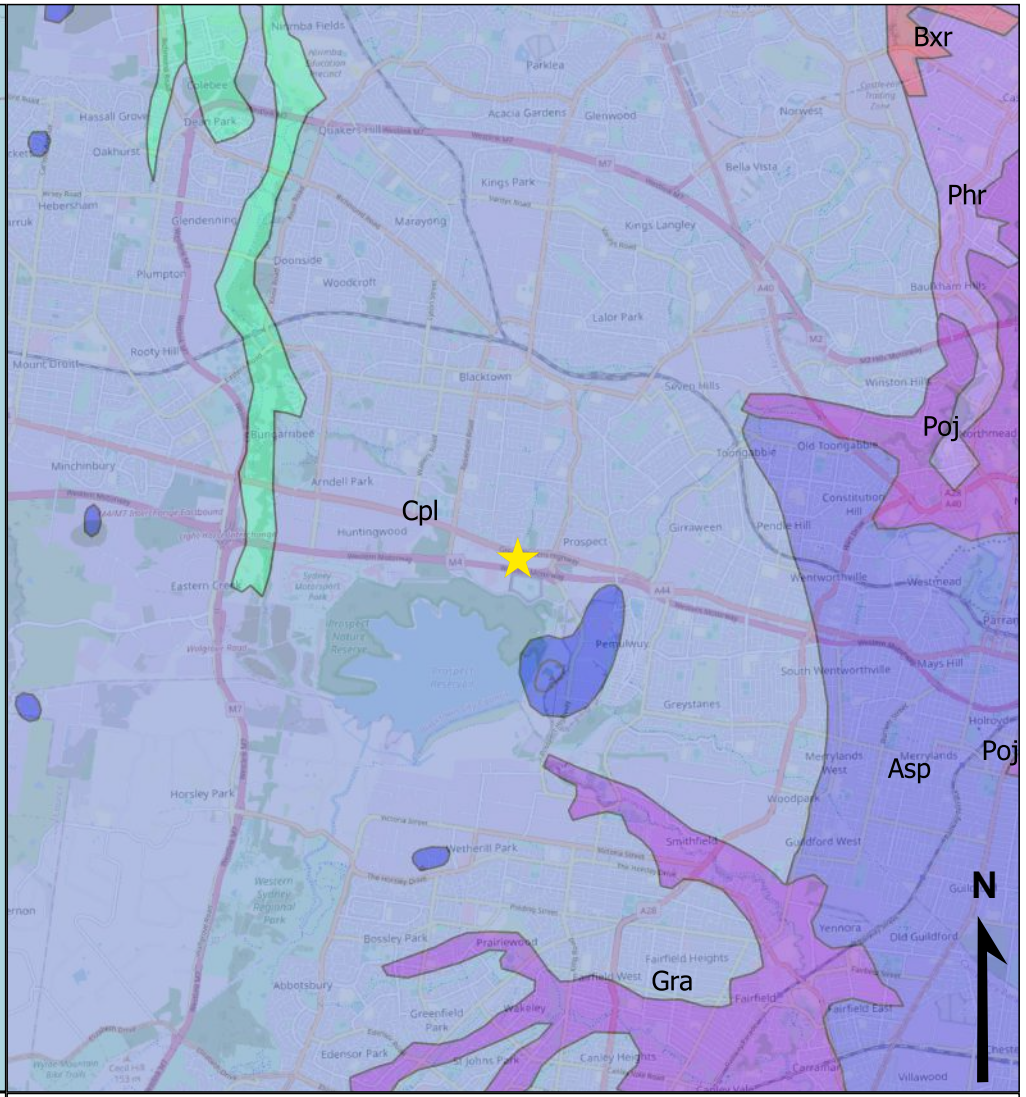
Site boundary

0 100 200 m

Geocentric Datum of Australia 1994

Figure 1b-2.
Site boundary overlaid on the E-topo Prospect topographic map sheet 9030-2N - close up





ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
Environmental and Botanical Consultants

Date created: 17-03-2022

Site Location
NSW North Coast
NSW South Western Slopes
South Eastern Highlands
Sydney Basin

0 20 40 km
Geocentric Datum of Australia

Figure 1c-1.
Site location overlaid on the IBRA subregions map - version 7

Site Location
Asp Ashfield Plains
Bxr Blaxlands Ridge
Cpl Cumberland Plain
Gra Georges River Alluvial Plain
Hac Hawkesbury - Nepean Channels and Floodpl
Phr Pennant Hills Ridges
Poj Port Jackson Basin
Dia Sydney Basin Diatremes

0 2.5 5 km
Geocentric Datum of Australia

Figure 1c-2.
Site location overlaid on the NSW Mitchell Landscapes - version 3.1



Figure 1d-1.
Site boundary overlaid on the Penrith 1 Metre DEM LiDAR dated February 2011 and April 2013 (Spatial Services, ELVIS)

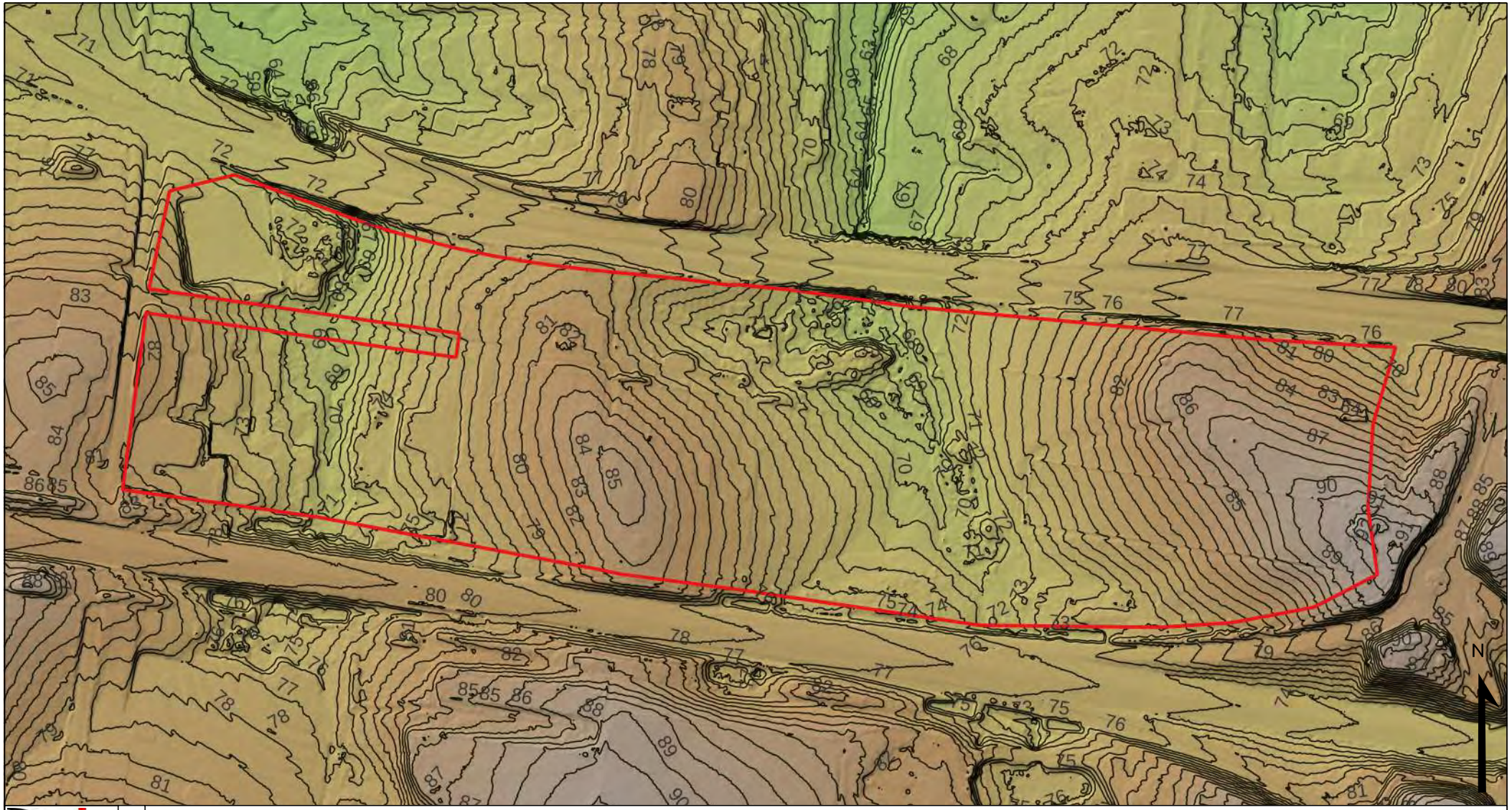


Figure 1d-2.
Site boundary overlaid on the Penrith 1 Metre DEM
LiDAR dated June 2019 (Spatial Services, ELVIS) - close up





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Environmental and Botanical Consultants

Date created: 20-06-2023

Site boundary

0 150 300 m

Geocentric Datum of Australia 1994

Figure 1930-1956.
Site boundary overlaid on the 1930 and 1956 historic aerial photographs (Spatial Services)





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Environmental and Botanical Consultants

Date created: 20-06-2023

Site boundary

0 150 300 m

Geocentric Datum of Australia 1994

Figure 1965 - 1970.
Site boundary overlaid on the 1965 and 1970 historic aerial photographs (Spatial Services)





ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
Environmental and Botanical Consultants

Date created: 20-06-2023

Site boundary

0 150 300 m

Geocentric Datum of Australia 1994

Figure 1978 - 1986.
Site boundary overlaid on the 1978 and 1986 historic aerial photographs (Spatial Services)





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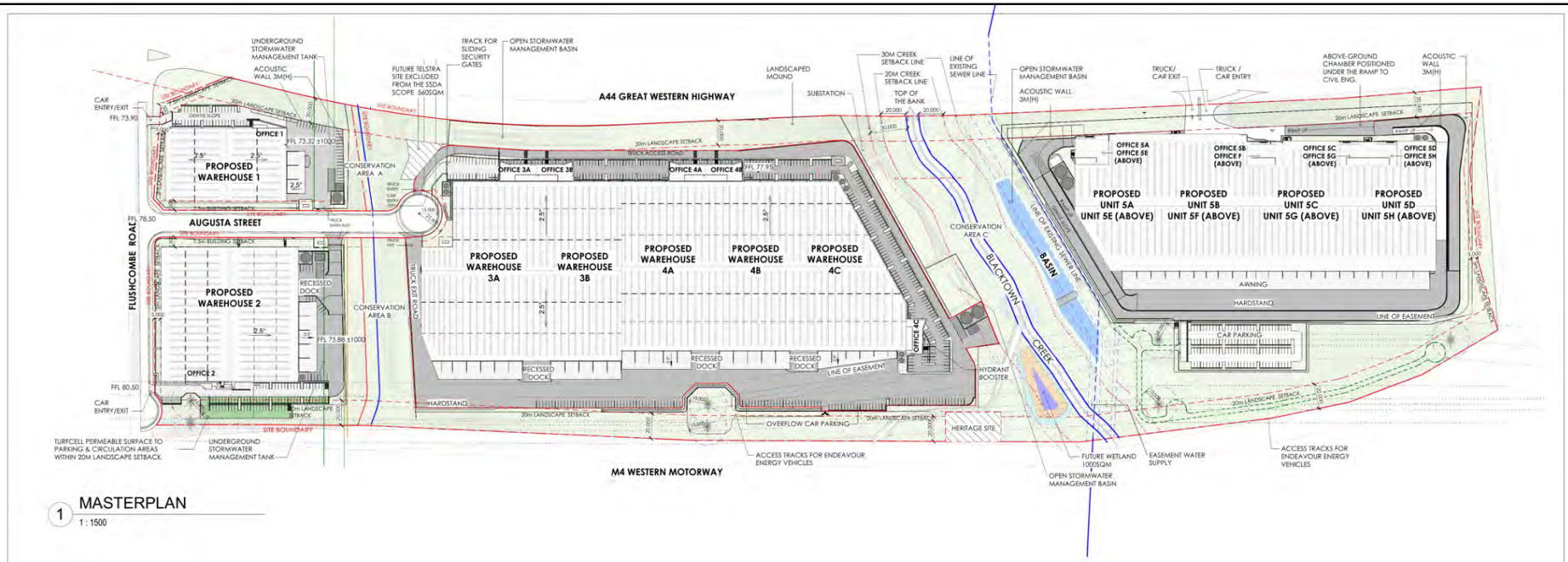
Date created: 20-06-2023

Site boundary

0 150 300 m

Geocentric Datum of Australia 1994

Figure 2002 - 2012.
Site boundary overlaid on the 2002 and 2012 historic aerial photographs (Spatial Services)



1 MASTERPLAN
1 : 1500

NOTE 1:
METHOD OF MEASUREMENT OF **GFA (GROSS FLOOR AREA)** IS AS FOLLOW:
- MEASURED FROM INTERNAL FACE OF EXTERNAL WALLS;
- INCLUDED MEZZANINES AND ANY HABITABLE ROOMS IN THE BASEMENTS
-VERTICAL CIRCULATION SUCH AS LIFTS AND STAIRS:
EXCLUDED - IF SHARED BETWEEN TENANCIES
INCLUDED - IF EXCLUSIVE FOR ONE TENANT
- EXCLUDED BASEMENTS UNLESS THEY ARE HABITABLE ROOM
- EXCLUDE GARBAGE AREAS, SPACES USED EXCLUSIVELY FOR SERVICE SUCH AS DUCTING, PLANT ROOMS, LIFT MOTOR ROOMS AND CAR PARKING
- TERRACES AND BALCONIES:
EXCLUDED - IF OUTER WALL IS LESS THEN 1.4m HIGH
INCLUDED - IF OUTER WALL IS MORE THEN 1.4m HIGH
- EXCLUDED VOIDS AT ANY LEVEL THEY OCCUR
- EXCLUDED RECESSED LOADING DOCK AREA OCCURING WITHIN WAREHOUSE WHEN USED AS TRUCK REVERSING AREA

NOTE2:
PARKING CALCULATION (BASED ON GFA):
- INDUSTRIAL/ WAREHOUSE: BUILDING 7,500SQM OR LESS– 1 SPACE PER 100SQM GFA.
- BUILDING GREATER THAN 7,500SQM GFA– 1 SPACE PER 200SQM GFA ONLY FOR THE AREA IN EXCESS OF 7,500SQM WHERE THERE IS SPECIFIC END USER WHICH WOULD NOT DEMAND A HIGHER RATE AND WHERE EMPLOYEE PARKING IS ADEQUATELY CATERED FOR.
- COMMERCIAL: 1 SPACE PER 40SQM GFA
NUMBER OF DISABLED CAR PARKS AT LEAST %2 OR PART THEREOF OF THOSE SPACES.

NOTE3:
MOTORCYCLE PARKING CALCULATION (BASED ON CAR PARKING NUMBER):
EACH 50 CAR PARKS, ONE MOTORCYCLE PARK

BUILDING 1

DEVELOPMENT SUMMARY (BLDG1) - GFA

Name	Area
OFFICE 1	399 m²
OFFICE 1 LOBBY	75 m²
WAREHOUSE 1	5461 m²
Grand total	5935 m²
AWNING 15M (BLDG1)	511 m²
HEAVY DUTY PAVEMENT (BLDG 1)	3074 m²
LIGHT DUTY PAVEMENT (BLDG 1)	1352 m²

PROVIDED PARKING SCHEDULE (BLDG1)

Family	Type	Count
PK-CP1	5400 x 2500 - 90 deg	43
PK-CP3	5400 x 2500 - (Accessible)	2
PK-CP2	5400 x 2500 - (Backup)	25
PK-CP7	5400 x 2500 - EV CAR	3
Grand total		73
TOTAL CAR PARK REQUIRED		67

PROVIDED MOTORCYCLE PARKING (BLDG1)

Family	Type	Count
PK-CP8	2500 x 1200 (MOTORCYCLE)	2
Grand total		2

BUILDING 2

DEVELOPMENT SUMMARY (BLDG2) - GFA

Name	Area
OFFICE 2	363 m²
WAREHOUSE 2	11668 m²
Grand total	12031 m²
AWNING 10M (BLDG 2)	834 m²
HEAVY DUTY PAVEMENT (BLDG 2)	4035 m²
LIGHT DUTY PAVEMENT (BLDG 2)	1375 m²

PROVIDED PARKING SCHEDULE (BLDG2)

Family	Type	Count
PK-CP1	5400 x 2500 - 90 deg	83
PK-CP3	5400 x 2500 - (Accessible)	3
PK-CP2	5400 x 2500 - (Backup)	17
PK-CP7	5400 x 2500 - EV CAR	3
Grand total		106
TOTAL CAR PARK REQUIRED		104

PROVIDED MOTORCYCLE PARKING (BLDG2)

Family	Type	Count
PK-CP8	2500 x 1200 (MOTORCYCLE)	3
Grand total		3

BUILDING 3 | BUILDING 4

DEVELOPMENT SUMMARY (BLDG3&4) - GFA

Name	Area
OFFICE 3A	441 m²
OFFICE 3A LOBBY	42 m²
OFFICE 3B	439 m²
OFFICE 3B LOBBY	42 m²
OFFICE 4A	441 m²
OFFICE 4A LOBBY	42 m²
OFFICE 4B	441 m²
OFFICE 4B LOBBY	42 m²
OFFICE 4C	415 m²
OFFICE 4C LOBBY	66 m²
WAREHOUSE 3A	11703 m²
WAREHOUSE 3B	9733 m²
WAREHOUSE 4A	9093 m²
WAREHOUSE 4B	9088 m²
WAREHOUSE 4C	9838 m²
Grand total	51866 m²
AWNING 5M (BLDG 4)	56 m²
AWNING 15M (BLDG 3)	1834 m²
AWNING 15M (BLDG 4)	2183 m²
HEAVY DUTY PAVEMENT (BLDG 3&4)	23244 m²
LIGHT DUTY PAVEMENT (BLDG 3&4)	8114 m²

PROVIDED PARKING SCHEDULE (BLDG3&4)

Family	Type	Count
PK-CP1	5400 x 2500 - 90 deg	211
PK-CP3	5400 x 2500 - (Accessible)	10
PK-CP2	5400 x 2500 - (Backup)	113
PK-CP7	5400 x 2500 - EV CAR	12
Grand total		346
TOTAL CAR PARK REQUIRED		338

PROVIDED MOTORCYCLE PARKING (BLDG3&4)

Family	Type	Count
PK-CP8	2500 x 1200 (MOTORCYCLE)	7
Grand total		7

BUILDING 5

DEVELOPMENT SUMMARY (BLDG5) - GFA

Name	Area
OFFICE 5A	514 m²
OFFICE 5B	500 m²
OFFICE 5C	389 m²
OFFICE 5D	389 m²
OFFICE 5E	514 m²
OFFICE 5F	500 m²
OFFICE 5G	389 m²
OFFICE 5H	389 m²
UNIT 5A	9449 m²
UNIT 5B	7538 m²
UNIT 5C	6889 m²
UNIT 5D	6405 m²
UNIT 5E	9447 m²
UNIT 5F	7538 m²
UNIT 5G	6886 m²
UNIT 5H	5458 m²
Grand total	63194 m²
AWNING 15M (BLDG5)	3825 m²
HEAVY DUTY PAVEMENT (BLDG 5)	25426 m²
LIGHT DUTY PAVEMENT (BLDG 5)	20817 m²

PROVIDED PARKING SCHEDULE (BLDG5)

Family	Type	Count
PK-CP1	5400 x 2500 - 90 deg	268
PK-CP2	5400 x 2500 - (Backup)	120
PK-CP3	5400 x 2500 - (Disable)	12
PK-CP7	5400 x 2500 - EV CAR	14
PK-CP5	5900 x 2500 - 0 deg (PARALLEL PARKING)	13
Grand total		427
TOTAL CAR PARK REQUIREC (EXCLUDING BACKUP)		288

PROVIDED MOTORCYCLE PARKING (BLDG5)

Family	Type	Count
PK-CP8	2500 x 1200 (MOTORCYCLE)	12
Grand total		12

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Nominated Arch: Tristan Pace 6124 W 10131

Augusta St Warehouse and Distribution Centre
Augusta St, Blacktown within Blacktown
FOR APPROVAL

REVISION	DESCRIPTION	DATE
A	FOR SSDA SUBMISSION	23.06.23
B	TEST OF ADEQUACY UPDATES	11.08.23
C	TEST OF ADEQUACY UPDATES	18.08.23
D	TEST OF ADEQUACY UPDATES	21.08.23
E	POST SSDA UPDATES	20.02.24

ARCHITECT: PACE ARCHITECTS
BUILDER / PROJECT MANAGER:
CLIENT: LOGOS

GRAPHIC SCALE 1:100
purpose: FOR APPROVAL
H- MASTERPLAN

scale: As indicated A1
project no: 220207
date: 20.02.24
dwn: BH
dwg no: 220207 - DA-001
issue: E

Figure 1e.
Masterplan (PACE Architects, Dwg No. 220207 - DA - 001, Issue E. Dated 20.02.24

KEY

- Entry Feature Planting 1,924.52 sqm
- Conservation (Setback) 17,166.88 sqm
- Carpark and Office Planting 3,611.28 sqm
- Turf Cell (Permeable Paving) 3,157.36 sqm
- Conservation 22,717.08 sqm
- Conservation (Under Electrical Easement) 36,570.55 sqm
- Conservation Planting (Bioretention Basins) 10,924.37 sqm

NOTE:

1. Refer to Plant Schedules for species lists.
2. All Conservation Areas are subject to VMP.

PROPOSED CONSERVATION OUTCOME ONSITE:

STRATEGY	APPROXIMATE AREA
AREA FOR CONSERVATION	
Conservation setback from roads	1.72 ha
Conservation associated with drainage lines (excl area under Electricity Easement) * Not computed on total	5.08 ha
Conservation Planting	2.27 ha
Conservation (under Electricity Easement)	3.66 ha
Conservation Planting (bioretention basins)	1.09 ha
TOTAL	8.74ha
AREA NOT INCLUDED IN AREA CALCULATED FOR CONSERVATION	
Entry feature planting	0.19 ha
Carpark and Office Planting	0.36 ha
Turf Cell (Permeable Paving)	0.32 ha
TOTAL	0.87 ha
TOTAL LANDSCAPE AREA	9.61 ha



PROJECT	DRAWING TITLE	PROJECT NO.	PURPOSE	SCALE	REVISION	DATE	DRAWN	CHECKED	PAGE	CLIENT
HUNTINGWOOD LOGISTICS ESTATE AUGUSTA ST, HUNTINGWOOD EAST, NSW	LANDSCAPE STRATEGY	H8-22032	CLIENT REVIEW		M	14.03.2024	DG	DV	L07	LOGOS

0 10 50 100 150m

SCALE 1:3000 AT A3

HABIT8

Figure 1f.
Landscape Strategy (Habit8 - Project No. H8-22032. Rev. M. Dated 14.03.2024)



Figure 2a.
Site boundary overlaid on the
Blacktown Local Environmental Plan 2015 - Land Zoning Map.



Figure 2b.
Site boundary overlaid on the Blacktown Local Environmental Plan 2015 - Minimum Lot Size Map



ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
Environmental and Botanical Consultants

Date created: 28-06-2023

Figure 2c.
Site boundary overlaid on the Blacktown Local Environmental Plan 2015- Terrestrial Biodiversity Map

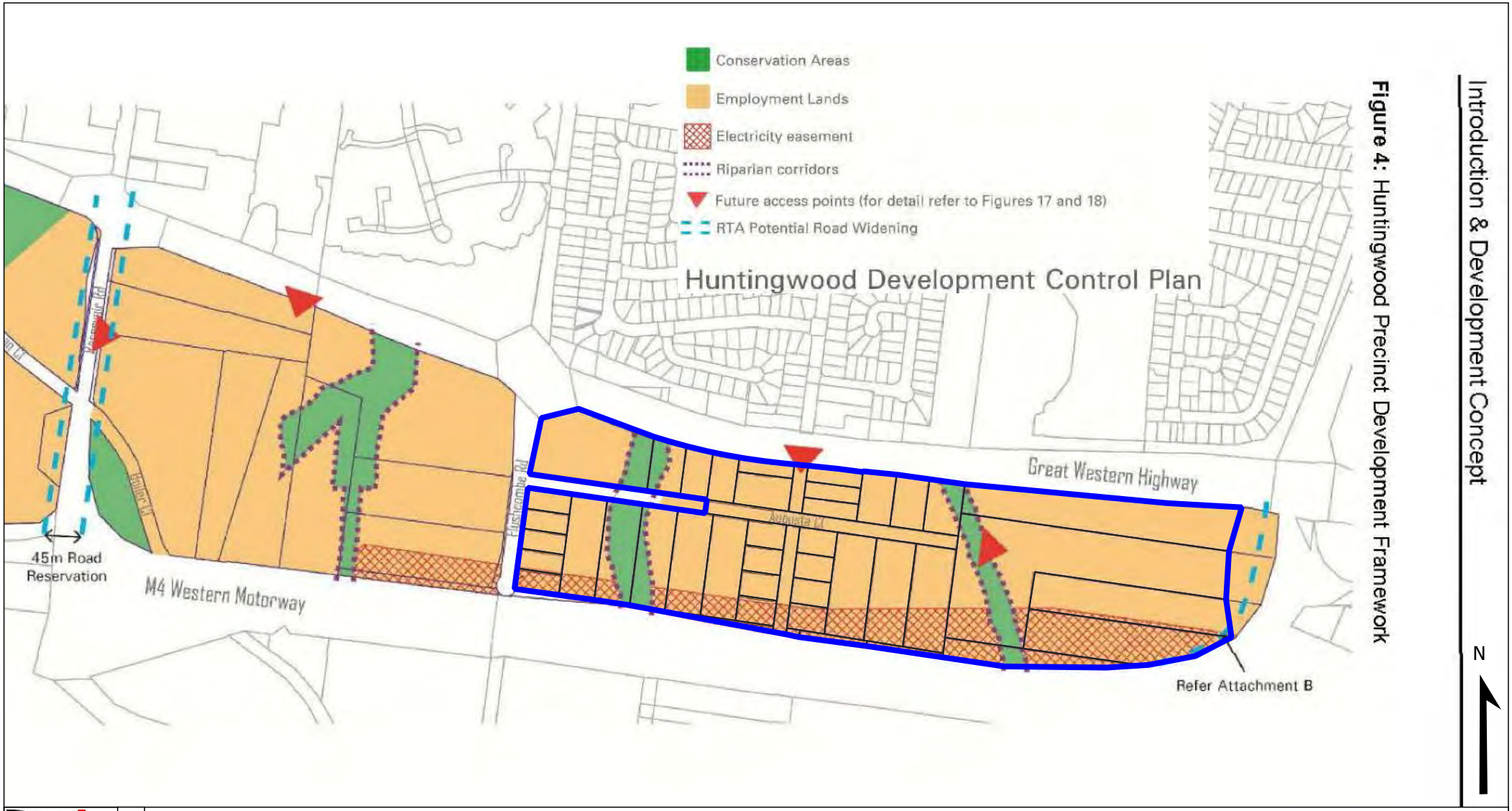


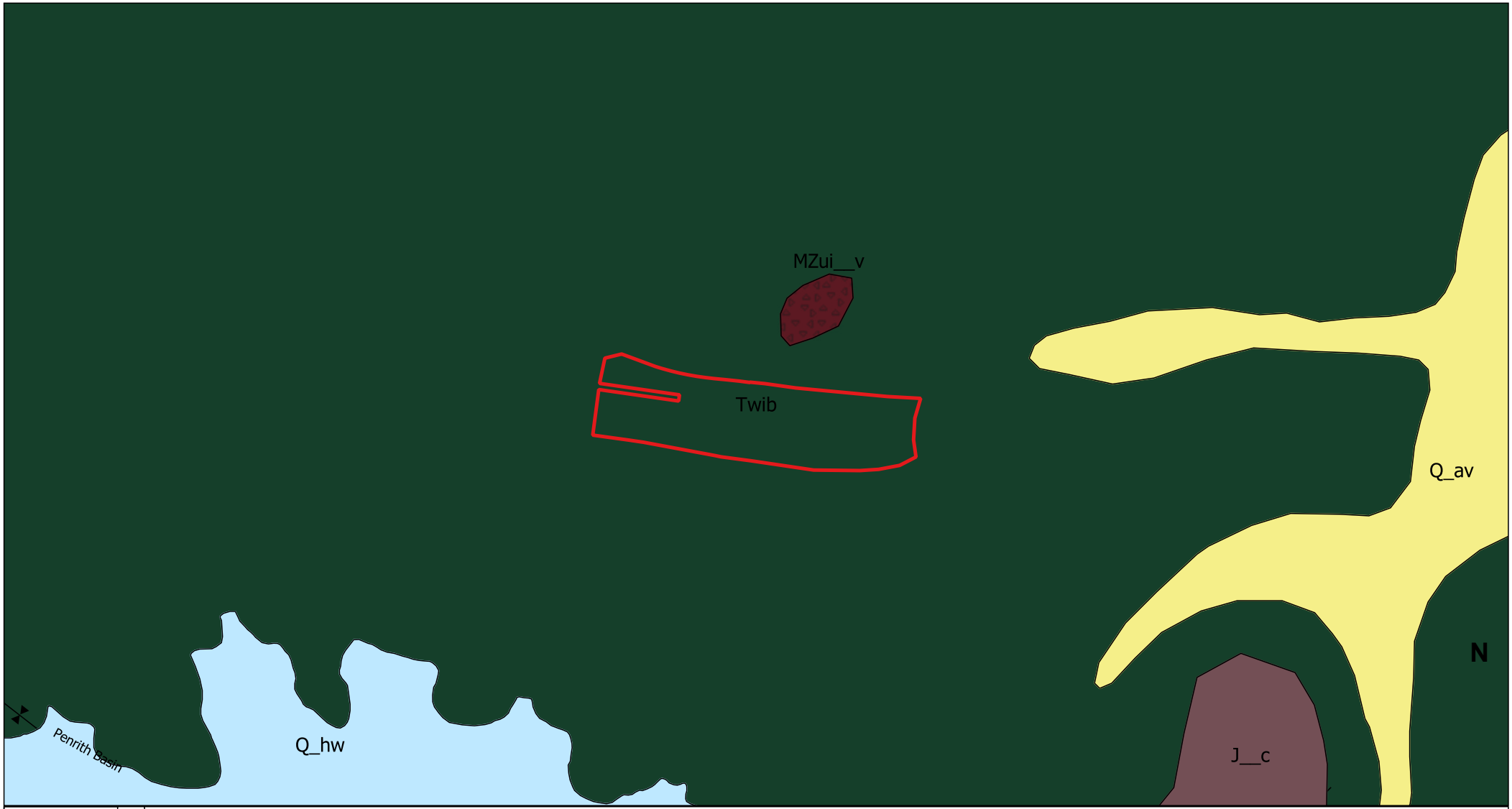
Figure 2d.
Site boundary overlaid on Huntingwood Precinct Development Framework (from Figure 4, page 7 of the Huntingwood Precinct DCP)



Figure 2e.
Site boundary overlaid on the Biodiversity Values Map - version 13



Figure 2f.
Site boundary overlaid on the Bushfire Prone Land map (NSW RFS 2020)



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Environmental and Botanical Consultants

Date created: 17-03-2022

Site boundary

Geological boundary position accurate

Cenozoic sedimentary province

- Q_av — Alluvial valley deposits
- Q_hw — Anthropogenic stored water, pondage, reservoirs, canals

Permian-Mesozoic ignous province

- J__c — Prospect Picrite
- MZui__v — Ungrouped Mesozoic igneous units - breccia
- Undifferentiated breccia

Permian-Triassic basins

- Twib — Bringelly Shale
- Syncline, position accurate

0 250 500 m

Geocentric Datum of Australia 1994

Figure 3a.
Site boundary overlaid on NSW Seamless Geology - version 2



Figure 3b.
Site boundary overlaid on Soil Landscapes of Central and Eastern NSW - version 2.1

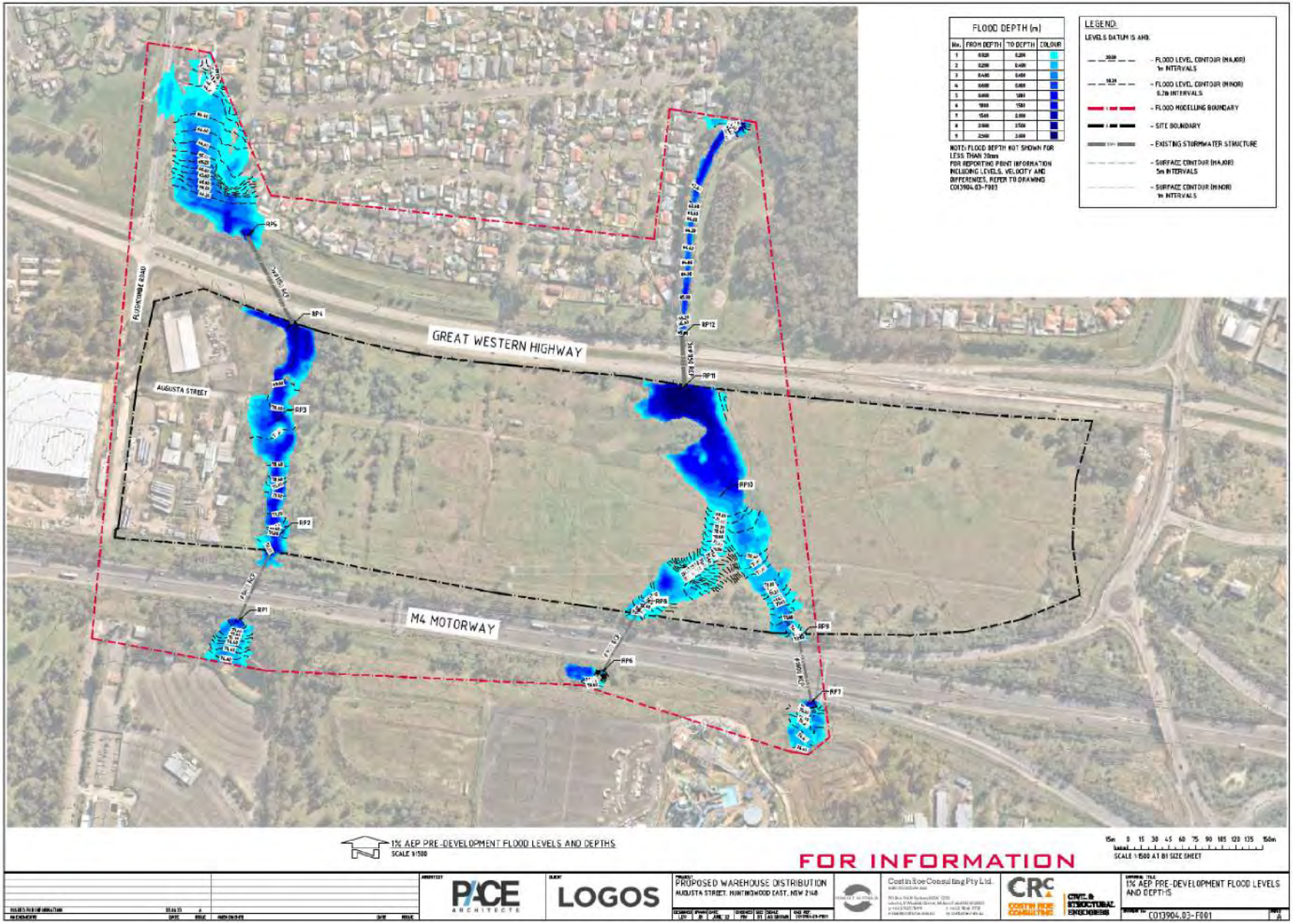
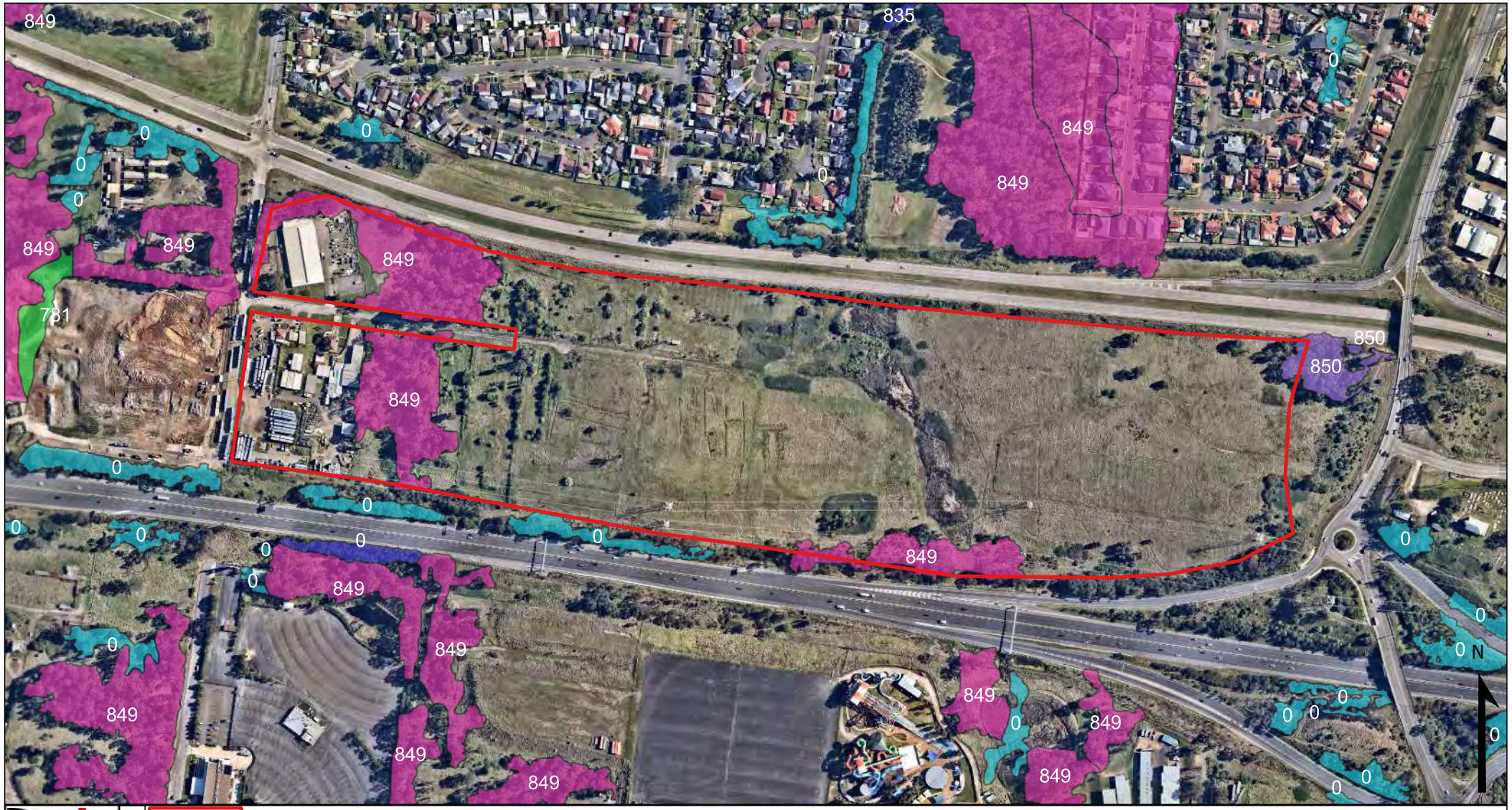


Figure 3c.
1% AEP pre-development flood levels and depth (Costin Roe Consulting Pty Ltd, Drawing No. C013904.03-F001. Issue A. Dated 23.06.23)



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Environmental and Botanical Consultants

Date created: 13-09-2022

	Site boundary
PCT - 835	S_FoW06: Cumberland Riverflat Forest
PCT - 781	S_FrW03: Coastal Freshwater Wetland
PCT - 850	S_GW02: Cumberland Shale Hills Woodland
PCT - 849	S_GW03: Cumberland Shale Plains Woodland
PCT - 0	Urban_E/N: Urban Exotic/Native
PCT - 0	Weed_Ex: Weeds and Exotics

0 100 200 m

Geocentric Datum of Australia 1994

Figure 4a.
The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH 2016) VIS_ID 4489



ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
Environmental and Botanical Consultants

Date created: 13-09-2022

Site boundary
PCT - 4024 Cumberland Blue Box Riverflat Forest
PCT - 3320 Cumberland Shale Plains Woodland
PCT - 3972 Sydney Creekflat Wetland

0 100 200 m

Geocentric Datum of Australia 1994

Figure 4b.
NSW State Vegetation Type Map (DPE 2022)

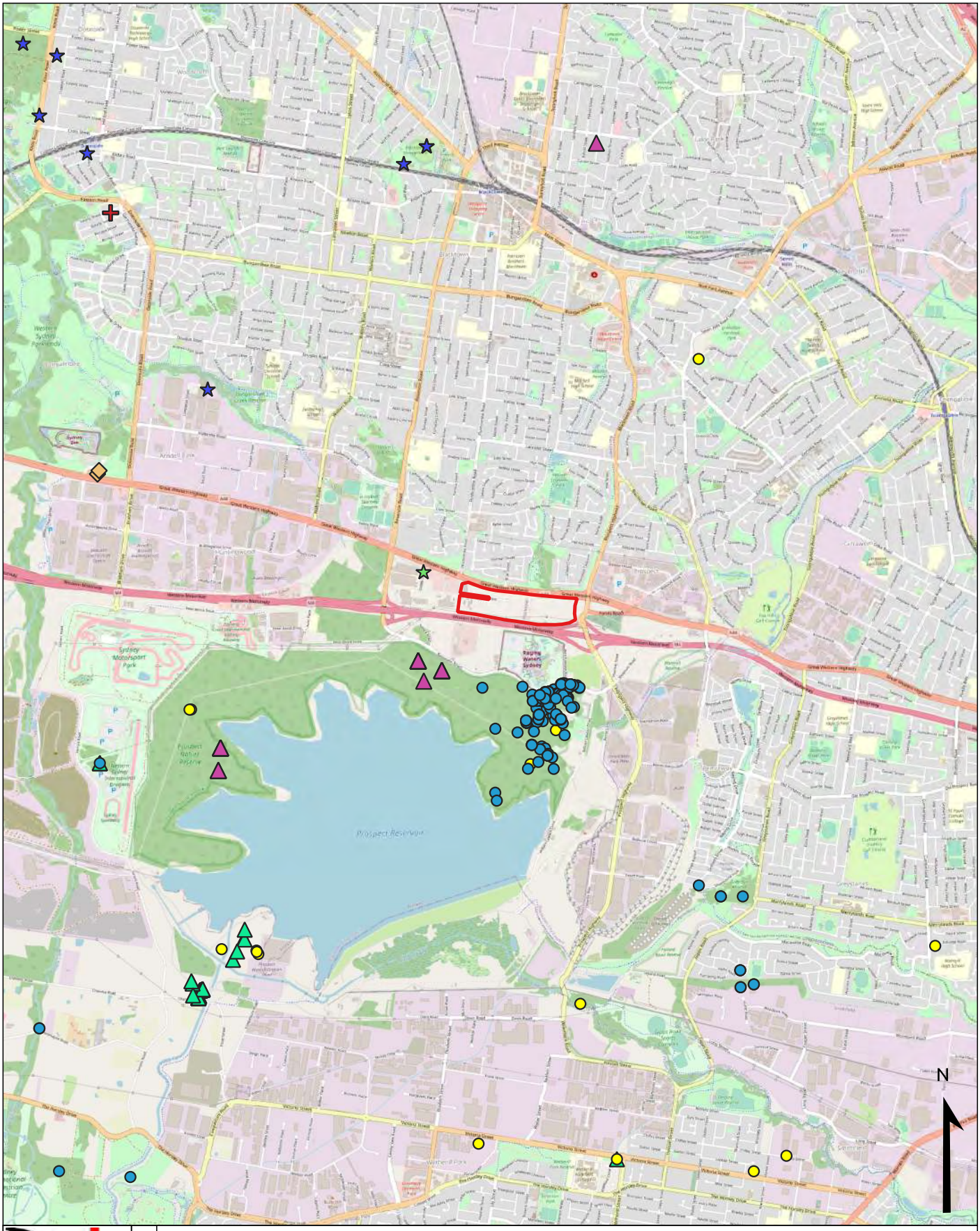


Figure 5a.
Site boundary and BioNet records of threatened Flora species overlaid on the Google Street Map imagery

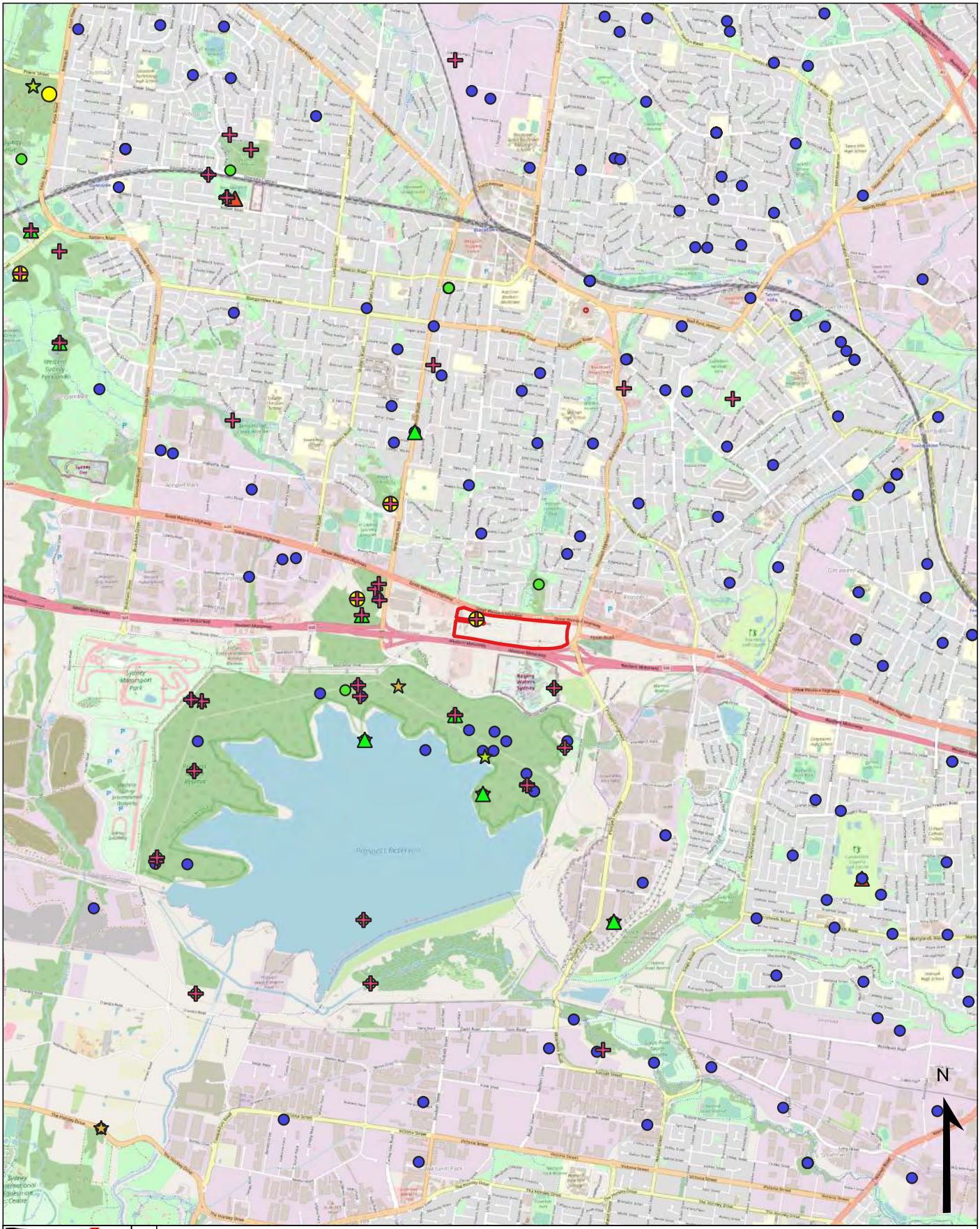


Figure 5b.
Site boundary and BioNet records of threatened mammal species overlaid on the Google Street Map imagery

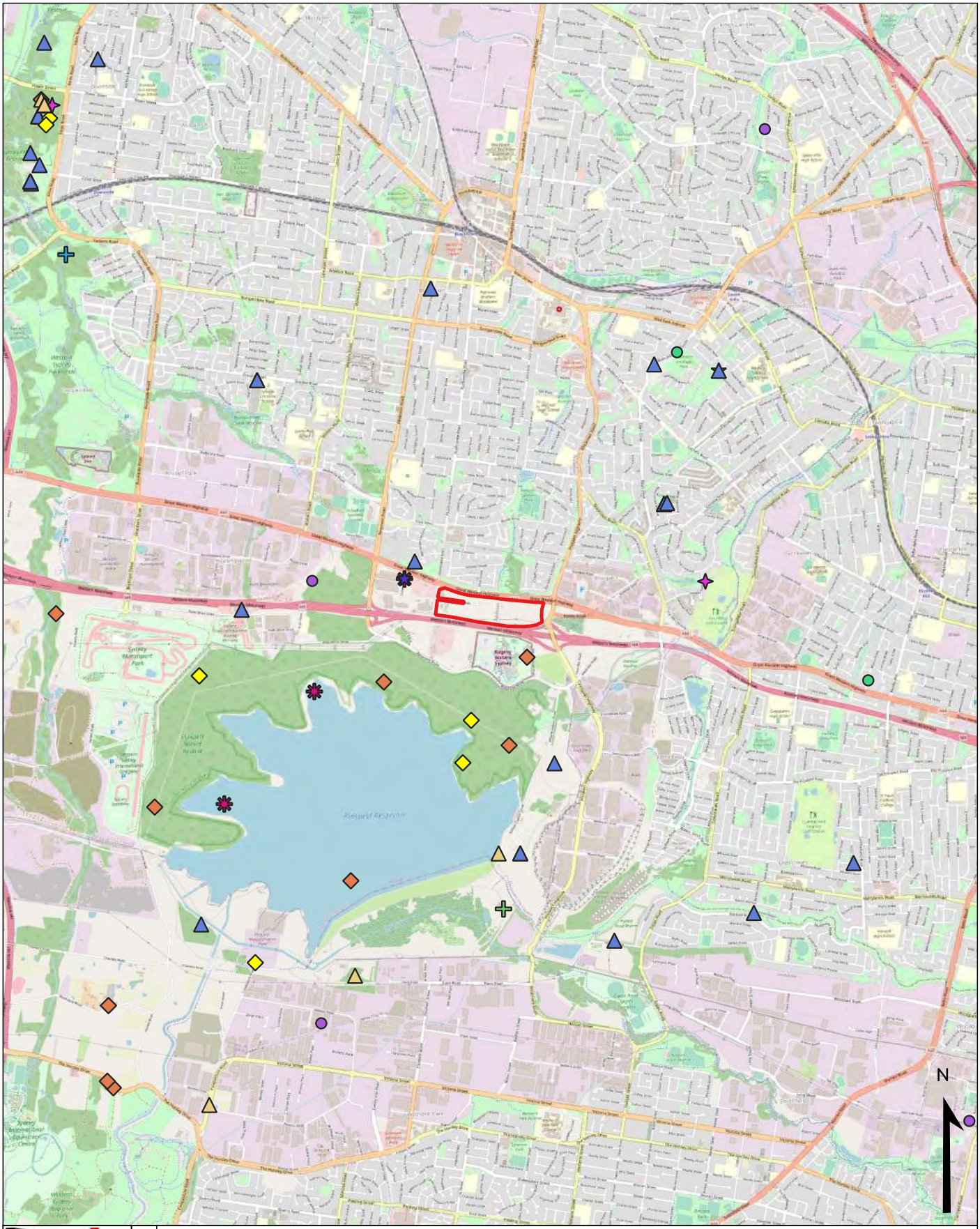


Figure 5c.
Site boundary and BioNet records of threatened bird species overlaid on the Google Street Map imagery

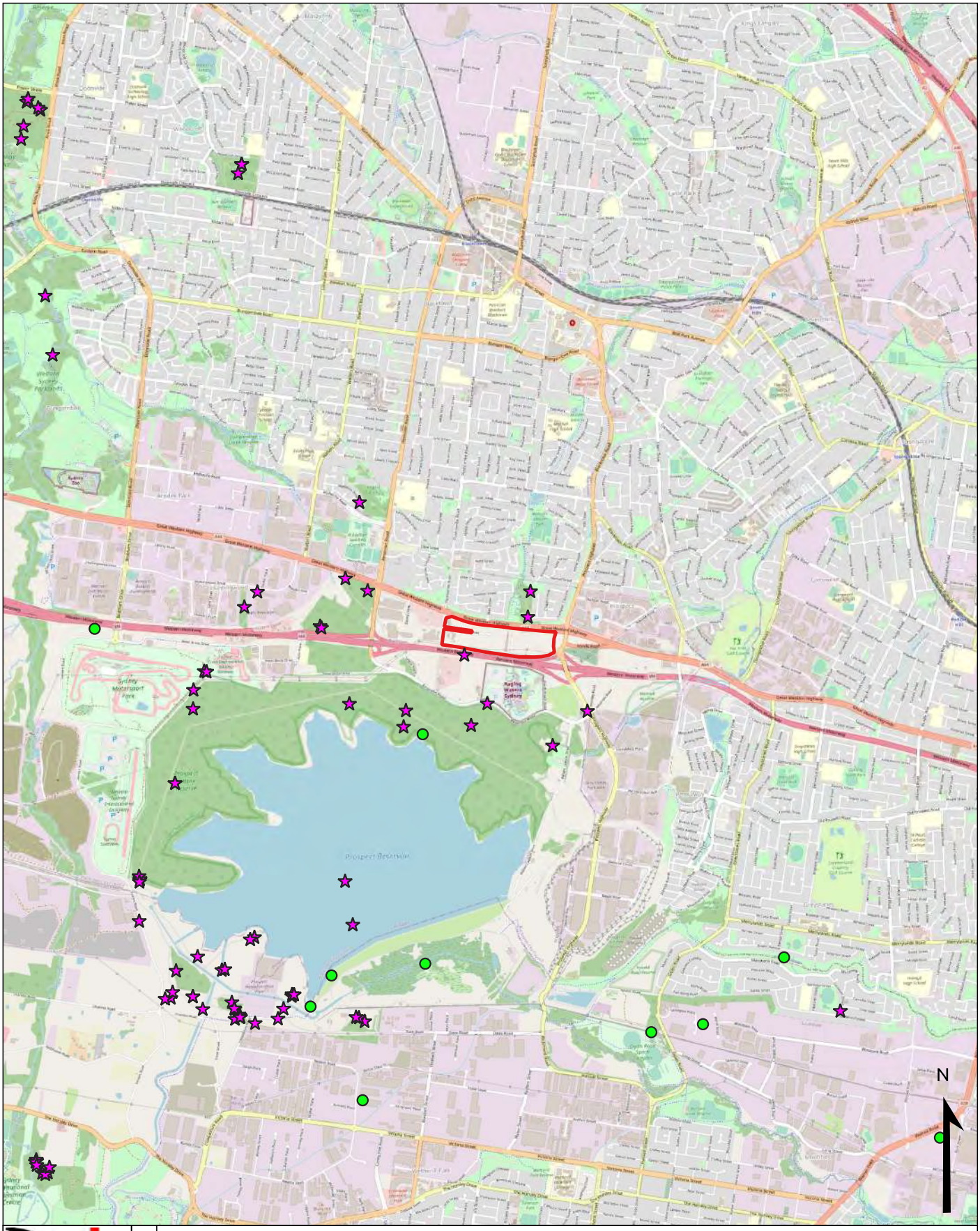
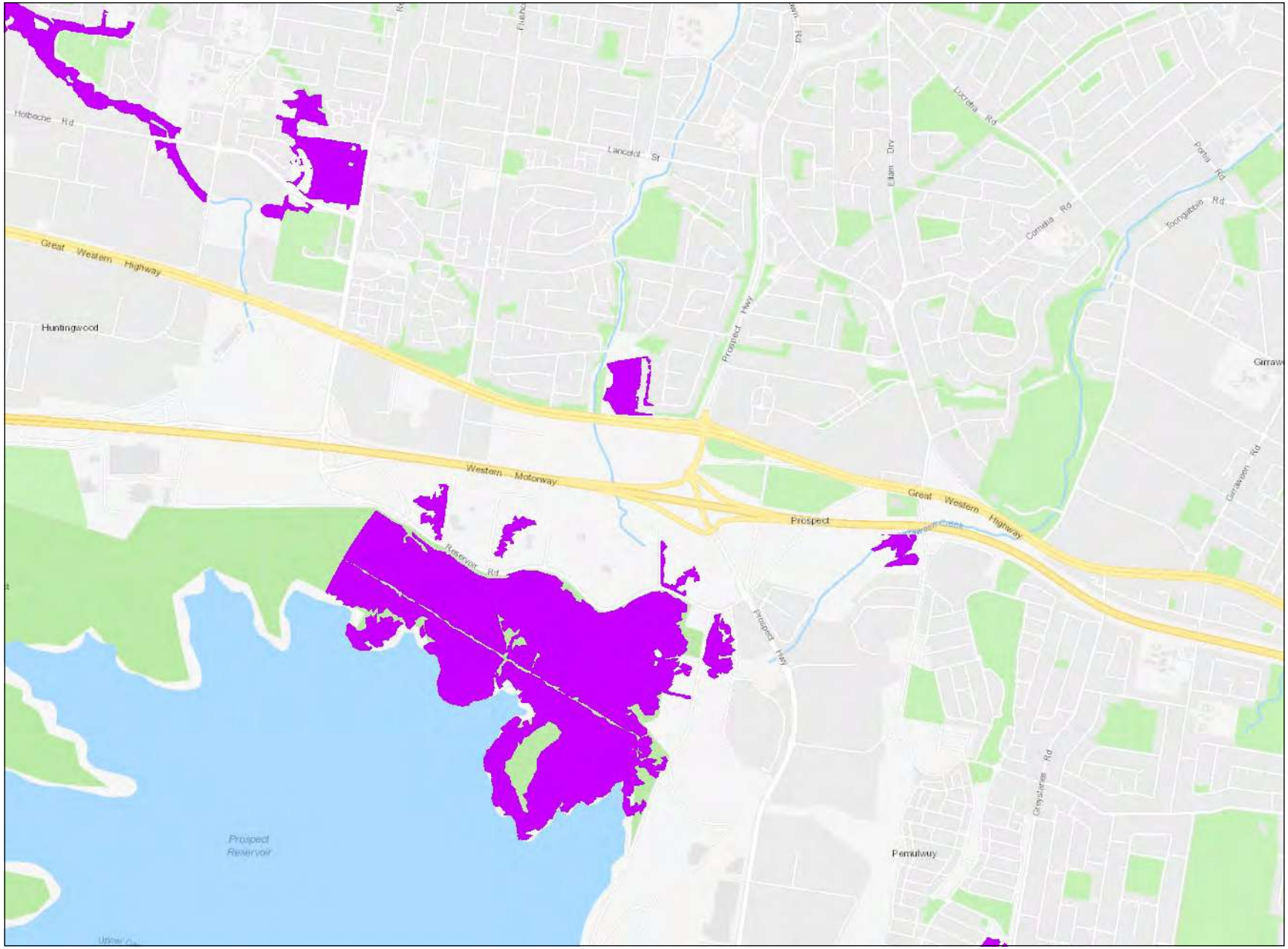


Figure 5d.
Site boundary and BioNet records of threatened amphibian and gastropod species overlaid on the Google Street Map imagery

Planning, Industry & Environment

Important Habitat map_Huntingwood

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Legend

- Swift Parrot Important Areas
- Migratory Shorebird Important Areas
- Regent Honeyeater Important Areas
- Plains-wanderer Important Areas
- DPEBasemap

0 1.3 2.5 5.0

Kilometres

Map Created 3:16 PM 29/6/2023

Figure 5e.
Important habitat map



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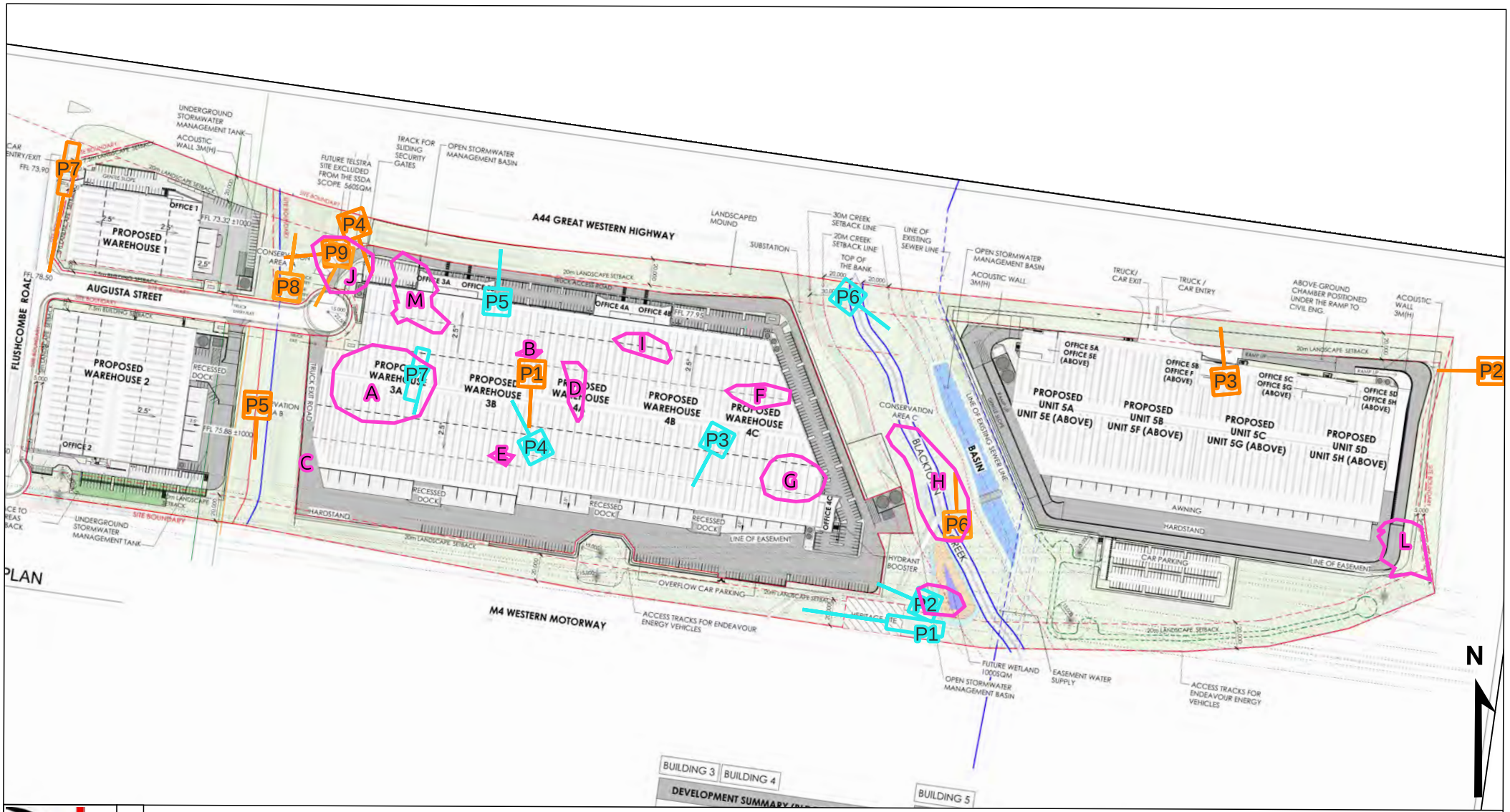
Date created: 29-06-2023

Site boundary
ACA BAM Plots
EP BAM Plots
ACA Patches

0 100 200 m

Geocentric Datum of Australia 1994

Figure 6a.
Sampling locations overlaid on the Nearmap aerial photograph dated 21 August 2022



EP BAM Plots
ACA BAM Plots
ACA Patches
Site boundary

ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
Environmental and Botanical Consultants

Date created: 21-03-2024

Figure 6b.
Sampling locations overlaid on the Masterplan (PACE Architects, Dwg No. 220207-DA-001, Issue E, dated 20.02.24)



ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
Environmental and Botanical Consultants

Date created: 29-06-2023

Site boundary

Sampling

BAM Plots ACA

BAM Plots PE

Patches ACA

PCTS

PCT 3319 - Degraded (2.37 ha)

Predominantly exotic vegetation or hardstand

0 100 200 m

Geocentric Datum of Australia 1994

Figure 6c.
Sampling locations overlaid on Vegetation Mapping



Figure 6d-1.
Canopy trees from Canopy Consulting with Grevillea robusta overlaid on the Nearmap aerial photograph dated 21 August 2022



Figure 6d-2.
Native canopy trees from Canopy Consulting overlaid on the Nearmap aerial photograph dated 21 August 2022



ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
Environmental and Botanical Consultants

Date created: 29-06-2023

Site boundary

Vegetation Zones

PCT 3319 - Degraded (2.03 ha) PCT

3319 - Less degraded (0.34 ha)

Predominantly exotic vegetation or hardstand (24.27 ha)

0 100 200 m

Geocentric Datum of Australia 1994

Figure 7a.
Vegetation Zones overlaid on the Nearmap aerial photograph dated 21 August 2022



ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
Environmental and Botanical Consultants

Date created: 20-03-2024

Management Zone

- Development footprint huntingwood (17.28 ha)
- Engineering footprint (0.36 ha)
- PCT 3319 - Degraded cleared (0.64 ha)
- PCT 3319 - Less Degraded cleared (0.07 ha)

Vegetation Zones

- Predominantly exotic vegetation or hardstand (24.27 ha)
- PCT 3319 - Degraded (2.03 ha)
- PCT 3319 - Less degraded (0.34 ha)

Figure 7b.
Vegetation and Management zones

Tables

Table 1. Cover of species recorded in 16 BAM Plots and species present in 13 patches A to M

Species	AC BAM Plots									AC Patches													EP BAM Plots						
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	A	B	C	D	E	F	G	H	I	J	K	L	M	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Tree (TG)																													
Acacia parramattensis																				X				2					
Eucalyptus moluccana		1	20	4	10		50	10	4					X									6						
Eucalyptus tereticornis		25		25	0.5			5	5					X					X				32	5					
Shrub (SG)																													
Acacia falcata		0.1																		X			0.5	0.2					
Acacia fimbriata		10																											
Acacia floribunda																							3						
Acacia implexa		0.3																											
Atriplex semibaccata											X		X																
Breynia oblongifolia																							0.1						
Bursaria spinosa subsp. *spinosa*		3		5	0.1		1		4				X										1	5					
Daviesia genistifolia													X																
Dillwynia sieberi		0.5					0.3																						
Eremophila debilis							0.7																						
Pittosporum undulatum									0.8																				0.1
Platysace lanceolata													X																
Grass & grasslike (GG)																													
Anthosachne scabra																													0.1
Aristida ramosa	0.1	1		1								X											0.1	0.1					
Aristida vagans		0.1										X																	
Bolboschoenus caldwellii						0.2																							
Bothriochloa decipiens var. *decipiens*											X		X										0.5	0.1					
Bothriochloa macra				0.1			0.5					X																	
Carex inversa				0.1					0.1														0.1	0.1		0.2	0.1		0.1
Chloris ventricosa							0.1																						
Cymbopogon refractus												X																	
Cynodon dactylon	0.3			0.1			0.1		25		X	X											0.1			2	1		1
Cyperus exaltatus																												0.3	
Cyperus gracilis		0.2		0.2			0.3					X																	
Dichelachne micrantha	0.1	0.1										X																	
Digitaria diffusa		0.1																											
Digitaria parviflora		0.1																											
Eleocharis plana																												0.5	
Entolasia marginata							0.5																						
Eragrostis brownii													X			X													
Eragrostis leptostachya																								0.1					
Eriochloa pseudoacrotricha							0.1			X																0.1			

Species	AC BAM Plots									AC Patches													EP BAM Plots						
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	A	B	C	D	E	F	G	H	I	J	K	L	M	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Fimbristylis dichotoma		0.5																											
Juncus usitatus									0.1								X										0.2	0.2	0.1
Lachnagrostis filiformis																	X											0.1	
Lomandra filiformis subsp. *filiformis*	0.3	2		0.1					0.1																				
Microlaena stipoides		5		15	0.5		4		0.3			X									X		8	20					0.5
Oplismenus aemulus								2																					
Paspalidium distans							0.3					X						X						0.1					
Paspalum orbiculare							0.1																						
Rytidosperma racemosum		0.1					0.1		0.3			X																	
Rytidosperma spp.																							0.1						
Sporobolus creber				0.1			0.3																						
Themeda triandra	0.3	0.1																											
Typha domingensis						90											X												
Typha orientalis																												25	
Forb (FG)																													
Alternanthera denticulata																												0.1	
Arthropodium milleflorum		0.1																											
Asperula conferta				0.1																						0.1			
Brunoniella australis		4					0.3																						0.1
Caesia parviflora		0.1																											
Calotis lappulacea							0.1																						
Commelina cyanea								0.1																					
Dianella longifolia	0.1	0.1										X	X	X									0.1						
Dichondra repens		2		2			5	1	0.2			X									X		0.3						1
Einadia hastata		0.1					0.1																						
Einadia nutans								0.3																					
Einadia nutans subsp. *linifolia*							0.1		0.1															0.2					
Einadia nutans subsp. *nutans*										X		X																	
Einadia polygonoides							0.3																						
Einadia trigonos								0.1																					
Einadia trigonos subsp. *trigonos*							0.1																						
Epilobium hirtigerum																	X												
Euchiton sphaericus									0.1																				0.1
Euphorbia drummondii							0.1																						
Geranium solanderi				0.1					0.1																				
Grona varians		0.1																											
Opercularia diphylla												X																	
Oxalis exilis																							0.1	0.1	0.1	0.1	0.1		
Oxalis perennans		0.1					0.1							X															0.1
Phyllanthus virgatus		0.1					0.1																0.1	0.1					

Species	AC BAM Plots									AC Patches													EP BAM Plots						
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	A	B	C	D	E	F	G	H	I	J	K	L	M	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Plectranthus parviflorus									0.1																				0.3
Portulaca oleracea							0.1																						0.1
Rumex brownii																		X											0.1
Senecio hispidulus		0.1																											
Tricoryne elatior		0.1																											
Vittadinia cuneata var. *cuneata*							0.1																						
Wahlenbergia gracilis	0.1	0.1		0.1							X		X											0.1					
Other (OG)																													
Amyema miquelii			2				2							X															
Glycine clandestina		0.1		0.1																			0.2						
Glycine tabacina		0.6		3			0.3		1	X													0.2	0.1		0.2			0.1
Hardenbergia violacea							1																						
Livistona australis					0.3																								
Unknown																													
Cyperaceae unknown genus																											0.3		
Cyperus sp.																								0.1					
Non-local native																													
Acacia baileyana							0.1																						
Eucalyptus robusta										X										X									0.1
Grevillea robusta				0.1					0.1	X			X						X			X							2
Melia azedarach								0.1														X							
Pandorea jasminoides										X																			
Plumbago zeylanica																													0.1
High threat weed																													
Anredera cordifolia				0.1	1			3	0.1																				
Asparagus aethiopicus				0.1	0.1			0.1	0.3	X																			
Asparagus asparagoides		0.2		0.1	0.1		0.1		0.4	X		X		X									0.1	0.1					0.3
Asparagus plumosus																							0.1	0.1					
Bidens pilosa		0.2	0.2	4			0.5		2	X				X							X	X	0.1	0.1		0.1	0.1		
Bidens subalternans		0.1																											3
Briza subaristata	15											X	X													0.5	0.5		
Cardiospermum grandiflorum					0.5																								
Cenchrus clandestinus	1		85					2		X						X		X			X	X	0.2	10	80	15	30		25
Cestrum parqui															X		X											0.1	0.1
Chloris gayana		0.1	3	5			1	0.8			X	X									X		0.5	1					
Cyperus eragrostis																	X												0.1
Ehrharta erecta		0.1		0.1	5		4	5	3	X													0.1						
Eragrostis curvula	0.3	10					35		0.1	x	X	X	X					X			X		10	0.5		0.3			
Hyparrhenia hirta											X																		
Hypericum perforatum	1	0.1								X			X	X							X				0.1	0.3			2

Species	AC BAM Plots									AC Patches												EP BAM Plots						
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	A	B	C	D	E	F	G	H	I	J	K	L	M	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Juncus acutus						5											X											15	
Lantana camara		3	0.5		20		2	5	5			X		X					X		X	X	7	20					
Ligustrum lucidum				10	15			3	3	X											X	X							0.1
Ligustrum sinense				10	3			0.8	10	X				X			x		X			X						0.5	
Lonicera japonica										X												X							0.1
Opuntia monacantha								0.8																					
Paspalum dilatatum	40	0.6	5	5			0.2		0.4		X			X							X		0.5	5	1	30	30		0.1
Rubus anglocandicans						5							X		X	X					X							10	0.5
Senecio madagascariensis		0.1		0.2			0.1		2	X	X	X	X			X		X					0.1	0.1	0.1	0.3	0.1		
Senna pendula var. *glabrata*				0.3				2	0.1	X												X							
Exotic																													
Agrostis stolonifera																	X												
Anagallis arvensis	0.1																												
Araucaria columnaris										X																			0.1
Araujia sericifera		0.1	0.1	0.3			0.1																				0.1	0.2	
Asparagus officinalis		0.1																											0.5
Aster subulatus									0.1	X															0.1			0.2	
Avena barbata	0.6															X		X											
Bromus catharticus										X				X													0.1		5
Campsis radicans										X																			
Cirsium vulgare	0.3		0.1					0.3	0.1					X		X		X					0.1	0.1		0.1	0.1	0.2	0.3
Conyza bonariensis																								0.1	0.1	0.2			0.1
Conyza sp.																													
Conyza sumatrensis	0.1			0.1					0.2	X											X					0.1	0.2		
Cortaderia selloana								1																					
Cotoneaster glaucophyllus									0.3																				
Cyanthillium cinereum var. *cinereum*																							0.1	0.1					1
Cyclospermum leptophyllum	0.1																												
Cyperus brevifolius							0.1																						
Dactylis glomerata																													0.1
Epilobium hirsutum																												0.6	
Erythrina crista-galli					30																								
Erythrina x sykesii																													
Festuca elatior										X																			2
Foeniculum vulgare			0.1																									0.2	
Gomphocarpus fruticosus				0.1									X								X								0.1
Hibiscus rosa-sinensis (unidentified cultivar)										X																			
Hypochaeris microcephala var. *albiflora*													X																0.1
Hypochaeris radicata	0.3								0.1																				10
Lactuca serriola																									0.1				0.1

Species	AC BAM Plots									AC Patches													EP BAM Plots						
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	A	B	C	D	E	F	G	H	I	J	K	L	M	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Lepidium bonariense																													
Linum trigynum	0.2						0.1				X		X																
Lolium perenne	10									X		X				X		X											
Lotus sp.	0.1																X												1
Lycium ferocissimum			0.5	0.3																									
Malva parviflora																									0.1				
Modiola caroliniana								0.1	0.1																				
Nerium oleander										X												X							
Nothoscordum gracile							0.1																		0.1		0.1		
Olea europaea subsp. *cuspidata*		0.8	2	15	4			5	3	X		X	X						X		X	X	0.5	2					15
Osteospermum ecklonis										X																			0.1
Osteospermum spinescens																													
Paspalum notatum		5		10								X	X			X							0.1			10			
Pavonia hastata																							0.1	0.1					
Phalaris aquatica												X				X	X												
Phalaris sp.																										0.1		0.1	
Plantago lanceolata	1			0.2			3		0.2			X						X			X		0.2		0.5	0.3	0.3		
Pyracantha sp.																		X											
Rosa banksiae Alboplena										X																			5
Rumex conglomeratus																												0.3	
Rumex crispus														X			X								0.1	0.1	0.1		
Schinus molle var. *areira*																													0.1
Senecio pterophorus									0.1	X																			
Setaria parviflora		0.1					0.3		0.9														0.1	0.2		0.7		0.4	0.2
Sida rhombifolia		0.6	1	0.1	0.1		0.1		0.8	X			X	X									0.2	0.1	0.1	0.2	0.1		
Solanum americanum									0.1													X							
Solanum nigrum								0.1		X				X											0.1		0.2		
Solanum sisymbriifolium								0.3						X												0.1			
Sonchus oleraceus	1	0.1					0.1									X		X							0.1	0.1		0.1	
Sorghum halepense																													
Sporobolus africanus		0.1		0.3					0.1	X		X		X															
Stachys arvensis	0.3																												0.1
Syagrus romanzoffiana										X																			
Taraxacum officinale																							0.1				0.1		
Tradescantia fluminensis				1	0.1																	X							0.1
Tragopogon porrifolius										X				X															
Trifolium glomeratum										X																			
Trifolium sp.																										0.1	0.1		
Verbena bonariensis		0.1		0.1					0.6	X		X	X	X		X		X			X			0.1	0.2	0.2	0.2	0.2	
Verbena incompta																									0.1	0.2			

Species	AC BAM Plots									AC Patches													EP BAM Plots						
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	A	B	C	D	E	F	G	H	I	J	K	L	M	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Verbena quadrangularis								0.3		X														0.1	0.1	0.1	0.1		
Verbena rigida var. *rigida*																							0.1						
Vicia sp.																									0.1	0.1	0.2		
Vicia tetrasperma	0.4								0.1	X				X															
Yucca elephantipes										X																			

Table 2. Maximum heights and numbers of individuals per 10 m x 10 m subquadrat, for species present ≥ 2 m.

Botanical name	Subquadrat 1		Subquadrat 1		Subquadrat 1		Subquadrat 1	
	Number	Height	Number	Height	Number	Height	Number	Height
Plot 1								
No trees								
Plot 2								
Acacia fimbriata			4	7m				
Bursaria spinosa			1	2m	1	2m	1	3m
Eucalyptus moluccana	1	9m						
Eucalyptus tereticornis	8	15m	8	15m	4	14 m	3	10m
**Olea europaea* subsp. *cuspidata*			1	4m				
Plot 3								
Eucalyptus moluccana			2	25m				
Plot 4								
Bursaria spinosa					3	4m		
Eucalyptus tereticornis	2	16m	1	17m	1	13m	2	25m
Eucalyptus moluccana					2	20m		
#*Grevillea robusta*					1	2m		
**Lantana camara*			2	2m				
**Ligustrum lucidum*	1	3m	2	4m	3	6m	8	5m
**Ligustrum sinense*	3	3m	3	4m	3	3m	2	3m
**Olea europaea* subsp. *cuspidata*					3	9m	1	7m
Plot 5								
Eucalyptus moluccana	1	12m	2	17m			2	25
Eucalyptus tereticornis					1	10m		
**Erythrina crista-galli*					6	13m	6	10m
**Ligustrum lucidum*			3	7m			1	3m
**Ligustrum sinense*			1	4m			4	4m
**Olea europaea* subsp. *cuspidata*	1	4m	5	7m				
Plot 6								
No trees								
Plot 7								
Eucalyptus moluccana	3	25 m	3	27 m	10	27 m	3	27 m
Bursaria spinosa			1	2 m				
Plot 8								
Eucalyptus moluccana	3	25 m	2	25 m	1	20 m	1	16 m
Eucalyptus tereticornis	5	23 m			1	22 m		
**Ligustrum lucidum*	3	4 m			2	5 m		
**Ligustrum sinense*					2	2 m		
**Opuntia monacantha*			2	3 m			2	2 m
Plot 9								
Bursaria spinosa	1	3 m	2	4 m			1	3 m
Eucalyptus moluccana			2	7 m			2	18 m
Eucalyptus tereticornis					1	18 m		
**Lantana camara*	1	2 m	2	2 m			1	2 m
**Ligustrum lucidum*					3	2 m	2	4 m
**Ligustrum sinense*	10	3 m	2	3 m	9	3 m	5	3 m
Pittosporum undulatum	3	2 m						
**Olea europaea* subsp. *cuspidata*	4	4 m			3	3 m		

= non-local native
* = exotic

Appendices

Appendix 1

Company profile and brief CVs of authors

ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
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February 2024

Anne Clements & Associates is a group of botanists, ecologists and restoration ecologists who specialise in botanical conservation assessment, as well as developing and implementing optimal conservation strategies. The company has more than 30 years of experience in:

- flora surveys of a wide range of ecosystems;
- environment and botanical assessments;
- assessments of impacts;
- vegetation plans of management;
- the implementation of rehabilitation/conservation programs as part of sustainable development of sites; and
- environmental management of development sites.

The group provides a broad variety of skills and a high level of experience.

The company works closely with community groups, fauna consultants, town planners, geologists, engineers, lawyers, land developers and mining companies in planning and implementing optimal conservation strategies as part of sustainable development of sites.

Four of the company's environmental managed sites have won excellence awards for their quality and innovations, including "Excellence of Excellence" in 2000, Gold and Silver in NSW Rivercare 2000, Silver and Excellence in NSW Mineral Resources Excellence Awards and Excellence in the Earthmovers Awards, 2006 Environment Award for Australian Property Industry and 2007 International Green Apple Award.

Brief CV s of key personnel

Dr AnneMarie Clements

A restoration ecologist with M.Sc. (Macquarie Univ.) Thesis - *The vegetation of bushland in the northern Sydney area* and a Ph.D. (Univ. of Sydney) Thesis – *The vegetation of the sand masses of the mid-north coast of New South Wales*. She has more than 30 years experience.

Her major research interests include the re-establishment of native ecosystems, impacts of urban development on vegetation and soil, pattern analysis, effects of inundation and salinity on the plant communities, metal concentrations on plant growth and bioaccumulation. She has utilised her research in designing and implementing numerous rehabilitation / conservation programs as part of sustainable developments.

Anne is certified as a BAM Assessor (Accreditation Number: BAAS17088) under the *Biodiversity Conservation Act 2016*, a BioBank Assessor, and an Ecology Specialists

Certified Environmental Practitioner under the Environmental Institute of Australia and New Zealand CEnvP Program (CEnvP Registration Number E200001).

Dr Anne Baumann

Anne has 20 years of broad industry experience in a range of technical flora related roles including with the Office of Environment and Heritage. Her formative career was in biosecurity having spent 6 years in the Australian Quarantine Inspection Service.

Anne has a Bachelor of Science in Agriculture from the University of Sydney and a PhD on the recruitment of the Broad-leaved Paperbark Tree on the mid north coast of NSW. She also has a Diploma in Arboriculture and a Certificate III in Conservation and Land Management.

Her skills include writing Biodiversity Assessment Reports and vegetation management plans. She has strong GIS mapping skills and plant identification and curatorial skills and has completed an internship with the NSW Herbarium at the Royal Botanical Gardens, Sydney. She is experienced in flora survey and BioBanking field assessment techniques and has worked in a range of endangered ecological communities.

Anne has also worked as a bushland regenerator and has implemented vegetation management plans.

Tony Rodd

A taxonomic botanist with B.Sc. (University of Sydney) with extensive experience in plant identification, Tony was the Horticultural Botanist at the Royal Botanic Gardens, Sydney for 13 years (1970-82). After leaving the Gardens, he continued as a consultant, including preparation of interpretative material and collection of plants from the wild for the living collections at the Mount Annan and Mount Tomah Botanic Gardens.

Tony has also worked extensively with book publishers, including in the role of Chief Consultant for *Botanica* (Random House 1997) and *Flora* (Timber Press / ABC Gardening Australia 2003), and co-author of *Trees: a visual guide* (Weldon Owen 2008). He has a long-standing interest in the taxonomy of Australian palms and has had a major revision of the palm genus *Livistona* published in the journal *Telopea*. For more than 25 years, he has worked with Anne Clements & Associates on many flora surveys and rehabilitation projects.

Dr Pamela Hazelton

Dr Pam Hazelton is a Certified Professional Soil Scientist (CPSS). She graduated from the University of Sydney with a Bachelor of Science degree; gained a Diploma of Education from the University of New England and a PhD from the University of NSW. She is an experienced pedologist of more than 30 years, and has produced over half of the Western Division (NSW) land system maps and also soil landscape maps in the south-eastern areas of New South Wales, Australia. She has published scientific papers on a variety of soil and education topics and is the editor of a widely used research text for the interpretation of soil test data.

Throughout her career she has lectured at a variety of universities including Hong Kong and France, worked in a government department and also worked as a consultant specialising in the association of soil types and their relationship with endangered ecological communities. Dr Hazelton's major research interests lie in the application of soil science to environmental engineering specifically in the areas of salinity, sodicity and acid sulfate soil in coastal and urban land use, At present she is the Program Head and coordinator of the Master of Environmental Engineering

Management in the School of Civil and Environment, Faculty of Engineering, University of Technology, Sydney.

Dr Margaret Donald

Margaret holds a Ph.D from the Queensland University of Technology; Thesis: *Using Bayesian methods for the estimation of uncertainty in complex statistical models*. She has been a co-author of 14 published journal articles and currently has additional articles in press.

Margaret's previous positions include a Senior research statistician, responsible for the development and design of databases and acquisition of machine data for Polartechnics Pty.Ltd, biometrician for Sydney Water, post-doctoral research fellow at UNSW. Margaret is engaged by Anne Clements & Associates to undertake statistical analysis of field collected data and for advice regarding field experiments. Margaret has been recognised by her peers (the Statistical Society of Australia) as a highly competent statistician with the award of an Astat.

Tim Harding

Tim holds a Bsc from UNSW with a major in Terrestrial Ecology. He has completed 2 years of a law degree and has had 2 years experience as a registration clerk including the asbestos department with Slater & Gordon. He has been intern at Atlas of Living Australia. He has experience plant identification, and GIS mapping.

Pauline Dever

Pauline holds a Bachelor of Environment majoring in Earth and Environmental Science. She has a Diploma of Conservation and Land Management and has worked as a bushland regenerator. She has experience in weed control, plant identification, soil classification and GIS mapping.

Appendix 2

Advice from Government Authorities

- email from NRAR on 3 July 2022

- email from BAM Support Team on 13 May 2022

A swale in west of the Huntingwood site

Inbox ×

Anne Clements <mail@acabotanic.com>
to Gina, Athlene, Greg.Oxley

Sun, 3 Jul 2022, 17:06

Hi Gina,
Hope you are well.

In the east of the site, there is Blacktown Creek, a 1st Order watercourse.

In the west, there is a swale (near the "UG" in AUGUSTA ROAD on the attached 1:25 000 topo). There is no blue line mapped in the area on the 1:25 000 topo.

Can you please clarify if this swale could be considered as containing a "watercourse" under the *Water Management Act 2000.*

Thanks,
Anne

Anne Clements & Associates Pty Limited

Environmental and Botanical Consultants

PO Box 1623 North Sydney NSW 2059

Ph: (02) 9955 9733 M: 0427553362

Email: mail@acabotanic.com

One attachment • Scanned by Gmail

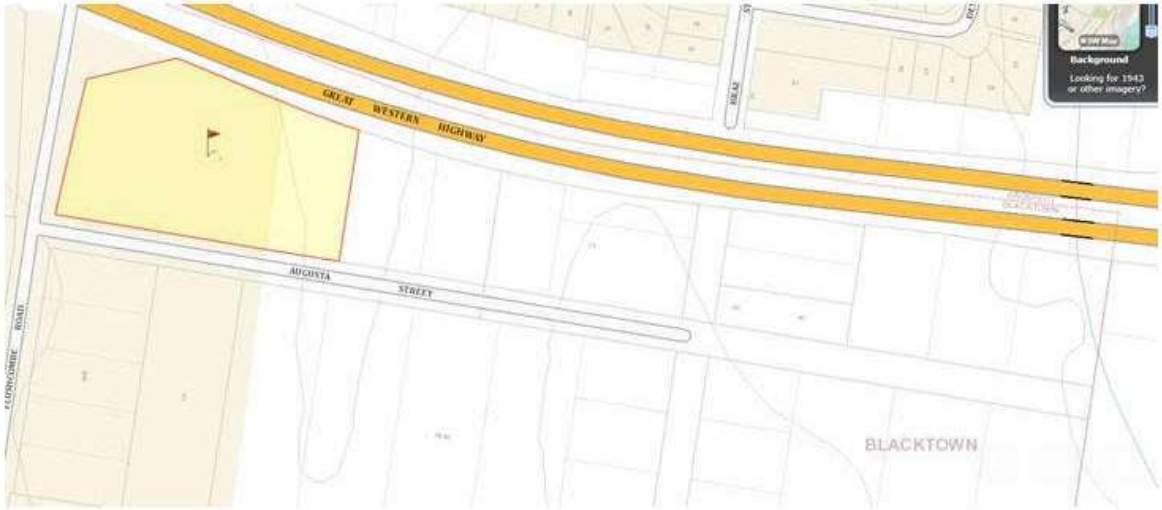


Figure 1b-2. Topo ...

Gina Potter <gina.potter@nrar.nsw.gov.au> 3 Jul 2022, 19:24
to Anne

Hi Anne,

No watercourse



regards,

Gina Potter | Water Regulation Officer

Water Regulation Officer

Licensing & Approval

W www.dpie.nsw.gov.au

Controlled Activities https://www.dpie.nsw.gov.au/water/licensing-and-trade/approvals/controlled-activity-approvals

4 Parramatta Square, 12 Darcy Street, Parramatta NSW 2150

Locked Bag 5022, PARRAMATTA NSW 2124.

NSW GOVERNMENT | Planning, Industry & Environment

Gmail **Anne Clements <acabotanic@gmail.com>**

Planted trees - Grevillea robusta and Eucalyptus robusta in the former house site

8 messages

Anne Clements <mail@acabotanic.com> 7 March 2022 at 13:08
To: OEH ROD BAM Support Mailbox <BAM.support@environment.nsw.gov.au>

Hi,
Can you please advise on the status of planted trees, in particular *Grevillea robusta* and *Eucalyptus robusta* in a former garden planting in western Sydney as being part of PCT 849 (*Cumberland Plain Woodland*)?

In the BAM (DPIE 2020) following the decision making key steps in Appendix D streamline assessment module - planted native vegetation.
The response to Appendix D1. 5, i) is Yes Go to D.2.
D.2 relates to use of planted native vegetation by threatened species.

QUESTIONS
For assigning a PCT
1. The planted trees *Grevillea robusta* and *Eucalyptus robusta* in the former garden are not local native trees, nor trees of PCT849 (Cumberland Plain Woodland).
SHOULD PCT 849 be assigned to this stand - CORRECT?

2. In terms of data to enter in the calculator
If PCT 849
Grevillea robusta and *Eucalyptus robusta*

- For calculating Composition score - Do we enter **TREES 2?**
- For calculating Structure Score - Do we enter **TREES 2.1% cover**?
- For calculating Function Score - Do we enter **stem classes 10-20, 20-30 and regeneration of *Grevillea robusta*?**

3. Can you please provide advice on:
a. planted trees near the former house
b. Stands of Privet and Lantana near the former house as fauna habitat
c. regeneration / naturalised stands of *Grevillea robusta.*

Looking forward to your response.

Regards,
Dr AnneMarie Clements
Assessor No. BAAS17088

Anne Clements & Associates Pty Limited

Environmental and Botanical Consultants

PO Box 1623 North Sydney NSW 2059

Ph: (02) 9955 9733 M: 0427553362

Email: mail@acabotanic.com

Anne Clements <mail@acabotanic.com> 4 May 2022 at 15:38
To: OEH ROD BAM Support Mailbox <BAM.support@environment.nsw.gov.au>

Gmail

Anne Clements <acabotanic@gmail.com>

BSM-4116

EES BOS Help Desk Mailbox <BOS.helpdesk@environment.nsw.gov.au> 13 May 2022 at 09:50
To: "mail@acabotanic.com" <mail@acabotanic.com>

Hi Anne,

The subject matter expert has provided the following response to your enquiry:

Question 1 – Assigning a PCT

The first item in the in Appendix D (Planted Native Vegetation) of BAM 2020 asks if the planted native vegetation occurs within an area that contains a mosaic of planted and remnant native vegetation.

In considering if a PCT can be assigned, an assessor should consider if:

- The planted native vegetation accounts for a minor component of the existing remnant native vegetation; and
- A PCT can be assigned for the purposes of a standard BAM assessment.

Q2. In terms of data to enter in the calculator

If the vegetation allows you to assign PCT 849 as the best-fit PCT in the same IBRA subregion as the proposal then the BAM must be applied. In this scenario, data should be entered into the calculator as you would for any standard BAM assessment. You will not progress any further in the decision-making key in Appendix D.

Alternatively, if a PCT cannot be assigned, then you must include justification for this in the BAR and proceed to Q2 in the decision-making key (Appendix D). If the decision-making key leads you to D.2, then you are only required to assess of planted native vegetation for threatened species habitat. In these circumstances, you don't need to use the BAM Calculator (See minimum requirements info below).

3. Can you please provide advice on:

a. planted trees near the former house

b. Stands of Privet and Lantana near the former house as fauna habitat

c. regeneration / naturalised stands of *Grevillea robusta.*

In applying Streamlined Assessment Module - Planted Native Vegetation, the minimum BAR requirements are:

- Inclusion of the decision key, documenting responses and justification for each decision in each step of the key. If you can establish that the planted vegetation meets D2 in the decision-making key in Appendix D, then regeneration from the same species of the original planted vegetation may also be included so long as it is justified in the BAR.
- Evidence of planting may include receipts of tubestock or seed purchase, plastic tree guards, tags, historical aerial photography, photos of planted vegetation relative to landscape (artificial bunds, contour beds, furrow lines, uniform patterning, ages). This may be needed for the trees planted near the former house if they are native vegetation. Please note that *Grevillea robusta* is on the draft Widely Cultivated Native Species list. If a species on the 'widely cultivated native species' list is found outside its accepted natural range, it is likely to have been planted and can be justified as a widely cultivated native species for the purposes of Q.6 without additional evidence provided (e.g. silky oak (Grevillea robusta) occurring outside the NSW North Coast IBRA Bioregion).
- Determination of which subsection of the D.1 decision-making key applies to the native vegetation to be cleared or impacted by the proposal.
- Describe the review of existing information and assessment of the suitability of the planted native vegetation for use by potentially occurring threatened species. The assessor needs to consider if the planted native vegetation provides habitat for threatened species. Rapid vegetation assessments and walking transects to identify any notable features or evidence of threatened species occupation would be necessary to underpin the assessment of the planted native vegetation as potential habitat for threatened species.
- Record any incidental sightings or evidence (e.g. scats, evidence of hollow use, diggings, adjacent records) of threatened species credit species (flora and fauna) found to be using, inhabiting or part of, the planted native vegetation.
- Provide methods for survey and field data including records of any incidental sightings or evidence of threatened species credit species as outlined above.

I hope this helps you with your assessment.

Kind regards,

The BOS Help Desk Team

Biodiversity and Conservation Division | Department of Planning and Environment
Mailbox: BOS.helpdesk@environment.nsw.gov.au

BOS Help Desk Hotline: 1800 931 717 (Tuesday to Thursday 9.30am to 4pm)



The Department of Planning and Environment acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging.

From: Angela Taylor <angela.taylor@environment.nsw.gov.au> **On Behalf Of** OEH ROD BAM Support Mailbox
Sent: Monday, 7 March 2022 3:44 PM
To: Anne Clements <mail@acabotanic.com>
Subject: BSM-4116

Hi Anne

[Quoted text hidden]
[Quoted text hidden]

Appendix 3

Detail survey plans (Land Partners Sheets 1 to 5, dated 02/06/2022)

SHEET 1 | SHEET 2 | SHEET 3 | SHEET 4 | SHEET 5

GREAT WESTERN HIGHWAY

FLUSHCOMBE ROAD

WESTERN FREEWAY

OVERALL SITE
SCALE 1:9000

DIAL BEFORE YOU DIG www.1100.com.au

A Dial Before You Dig enquiry must be lodged at least two business days prior to starting any excavation or work site project.

M.G.A

GDA2020

TREE DETAIL

HEIGHT (m) ie 12 = 12m
TRUNK (m) ie 03 = #0.3m DIAMETER
SPREAD (m) ie 52 = 2m SPREAD

TREE SYMBOLS ARE A TRUE REPRESENTATION OF THE SPREAD ie SYMBOL SIZE 2 (X - Y VALUE) = 2m SPREAD

2m DIAMETER SPREAD

FLUSHCOMBE ROAD

MOTORWAY

GREAT WESTERN HIGHWAY

1 DP1154528

3 DP1001101

1 DP835264

184–188 DP8716

183 DP8716

182 DP8716

(A1) EASEMENT FOR TRANSMISSION LINE 30 WIDE (R730705)
(A2) EASEMENT FOR TRANSMISSION LINE (J983245)
(A3) EASEMENT FOR TRANSMISSION LINE (J983234)
(A4) EASEMENT FOR TRANSMISSION LINE (T722919)
(A5) EASEMENT FOR TRANSMISSION LINE (T536159)
(A6) EASEMENT FOR TRANSMISSION LINE (K116727)
(A7) EASEMENT FOR TRANSMISSION LINE (V378957)

(A) PROPOSED EASEMENT FOR TRANSMISSION LINE 30 WIDE (DP604009)
(B) EASEMENT FOR TRANSMISSION LINE VARIABLE WIDTH (J946973)
(C) PROPOSED DRAINAGE EASEMENT 2.44 WIDE (DP8716)(A392054)

LEGEND:
HW TOP OF HEAD WALL
HB BOTTOM OF HEAD WALL
IL INVERT LEVEL
OBV OBVERT LEVEL
VC VEHICLE CROSSING
IP INSPECTION PIT
TW TOP OF WALL
BW BOTTOM OF WALL
TOP TOP OF BANK
BOTTOM BOTTOM OF BANK

THERE ARE LAYERS WITHIN THIS CAD PLAN THAT HAVE BEEN TURNED OFF FOR CLARITY PURPOSES

SURVEY BY RPS DATED 09-01-2020 REFERENCE JOB NO. PR146046 ADDED TO PLAN AT CLIENTS REQUEST.

0 10 25 55m
SCALE 1:500

ADJOINS SHEET 2

CLIENT

LOGOS PROPERTY

PROJECT

DETAIL SURVEY OF FLUSHCOMBE ROAD, AUGUSTA STREET & LOT 1 DP835264, LOTS 218-219 DP457024, LOTS 168, 180-183 & 188 DP8716, LOTS 50-52 DP1144623, LOTS 4 & 5 DP226294, LOT 10 DP801210 & LOT 7 DP803359

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2	GKO	04/03/2022	ROAD INFORMATION ADDED (GWH)
1	GKO	16/02/2022	INITIAL ISSUE

SYM	CODE	DESCRIPTION
■	APB	AUSPOST BOX
△	BM	BENCH MARK
●	BO	BOLLARD
■	DJM	DRAINAGE MANHOLE
■	GUL	DRAINAGE GULLY PIT
✲	ELP	ELEC GARDEN LIGHT
⊠	EL	ELEC GREEN PILLAR
⟶	LPL	ELEC LIGHT POLE
▭	EP	ELECT SINGLE PIT
○	SPL	ELEC STAY POLE
⊘	PP	ELEC POWER POLE
⟶	PLP	POWER POLE/LIGHT
⊲	PTR	ELE POLE/TRANSFORM
▭	ETP	ELEC TWIN PIT
▭	EFP	ELEC FUSE BOX
▥	GMR	GAS METER
▭	GAS	GAS VALVE
▭	GM	GAS MAIN
⊠	MBX	MAIL BOX
Ⓑ	BIN	BIN
⊕	BOR	BOREHOLE
◉	FD	FUEL DIP
▬	SE	SEAT
⚑	FLG	FLAG POLE
⊶	AG	GATE

SYM	CODE	DESCRIPTION
⊕	OFM	OPTICAL FIBRE MARKER
□	OFP	OPTICAL FIBRE PIT
◪	TDP	TELECOM DIST PILLAR
◔	TPL	TELECOM POLE
▰	TSP	TELECOM SINGLE PIT
▰	TTP	TELECOM TWIN PIT
ⓢ	SLH	SEWER LAMP HOLE
◉	SMH	SEWER MANHOLE
◉	SVP	SEWER VENT PIPE
✳	TM	PALM TREE
✳	TS	SHRUB
✳	T	TREE
✳	CAM	SPEED CAMERA
□	SCL	TRAFFIC CONTROLLER
⊠	SJX	TRAFFIC JUNCTION BOX
⊘	SGL	TRAFFIC LIGHT
⚑	BUS	BUS STOP SIGN
⟶	SI	TRAFFIC SIGN
?	US	UNKNOWN SERVICE
ⓦ	WHY	WATER HYDRANT
M	WMR	WATER METER
ⓦ	WEP	WATER PUMP
ⓦ	WSV	WATER STOP VALVE
◪	WAV	WATER AIR VALVE
⊶	WTP	WATER TAP

Symbols shown are indicative only. The symbol size and orientation does not necessarily represent the real size or orientation of the feature.

DRAINAGE PIPE U/G	SW SW SW SW
DRAIN	D D D D
ELECT. CABLE A/G	E E E E
ELEC. CABLE U/G	E E E E
GAS PIPE	GAS GAS GAS GAS
FENCE LINE	
SEWERAGE PIPE	S S S S
TELSTRA CABLE	T T T T
WATER PIPE	W W W W

LANDPARTNERS Surveyors and Planners

Sydney Office
Level 2, 23-29 South Street
Rydalmere NSW 2116
PO Box 1144
Dundas NSW 2117

p: (02) 9685 2000
e: info@landpartners.com.au
w: www.landpartners.com.au

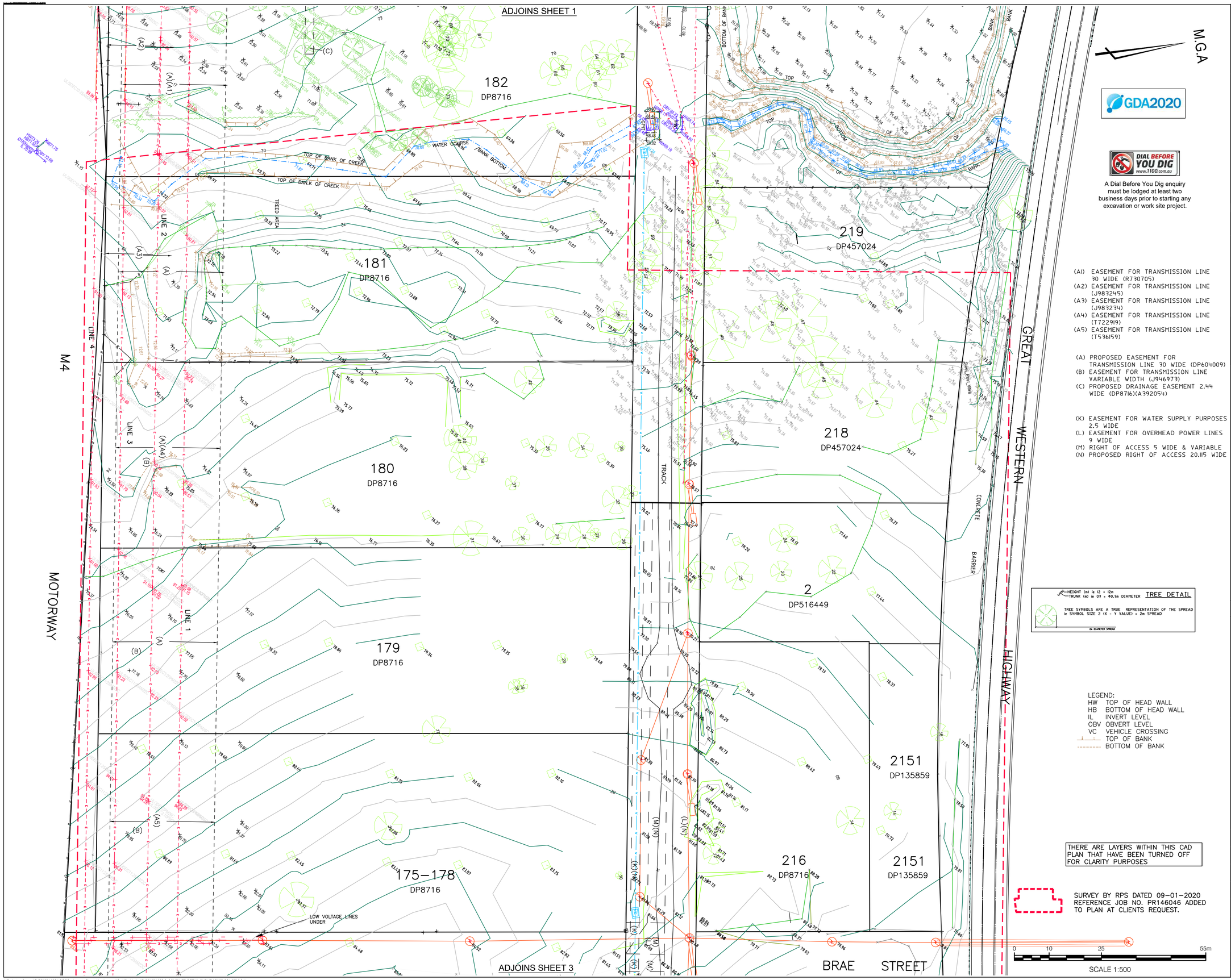
ISO 9001 Quality Management

HEIGHT DATUM: AHD	LOCAL AUTHORITY: BLACKTOWN
HEIGHT ORIGIN: SSM44285 RL 70.195	SCALE: 1:500 (A1)
MERIDIAN: MGA ZONE 56	CONTOUR INTERVAL: 1.0 Metre
CO-ORD SYSTEM: GDA 2020	SURVEYOR: BB/SA/MC/BL, BB — DATE OF SURVEY: 15/04/2020, 01/06/2022
CCAD FILE: 74904	DRAWN: SF — DATE: 2/06/2022
AUTOCAD FILE: SY074904.002.2.3	CHECKED: BB/SA/MC — DATE: 2/06/2022
ARCHIVE FILE: SY074904.000.3	APPROVED: GKO — DATE: 2/06/2022
PLAN NUMBER: SY074904.002.2.3	SHEET 1 OF 5

PO GKO

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M.G.A

GDA2020

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(K) EASEMENT FOR WATER SUPPLY PURPOSES 2.5 WIDE
(L) EASEMENT FOR OVERHEAD POWER LINES 9 WIDE
(M) RIGHT OF ACCESS 5 WIDE & VARIABLE
(N) PROPOSED RIGHT OF ACCESS 20.115 WIDE

TREE DETAIL

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2m DIAMETER SPREAD

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TOP OF BANK
BOTTOM OF BANK

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SURVEY BY RPS DATED 09-01-2020 REFERENCE JOB NO. PR146046 ADDED TO PLAN AT CLIENTS REQUEST.

0 10 25 55m
SCALE 1:500

CLIENT
LOGOS PROPERTY

PROJECT
DETAIL SURVEY OF FLUSHCOMBE ROAD, AUGUSTA STREET & LOT 1 DP835264, LOTS 218-219 DP457024, LOTS 168, 180-183 & 188 DP8716, LOTS 50-52 DP1144623, LOTS 4 & 5 DP226294, LOT 10 DP801210 & LOT 7 DP803359

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GAS PIPE — GAS
FENCE LINE
SEWERAGE PIPE — S
TELSTRA CABLE — T
WATER PIPE — W

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ISO 9001 Quality Management
Sydney Office
Level 2, 23-29 South Street
Rydalmere NSW 2116
PO Box 1144
Dundas NSW 2117
p: (02) 9685 2000
e: info@landpartners.com.au
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PD.GKO

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ADJOINS SHEET 2

ADJOINS SHEET 4

M4 MOTORWAY

M.G.A

GDA2020

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175–178 DP8716

216 DP8716

2151 DP135859

BRAE STREET

LOW VOLTAGE LINES UNDER

TRACK

171–174 DP8716

164 DP8716

163 DP8716

1 DP119616

CH 478.14

CH 484.96

TOWER

EARTHSTAP

170 DP8716

AUGUSTA STREET

169 DP8716

168 DP8716

6 DP226294

5 DP226294

4 DP226294

GREAT WESTERN HIGHWAY

CONC BARRIER

LINE 3 47.79

(K) EASEMENT FOR WATER SUPPLY PURPOSES 2.5 WIDE
(L) EASEMENT FOR OVERHEAD POWER LINES 9 WIDE
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(N) PROPOSED RIGHT OF ACCESS 20.115 WIDE

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HB BOTTOM OF HEAD WALL
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OBV OBVERT LEVEL
VC VEHICLE CROSSING
TOP OF BANK
BOTTOM OF BANK

0 10 25 55m
SCALE 1:500

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CLIENT

LOGOS PROPERTY

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◍	BIN	BIN
⊕	BOR	BOREHOLE
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▬	SE	SEAT
⚑	FLG	FLAG POLE
⊸	AG	GATE

SYM	CODE	DESCRIPTION
⊕	OFM	OPTICAL FIBRE MARKER
▯	OFP	OPTICAL FIBRE PIT
◪	TDP	TELECOM DIST PILLAR
◔	TPL	TELECOM POLE
▰	TSP	TELECOM SINGLE PIT
▰	TTP	TELECOM TWIN PIT
ⓢ	SLH	SEWER LAMP HOLE
◉	SMH	SEWER MANHOLE
⊛	SVP	SEWER VENT PIPE
✳	TM	PALM TREE
✳	TS	SHRUB
✳	T	TREE
✳	CAM	SPEED CAMERA
▯	SCL	TRAFFIC CONTROLLER
⊠	SJX	TRAFFIC JUNCTION BOX
⊘	SGL	TRAFFIC LIGHT
⊬	BUS	BUS STOP SIGN
⊸	SI	TRAFFIC SIGN
?	US	UNKNOWN SERVICE
▭	WHY	WATER HYDRANT
M	WMR	WATER METER
▯	WEP	WATER PUMP
⊛	WSV	WATER STOP VALVE
◪	WAV	WATER AIR VALVE
⊸	WTP	WATER TAP

Symbols shown are indicative only. The symbol size and orientation does not necessarily represent the real size or orientation of the feature.

DRAINAGE PIPE U/G	SV SV SV SV
DRAIN	D D D D D
ELECT. CABLE A/G	E E E E E
ELEC. CABLE U/G	E E E E E
GAS PIPE	GAS GAS GAS GAS
FENCE LINE	// // // // //
SEWERAGE PIPE	S S S S S
TELSTRA CABLE	T T T T T
WATER PIPE	W W W W W

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w: www.landpartners.com.au

HEIGHT DATUM: AHD	LOCAL AUTHORITY: BLACKTOWN
HEIGHT ORIGIN: SSM44285 RL 70.195	SCALE: 1:500 (A1)
MERIDIAN: MGA ZONE 56	CONTOUR INTERVAL: 1.0 Metre
CO-ORD SYSTEM: GDA 2020	SURVEYOR: BB/SA/MC/BL, BB — DATE OF SURVEY: 15/04/2020, 01/06/2022
CCAD FILE: 74904	DRAWN: SF — DATE: 2/06/2022
AUTOCAD FILE: SY074904.002.2.3	CHECKED: BB/SA/MC — DATE: 2/06/2022
ARCHIVE FILE: SY074904.000.3	APPROVED: GKO — DATE: 2/06/2022
PLAN NUMBER: SY074904.002.2.3	SHEET 3 OF 5

GKO-04

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ADJOINS SHEET 3

ADJOINS SHEET 5

WESTERN FREEWAY

GREAT WESTERN HIGHWAY

168 DP8716

4 DP226294

51 DP1144623

50 DP1144623

10 DP801210

7 DP 803359

52 DP1144623

DP 1144623

LINE 1

LINE 2

LINE 3

LINE 4

CH 840

CH 845

BLACKBERRY BUSHES

APPROXIMATE LOCATION OF SEWER LINE (SYDNEY WATER)

M.G.A

GDA2020

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A Dial Before You Dig enquiry must be lodged at least two business days prior to starting any excavation or work site project.

Note:
Location of the Sydney Water sewer has been obtained from Sydney Water plan 126950WW

SURVEY BY RPS DATED 09-01-2020 REFERENCE JOB NO. PR146046 ADDED TO PLAN AT CLIENTS REQUEST.

(A) PROPOSED EASEMENT FOR TRANSMISSION LINE 30 WIDE (DP604009)
(B) EASEMENT FOR TRANSMISSION LINE VARIABLE WIDTH (J946973)
(D) PROPOSED EASEMENT FOR CONSTRUCTION PURPOSES 9 WIDE (DP634063)
(E) EASEMENT FOR CONSTRUCTION 3 WIDE (DP1216918)
(F) EASEMENT FOR WATER SUPPLY PURPOSES 10 WIDE (DP1216918)
(G) EASEMENT FOR CONSTRUCTION 9 WIDE (DP1216918)
(H) EASEMENT FOR TRANSMISSION LINE (K116733)
(J) PROPOSED EASEMENT FOR WATER MAIN 6 WIDE (DP634063)

LEGEND:
HW TOP OF HEAD WALL
HB BOTTOM OF HEAD WALL
IL INVERT LEVEL
OBV OBVERT LEVEL
VC VEHICLE CROSSING
TOP OF BANK
BOTTOM OF BANK

TREE DETAIL

HEIGHT (m) ie 12 = 12m
TRUNK (m) ie 03 = Ø0.3m DIAMETER

TREE SYMBOLS ARE A TRUE REPRESENTATION OF THE SPREAD ie SYMBOL SIZE 2 (X - Y VALUE) = 2m SPREAD

THERE ARE LAYERS WITHIN THIS CAD PLAN THAT HAVE BEEN TURNED OFF FOR CLARITY PURPOSES

0 10 25 55m

SCALE 1:500

CLIENT

LOGOS PROPERTY

PROJECT

DETAIL SURVEY OF FLUSHCOMBE ROAD, AUGUSTA STREET & LOT 1 DP835264, LOTS 218-219 DP457024, LOTS 168, 180-183 & 188 DP8716, LOTS 50-52 DP1144623, LOTS 4 & 5 DP226294, LOT 10 DP801210 & LOT 7 DP803359

NOTES

The title boundaries shown hereon were not marked at the time of survey and have been determined by plan dimensions only and not by field survey. Services shown hereon have been located where possible by field survey. If not able to be so located, services have been plotted from the records of relevant authorities where available and have been noted accordingly on the plan. Where such records do not exist or are inadequate a notation has been made hereon.
Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services.

3	GKO	02/06/2022	CREEK INFORMATION LOT 181-182 ADDED
2	GKO	04/03/2022	ROAD INFORMATION ADDED (GWH)
1	GKO	16/02/2022	INITIAL ISSUE

SYM	CODE	DESCRIPTION
■	APB	AUSPOST BOX
△	BM	BENCH MARK
●	BO	BOLLARD
■	DJM	DRAINAGE MANHOLE
■	GUL	DRAINAGE GULLY PIT
✳	ELP	ELEC GARDEN LIGHT
⊠	EL	ELEC GREEN PILLAR
	LPL	ELEC LIGHT POLE
▭	EP	ELECT SINGLE PIT
○	SPL	ELEC STAY POLE
⊘	PP	ELEC POWER POLE
	PLP	POWER POLE/LIGHT
⊠	PTR	ELE POLE/TRANSFORM
▭	ETP	ELEC TWIN PIT
▭	EFP	ELEC FUSE BOX
▥	GMR	GAS METER
▭	GAS	GAS VALVE
▤	GM	GAS MAIN
⊠	MBX	MAIL BOX
⊕	BIN	BIN
⊕	BOR	BOREHOLE
◉	FD	FUEL DIP
▬	SE	SEAT
⚑	FLG	FLAG POLE
⊶	AG	GATE

SYM	CODE	DESCRIPTION
⊕	OFM	OPTICAL FIBRE MARKER
▭	OFP	OPTICAL FIBRE PIT
◪	TDP	TELECOM DIST PILLAR
◔	TPL	TELECOM POLE
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▭	TTP	TELECOM TWIN PIT
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⊕	SVP	SEWER VENT PIPE
✳	TM	PALM TREE
✳	TS	SHRUB
✳	T	TREE
✳	CAM	SPEED CAMERA
▭	SCL	TRAFFIC CONTROLLER
⊠	SJX	TRAFFIC JUNCTION BOX
⊘	SGL	TRAFFIC LIGHT
⚑	BUS	BUS STOP SIGN
⊶	SI	TRAFFIC SIGN
ⓤ	US	UNKNOWN SERVICE
▭	WHY	WATER HYDRANT
M	WMR	WATER METER
▭	WEP	WATER PUMP
⚠	WSV	WATER STOP VALVE
◪	WAV	WATER AIR VALVE
⊶	WTP	WATER TAP

Symbols shown are indicative only. The symbol size and orientation does not necessarily represent the real size or orientation of the feature.

DRAINAGE PIPE U/G — SW
DRAIN — D
ELECT. CABLE A/G — E
ELEC. CABLE U/G — E
GAS PIPE — GAS
FENCE LINE
SEWERAGE PIPE — S
TELSTRA CABLE — T
WATER PIPE — W

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HEIGHT DATUM: AHD	LOCAL AUTHORITY: BLACKTOWN
HEIGHT ORIGIN: SSM44285 RL 70.195	SCALE: 1:500 (A1)
MERIDIAN: MGA ZONE 56	CONTOUR INTERVAL: 1.0 Metre
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PLAN NUMBER: SY074904.002.2.3	SHEET 4 OF 5

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ADJOINS SHEET 4

M.G.A

GDA2020

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10 DP801210

7 DP 803359

52 DP1144623

51 DP1144623

50 DP1144623

GREAT WESTERN HIGHWAY

LINE 1

LINE 2

LINE 3

LINE 4

(A)

TOWER CH 1080

BLACKBERRY BUSHES

THERE ARE LAYERS WITHIN THIS CAD PLAN THAT HAVE BEEN TURNED OFF FOR CLARITY PURPOSES

SURVEY BY RPS DATED 09-01-2020 REFERENCE JOB NO. PR146046 ADDED TO PLAN AT CLIENTS REQUEST.

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TREE SYMBOLS ARE A TRUE REPRESENTATION OF THE SPREAD ie SYMBOL SIZE 2 (X - Y VALUE) = 2m SPREAD

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0 10 25 55m

SCALE 1:500

LEGEND:
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HB BOTTOM OF HEAD WALL
IL INVERT LEVEL
OBV OBVERT LEVEL
VC VEHICLE CROSSING
TOP OF BANK
BOTTOM OF BANK

CLIENT

LOGOS PROPERTY

PROJECT

DETAIL SURVEY OF FLUSHCOMBE ROAD, AUGUSTA STREET & LOT 1 DP835264, LOTS 218-219 DP457024, LOTS 168, 180-183 & 188 DP8716, LOTS 50-52 DP1144623, LOTS 4 & 5 DP226294, LOT 10 DP801210 & LOT 7 DP803359

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	TM	PALM TREE
	TS	SHRUB
	T	TREE
	CAM	SPEED CAMERA
	SCL	TRAFFIC CONTROLLER
	SJX	TRAFFIC JUNCTION BOX
	SGL	TRAFFIC LIGHT
	BUS	BUS STOP SIGN
	SI	TRAFFIC SIGN
	US	UNKNOWN SERVICE
	WHY	WATER HYDRANT
	WMR	WATER METER
	WEP	WATER PUMP
	WSV	WATER STOP VALVE
	WAV	WATER AIR VALVE
	WTP	WATER TAP

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DRAINAGE PIPE U/G
DRAIN
ELECT. CABLE A/G
ELEC. CABLE U/G
GAS PIPE
FENCE LINE
SEWERAGE PIPE
TELSTRA CABLE
WATER PIPE

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PLAN NUMBER: SY074904.002.2.3	SHEET 5 OF 5

PD:GKO

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Appendix 4

Figures 13 and 14 from Huntingwood Precinct DCP

Figure 13 – Vegetation conservation significance

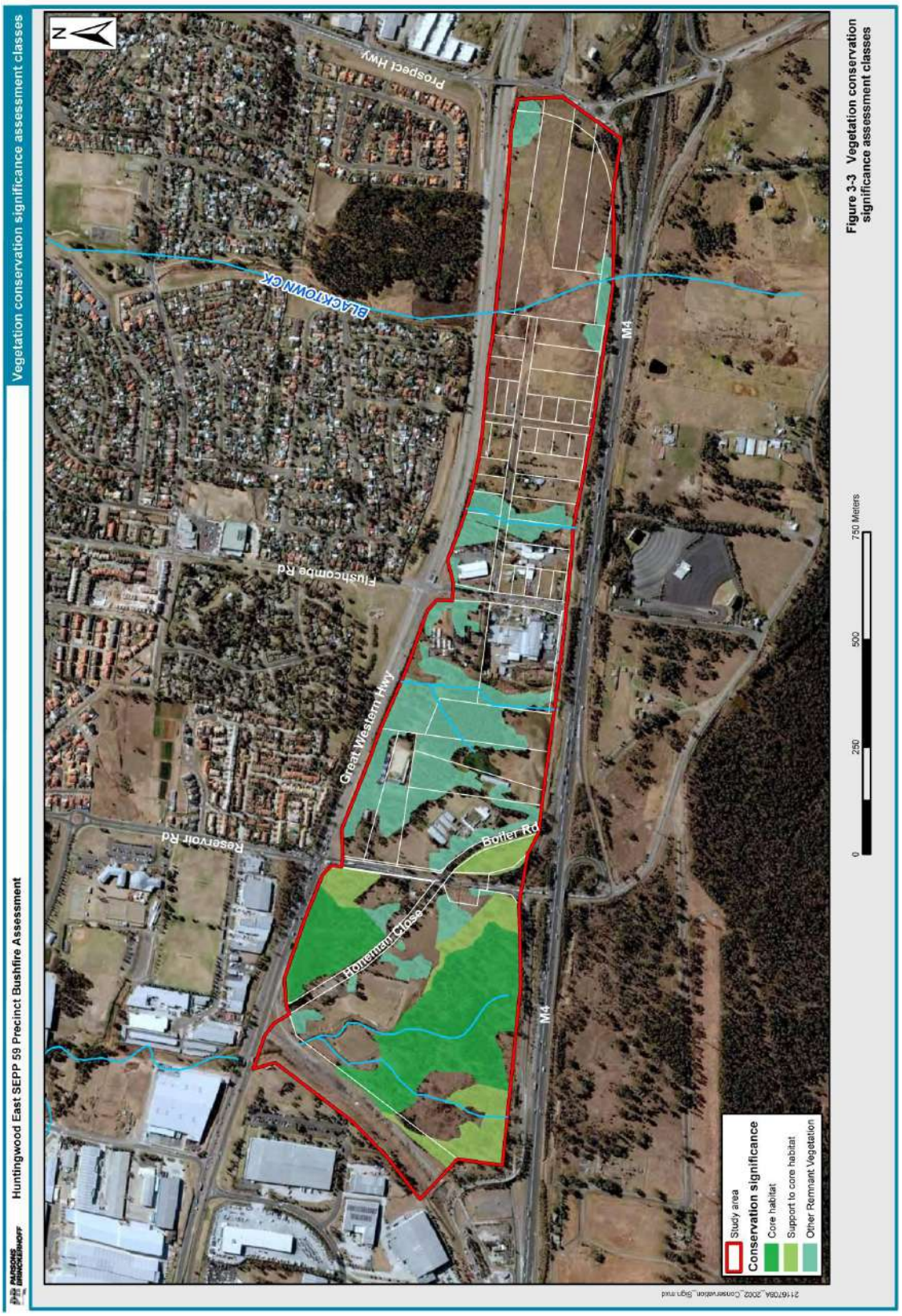
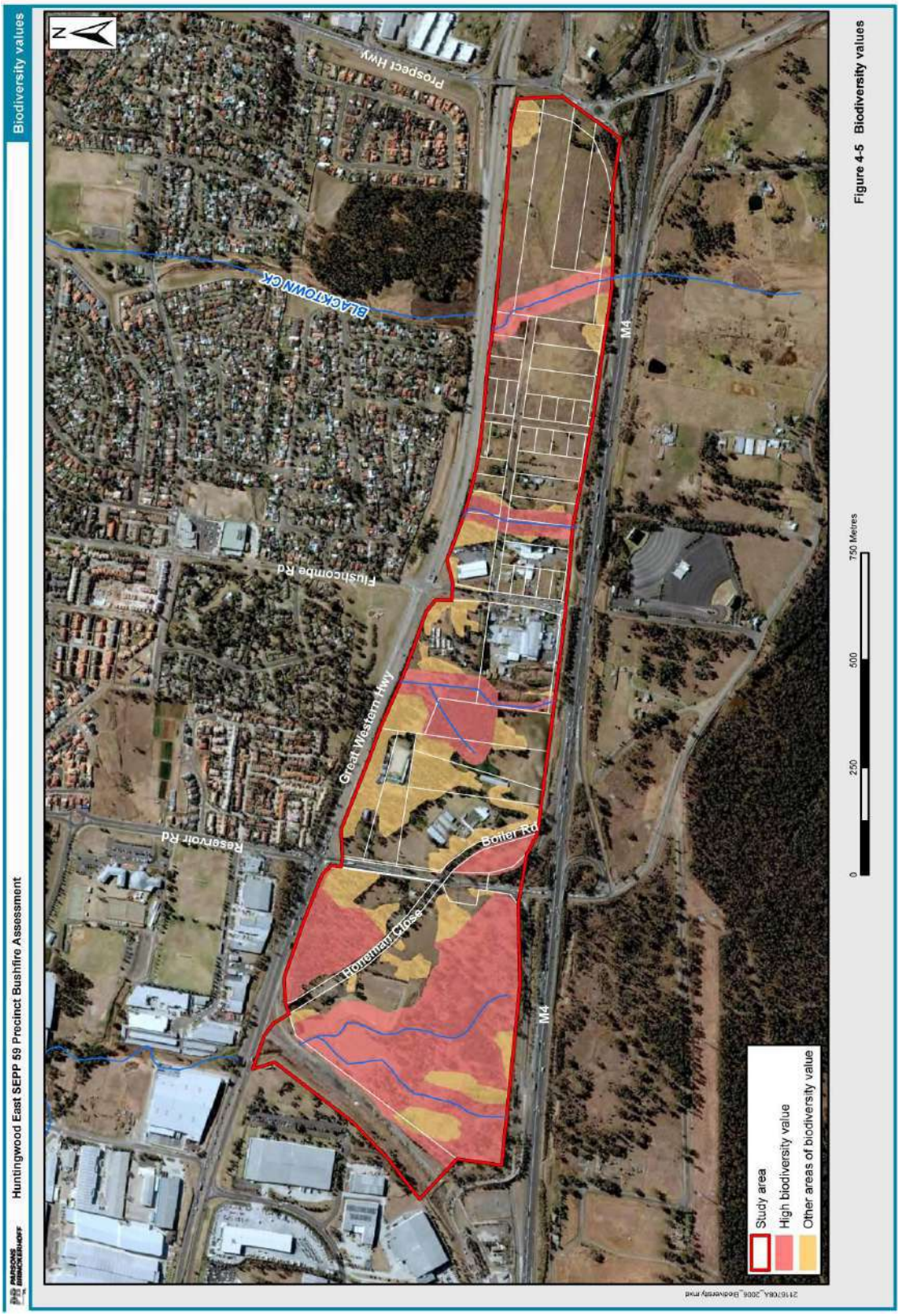


Figure 14 – Biodiversity values



Appendix 5

Photographic record

(26 October 2021, 10 and 30 March 2022, 20 January 2023 and 14 June 2023)

Photographic record of vegetation surveys from 26 October 2021,10 and 30 March 2022 and 20 January and 14 June 2023



BAM Plot 1 – 0 m on tape, looking south towards M4.



BAM Plot 1 – 10 m on tape looking south.



BAM Plot 1 – looking north towards Great Western Highway.



BAM Plot 1 – end of 50 m tape looking south.



near BAM Plot 1 - view to west.



near BAM Plot 1 – view to northwest across Plot 1.



BAM Plot 2 – 10 m looking west (into floristic quadrat).



BAM Plot 2 – from 50 m mark looking back east.



Near BAM Plot 2 – Looking north.



Near BAM Plot 2 – looking west: *Bursaria spinosa* and *Eucalyptus tereticornis.*



BAM Plot 3 – 0m on tape looking north (into the floristic quadrat), *Cenchrus clandestinus* in the groundlayer.



BAM Plot 3 – 20 m along the tape looking south (into the floristic quadrat), *Eucalyptus tereticornis* with *Amyema miquelii* and *Olea europaea subsp. cuspidata* at base.



BAM Plot 3 – 40 m along the tape looking south, *Acacia falcata* in foreground.



BAM Plot 4 – 0 m on the tape (looking into the floristic quadrat).



BAM Plot 4 – 20 m along the tape looking north west (into the floristic quadrat).



BAM Plot 4 – 20 m along the tape looking southeast.



near Spot M – looking towards BAM Plot 4.



beside BAM Plot 4 – looking over boundary fence to Great Western Highway batter.



BAM Plot 5 – looking north from start of tape.



BAM Plot 5 – looking north from start of tape: *Erythrina crista-galli* at left, *E. moluccana* at right.



BAM Plot 5 – looking forward from 10 mark on tape. Large tree is *E. moluccana*.



BAM Plot 5 – creek line.



BAM Plot 5 – looking forward from 20 mark on tape; small trees mostly *Ligustrum* spp.



BAM Plot 5 – Looking south to tall *E. moluccana.*



BAM Plot 6 – *Typha domingensis, Juncus acutus, Rubus anglocandicans*



BAM Plot 6 – *Typha domingensis, Juncus acutus, Rubus anglocandicans, Cynodon dactylon*



BAM Plot 7 – start of tape looking south, with a *Eucalypts moluccana* canopy and a grassy understorey.



BAM Plot 7 – start of tape looking east towards site and Great Western Highway.



BAM Plot 7 – 20 m on tape looking north back along floristic quadrat with Great Western Highway in background.



BAM Plot 7 – exposed soil profile on batter slope along Flushcombe Road.



BAM Plot 7 – looking north at the end of tape with dense cover of *Lantana camara* and *Olea europaea subsp. cuspidata*



BAM Plot 8 – looking north from start of tape. *Eucalyptus moluccana* at centre, *E. tereticornis* at left, *Ligustrum lucidum* foreground, clump of *Cortaderia selloana* centre-left.



BAM Plot 8 – looking west from start of tape, *E. tereticornis* behind fence, *Ligustrum lucidum* in foreground.



BAM Plot 8 – looking south from 20 m on tape. Dominant weeds are *Lantana camara, Cenchrus clandestinus, Ligustrum lucidum.*



BAM Plot 8 – looking north from 20 m on tape. *E. moluccana* in centre.



BAM Plot 8 – looking northwest from near 20 m on tape, 2 trees of *E. moluccana* at left, further trees *are E. tereticornis.* Large mound of fill behind, extending toward Great Western Highway.



BAM Plot 8 – looking northwest across old fence from near 20 m tape, *E. tereticornis* on far side.



BAM Plot 8 – *Opuntia monacantha* near start of tape.



BAM Plot 8 – looking southwest from near middle of plot, across old fence and creek line towards Augusta Street. *E. tereticornis* with dense weed cover, mainly *Lantana camara* and *Anredera cordifolia.*



BAM Plot 8 – mound of demolition rubble around 30–40 m from start of tape extending along inside old fence, with dense growth of *Ligustrum* spp.



BAM Plot 8 – looking north from near 50 m on tape, showing east edge of rubble mound.



BAM Plot 9 – looking south from start of tape with *Lantana camara* in foreground and *Olea europaea* subsp. *cuspidata* in centre background.



BAM Plot 9 – at the start of tape looking north towards BAM Plot 4 and the Great Western Highway, with dense growth of *Lantana camara.*



BAM Plot 9 – 20 m on tape looking south towards Augusta Street, with *E. tereticornis* in centre of

weedy understorey of *Ligustrum sinense, Lantana camara* and *Asparagus asparagoides.*



BAM Plot 9 – near the end of the 50 m tape with a dense stand of *Ligustrum sinense* in background and *Chloris gayana* in right foreground.



Spot L – *Olea europaea* subsp. c*uspidata*, *Rubus anglocandicans, Verbena bonariensis.*



Spot L – Looking southeast.



Spot M – *Olea europaea* subsp. c*uspidata, Lantana camara, Ligustrum lucidum, Melia azedarach, Grevillea robusta.*



Spot M – looking south.



Spot M – *Grevillea robusta* (left), *Melia azedarach* (centre) defoliated by caterpillars.

Appendix 6

BAM input data and number and cover of exotic species

BAM input data and number and cover of exotic species

Location values

Plot	Location							
	PCT	Area of zone	Patch size	Condition class	Zone	Eastings	Northings	Bearing
Plot 1	3319	20.58	100	Predominantly Exotic	56	306297	6257780	180
Plot 2	3319	0.34	100	Less Degraded	56	307036	6257776	265
Plot 3	3319	20.58	100	Predominantly Exotic	56	306825	6257757	355
Plot 4	3319	2.03	100	Degraded	56	306158	6257892	160
Plot 5	3319	2.03	100	Degraded	56	306089	6257755	180
Plot 6	3319	20.58	100	Predominantly Exotic	56	306620	6257667	175
Plot 7	3319	0.34	100	Less Degraded	56	305949	6257944	190
Plot 8	3319	2.03	100	Degraded	56	306119	6257851	200
Plot 9	3319	2.03	100	Degraded	56	306162	6257864	265

Note: Area of predominantly exotic vegetation or hardstand is 24.27 ha with:

- 20.58 ha as predominately exotic paddock; and
- 3.69 ha west of the drainage swale associated with the industrial building.

Composition values

Note: Growth form groups from power query on the online BAM Calculator: Tree = TG, Shrub = SG, Groundcover and other (GG= Grass & grasslike, FG= Forb, EG= Fern, OG = Other)

Plot	Composition (number of trees, shrubs and groundcover species recorded in the plots) and for exotic species						
	TG	SG	GG	FG	EG	OG	Exotic (Not entered in the BAM calculator)
Plot 1	0	0	5	2	0	0	18
Plot 2	2	5	11	12	0	2	19
Plot 3	1	0	0	0	0	1	11
Plot 4	2	1	8	4	0	2	22
Plot 5	2	1	1	0	0	1	12
Plot 6	0	0	2	0	0	0	2
Plot 7	1	3	11	12	0	3	16
Plot 8	2	0	1	4	0	0	17
Plot 9	2	2	6	5	0	1	27

Structure values

Note: Growth form groups from power query on the online BAM Calculator: Tree = TG, Shrub = SG, Groundcover and other (GG= Grass & grasslike, FG= Forb, EG= Fern, OG = Other)

Plot	Structure (summed percent cover for trees, shrubs and groundcover species recorded in the plots) and for exotic species						
	TG	SG	GG	FG	EG	OG	Exotic (Not entered in the BAM calculator)
Plot 1	0	0	1.1	0.2	0	0	71.8
Plot 2	26	13.9	9.3	7	0	0.7	21.5
Plot 3	20	0	0	0	0	2	97.5
Plot 4	29	5	16.7	2.3	0	3.1	62.4
Plot 5	10.5	0.1	0.5	0	0	0.3	78.9
Plot 6	0	0	91	0	0	0	10
Plot 7	50	2	6.4	6.5	0	3.3	46.8
Plot 8	15	0	2	1.5	0	0	29.6
Plot 9	9	4.8	25.9	0.6	0	1	33.2

Function values

Note: The benchmark for Large Tree stem class DBH for PCT 3319 is 50cm:
The number of trees with stem classes above the benchmark has been entered in the BAM Calculator (shown as bold).

Plot	Function										
	Litter cover	Length of fallen logs	Hollow bearing trees	Stem class DBH (cm)							Percent cover of High Threat Weeds
				<5	5-9	10-19	20-29	30-49	50-79	80+	
Plot 1	37.6	0	0	0	0	0	0	0	0	0	57.3
Plot 2	44	0	0	1	1	1	1	1	0	0	14.5
Plot 3	0	6	1	0	0	1	1	1	0	**1**	93.7
Plot 4	51	5	0	1	0	1	1	0	**1**	**1**	34.9
Plot 5	53	91	0	0	1	1	1	1	**1**	**1**	44.7
Plot 6	0	0	0	0	0	0	0	0	0	0	10
Plot 7	47	0	0	1	1	1	1	1	**1**	**1**	42.9
Plot 8	10	0	0	1	1	1	1	1	**1**	**1**	22.5
Plot 9	42	27	0	1	1	1	1	1	**1**	0	26.4

Appendix 7

Huntingwood frog survey outcomes and habitat suitability for microbats with recommendations for habitat restoration for threatened fauna

Huntingwood Frog Survey Outcomes and Habitat Suitability for Microbats with Recommendations for Habitat Restoration for Threatened Fauna

Date: 24 August 2022



Prepared by: Grant Webster and Jayden Walsh

Prepared for: Anne Clements & Associates

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Front cover image: Green and Golden Bell Frog. Photo by Grant Webster

1.0 Introduction

This report has been prepared to assess the presence of and habitat suitability for threatened fauna species in particular the Green and Golden Bell Frog (*Litoria aurea*) and the Southern Myotis (*Myotis macropus*) along Blacktown Creek on the Huntingwood site in Blacktown City Local Government Area. This report also provides advice on habitat restoration for threatened species with a likelihood of local occurrence.

The approximately 27 ha site is located west of the Prospect Highway between the Great Western Highway and the M4 Motorway and accessed via Augusta Street. The 1st Order watercourse Blacktown Creek flows through the site from south to north (**Figure 1**).

It is an approximately 270 m wide strip of former agricultural land, highly degraded and largely cleared of native vegetation. The riparian corridor associated with Blacktown Creek is heavily overgrown with native and exotic vegetation leaving little open water.

1.1 Previous surveys

Ecoplanning (2020) in their Biodiversity Development Assessment Report for a previous development application considered:

- Green and Golden Bell Frog as a candidate species for the subject site. The species was assumed to be present due to Blacktown Creek being considered to have characteristics of suitable habitat for Green and Golden Bell Frog. It's presence was not confirmed by targeted survey;
- Southern Myotis as a candidate species for the subject site and assumed present as the 18 targeted survey nights (two ultrasonic detectors over 9 nights from 8-17th April 2020) were outside the allowable survey period for the species.

Ecoplanning (2020) in their targeted microbat survey recorded a *total of seven microchiropteran bat species from calls within and near the site*, *including three species listed as vulnerable under the BC Act (Little Bent-winged Bat, Large Bent-winged Bat, Eastern Coastal Free-tailed Bat)*.

2.0 Survey effort and methology for the current survey

The approximately 300 m stretch of the Blacktown Creek riparian corridor was surveyed for the presence of Green and Golden Bell Frog and the site was assessed for habitat suitability for the Southern Myotis and other threatened microbat species. Other fauna species detected during the surveys were noted and opportunistic searches for threatened birds were also conducted.

Surveying consisted of nocturnal aural-visual spotlighting as well as diurnal habitat searches on four separate nights over February and March 2022 for 2-3 hours per night by Jayden Walsh, accompanied by Joelan Sawyer on one of these nights (see Appendix 2 for daily survey effort and Appendix 3 for associated climatic conditions).

Total survey effort (>480 mins/~300 m transect) exceeded that required for Green and Golden Bell Frogs according to the NSW Guidelines which recommend four surveys and at least 288 mins of survey time for a 300 m transect (NSW DPIE, 2020). The NSW guidelines also require surveys to be conducted between November and March (NSW DPIE, 2020) but do not state specific environmental conditions necessary for surveying.

The Green and Golden Bell Frog species profile (OEH, 2017) states *the species is active by day and usually breeds in summer when conditions are warm and wet.*

The targeted survey was undertaken at a suitable time with favourable conditions for species detection and breeding activity, including recent rainfall and warm temperatures and with one of the surveys following a flood.

3.0 Survey results

Common fauna species, generally typical of the region, were detected on the site (listed in Appendix 4), namely:

- 24 bird species (21 native and three exotic) including Australian Reed-Warbler, listed as “Marine” on the EPBC Act being recorded in dense reeds of the riparian corridor;
- two frog species, Common Eastern Froglet and Striped Marsh Frog;
- three reptiles, Eastern Brown Snake, Dark-flecked Sunskink and Pale-flecked Sunskink; and
- two mammals, Eastern Grey Kangaroo and European Rabbit.

The Green and Golden Bell Frog was not detected during the current targeted survey.

4.0 Habitat suitability and likelihood of occurrence of threatened species

4.1 Green and Golden Bell Frog

In the current targeted survey along Blacktown Creek riparian corridor, it was found that there was a lack of suitable habitat, in the form of open and pooling water. It is unlikely that this species would utilise the site for breeding.

Further, given the species was not detected over the course of the February-March 2022 surveys, it is unlikely that the species occurs on the site or that the site forms an important area for the species.

Green and Golden Bell Frogs are now very rare in Western Sydney and despite some relatively close records to the site, none of these records are more recent than the 1960s (**Figure 2**).

The closest more recent records from the broader area are from 1998-1999 in the Guildford-Holroyd region and are along a different creek system from Blacktown Creek (**Figure 3**). The most recent record in the broader area is from 2012 at Tregear about 12 km from the site and again along a separate creek system (**Figure 3**). According to the Draft Recovery Plan for this species a population persists at Holroyd Gardens (approximately 9km from the site)

but it is highly unlikely that frogs would be able to disperse from this population to the site given the dense urbanisation between these locations.

It is unlikely that Green and Golden Bell Frogs still persist in the immediate vicinity of the site (within about 5km of the site). However, if a population of the species does still occur undetected in the vicinity, perhaps in very low density, the site would at best currently provide only marginally suitable habitat. This degraded creek corridor is limited to potential foraging habitat and could possibly enable dispersal across the landscape by providing sheltering habitat amongst aquatic vegetation as well as access to water.

As part of a sustainable development, restoration of breeding habitat for Green and Golden Bell Frog is being proposed (details below).

4.2 Microbats

There are eight species of threatened microbats with records within 10 km of the site (**Table 1**). The Eastern Coastal Free-tailed Bat, Southern Myotis, Eastern False Pipistrelle, Greater Broad-nosed Bat, Little Bent-winged Bat and Large Bent-winged Bat are recorded particularly close to the site (within approximately 3 km). Ecoplanning (2020) recorded three of these microbat species within and near the subject site (Little Bent-winged Bat, Large Bent-winged Bat, Eastern Coastal Free-tailed Bat).

There are numerous nearby records of the Southern Myotis (**Figure 4**) particularly around Prospect Reservoir to the south of the site and along Eastern Creek to the north-west of the site.

Suitable roosting habitat for microbats exists on / adjacent to the site in the form of a culvert as well as dead / potential hollow bearing trees and possibly infrastructure (buildings etc) in the immediate vicinity (photos in Appendix 4). Along Blacktown Creek within the site, there is reduced habitat suitability for Southern Myotis due to the lack of open water (i.e., foraging space). However, given the records in close proximity and suitability of the culverts for roosting, occurance of, and utilisation of the site by Southern Myotis is moderately likely.

The site may also provide potential foraging/dispersal or roosting habitat for the Yellow-bellied Sheathtail-bat, and the Greater Broad-nosed Bat, it is also possible that these species could occur on or utilise the site. Due to the lack of suitable more extensive areas of forest or woodland on the site, occurrence of the Large-eared Pied Bat and Eastern False Pipistrelle is unlikely.

As part of a sustainable development, restoration of microbat habitat is being proposed in particular, foraging habitat for Southern Myotis (details below).

4.3 Other threatened fauna species

A total of 28 threatened fauna species have been recorded in the vicinity of the site (10 km radius) (**Table 2**).

In its current state, the site provides little opportunity for other threatened species with the exception of Grey-headed Flying-fox and some woodland bird species (e.g. Swift Parrot, Little Lorikeet and Dusky Woodswallow) which may forage among remnant trees and woodland patches on the site.

The Grey-headed Flying-fox and Dusky Woodswallow are likely to occur on and utilise site, while the Swift Parrot and Little Lorikeet are moderately likely to occupy the site when flowering eucalypts provide valuable food resources. All of these species are either migratory or nomadic in their behaviour and move between areas of suitable habitat within their range.

5.0 Habitat reconstruction / restoration

5.1 Existing habitat

The proposed industrial subdivision is on the former productive agricultural land, which included market gardens with houses and sheds. With urban expansion, the agricultural activities decreased over time and now have ceased on the site. Inferred by aerial photographs, the land use changes have been the following:

Year	Observed from aerial photographs
1956	Farming activities with dam offsite to the north of the site;
1965	The high voltage pylons installed in the south of the site;
1970	The Great Western Highway built along the northern boundary, agriculture decreasing east of Blacktown Creek onsite, but intensifying west of the creek;
1986	Market gardens having ceased onsite; and
1991	The Western Motorway (M4) being built to the south of the site.

The aerial photo from 1956 (**Figure 5**) shows roughly the same extent of native vegetation and cleared land on the site as the present day with some losses of native woodland remnants on neighbouring land since 1956.

In terms of breeding habitat for Green and Golden Bell Frog, there were visible sections of open and pooling water suitable for breeding along Blacktown Creek in 1956, which are no longer present.

Habitat value along Blacktown Creek is presently significantly reduced for most stream-dwelling fauna. Invasion of the exotic *Juncus acutus* (Sharp/Spiny Rush) has resulted in a loss of open water that receives direct sunlight and water bodies being no longer deep enough for Green and Golden Bell Frog tadpoles to complete development.

The large stand of *Juncus acutus*, however, currently supports a population of the ‘marine’ protected Australian Reed-Warbler (*Acrocephalus australis*) (EPBC Act). Proposed riparian corridor works need to minimise impact upon this species and other wetland birds potentially present such as Bitterns, Crakes and Rails.

5.2 Key fauna species for habitat reconstruction / restoration

There are a number of threatened fauna species that have been recorded within the vicinity of the site that are likely to benefit from habitat reconstruction / restoration on the site (see **Table 3**).

5.3 Reconstruction / restoration areas

5.3.1 Woodlands

The woodland conservation areas largely cover existing treed land in the west of the site. Mature eucalypt trees are to be retained where practicable in these areas to provide important foraging resources for microbats and birds as well as potential hollows and anchor points for nest boxes.

Restoration efforts within these conservation areas focus on progressively replacing weeds with local native vegetation.

5.3.2 Blacktown Creek riparian corridor

Background

This is the largest of the conservation areas for the site and covers the riparian zone of Blacktown Creek, closely following the creek corridor and extending at least 10 m beyond the top of bank. This will potentially benefit the Green and Golden Bell Frog, which was formerly very common and widely distributed across much of coastal NSW including the Cumberland Plain.

The species declined severely following the global spread of the amphibian chytrid fungus, among other existing pressures such as land clearing and habitat modification. Additionally, *Gambusia holbrooki* (Mosquito Fish) pose a significant threat to tadpole mortality. For an effective wetland habitat construction these factors need to be considered and accounted for.

Best practice management involves a matrix of ephemeral and permanent water sources, saline influence and earthen bund walls (Klop-toker et al, 2017; Beranek et al, 2020; Klop-toker et al, 2021).

This wetland/creek restoration proposal is consistent with habitat known to support extant Green and Golden Bell Frog populations and restored wetlands occupied by this species (Beranek et al 2020). For example, Klop-toker et al. (2021) found that ideal Green and Golden Bell Frog habitat *included a mosaic of permanent and ephemeral ponds, increased salinity in a subset of ponds, fencing to exclude predators and prevent* L. aurea *dispersal, and rock piles for shelter*.

Wetlands should also be constructed to have a short hydro-period where chytrid fungus zoospores are eliminated due to desiccation (Scheele et al. 2015); this will also prevent the establishment of large populations of Mosquito Fish. This is achievable at the site, by establishing ephemeral ponds and also by incorporating inflow/outflow drains into the

earthen bunds of the ponds that allow for the mechanical regulation of water level and filling/draining of all the proposed ponds in the riparian zone.

If run-off/discharge or detention basin ponds are proposed as part of the development, then these could potentially be formed into additional wetlands suitable for Green and Golden Bell Frogs and other fauna. These are to be planted with aquatic vegetation and landscaping of the surrounding area should utlise native vegetation species proposed for planting in the riparian corridor.

Water from these detention basins could potentially be used to help regulate water level during droughts in the permanent ponds proposed as part of the Blacktown Creek riparian corridor reconstruction / restoration. Further, water from detention basins could be used to periodically inundate the proposed ephemeral ponds in the riparian corridor during drier periods to provide additional available breeding habitat for frogs, and foraging habitat for wetland birds, when environmental conditions are otherwise not conducive to natural inundation of these ponds.

An off-line matrix of four or five ponds with direct connectivity to Blacktown Creek is proposed within the riparian corridor, below the top of bank (**Figure 6**). This will consist of at least two ephemeral and two permanent ponds with bund walls controlling water flow, allowing for the inundation of the ephemeral wetlands during flood events and the regulating of water level in the permanent ponds. A matrix of permanent and ephemeral ponds allows for frog populations to persist during droughts, where the permanent ponds form refugia, while during wetter periods ephemeral ponds are likely to be favoured for breeding.

At a minimum, both an ephemeral and a permanent pond should be >20 m long each, with the permanent pond >10 m wide and the ephemeral pond >5 m wide. The other two ponds may be smaller, both approximately 10 m long by 5 m wide. Depths will be dependent upon nature of water body, and should be 1.1–1.9 m deep for permanent ponds and 0.3–0.7 m deep for ephemeral ponds (Pyke & White, 1996; Beranek et al, 2020). All ponds should be slightly deeper at the end where water inflows from the creek (Pyke & White, 1996), with capacity to drain/overflow from the shallow end. Water inflow access and drainage/overflow channels, with associated mechanisms for regulating pond water level, need to be constructed within and on the bund walls in direct contact to the closest upstream and downstream flowing section of the creek respectively.

All ponds need to be surrounded on every bank with a constructed bund, being an elevated earthen wall that sits >0.6 m and >1.2 m above the respective maximum water levels of the ephemeral and permanent ponds (Beranek et al 2020), and at least 1 m higher than the maximum water level of the creek (i.e. during flood events). The bunds should be roughly 3.5 m wide and can be created from material excavated during pond construction, and compacted for stability (Beranek et al 2020). Bunding is necessary to prevent the predatory exotic Mosquito Fish (*Gambusia holbrooki*) from entering the ponds during floods (Chapman & Kramer, 1991; Kerezsy, 2015).

Within the appropriate bund walls, regulated water inflow and outflow access points need to be constructed to allow water to flow in from Blacktown Creek and be drained back into the creek as required. On the bund wall containing the outflow access, an additional above

ground, gently sloping, overflow “spillway” needs to be constructed in the event that extreme rainfall causes the pond water level to reach the top of the bund.

The access (i.e. inflow) points need to be well below the normal or average water level of the creek (i.e. close to the streambed) for the permanent ponds, and well above the normal water level but below the maximum/ “flood” level for ephemeral ponds. The inflow access then connects to the pond entry point, best located just above the bottom of the bund near where it joins the base of the pond, allowing the ponds to fill from the deepest point. The outflow point within the ponds must to be located at the pond base, where it joins the bottom of the bund, with the exit point into the creek located below the normal creek water level.

Valves to open and close the water access points need to be installed so pond water level can be regulated, with valve filters fitted at inflow (creek side) and outflow (pond side) points to prevent Mosquito Fish entering the ponds.

Once constructed, the bunds can be vegetated with local native groundcover species.

As water salinity has an important influence on the persistence of Green and Golden Bell Frog populations, a salinity of 2 ppt in the proposed large permanent pond at the northern end of the site and 4 ppt in the smaller proposed permanent pond is recommended. Salinity of the ephemeral ponds should be lower, ideally between 1 and 2 ppt. Salinity should never exceed 9 ppt in any of the ponds.

Pond salinity can be regulated either by:

1) physically adding rock salt (NaCl) into the pond (while concurrently measuring pond salinity) to reach the desired salt concentration (Stockwell et al 2014; Klop-toker et al, 2017); or

2) digging deep enough or boring a hole within the base of the pond to intersect the water table, allowing groundwater to enter the pond and increase salinity (Beranek et al 2020).

For the proposed ephemeral ponds, adding rock salt post inundation would be a practical way to regulate salinity level, especially as lower salt concentration is recommended for these ponds. Adding rock salt to the proposed permanent ponds could also be used to regulate or alter salt levels in these water bodies, however depending on the depth of the water table, boring to allow groundwater to mix with the pond water may be a better method of maintaining salinity in the long term (particularly as these ponds are intended to be permanent water sources).

Monitoring salt concentration could be achieved by taking measurements with a salinity meter or installing data loggers, the latter being more practical for the permanent water bodies. From the salinity report for the site (PSM letter, dated 22 March 2022) the concentrations of chlorides in soil samples varied from less than 50 mg/kg to 830 mg/kg, it is likely that the natural groundwater is slightly saline.

Table 4 provides a list of suitable aquatic and fringing vegetation for Green and Golden Bell Frogs that is recommended for planting within and around the proposed permanent and ephemeral ponds. Species such as *Phragmites australis* and *Typha* spp. should be mostly avoided in plantings given their tendency to quickly colonise water bodies and reducing the amount of open water (Pyke & White, 1996; Beranek et al 2020), however actively facilitating

Typha domingensis to naturally colonise some sections of Blacktown Creek as a replacement for existing *Juncus acutus*, that will be removed, is important to ensure the local population of Australian Reed-Warblers persists.

Trees should not be planted close enough to the proposed ponds that they would shade or overhang any of the pond area (Pyke & White, 1996). Rather, tree planting along the riparian corridor should occur along sections of Blacktown Creek away from the proposed ponds, and higher up the bank. Maintaining sections of unshaded, open water will benefit both Green and Golden Bell Frogs and Southern Myotis.

Other habitat features, such as logs and rock piles should be placed around the perimeter of the deeper ends of the ponds in order to provide overwintering and sheltering habitat for Green and Golden Bell Frogs (Pyke & White, 1996; Klop-toker et al 2021).

Rock piles along the pond perimeter should extend for 2–3 m and range from at least 1 m below and up to 5 m above the water level of the pond when full (Pyke & White, 1996).

In brief

As part of creek reconstruction / restoration works, open and pooling water ponds are designed to provide breeding habitat for the Green and Golden Bell Frog and to minimise the risks of:

- Amphibian Chitrid fungus by use of permanent and ephemeral ponds; and
- Predation of Green and Golden Bell Frog tadpoles by *Gambusia holbrooki* (Mosquito Fish) by encouraging the threatened fishing bat, Southern Myotis. This bat's diet includes *Gambusia holbrooki.*

Southern Myotis requires unimpeded flight paths over open water with a glide slope of approximately 3 m on approach to these open ponds. The restoration works incorporate flight paths along Blacktown Creek for both bats and birds.

The ponds will include at least:

- two permanent (at least 20m x 10m & 10m x 5m), depth 1.1-1.9m;
- two ephemeral (20m x 5m & 10m x 5m), depth 0.3-0.7m; and
- Rock piles/logs for shelter.

These ponds are being designed by the hydro engineer to meet the requirements of the Green and Golden Bell Frog as part of the water management for the proposal.

Tree plantings within this riparian zone are to be away from the constructed ponds so that they will not shade or overhang the ponds when mature.

Acknowledgements

We wish to thank Chad Beranek for his helpful discussions on Green and Golden Bell Frog designs and his research findings on the implementation of reconstruction of habitat ponds at Ash Island in the Kooragang Wetlands in Hunter Wetlands National Park.

We would also like to thank Joelan Sawyer with assistance with field survey.

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Appendix 1. Details of authors

Name	Position	Tasks performed include	Relevant qualifications
Grant Webster	Fauna Ecologist	- Report preparation, - Data analysis; - Research.	B.Sc (Hons) in Biology and a M.Res in Science. Grant graduated from his Masters degree in 2017, with a project studying the geographic variation in the frogs *Pseudophryne bibronii* and *P dendyi*. Grant is currently completing his PhD on the conservation and ecology of the threatened frog species, Mahony's Toadlet.
Jayden Walsh	Ecologist	- Field survey, - data collection - photography	Experienced naturalist with a B.Sc from Macquarie University

Appendix 2. Daily survey effort

07/02/22 – 7-9:45pm - JW
08/02/22 – 8-10pm - JW
14/02/22 – 8-10pm - JW
09/03/22 – 6:30-9:45pm – JW & JS

(JW = Jayden Walsh, JS = Joelan Sawyer)

Appendix 3. Survey date climatic conditions

Date / time	Rainfall (Prospect)	Rainfall (Horsley Park)	Temp at 3 pm (Horsley Park)	Wind at 3 pm (Horsley Park)
07/02/22 – 7-9:45pm	Dry	7.4 mm	21.2	15 km/hr SSE
08/02/22 – 8-10pm	Dry	5.6 mm	24.1	11km/hr ENE
14/02/22 – 8-10pm	Dry	19 mm from 11, 12, 13 Feb, none on 14 Feb	28.2	6 km/hr N
09/03/22 – 6:30-9:45pm	More than 500 mm recorded between 16 Feb and 8 March.	30 mm on 9 Mar More than 350 mm between 11 Feb and 8 March (226.2 + 129mm)	24.0	20 km/hr SSW

(Source: Bureau of Meteorology online climate data)

Appendix 4. Fauna species detected onsite

Common Name	Scientific Name	Observation Type
Birds		
Bell Miner	*Manorina melanophrys*	OW
Red-whiskered Bulbul*	*Pycnonotus jocosus*	OW
Black-shouldered Kite	*Elanus axillaris*	OW
Australian Raven	*Corvus coronoides*	OW
Australian Magpie	*Gymnorhina tibicen*	O
Australian Reed-Warbler^	*Acrocephalus australis*	OW
Grey Fantail	*Rhipidura albiscapa*	OW
Willie Wagtail	*Rhipidura leucophrys*	O
New Holland Honeyeater	*Phylidonyris novaehollandiae*	OW
Little Grassbird	*Megalurus gramineus*	W
Spotted Dove*	*Spilopelia chinensis*	OW
Laughing Kookaburra	*Dacelo novaeguineae*	OW
Red-rumped Parrot	*Psephotus haematonotus*	OW
Rainbow Lorikeet	*Trichoglossus moluccanus*	OW
Superb Fairywren	*Malurus cyaneus*	OW
Magpie Lark	*Grallina cyanoleuca*	OW
Common Myna*	*Acridotheres tristis*	O
Noisy Miner	*Manorina melanocephala*	OW
Red Wattlebird	*Anthochaera carunculata*	OW
Welcome Swallow	*Hirundo neoxena*	OW
Grey Butcherbird	*Cracticus torquatus*	OW
White-plumed Honeyeater	*Lichenostomus penicillatus*	OW
Frogs		
Common Eastern Froglet	*Crinia signifera*	OW
Striped Marsh Frog	*Limnodynastes peronii*	OW
Reptiles		
Eastern Brown Snake	*Pseudonaja textilis*	O
Dark-flecked Sunskink	*Lampropholis delicata*	O
Pale-flecked Sunskink	*Lampropholis guichenoti*	O
Mammals		
Eastern Grey Kangaroo	*Macropus giganteus*	O
European Rabbit*	*Oryctolagus cuniculus*	O

O = seen; W = heard; OW = seen and heard, ^ = listed on EPBC Act, * = exotic species

Appendix 5. Site photographs

Plate 1. Site access via Augusta Street.

Plate 2. Dead trees along Augusta Street

Plate 3. View east across cleared former agricultural land towards the riparian zone onsite

Plate 4. Culvert of Blacktown Creek with potential microbat roosting habitat

Plate 5. View of paddock grassland typical of the site

Appendix 5. Site photographs



Plate 1. Site access via Augusta Street.



Plate 2. Dead trees along Augusta Street



Plate 3. View east across cleared former agricultural land towards the riparian zone onsite



Plate 4. Culvert of Blacktown Creek with potential microbat roosting habitat



Plate 5. View of paddock grassland typical of the site

FIGURES



Figure 1. Site location

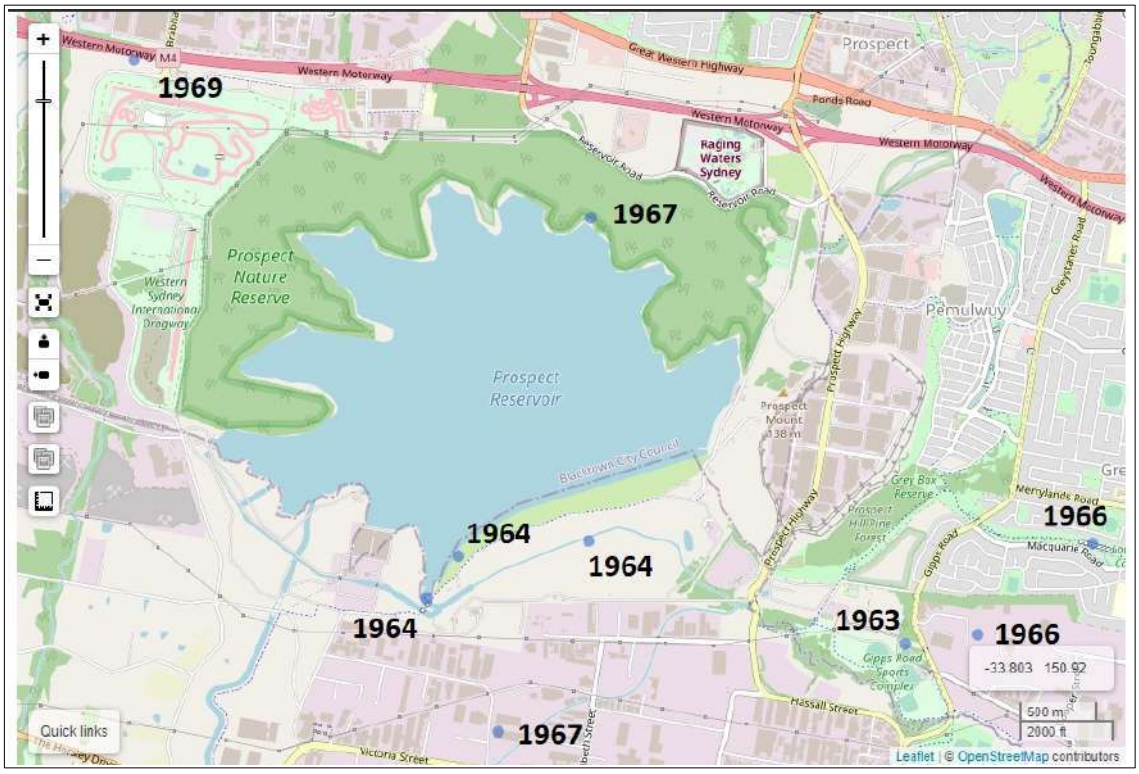


Figure 2. Green and Golden Bell Frog records (blue circles) in close proximity to the site with the dates of the records labelled

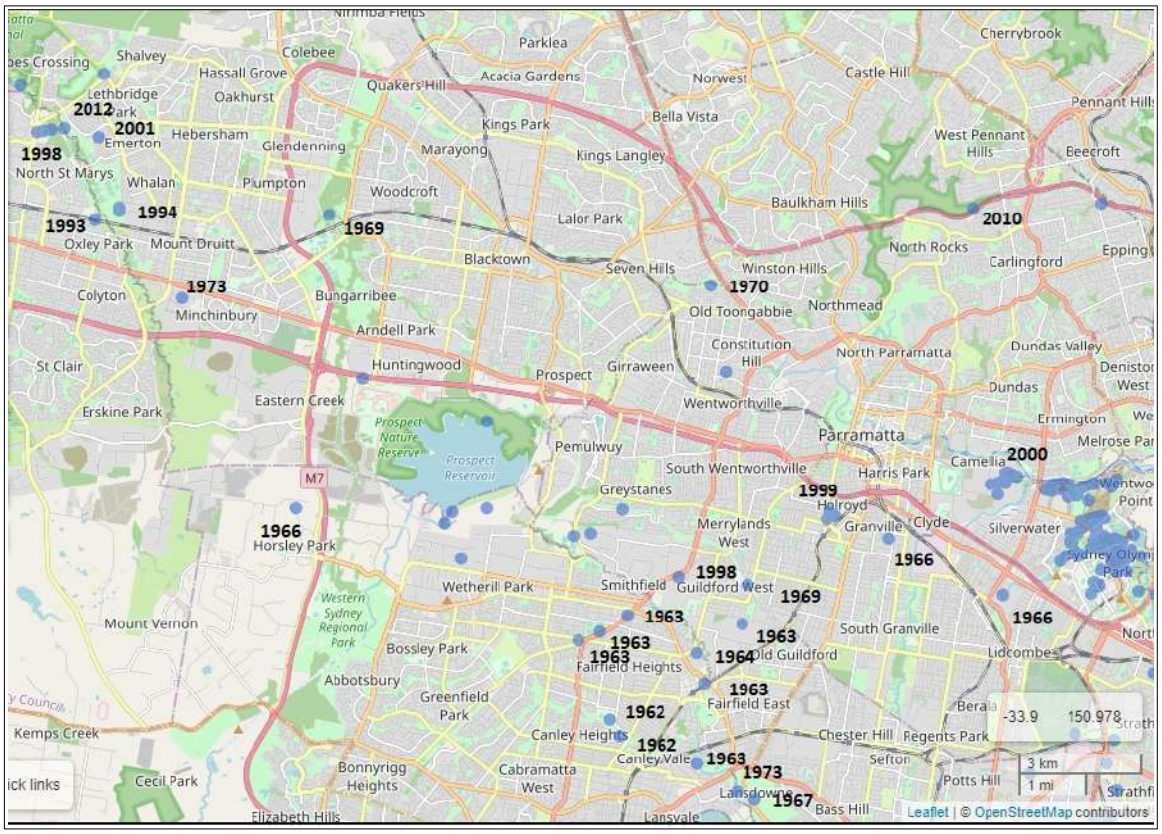


Figure 3. Records of Green and Golden Bell Frogs (blue circles) in the broader area with the dates of the records labelled

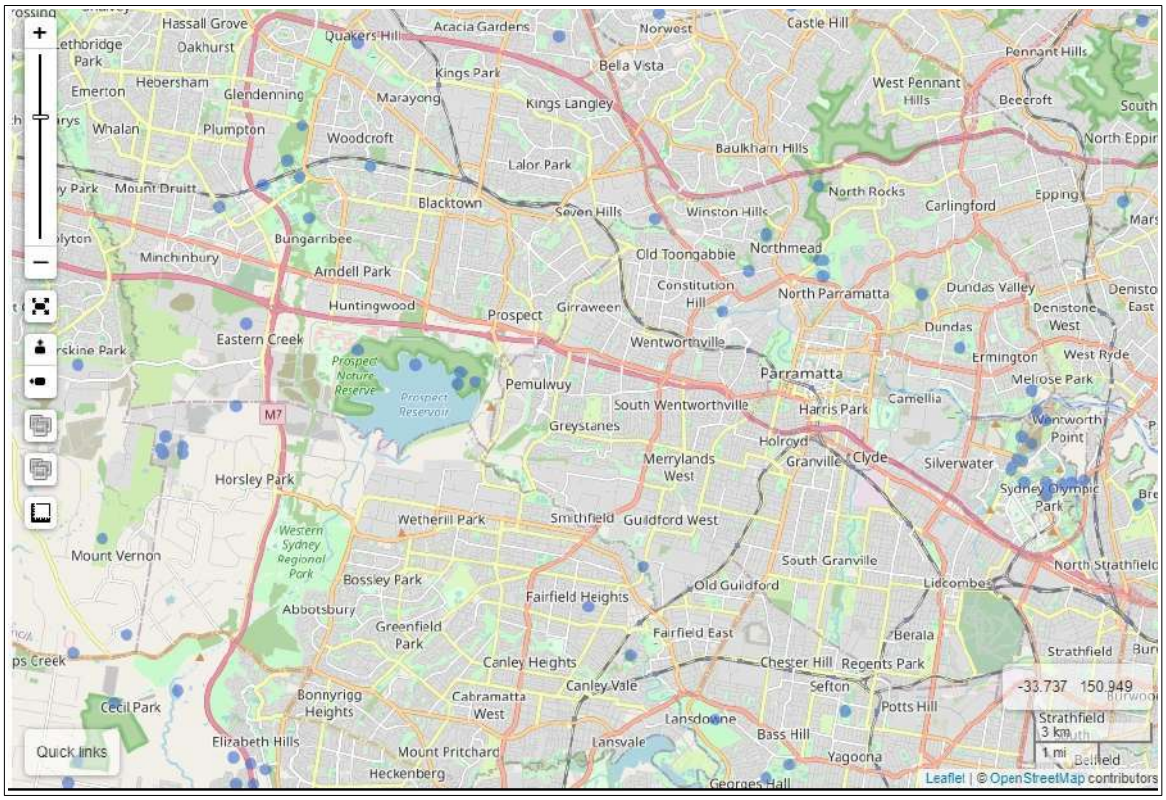


Figure 4: Records of Southern Myotis (blue circles) in the broader area around the site.



Figure 5. Historic aerial photograph of the site in 1956

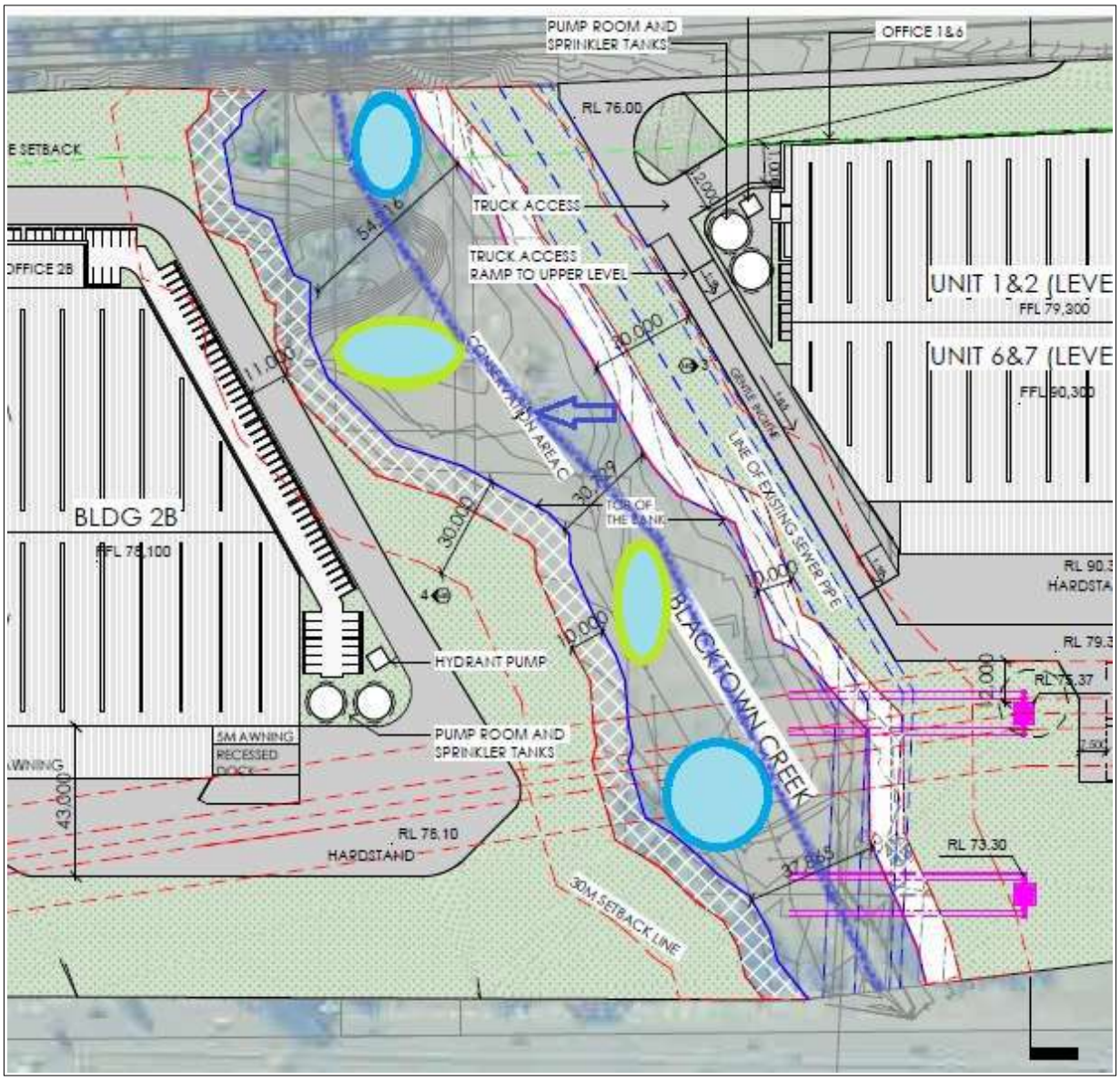


Figure 6. Sketch of proposed permanent and ephemeral ponds with direct connectivity to Blacktown Creek.

Note: Permanent Ponds = Blue outline; ephemeral ponds = green outline; approximate alignment of water channel is the shaded dark blue line, indicated with blue arrow.

TABLES

Table 1. Threatened microbat species records within 10 km of the site

(Note: all species other than the Large-eared Pied Bat are recorded within 5km of the site)

Emballonuridae	Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	☐	V,P		1
Molossidae	Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	☐	V,P		23
Vespertilionidae	Large-eared Pied Bat	Chalinolobus dwyeri	☐	V,P	V	1
	Eastern False Pipistrelle	Falsistrellus tasmaniensis	☐	V,P		9
	Southern Myotis	Myotis macropus	☐	V,P		10
	Greater Broad-nosed Bat	Scoteanax rueppellii	☐	V,P		11
Miniopteridae	Little Bent-winged Bat	Miniopterus australis	☐	V,P		4
	Large Bent-winged Bat	Miniopterus orianae oceanensis	☐	V,P		41

Table 2. Threatened fauna species records in the vicinity of the site (within a 10 km radius).

	Common name	Scientific name	Map [Clear all]	NSW status	Comm. status	No. of records
Animalia Amphibia Hylidae	Green and Golden Bell Frog	Litoria aurea	☐	E1,P	V	10
Aves Apodidae	Fork-tailed Swift	Apus pacificus	☐	P	C,J,K	4
	White-throated Needletail	Hirundapus caudacutus	☐	P	V,C,J,K	1
Accipitridae	Little Eagle	Hieraaetus morphnoides	☐	V,P		12
Falconidae	Black Falcon	Falco subniger	☐	V,P		1
Charadriidae	Grey Plover	Pluvialis squatarola	☐	P	C,J,K	1
Scolopacidae	Latham's Snipe	Gallinago hardwickii	☐	P	J,K	1
Psittacidae	Little Lorikeet	Glossopsitta pusilla	☐	V,P		2
	Swift Parrot	^^Lathamus discolor	☐	E1,P,3	CE	28
	Turquoise Parrot	^^Neophema pulchella	☐	V,P,3		1
Strigidae	Barking Owl	^^Ninox connivens	☐	V,P,3		2
	Powerful Owl	^^Ninox strenua	☐	V,P,3		4
Tytonidae	Masked Owl	^^Tyto novaehollandiae	☐	V,P,3		3
Meliphagidae	Regent Honeyeater	Anthochaera phrygia	☐	E4A,P	CE	13
Neosittidae	Varied Sittella	Daphoenositta chrysoptera	☐	V,P		6
Artamidae	Dusky Woodswallow	Artamus cyanopterus cyanopterus	☐	V,P		10
Petroicidae	Flame Robin	Petroica phoenicea	☐	V,P		1
Mammalia Dasyuridae	Spotted-tailed Quoll	Dasyurus maculatus	☐	V,P	E	7
Pteropodidae	Grey-headed Flying-fox	Pteropus poliocephalus	☐	V,P	V	318
Emballonuridae	Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	☐	V,P		1
Molossidae	Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	☐	V,P		23
Vespertilionidae	Large-eared Pied Bat	Chalinolobus dwyeri	☐	V,P	V	1
	Eastern False Pipistrelle	Falsistrellus tasmaniensis	☐	V,P		9
	Southern Myotis	Myotis macropus	☐	V,P		10
	Greater Broad-nosed Bat	Scoteanax rueppellii	☐	V,P		11
Miniopteridae	Little Bent-winged Bat	Miniopterus australis	☐	V,P		4
	Large Bent-winged Bat	Miniopterus orianae oceanensis	☐	V,P		41
Gastropoda Camaenidae	Cumberland Plain Land Snail	Meridolum corneovirens	☐	E1		74

Table 3. Key fauna species for habitat reconstruction / restoration

Species	Common Name	Preferred Habitat (source: NSW OEH species profiles)	Proposed Habitat creation
Frogs			
Litoria aurea	Green and Golden Bell Frog	Wetlands and slow flowing streams with emergent vegetation in woodland and open forest, or urban areas.	At least 4 open water ponds: – two permanent (20x10m & 10x5m, depth 1.1-1.9m), and – two ephemeral (20x5m & 10x5m, depth 0.3-0.7m). Rock piles/logs for shelter.
Microbats			
Myotis macropus	Southern Myotis	Forages over streams and ponds. Roosts close to water in hollow-bearing trees or dense foliage, and artificial structures such as under bridges, storm water channels or buildings.	Wetlands proposed as for Green and Golden Bell Frog. Installation of microbat nest boxes mounted on wood pylons in the riparian zone. If possible, retrofit microbat roosts in culverts.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Dry sclerophyll forests and woodland, roosts in tree hollows but also under bark or artificial structures.	Planting and restoration of native woodland in conservation areas. Installation of microbat nest boxes. If possible, retrofit microbat roosts in culverts.
Scoteanax rueppellii	Greater Broad-nosed Bat	Woodland and moist or dry eucalypt forest. Roosts in tree hollows and buildings.	Planting and restoration of native woodland in conservation areas. Installation of microbat nest boxes.
Miniopterus australis	Little Bent-winged Bat	Moist eucalypt forest and wet/dry sclerophyll forests. Roosts in tree hollows, storm water drains, culverts, bridges and buildings.	Planting and restoration of native woodland in conservation areas. Installation of microbat nest boxes. If possible, retrofit microbat roosts in culverts.
Miniopterus orianae oceanensis	Large Bent-winged Bat	Roosts in caves or artificial structures such as storm water tunnels and buildings. Forages in forested areas.	Planting and restoration of native woodland in conservation areas. If possible, retrofit microbat roosts in culverts.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Moist habitats with trees taller than 20 m. Roosts in eucalypt hollows but also under loose bark or in buildings.	Riparian corridor plantings e.g. *Eucalyptus amplifolia, Angophora floribunda, Casuarina glauca*. Installation of microbat nest boxes.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Roosts in tree hollows, buildings or burrows. Occurs in most habitat types.	Planting and restoration of native woodland in conservation areas. Installation of microbat nest boxes.
Other Mammals			
Pteropus poliocephalus	Grey-headed Flying-fox	Forests and woodlands, including urban areas.	Planting *Eucalyptus tereticornis, E.*

Species	Common Name	Preferred Habitat (source: NSW OEH species profiles)	Proposed Habitat creation
		Favours *Eucalyptus spp* and *Melaleuca spp* for feeding.	*moluccana, E. crebra, Melaleuca styphelioides.*
Birds			
Lathamus discolor	Swift Parrot	Woodlands and forests, favours *Eucalyptus robusta, E. tereticornis, E. moluccana, E. sideroxylon* and *Corymbia maculata.*	Restore sections of native woodland, plant *Eucalyptus tereticornis, E. moluccana*.
Glossopsitta pusilla	Little Lorikeet	Open eucalypt forest/woodlands, nests in hollows often in riparian zones.	Restore sections of native woodland, plant eucalypts, install small nest boxes.
Acrocephalus australis	Australian Reed-Warbler	Riparian zones with dense emergent vegetation and reed beds.	Sequentially replace sections of *Juncus acutus* with native species e.g. *Typha domingensis*, *Bolboschoenus caldwellii, Carex appressa.*
Hieraaetus morphnoides	Little Eagle	Open eucalypt forest and woodland, nests in tall living trees.	Restore sections of native woodland; retain existing living native trees.
Anthochaera phrygia	Regent Honeyeater	Open forest and woodland, particularly box-ironbark woodlands, favours mistletoes.	Restore sections of native woodland, plant *Eucalyptus moluccana, E. crebra.*
Daphoenositta chrysoptera	Varied Sittella	Eucalypt forests and woodlands, favours trees with dead branches.	Restore sections of native woodland; retain /prune dead trees where practicable.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Dry, open eucalypt forests or woodlands with a sparse understory of shrubs, groundcovers and debris.	Restore sections of native woodland, ensuring natural vegetation structuring and features such as logs are present.
Invertebrates			
Meridolum corneovirens	Cumberland Plain Land Snail	Cumberland Plain Woodland, i.e. open woodland with grassy understory and areas of shrubs.	Restore native vegetation, ensuring natural vegetation structuring and features such as logs are present.

Table 4. Aquatic and fringing vegetation suitable for Green and Golden Bell Frogs that is recommended for planting within and around the proposed permanent and ephemeral ponds (Beranek et al 2020).

Species	
Bolboschoenus caldwellii	*Persicaria decipiens*
Bolboschoenus fluviatilis	*Persicaria praetermissa*
Carex appressa	*Ranunculus inundates*
Eleocharis acuta	*Schoenoplectus validus*
Eleocharis sphacelata	*Cycnogeton procerum*
Juncus usitatus	*Lomandra longifolia*

Appendix 7a

Application to become an Expert, lodged December 2023

Department of Planning and Environment

Application to become an Expert (within the meaning of the Biodiversity Assessment Method)

Instructions

This form must be completed by the Expert Applicant and the Accredited Assessor managing the Biodiversity Assessment Method (BAM) case for which an expert report is required. The department will only consider applications for approval to be an expert for projects that require an Expert Report.

One form is to be prepared for each species-credit species for which an expert report is being prepared for a BAM assessment.

Once this form is complete, scan this dual-signed form with attached submission (detailed in section 5), and send to BAM_species_expert@environment.nsw.gov.au

Section 1 Project details for which an expert report is being prepared

Project name	Proposed Augusta Street warehouse and distribution centre
Project type	State Significant Development Application (SSD - 36138263)
Local Government Area	Blacktown City Council

Section 2 Expert applicant details

Name	Grant Webster		
Email	grantwebster.aecs@gmail.com		
Contact phone	0459 221 596		
Signature		Date	27/11/2023

Section 3 Name of BAM Assessor managing the case provided in (1)

Name	Dr AnneMarie Clements		
Email	mail@acabotanic.com		
Contact phone	0427553362		
Signature		Date	27/11/2023

Section 4 The individual species for which expert status is being nominated

Scientific name	Common name
Litoria aurea	Green and Golden Bell Frog
Myotis macropus	Southern Myotis

Section 5 Submission describing evidence for expert status

A submission should be attached to this form addressing the following factors for the species. Each section should be clearly labelled and addressed to assist in review.

1. The expert's academic qualifications such as relevant degrees, post graduate qualifications.
2. Their history of experience in the ecological research, habitat assessment and survey method, for the relevant species.
3. A resumé detailing projects pertaining to the survey of the relevant species (including the locations and dates of the work), their employers' names and periods of employment (where relevant) over the previous 10 years.
4. Peer-reviewed publications on the species or other evidence that the person is a well-known authority on the species to which the survey relates. The assessor cannot act as a referee for the proposed expert for this purpose.

Section 6 Authority to publish name and personal details on the website

I, the expert applicant listed in section 2, agree/disagrees to my details being placed on the List of Experts on the department website if my application is approved.

Full name	Grant Webster		
Signature			
Email	grantwebster.aecs@gmail.com	Agree to publication	☐
Contact phone	0459221596	Agree to publication	☐

Grant Nicholas Webster

Resumé

Grant is an experienced research biologist and conservation ecologist with a strong background in Australian flora and fauna. He is a specialist in herpetology and has an expert knowledge of Australian frogs. He is an enthusiastic researcher and has a good general knowledge of ecological communities, standard ecological practices and methodologies.

Contact Details

Phone: 0431538729

Email: grantwebster.aecs@gmail.com

Website: https://www.flickr.com/photos/14807473@N08/
https://www.facebook.com/AECSAustralia/

Education

2019 (ongoing) PhD – University of New England

Thesis title: "Ecology and conservation of the endangered Mahony's Toadlet (*Uperoleia mahonyi*)".

2017 Master of Research – Macquarie University

Thesis title: "Geographic variation in the frog *Pseudophryne bibronii*" a taxonomic study on the *P. bibronii* species complex.

2013 Bachelor of Science (First Class Honours) – Macquarie University

Thesis title: "Revelations on Dynamic Sexual Dichromatism in Frogs" a study on sexual dichromatism as an indicator of genetic quality in the Whirring Tree Frog (*Litoria revelata*)

2011 Bachelor of Science – Macquarie University

Major in Biology and minor in Geographic Information Systems

2008 HSC - Epping Boys High School

Received Macquarie University Environmental Award in 2006 for work with Streamwatch and Environment Group at Epping Boys

Awards

- 2019 Received three research grants towards my PhD research:
  - $8,000 from Lake Macquarie Council
  - $1,000 from Ecological Consultants Australia
  - $1,000 from the Frog and Tadpole Study Group

- 2016 Received one $500 research grant from the Frog and Tadpole Study Group towards my Masters research.
- 2013 Masters/honours student award for best presentation for my honours research at the 37th Australian Society of Herpetologists conference, Newcastle.
- 2012 Received two $500 research grants from the Frog and Tadpole Study Group towards my honours research.

Work Experience

All Environmental and Conservation Services (2008-2023) as the Director of my own research business I have worked as a Contract Ecologist for:

Willoughby City Council (2011 – 2022)

- Led 1-2 annual guided spot lighting and educational tours for community members through Northbridge Golf Course. During tours I identified flora and fauna and provided information about the local environment to the participants.
- Presented information on frogs at local council community environment fairs.

Blacktown City Council (2008 – 2023)

- Delivered 2-3 annual frog presentations followed by guided spot lighting and educational tours through Nurragingy Reserve and The Ponds. Tours were mostly focused on frogs and local species were identified and shown to participants.

ACS Environmental Pty Ltd (2013)

- Supervised the draining and removal of two basins at a development site at Caringbah.

Coastwide Marine Pty Ltd (2016-2018)

- Systematic herpetofauna surveys of the Ingleside Escarpment.

Future-Plus Environmental Pty Ltd (2019)

- Groundwater monitoring at a remediating landfill site in Riverwood.

Habitat Management Services Pty Ltd (2020-2021)

- Threatened flora and fauna surveys, development of appropriate mitigation strategies and report writing for management of works proposed on an existing easement operated by Jemena (SGSP Assets Pty Ltd) in Brisbane Water National Park.
- Site and literature assessment, developing associated mitigation measures and report writing for proposed works by Jemena (SGSP Assets Pty Ltd) in Menangle Park.
- Threatened flora and surveys, development of appropriate mitigation strategies and report writing for management of works proposed on an existing easement operated by Jemena (SGSP Assets Pty Ltd) in Sugarloaf State Conservation Area.

Key Achievements:

- Tours have always been well received with feedback indicating young people were inspired to have an interest in the environment.
- Developed extensive frog and fauna species lists/records for both Nurragingy Reserve and Northbridge Golf Course over consecutive years.
- The basin which was removed at Caringbah was a breeding site of the Cane Toad and this helped with the control of this population in Sydney.
- Identified a breeding site for the threatened Giant Burrowing Frog at Ingleside.
- Work with Habitat Management Services identified two additional threatened species (Giant Burrowing Frog and Red-crowned Toadlet) at the Brisbane Water site and identified the presence of previously overlooked Critically Endangered Cumberland Plain Woodland at Menangle Park.

Cumberland Ecology (2005 – 2013) as an ecologist/research assistant

Key Projects: I conducted and managed field work for a number of sites including Cooks Cove, Maules Creek, West Menai, St. Marys, Woronora Cemetery, M2 Motorway upgrade and Sydney Water North-west and South-west growth centres.

Key Tasks:

- Conducted surveys for threatened frog and reptile species such as *Litoria aurea*, *Pseudophryne australis* and *Varanus rosenbergi*
- Practised other fauna surveying techniques such as spotlighting, active searches, hairtubes, trapping (cage and Elliot traps), Harp Traps/Anabats, Koala scat searches
- Assessed and identified habitat for threatened frog species
- Conducted flora surveys, including general quadrats and transects for threatened species such as *Allocasuarina glareicola, Epacris purpurascens, Grevillea juniperina, Persoonia nutans* and *Pultenaea parviflora*
- Supervised habitat clearing and fauna rescue
- Installed and monitored nest boxes
- Kangaroo herding
- Compilation of species lists and entry of field data
- Researching, in particular threatened species habitats and occurrence records
- Maintained and cleaned field gear
- Other administrative duties such as filing, photocopying and binding

Key Achievements:

- Monitored the endangered Green and Golden Bell Frog population at Kogarah in Sydney
- Identified several new localities for threatened species such as *Pseudophryne australis* and *Litoria booroolongensis*
- Monitored a regeneration site of critically endangered Cumberland Plain Woodland

Anne Clements & Associates (2016-2018) as an ecologist/botanist

Key Projects: I conducted and managed field work and report writing for a number of sites including Bayview Golf Course redevelopment, St Narsai School at Horsley Park, Jennifer Street Little Bay, Denis Winston Drive subdivision at Doonside and Waterbrook Bowral Seniors Living development.

Key Tasks:

- Systematic flora surveys including specimen identification
- Targeted flora survey for threatened species such as *Epacris purpurascens*
- Supervising Reedy Creek reconstruction and rescue/relocate fauna
- Survey for threatened fauna including Green and Golden Bell Frog and Powerful Owl
- Habitat assessment for threatened flora and fauna species, including hollow-bearing trees
- Mapping using GIS software (QGIS)
- Report writing including:
    - Species Impact Statements (Doonside subdivision)
    - Assessments of Significance (Bayview Golf Course)
    - Vegetation/Conservation Management Plans (Werrington subdivision)
    - EPBC Referrals (Doonside subdivision)

Key Achievements:

- Identified a breeding location for the threatened Powerful Owl (Bayview)
- Restoration of critically endangered Cumberland Plain Woodland (Horsley Park)
- Presented a paper at the Sustainability, Technology and Education Conference (2017), on the restoration program at St Narsai School

Publications

Webster GN, White TE, Whiting MJ (2023) Male nuptial colour and vocalisation appear to signal independent information in the whirring tree frog. *Behavioural Ecology and Sociobiology* doi: 10.1007/s00265-023-03343-5

Webster GN and Bool I (2022) A new genus for four species of myobatrachid frog from the South Western Australian Ecoregion. *Zootaxa*, 5154(2): 127-151.

Bell RC, Webster GN, Whiting MJ (2017). Breeding Biology and the Evolution of Dynamic Sexual Dichromatism in Frogs. *Journal of Evolutionary Biology* doi: 10.1111/jeb.13170

Shamon O, Clements AM, Baumann A, Webster G, Young M and Snowdon R (2017). Environmental Education and its Role in Restoring Native Ecosystems at Saint Narsai Asssyrian Christian College, Horsley Park (F133). STE Conference Proceedings, Parramatta

Other Research Skills

- Venomous Snake Handling and Husbandry – course completed with Johns Reptile Awareness Displays, 2015
- NSW Scientific License – Principal licensee. License Number SL101548

Professional Associations

Australian Museum

I have been involved with a collaborative project with the Australian Museum between 2016 and 2017 as follow up research from the Masters project. We examined:

- Distinct lineages present in New South Wales that may be new species (*Pseudophryne spp*);
- Genetic complexity of the *Pseudophryne bibronii* complex.

Additionally I have also provided the Museum with photographs, call recordings and information on other frog species for use in Apps and information available online, such as the FrogID App.

Australian Society of Herpetologists (ASH)

- Member of ASH since 2013
- Attended the 37th, 38th, 39th, 40th and 45th annual conferences

World Congress of Herpetology

- Attended and presented at the 9th congress in Dunedin, New Zealand

Frog and Tadpole Study Group of NSW (FATS)

I have been actively involved in the Frog and Tadpole Study Group of NSW (FATS) since the age of 12 (2002). I have been a member of the Executive Committee since 2006 and was Chairperson between 2007 and 2008. Work that I have done with the group includes:

- Developed and led frog field trips in parts of the Sydney region
- Ran and assisted with frog displays and various workshops at locations such as the Royal Easter Show
- Chaired public meetings of the group
- Presented talks on frogs at public meetings
- Surveyed for Green and Golden Bell Frogs (Homebush population) and other threatened frog species

PhD Students

I have volunteered as a research assistant with several PhD students who have been conducting research on frogs.

2013-2015 Marta Vidal Garcia – Australian National University, ACT

- Located frog sites, identified and collected frogs for a project studying the locomotion behaviours of Australia frogs.

2008-2011 Riona Twomey Tindal – Newcastle University, NSW

- Assisted with the collection of frogs and location of frog sites for a project studying the morphology of frogs from across New South Wales.

2005-2006 Abraham Mijares Urrutia – Griffith University, QLD

- Identified frog habitat and helped collect and measure frogs for a project on molecular systematics and phylogeography of *Crinia tinnula, Litoria freycineti, L. latopalmata, L. nasuta* and *L. olongburensis.*

Volunteer Work

- 2016 Spoke at NSW Parliament inquiry into WestConnex impacts on *Litoria aurea*
- 2006-2008 Bush Regeneration at Cumberland State Forest
- 2005-2008 Streamwatch water quality testing in the Lane Cove River valley

Personal Interests

Independent Research

I have conducted independent research on frogs since about 2006. As part of this research I have been regularly involved in frog surveys throughout south-eastern Australia, south-western Australia and North Queensland, as well as New Zealand, South Korea and parts of North America. Through this work I have gained considerable knowledge on frogs, particularly Australian species, and can accurately identify any Australian species on the basis of frog or tadpole observation and frog advertisement call.

I also have a broad knowledge on frog ecology and habitat and can accurately identify suitable habitat for threatened frog species such as *Litoria aurea, Lit. booroolongensis, Lit. littlejohni, Mixophyes spp, Philoria spp, Heleioporus australiacus, Crinia tinnula* and *Pseudophryne australis*.

I am currently involved in a major independent research project – "Taxonomy of the *Pseudophryne bibronii* species group" that I have been working on since 2015 and incorporated my Master's thesis. The study is ongoing and seeks to provide resolution to the taxonomic uncertainty in this species group.

Photography

I am also an avid frog photographer with an extensive collection of photos of over 170 species of frogs, tadpoles, eggs and frog habitat. I have had several of my photos featured in a variety of publications including:

- 2018 'A Naturalist's Guide to the Frogs of Australia' book by S. Eipper and P. Rowland
- 2015 'Amazing Animals of Australia's National Parks' book by Australian National Library
- 2015 '*Crinia tinnula* information sign' by Cardno Landscape Architects at Port Macquarie
- 2014 'Corroboree Frog minisheet and coin set' Australia Post stamp release
- 2013 'Frogs and Tadpoles of Australia' book by Marion Anstis
- 2012 'Frogs on Farms in the Murray Catchment' Australian National University brochure
- 2012 'Bathurst Region Backyards for Wildlife' Bathurst Regional Council brochure

Appendix 8

Targeted survey for the Cumberland Plain Land Snail (Meridolum corneovirens (Pfeiffer, 1851)) at Augusta Street, Huntingwood.

INVERTEBRATE IDENTIFICATION AUSTRALASIA
• Identifications • Surveys • Environmental Interpretations

4 October 2022

Targeted survey for the Cumberland Plain Land Snail (*Meridolum corneovirens* (Pfeiffer, 1851)) at Augusta Street, Huntingwoood.

Introduction

The study area located off the eastern end of Augusta Street, Huntingwood is bounded by the Great Western Highway to the north and the M4 Motorway along the south and the Prospect Highway to the east (Figure 1).

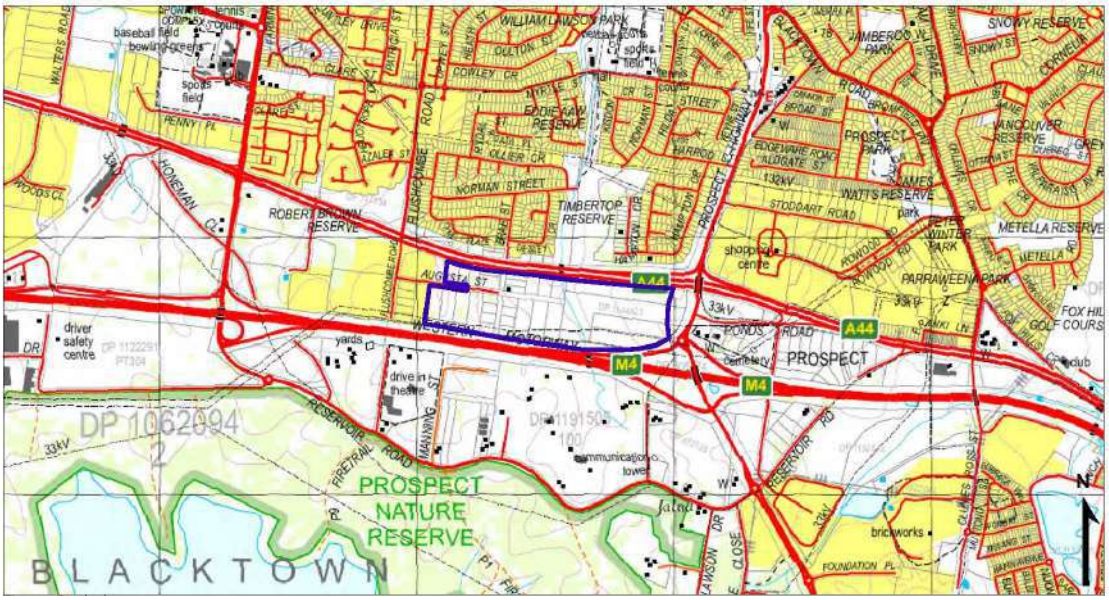


Figure 1. The purple line outlines the study area.

Methods

The study area was visited on 9th August, 2022. Search effort was concentrated where the major vegetation patches are located in the eastern and western sections of the study area and around the southern reach of Blacktown Creek near where it flows north of the M4 Motorway. Logs and non-natural debris such as old pieces of tin, bricks and other debris were turned where possible and leaf litter accumulations around the base of large eucalypts such as *Eucalyptus tereticornis* (Forest Red Gum) were searched. On the day it was cloudy, around 20 °C and light rain.

In addition, Blacktown Creek was sampled about 50m N. of the M4 Motorway. This sample was preserved in 95% ethanol and sorted under the microscope in the lab.

Results

No evidence of *Meridolum corneovirens* was found, what little potential suitable habitat present is heavily weed infested and no other species of snails or slugs were found.

However, four species of freshwater snails were found in Blacktown Creek about 25-50 N. of the M4 Motorway (Table 1). In addition, two species of small terrestrial snails, each represented by single old specimens were present in the sample which had been washed into the creek from nearby. The presence of the freshwater snail *Posticobia*, plus other aquatic insects such as caddis flies and diving beetles suggests the aquatic macroinvertebrate biodiversity is reasonable considering the streams location in western Sydney.

Family	Species	Habitat
Lymnaeidae	*Pseudosuccinea columella* (Say, 1817) **	Freshwater
Physidae	*Physella acuta* (Draparnaud, 1805) **	Freshwater
Tateidae	*Posticobia brazieri* (Smith, 1882)	Freshwater
Tateidae	*Potamopyrgus antipodarum* (Gray, 1843) **	Freshwater
Euconulidae	*Wilhelminaia mathildae* Preston, 1913	Terrestrial
Succineidae	*Austrosuccinea macgillivrayi* (Cox, 1864)	Terrestrial

Table 1. List of species of snail found in Blacktown Creek. ** - introduced species.

Yours sincerely



Dr Stephanie A. Clark
Director

INVERTEBRATE IDENTIFICATION AUSTRALASIA
481a Great Western Highway, Faulconbridge, NSW 2776
Phone 0426204240
Email: meridolum@ozemail.com.au
http://www.invertebrateidentification.com/

Appendix 9

Additional microbat survey on 27 February 2024 (Kane Durrant of Wild Conservation 2024).

5 MARCH 2024

Microbat Survey at Augusta Street Warehouse Site Blacktown

REPORT PREPARED FOR
ANNE CLEMENTS AND ASSOCIATES PTY LTD
BY WILD CONSERVATION PTY LTD - KANE DURRANT
MARCH 2024

WILD Conservation March 2024
WILD CONSERVATION | PO BOX 1143, NARELLAN, NSW 2567

WILD Conservation Pty Ltd were engaged by Anne Clements and Associates Pty Ltd to undertake surveys for the Microbat presence at a site in western Sydney, specifically Augusta Street Blacktown (Augusta Street Warehouse and Distribution Centre SSD-36138263) on February 27, 2024. Principal Ecologist Kane Durrant and two qualified Fauna Spotter Catchers attended the site during the afternoon and searched the potential roosting sites for Microbat activity or evidence of presence. The culverts were searched on foot by torchlight and an Echo Meter Touch 2 was utilised to detect calls.

The site is highly degraded with heavy aggregations of blackberry, privet and lantana vegetation wrapped around sparse native trees. Two creek lines transect the site from south to north originating in the south through culverts under the M4 Motorway and exiting the site in the north through culverts under the Great Western Highway (Figure 1)

Culverts are known roosting sites for various Microbat species including the target Myotis. The culverts were first assessed for their viability as a roost site in terms of flight access, proximity to open water and safety from predators. The culverts were walked on foot by Kane Durrant and each crack and crevice was searched by torchlight for Microbats, as well as evidence such as scratch marks and faeces (Figure 2)

An Echo Meter Touch 2 was deployed at the entrance of each culvert and recorded the frequencies. No Microbat calls were detected during the dusk or night hours of survey. The culverts were mostly inaccessible and would not be suitable for Microbats to fly into as most culverts were fully obscured by exotic weed species. The thickets of brambles were so impenetrable that the culverts could not be seen by the investigating team (Figure 3).

The site was walked in a random meander pattern through the paddock that dominated the site with no Microbats seen or detected by Echo Meter Touch 2. The creek lines were both walked from south to north with no Microbats detected by sight, torch or Echo Meter Touch 2.

No evidence of Microbats was found during the surveys conducted at this site. The only fauna detected during surveys were domestic cats wandering the site, European red foxes and their scat in the culverts, and black rats swarming through the exotic weeds.



Figure 1. Aerial image of the site with culvert locations marked X. Each culvert was inspected for Microbat activity and presence.



Figure 2. One of many cracks formed by the joins in the culvert sections. These cracks and other crevices were searched by torchlight during surveys. No evidence of Microbat presence was found.



Figure 3. This is the location of two culverts. They are completely obscured by vegetation and are unsuitable flight paths for Microbats.



Figure 4. The larger culverts are more open but allow for fox and cat travel. This one had more water than the others but still showed no signs of Microbat presence during the visual inspections or Echo Meter Touch 2 monitoring.



Figure 5. There is minimal open water on the site. It is nearly all covered by vegetation and is likely not suitable for fishing bats to utilise as a forage site.

Company profile for WILD Conservation Pty Ltd and brief CV of Kane Durrant

WILD Conservation Pty Ltd is led by Director and Principal Ecologist Kane Durrant BSc Ecology UNSW. We have been involved in the ecology and conservation space for approximately the last decade. I am currently undertaking my Honours at UNSW where I have also been employed as a casual Academic teaching Vertebrate Zoology, and as a guest lecturer in Herpetology. Our team at WILD Conservation consists of several Ecologists and Fauna Spotter Catchers with varying levels of experience from undergrads to post doctoral researchers, each with their own specialisations spanning several disciplines within the ecological field.

I am a member of the IUCN Species Survival Commission for Tortoises and Freshwater Turtles Specialist Group, as well as the Australian Society of Herpetologists and Editor at Australian Herpetological Society here in Sydney. We have undertaken Microbat surveys and installed supplementary habitat for them at several sites across Sydney, including some of those listed below.

Some of the major projects and roles we have worked on include:

- Windsor Bridge Upgrade (Ecology and Fauna Management)
- King Georges Road Upgrade (Pre clearance surveys)
- Heathcote Road Upgrade (Project Ecologist)
- Figtree Hill Master Community (Project Ecologist)
- Northern Road Upgrade (Fauna management and pre clearance surveys)

Appendix 10

Comparison of the recorded data with the Final Determination and Listing Advice

Comparison of the recorded data with the Final Determination and Listing Advice

1.0 Introduction

The best fit Plant Community Type onsite, *PCT 3319 Cumberland Shale Hills Woodland*, has the following associated Threatened Ecological Communities (TECs) (from the online PCT profile, Vegetation Classification public application):

PCT	Associated TEC
PCT 3319 Cumberland Shale Hills Woodland	*• Listed BC Act: Critically Endangered Ecological Community: Cumberland Plain Woodland in the Sydney Basin Bioregion (Part);* *• Listed EPBC Act: Critically Endangered: Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Part).*

Listed TECs under the BC Act are legally defined by the Final Determinations. The listed TECs under the EPBC Act are defined in the Listing Advice.

Of the nine surveyed BAM plots, there were:

- Two plots (Plots 1, 6) with no native canopy trees recorded. These plots had Vegetation Integrity Scores (VIS) of <5;
- Seven plots (Plots 2, 3, 4, 5, 7, 8, 9) had local native canopy trees recorded. These plots had VIS's varying from <15 (Plots 3, 8) to >50 (Plots 2, 7), namely:

Sampled in	Vegetation mapped as	Composition condition score	Structure condition score	Function condition score	Current vegetation integrity score
Without native canopy trees					
Plot 1	exotic grassland	12.7	0	14.9	1.6
Plot 6	riparian corridor	1.5	42.1	0	4
With native canopy trees					
Plot 2*	less degraded	80.4	40.8	45	52.9
Plot 3	exotic grassland	2.3	15.4	24.3	9.5
Plot 4	degraded	38.8	40.4	49.1	42.5
Plot 5	degraded	6.5	3.3	59.7	10.8
Plot 7	less degraded	72	46.7	54.7	56.9
Plot 8	degraded	10.8	8	11	9.9
Plot 9	degraded	38.2	25.5	62	39.3

* Plot 2 was offsite to the east

For a VIS <15, section 9.2.1 of the BAM (DPIE 2020) states that:

> ***9.2.1 Impacts on native vegetation and TECs (ecosystem credits)***
> *1. The assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:*
> *a. ≥15, where the PCT is representative of an EEC or a CEEC*
> *…*

Of the plots with a VIS <15:

- Plot 1 is on the formerly cleared farming land without canopy trees recorded with minor occurrences of native grasses and forbs;
- Plot 3 is on the formerly cleared farming land, with an entirely exotic understorey and two regenerating *Eucalyptus moluccana* trees up to 25 m recorded in one 10 m x 10 m subquadrat;
- Plot 6 is along the riparian corridor without canopy trees recorded;

In the western drainage swale

- Plot 5 had a low VIS attributed to low composition and structure score, but a high function score;
- Plot 8 is an area appearing as densely wooded on the aerial imagery with a canopy of *Eucalyptus moluccana* and *E. tereticornis* and a disturbed understorey, with ground-hollows and low mounds, some containing rubble that appeared to originate from demolition of a brick house.

The recorded data used in the comparisons with the Final Determination and Conservation Advice are from Plots 2, 4, 5, 7, 8, 9. [Note: Despite the low VIS for Plots 5, 8, these two plots are in the same drainage swale as Plots 4, 5, 9].

2.0 Comparison with the Final Determination for the critically endangered ecological community Cumberland Plain Woodland in the Sydney Basin Bioregion

The Scientific Committee has found that:

1. Cumberland Plain Woodland was listed as an Endangered Ecological Community under the *Threatened Species Conservation Act* 1995 in June 1997 (NSW Scientific Committee 1997). Since this listing, a large volume of new data and analyses have become available. In addition, a nomination to change the status of Cumberland Woodland to Critically Endangered status has been received. This Determination addresses additional information now available in accordance with current listing criteria under the *Threatened Species Conservation Regulation* 2002.

No additional comment.

2. Cumberland Plain Woodland is the name given to the ecological community in the Sydney Basin bioregion associated with clay soils derived from Wianamatta Group geology, or more rarely alluvial substrates, on the Cumberland Plain, a rainshadow area to the west of Sydney's Central Business District. The mean annual rainfall of this area is typically in the range of 700-900 mm, and is generally lower than that received on more elevated terrain that partially surrounds the Plain.

The site is on clay soil derived from Wianamatta Group geology (Figures 3a, 3b). Part of the vegetation in the western drainage swale is growing on dumped building material, especially in Plots 8, 9.

The site is located in the rainshadow area to the west of Sydney's Central Business District within 700 to 800 mm rainfall isohytes (Division of National Mapping 1986).

The community typically occurs on flat to undulating or hilly terrain up to about 350 m elevation but may also occur on locally steep sites and at slightly higher elevations. Cumberland Plain Woodland is characterised by the assemblage of species listed in paragraph 3 and typically comprises an open tree canopy, a near-continuous groundcover dominated by grasses and herbs, sometimes with layers of shrubs and/or small trees. Shrubs may sometimes occur in locally dense stands. Less disturbed

stands of the community may have a woodland or forest structure. Small trees or saplings may dominate the community in relatively high densities after partial or total clearing, and the groundcover may be relatively sparse, especially where densities of trees or shrubs are high. The community also includes 'derived' native grasslands which result from removal of the woody strata from the woodlands and forests.

The site is on gently undulating terrain with elevation of the site ranging from approximately 85 m AHD on the top of the hill west of Blacktown Creek and approximately 90 m AHD on the eastern boundary, to less than 70 m AHD along Blacktown Creek close to the northern boundary (Figure 1c-1).

The site is highly disturbed without a near-continuous groundcover dominated by native grasses and herbs.

3. Cumberland Plain Woodland is characterised by the following assemblage of species:
(listed species on https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/cumberland-plain-woodland-critically-endangered-ecological-community-listing, accessed 20 June 2023)

Of the 114 characteristic species, the highest number was recorded offsite in Plot 2 (26 species) in the north-east adjoining Prospect Highway, followed by Plot 7 (19 species) and Plot 4 (15 species) and less than 10 species in Plots 5, 8, 9, namely:

	Plot 2	Plots 4	Plot 5	Plot 7	Plot 8	Plot 9
Number of characteristic species recorded	29	15	4	19	6	9

4. The total species list of the community is larger than that given above, with many species present in only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including grazing, land clearing and fire) history. The number and relative abundance of species will change with time since fire, and may also change in response to changes in fire frequency or grazing regime. At any one time, above-ground individuals of some species may be absent, but the species may be represented below-ground in soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. Benson and Howell (2002) and Benson & von Richter (2008) document the temporal variability in the species composition of the community. The list of species given above is mainly of vascular plant species, however the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. The mammalian and avian components of the fauna have been described by Leary (in litt. August 2007) and Farrell (in litt. June 2007). Other components of the community are poorly documented (although see Benson & von Richter 2008).

No additional comments.

5. Cumberland Plain Woodland is characterised by an upper-storey that is usually dominated by *Eucalyptus moluccana* (Grey Box) and *E. tereticornis* (Forest Red Gum), often with *E. crebra* (Grey Ironbark), *E. eugenioides* (Narrow-leaved Stringybark), *Corymbia maculata* (Spotted Gum) or other less frequently occurring eucalypts, including *Angophora floribunda, A. subvelutina* (Broad-leaved Apple), *E. amplifolia* (Cabbage Gum) and *E. fibrosa* (Broad-leaved Ironbark).

Of the upper-storey species recorded, the cover varied from approximately 10% (Plots 5, 9) to 50% (Plot 7), namely:

Upper species recorded	Plot 2	Plots 4	Plot 5	Plot 7	Plot 8	Plot 9
Eucalyptus moluccana	1%	4%	10%	50%	10%	4%
Eucalyptus tereticornis	25%	25%	0.5%		5%	5%
Total	26%	29%	10.5%	50%	15%	9%

The community may have an open stratum of small trees that may include any of these eucalypts, as well as species such as *Acacia decurrens* (Black Wattle), *A. parramattensis* (Parramatta Wattle), *A.implexa* (Hickory Wattle) or *Exocarpos cupressiformis* (Native Cherry). Shrubs are typically scattered in the understorey but may be absent or locally dense as a result of clearing activity or changes in grazing or fire regimes. *Bursaria spinosa* (Blackthorn) is usually dominant, while other species include *Daviesia ulicifolia* (Gorse Bitter Pea), *Dillwynia sieberi, Dodonaea viscosa* subsp. *cuneata* and *Indigofera australis* (Native Indigo).

Of the listed native understorey trees and shrubs recorded, the total cover (and number of species) was highest in Plot 2 (offsite in the east) and the total cover in Plots 4, 5, 7, 8, 9 varied from 0 to 5%.

Understorey trees and shrubs recorded	Plot 2	Plot 4	Plot 5	Plot 7	Plot 8	Plot 9
Acacia falcata	0.1					
Acacia fimbriata	10					
Acacia implexa	0.3					
Bursaria spinosa subsp. spinosa	3	5	0.1	1		4
Dillwynia sieberi	0.5			0.3		
Eremophila debilis				0.7		
Pittosporum undulatum						0.8
Total	**13.9**	**5**	**0.1**	**2**	**0**	**4.8**

The ground cover is dominated by a diverse range of grasses including *Aristida ramosa* (Purple Wiregrass), *A. vagans* (Threeawn Speargrass), *Cymbopogon refractus* (Barbed Wire Grass), *Dichelachne micrantha* (Plumegrass), *Echinopogon caespitosus* (Forest Hedgehog Grass), *Eragrostis leptostachya* (Paddock Lovegrass), *Microlaena stipoides* (Weeping Grass), *Paspalidium distans* and *Themeda australis* (Kangaroo Grass), and with graminoids *Carex inversa* (Knob Sedge), *Cyperus gracilis, Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush) and *L. multiflorus* subsp. *multiflorus* (Many-flowered Mat-rush). The ground cover also includes a diversity of forbs such as *Asperula conferta* (Common Woodruff), *Brunoniella australis* (Blue Trumpet), *Desmodium varians* (Slender Tick Trefoil), *Dianella longifolia* (Blue Flax Lily), *Dichondra repens* (Kidney Weed), *Opercularia diphylla*, *Oxalis perennans* and *Wahlenbergia gracilis* (Australian Bluebell), as well as scramblers, *Glycine* spp. and *Hardenbergia violacea* (Native Sarsaparilla) and the fern *Cheilanthes sieberi* (Poison Rock Fern).

The native groundcover recorded on the site:

- was not diverse, except in Plots 2, 7; and
- had low recorded cover, except Plot 2 (17%) and Plot 7 (16.1%). The higher cover recorded in Plot 9 (27.5%) was attributed to 25% cover by the cosmoplitian grass *Cynodon dactylon.* Similarly, Plot 4 (22.1%) had 15% cover by the native grass *Microlaena stipoides.*

Native groundcover (%)	Plot 2	Plot 4	Plot 5	Plot 7	Plot 8	Plot 9
Native grasses						
Aristida ramosa	1	1				
Aristida vagans	0.1					
Bothriochloa macra		0.1		0.5		
Carex inversa		0.1				0.1
Chloris ventricosa				0.1		
Cynodon dactylon		0.1		0.1		25
Cyperus gracilis	0.2	0.2		0.3		
Dichelachne micrantha	0.1					
Digitaria diffusa	0.1					
Digitaria parviflora	0.1					
Entolasia marginata				0.5		
Fimbristylis dichotoma	0.5					
Juncus usitatus						0.1
Lomandra filiformis subsp. filiformis	2	0.1				0.1
Microlaena stipoides	5	15	0.5	4		0.3
Oplismenus aemulus					2	
Paspalidium distans				0.3		
Paspalum orbiculare				0.1		
Rytidosperma racemosum	0.1			0.1		0.3
Sporobolus creber		0.1		0.3		
Themeda triandra	0.1					
Native forbs						
Arthropodium milleflorum	0.1					
Asperula conferta		0.1				
Brunoniella australis	4			0.3		
Caesia parviflora	0.1					
Calotis lappulacea				0.1		
Commelina cyanea					0.1	
Dianella longifolia	0.1					
Dichondra repens	2	2		5	1	0.2
Einadia hastata	0.1			0.1		
Einadia nutans					0.3	
Einadia nutans subsp. linifolia				0.1		0.1
Einadia polygonoides				0.3		
Einadia trigonos					0.1	
Einadia trigonos subsp. trigonos				0.1		
Epilobium hirtigerum						
Euchiton sphaericus						0.1
Euphorbia drummondii				0.1		
Geranium solanderi		0.1				0.1
Grona varians	0.1					
Oxalis perennans	0.1			0.1		
Phyllanthus virgatus	0.1			0.1		

Native groundcover (%)	Plot 2	Plot 4	Plot 5	Plot 7	Plot 8	Plot 9
Plectranthus parviflorus						0.1
Portulaca oleracea				0.1		
Senecio hispidulus	0.1					
Tricoryne elatior	0.1					
Vittadinia cuneata var. cuneata				0.1		
Wahlenbergia gracilis	0.1	0.1				
Others						
Amyema miquelii				2		
Glycine clandestina	0.1	0.1				
Glycine tabacina	0.6	3		0.3		1
Hardenbergia violacea				1		
Total	**17**	**22.1**	**0.5**	**16.1**	**3.5**	**27.5**

6. The structure of the community varies depending on past and current disturbances, particularly clearing, fire and grazing. Contemporary tree-dominated stands of the community are largely relics or regrowth of originally taller forests and woodlands, which are likely to have had scattered shrubs and a largely continuous grassy groundcover. At some sites, mature trees may exceed 30m tall, although regrowth stands may be shorter than 10 m tall. After total or partial clearing, the tree canopy may remain sparse or may regrow to form dense stands of saplings and small trees, which are typically associated with a ground layer of reduced cover and diversity. Either or both of the upper-storey and mid-storey may be absent from the community. Native grasslands derived from clearing of the woodland and forest are also part of this community if they contain characteristic non-woody species listed in paragraph 3.

On this former cleared farming land, native canopy trees are restricted to regrowth trees (see Figure 6d-2), located:

- along the drainage swale in the west;
- in the road reserve of the road frontage to Flushcombe Road in the northwest;
- in the extreme north-east corner (extending offsite); and
- close to the M4 Motorway.

7. Cumberland Plain Woodland includes: ‘Shale Hills Woodland’ (map unit 9) and ‘Shale Plains Woodland’ (map unit 10) of Tozer (2003); ‘Spotted Gum Forest’ (map unit 9b), ‘Grey Box Woodland’ (map unit 10c) and ‘Grey Box – Ironbark Woodland’ (map unit 10d) of Benson (1992); and ‘Cumberland Plain Woodlands’ of Benson & Howell (1990a; b). Tindall *et al*. (2004) and Tozer *et al*. (2006) subsequently reproduced Tozer’s (2003) classification and mapping, re-labelling map units 9 and 10 as ‘Cumberland Shale Hills Woodland’ (map unit GW p28) and ‘Cumberland Shale Plains Woodland’ (map unit GW p29), respectively. Cumberland Plain Woodland belongs to the Coastal Valley Grassy Woodlands vegetation class (Keith 2004).

No additional comments.

8. Several other ecological communities listed under the *Threatened Species Conservation Act* 1995 may intergrade with Cumberland Plain Woodland. These include Cooks River/ Castlereagh Ironbark Forest in the Sydney Basin Bioregion; Moist Shale Woodland in the Sydney Basin Bioregion; Shale / Sandstone Transition Forest; Shale Gravel Transition Forest in the Sydney Basin Bioregion; and Sydney Turpentine-Ironbark Forest. While Tozer (2003) provides information on the features that distinguish these communities, some transitional stands will be difficult to assign to a single community with a high level of confidence (Keith 2009). Transitional stands between Cumberland

Plain Woodland and other communities listed under the *Threatened Species Conservation Act* 1995 are considered part of a listed community, and should be assigned to the community with which they share greatest resemblance in species composition and other properties.

No additional comments.

9. Cumberland Plain Woodland in the Sydney Basin Bioregion is included within the critically endangered ecological community listed under the *Environment Protection and Biodiversity Conservation Act* as "Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest". However the Commonwealth listing advice excludes some patches, here regarded as Cumberland Plain Woodland, on the basis of condition or structure thresholds.

The threshold criteria for the ecological community listed under the Environment Protection and Biodiversity Conservation Act (EPBC Act) were applied in section 3 of this Appendix. It was found that none of the vegetation sampled onsite met the thresholds. The vegetation offsite to the NE adjoining Prospect Highway (sampled in Plot 2) appears to meet the thresholds.

10. The following threatened species have been recorded from Cumberland Plain Woodland: (listed species on https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/cumberland-plain-woodland-critically-endangered-ecological-community-listing, accessed 20 June 2023).

A search for Cumberland Land Snail was undertaken onsite by Dr Stephanie Clark with:

> *No evidence of* Meridolum corneovirens *was found, what little potential suitable habitat present is heavily weed infested and no other species of snails or slugs were found.*

The potential habitats for threatened avifauna were assessed. There is some potential foraging habitat, with important habitat for Swift Parrot (*Lathamus discolor*) mapped nearby to the north in Timbertop Reserve.

11. Cumberland Plain Woodland is restricted to the Sydney Basin Bioregion (*sensu* Thackway and Cresswell) and is currently known to occur within the local government areas of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly, but may occur elsewhere within the bioregion. Using map data from Tozer (2003), Cumberland Plain Woodland was estimated to occur within an extent of occurrence of 2810 km^2, and an area of occupancy of just under 2 100 km^2 based on 2 x 2 km grid cells, the spatial scale recommended by IUCN (2008) for assessing areas of occupancy for species.

The site is in Blacktown LGA.

12. Small areas of Cumberland Plain Woodland have been recorded from Kemps Creek, Mulgoa and Windsor Downs Nature Reserves, Scheyville National Park, and Leacock, Rouse Hill and Western Sydney Regional Parks.

No additional comments.

13. Based on aerial photography flown in November 1998, Tozer (2003) estimated the total extent of woody vegetation referred to as Cumberland Plain Woodland was 11 054 (±1 564) ha (upper and lower plausible bounds, *sensu* Keith et al. 2009), representing 8.8 (±1.2)% of the pre-European

distribution of the community. Patches of the community lacking woody vegetation are very small in extent and can be considered to be included within the plausible bounds. For that part of the community's distribution to the east of the Hawkesbury-Nepean River, earlier mapping at coarser resolution by Benson & Howell (1990b) suggests a similar level of depletion, with an estimated 6 420 ha of 'Cumberland Plain Woodlands', representing 6% of the pre-European distribution east of the Hawkesbury-Nepean River. An update of Tozer's (2003) map, based on interpretation of imagery flown in January-March 2007 shows that the extent of Cumberland Plain Woodland east of the Hawkesbury – Nepean River had declined by 442±46 ha, a reduction of 5.2±0.6% in 9 years (NSW Scientific Committee & Simpson 2008). These estimates indicate that the geographic distribution of the community has undergone a very large reduction over a time frame appropriate to the life cycle and habitat characteristics of its component species.

No additional comments.

14. Some areas of Cumberland Plain Woodland subjected to a history of partial clearing and grazing have recently undergone a change in management to conserve the community. Examples include Mt Annan Botanic Garden, Scheyville National Park, Western Sydney Regional Park, Elizabeth Macarthur Agricultural Institute, Orchard Hills Defence Site and the former Australian Defence Industries site at St Marys. Experience from these areas suggests that the community is capable of some recovery, provided the soil has not been disturbed by earthworks, cultivation, fertiliser application or other means of nutrient or moisture enrichment (Benson & Howell 2002; Pellow 2003; Keith *et al*. 2005; J. Howell *in litt*. August 2007; J. Sanders *in litt*. January 2008). In contrast, restoration of Cumberland Plain Woodland has proved to be problematic on sites that have been exposed to such soil disturbance. At Western Sydney Regional Park, for example, Wilkins *et al*. (2003), Nichols (2005) and Nichols *et al.* (2005) studied the recovery of abandoned pastures that had been planted with more than 20 native tree and shrub species of Cumberland Plain Woodland. Over 10 years they found no evidence of convergence in species composition with nearby remnant stands of the community and the species composition of restored areas remained indistinguishable from untreated pastures. There was some evidence that restored vegetation had begun to develop more species-rich assemblages of moths and butterflies compared to untreated pastures, although after 10 years, it lacked a number of species characteristic of remnant woodland (Lomov *et al.* 2006). Ant communities also showed marked differences between restored and remnant vegetation although some ecological processes, such as pollination and seed dispersal, showed some evidence of development at restored sites (Lomov 2005). These results suggest that sites with a history of soil disturbance will be extremely slow to recover characteristics of Cumberland Plain Woodland, if at all, and that experimentation with alternative restoration technologies is required. As a large proportion of the former distribution of the community has either undergone similar histories of soil disturbance or are now occupied by urban development, opportunities for restoration of the community across significant areas appear limited.

No additional comments.

15. The reduction in the geographic distribution of Cumberland Plain Woodland was initially due to tree-felling for timber and clearing for crops and pastures (Benson & Howell 1990a). Benson & Howell (1990b) estimated that the community had been reduced to approximately half of its pre-European extent by 1850. Following World War II, there was a marked acceleration in urban and industrial development, which continues to deplete the distribution of the community to the present day. These trends appear likely to continue into the future as the urban area continues to expand to accommodate Sydney's increasing population, which is projected to grow by 1.0-1.1 million people during the 20 years 2007-2026 and 2.2-3.3 million during the 50 years 2007-2056 (Australian Bureau of Statistics 2008). Recent draft plans to develop growth centres in north-west and south-west Sydney, for example, identify staged release of land for residential and employment development over the next 25 years. These areas contain approximately 2000 ha (one-fifth) of the estimated remaining Cumberland Plain Woodland based on Tozer (2003), of which about two-thirds will be available for development, the loss of which is planned for offsetting through voluntary land

acquisition and/or the establishment of conservation agreements on lands outside the Growth Centres (Growth Centres Commission 2007) for the primary purpose of biodiversity conservation. While important examples of Cumberland Plain Woodland are represented within conservation reserves, much of the remaining area of the community occurs on private land or on public easements, where it is at risk from small-scale clearing associated with housing, industrial development and transport infrastructure. There are significant logistic and technological constraints and time lags associated with efforts to restore the community (Wilkins *et al*. 2003; Nichols 2005; Nichols *et al*. 2005). 'Clearing of native vegetation' is listed as a Key Threatening Process under the *Threatened Species Conservation Act* 1995.

No additional comments.

16. Fragmentation of habitat associated with clearing has resulted in a very large reduction in the ecological function of Cumberland Plain Woodland. The remaining area of the community is severely fragmented, with more than half of the remaining tree cover mapped by Tozer (2003) occurring in patches of less than 80 ha and half of all mapped patches being smaller than 3 ha (Tozer *in litt*. October 2007). The integrity and survival of small, isolated stands is impaired by the small population size of many species, enhanced risks from environmental stochasticity, disruption to pollination and dispersal of fruits or seeds, and likely reductions in the genetic diversity of isolated populations (Young *et al*. 1996; Young & Clarke 2000). The impacts of fragmentation and associated processes are most evident in the loss of vertebrate fauna from the community (Farrell 2005; Farrell *in litt*. June 2007; Leary 2005; *in litt*, August 2007). As well, some invertebrate species, such as the Endangered Cumberland Land Snail, appear to be in decline, at least in the smaller fragments (M. Shea *in litt*. June 2007). The dieback of eucalypt canopies observed in stands of Cumberland Plain Woodland at Scheyville (D. Keith pers. comm. October 2008) may be a result of complex interactions involving insect attack, weed invasion, nutrient enrichment and drought, in which fragmentation also plays a role (Reid & Landsberg 2000; Wardell-Johnson *et al*. 2006). Despite their history of fragmentation, some very small and apparently degraded remnants may contain a surprisingly high diversity of species and important examples of rare species, particularly plants (James *et al*. 1999; Benson & Keith 1984; McBarron *et al*. 1988; Benson & Howell 1990a; Kirkpatrick & Gilfedder 1995). However, clearing and continuing degradation of these patches reduces the likelihood that all of these species will persist, particularly because a large proportion of species are known from very few locations which are not clustered in predictable ways (Benson & Howell 2002; Tozer 2003). Fragmentation also results in reduced fire frequencies within some patches, which may reduce the viability of some native plant populations, and hence the diversity of species within the patches (Clarke 2000; Watson 2005).

No additional comments.

17. Changes in structure contribute to a very large reduction in the ecological function of Cumberland Plain Woodland. Almost all of the remaining area of the community is regrowth forest and woodland from past clearing activities (Benson & Howell 1990a). Mean tree densities in contemporary stands of the community were found to be substantially higher than historical estimates and tree sizes were thought to be smaller (Benson 1992). Large trees approximating the stature of the community prior to European settlement occur very sparsely within remnant patches of vegetation or remain as isolated individuals within paddocks or urban areas. Scheyville National Park, for example, which contains a large remnant of Cumberland Plain Woodland, was extensively logged and partially cleared over many decades prior to its reservation and is thought to contain as few as five large old trees likely to date from pre-European times (J. Sanders, *in litt*. January 2008). Loss of these large trees, which provide habitat resources for a range of fauna, is associated with declines and local extinctions of numerous birds and mammals that were once more common on the Cumberland Plain (Farrell 2005; T. Leary *in litt*. August 2007). Changes in understorey are difficult to assess, as responses to anthropogenic disturbances are confounded with responses to climatic variability (Benson & Howell 2002). Nevertheless, other structural changes to the community include the removal of fallen woody debris and standing dead trees, the removal of woody understorey plants, or conversely the

development of regrowth stands with very high densities of eucalypt saplings or shrubs, notably *Bursaria spinosa*, which may suppress the ground flora. Botanist Allan Cunningham noted high densities of *B. spinosa* in farmland near Liverpool as early as 1817 (Lee 1927; Benson 1992), while similar phases of high shrub abundance have been observed recently at Mt Annan and Scheyville in response to abandonment of farming practices (Benson & Howell 2002; J. Sanders, *in litt.* January 2008). Some areas of the community now devoid of woody plant species may retain a substantial suite of native grasses and herbs in the ground layer. The Orchard Hills Defence Site includes outstanding examples of this phenomenon (Pellow 2003; Keith *et al*. 2005). 'Loss of hollow-bearing trees' and 'Removal of dead wood and dead trees' are listed as Key Threatening Processes under the *Threatened Species Conservation Act* 1995.

No additional comments.

18. While a sample of the original fauna of Cumberland Plain Woodland persists, some components have already been lost and others continue to decline (Leary 2005; *in litt*. Aug. 2008). The original mammal fauna of the Cumberland Plain was estimated to include approximately 60 species (NPWS 1997), of which less than 40 were detected in recent intensive surveys and only 14 species are now considered to be relatively common and widespread (Leary 2005; *in litt*. August 2008). The majority of these latter species are micro-bats, while small ground-dwelling mammals are unexpectedly scarce. A systematic survey involving 22 000 trap nights and 14 000 hair tube nights across conservation reserves containing Cumberland Plain Woodland failed to detect any native rodents or dasyurids, except at sites on the periphery of the plain, close to larger vegetated areas on sandstone (Leary 2005; *in litt*. August 2008). Long-nosed Bandicoots have recently been recorded in inner western Sydney (NSW Scientific Committee 2008), but remain scarce and have not been recorded during the systematic fauna surveys of Cumberland Plain Woodland. A number of bird species have also disappeared from or markedly declined on the Cumberland Plain (Keast 1995; Farrell 2005; Leary 2005; *in litt*. August 2008). A sequence of repeated surveys in Scheyville National Park, the largest remnant of Cumberland Plain Woodland, have documented disappearance of the Black-chinned Honeyeater, Brown Treecreeper, Diamond Firetail, Zebra Finch, Hooded Robin, Red-capped Robin, Scarlet Robin, Flame Robin and Black-eared Cuckoo, while declines have been observed in populations of the Speckled Warbler, Fuscous Honeyeater, Jacky Winter, Weebill and Buff-rumped Thornbill (Farrell 2005; *in litt.* June 2008). Repeated surveys of Nurragingy Reserve near Blacktown indicate that all of these species have also been lost from the reserve, except for the Fuscous Honeyeater and Weebill (Farrell 2005; *in litt*. June 2008). Many of these species either feed or nest on or near the ground. Declines of reptiles and amphibians on the Cumberland Plain have been less well documented, but include at least three species of frog, one species of turtle, one skink, possibly two species of goanna and one species of snake (Leary 2005; *in litt*. August 2008). Two species of plants, *Swainsona monticola* and *Thesium australe*, are presumed to have gone extinct in Cumberland Plain Woodland (Benson & Howell 2002), while James *et al*. (1999) list many other species that have undergone substantial declines, including threatened species such as *Acacia pubescens, Pimelea spicata* and *Pterostylis saxicola*. In addition to these losses and declines across a wide range of biota within the community, Benson & Howell (1990a; 2002) describe other changes in species composition that indicate a very large reduction in the ecological function of Cumberland Plain Woodland.

No additional comments.

19. Weed invasion also poses a major threat to Cumberland Plain Woodland. While very large numbers of weed species have invaded many different areas of the community, principal weed species include (Benson 1992; Tozer 2003; Benson & von Richter 2008): (listed species on https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/cumberland-plain-woodland-critically-endangered-ecological-community-listing, accessed 20 June 2023)

Several of these species, particularly grasses, form a dense ground layer capable of smothering

indigenous plants, reducing both reproduction and survival, and inhibiting emergence and establishment of their seedlings. The propagules of weeds are spread into Cumberland Plain Woodland by stormwater, dumping of refuse, frugivorous birds and wind (Benson & Howell 1990b), making it difficult to abate the invasion process, especially for those species capable of establishing in sites that have been exposed to relatively little disturbance (J. Sanders, *in litt.* January 2008). Hill *et al*. (2005) found that high species richness and abundance of weeds was associated with remnants that either had a history of clearing and grazing, were in close proximity to creeks or downslope from sealed roads. They also found some relationship between weeds and elevated total soil phosphorus, conductivity and water retention capacity, but relationships with these soil properties were weak and varied between sites with different types of disturbance history. The dramatic recent expansion of African Olive poses the greatest invasive threat to Cumberland Plain Woodland. Initially introduced to south-western Sydney in the 1820s, it was generally confined to the Camden-Picton area until the 1970s and now occurs frequently throughout the distribution of the community (Tozer 2003; Cuneo & Leishman 2006). Roberts (1999) mapped approximately 1000 ha of Cumberland Plain Woodland (c. 10% of total remaining) which had a dense understorey of African Olive that was visible on aerial photographs flown in November 1997. Tozer (2003) recorded African Olive in 43% of 198 plots surveyed throughout the distribution of Cumberland Plain Woodland. Cuneo *et al*. (2009) found that 837 ha of Cumberland Plain Woodland in south-west Sydney was invaded by African Olive (8.5% of the area assessed). The species is highly fecund, with fleshy fruit spread widely by a range of frugivorous birds, and seedlings establish readily in relatively undisturbed bushland, as well as fragmented edges (Cuneo & Leishman 2006). As shrubs grow, their canopies cast deep shade and suppress and ultimately eliminate most native shrub and groundcover species. Cook *et al*. (2005) and Tozer (*in litt*. October 2007, based on data from Tozer 2003), both recorded strong inverse relationships between the cover abundance of African Olive and the diversity and cover of native ground layer species. Other weeds that pose future threats to the community include *Ailanthus altissima, Asparagus asparagoides, Acer negundo, Gleditsia triacanthos* and *Macfadyena unguis-cati* (Benson & Howell 2002; J. Howell *in litt*. August 2007; J. Sanders *in litt*. January 2008; L. Harrold pers comm. 2009). The invasion and establishment of exotic weeds is resulting in a very large reduction in the ecological function of Cumberland Plain Woodland. 'Invasion of exotic perennial grasses' and 'Invasion and establishment of exotic vines and scramblers' are listed as Key Threatening Processes under the *Threatened Species Conservation Act* 1995.

There was a dense occurrence of weeds in the western drainage swale (Plots 4, 5, 8, 9), including:

- the woody weeds *Erythrina crista-galli, Lantana camara, Ligustrum lucidium, Ligustrum sinense,* and *Olea europaea* subsp. *cuspidata* recorded in Plots 4, 5, 9; and
- the High Threat Weed, *Eragrostis curvula*, which was abundant.

Percent cover of listed exotic species from paragraph 19	**Plot 2**	**Plot 4**	**Plot 5**	**Plot 7**	**Plot 8**	**Plot 9**
Weedy grasses						
Ehrharta erecta	0.1	0.1	5		4	5
Eragrostis curvula	10				35	
Woody weeds						
Erythrina crista-galli			30			
Lantana camara	3		20		2	5
Ligustrum lucidium		10	15		3	3
Ligustrum sinense		10	3		0.8	10
Olea europaea subsp. *cuspidata*	0.8	15	4			5
Total cover of woody weeds (%)	**3.8**	**35**	**72**	**0**	**5.8**	**23**

20. Moderate to heavy grazing of Cumberland Plain Woodland by livestock and rabbits results in the decline and disappearance of palatable plant species, including shrubs and herbs, and compaction and erosion of topsoil, making re-establishment of a diverse native understorey problematic. The effects of such overgrazing may be exacerbated under drought conditions. Habitat degradation associated with overgrazing and erosion contributes to a large reduction in ecological function of the community.

No additional comments.

21. The soils of Cumberland Plain Woodland have undergone chemical and structural modification associated with agricultural land uses. Trampling by livestock has resulted in localised areas of soil compaction, primarily around watering points. Research carried out at the University of Western Sydney found that mean soil inorganic nitrogen levels were two to three times higher in areas of former agricultural land use than in remnant woodland, but was unable to detect differences in other soil properties (E. C. Morris *in litt*. June 2007). Addition of carbon and burning reduced soil inorganic nitrogen and reduced growth of exotic ground layer species relative to native species, suggesting that elevated soil inorganic nitrogen could favour exotics to the detriment of natives in Cumberland Plain Woodland (E. C. Morris *in litt*. June 2007). Hill *et al*. (2005) found elevated levels of phosphorus and conductivity in former agricultural areas compared to remnant woodland, but did not examine soil nitrogen. The sources of nutrient addition to soils of Cumberland Plain Woodland include addition of fertilisers during previous agricultural land use, deposition of livestock dung, rubbish dumping and stormwater runoff from urban areas. Expansion of urban land uses across the Cumberland Plain is likely to increase urban runoff from sealed surfaces into remaining bushland fragments, resulting in further nutrient enrichment of soils and associated replacement of native flora by exotic species. Disruption of ecological processes and degradation of habitat associated with nutrient enrichment contributes to a very large reduction in ecological function of the community.

The site has been historically cleared and farmed.

22. Fire regimes influence the plant species composition and vegetation structure of Cumberland Plain Woodland (Benson & Howell 2002; Watson 2005) and are also likely to influence other components of the biota. Based on a study of Cumberland Plain Woodland remnants with varying fire histories, Watson (2005) found that variable intervals of 4 - 12 years between successive fires are likely to maintain populations of most understorey species in the community, including resprouting and obligate-seeding shrubs, grasses and herbs. Fragmentation of Cumberland Plain Woodland may exclude fire from some patches for extended periods by reducing fire spread. The consequent reduction in fire frequency sometimes leads to increased dominance of shrubs and associated declines in diversity of grasses and herbs (Watson 2005), as well as increased abundance of woody exotic species, such as African Olive (Benson & Howell 2002; Watson 2005; von Richter *et al*. 2005), which is likely to further reduce the flammability of the community. Conversely, high frequencies of fires may result where fragmentation increases the interface between urban areas and bushland, as this results in increased arson, car dumping, planned fuel-reduction fires and accidental ignitions. High fire frequencies are associated with reduced diversity of native plant species in Cumberland Plain Woodland (Watson 2005). 'High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' is listed as a Key Threatening Process under the *Threatened Species Conservation Act* 1995. The season of fire, which may be altered as a consequence of hazard reduction fires, may also influence the species composition of the grassy woodland understorey (Knox & Clarke 2006; Benson & von Richter 2008). Disruption of ecological processes associated with alteration of fire regimes contributes to a very large reduction in ecological function of the community.

No additional comments.

23. Cumberland Plain Woodland in the Sydney Basin Bioregion is eligible to be listed as a Critically

Endangered Ecological Community as, in the opinion of the Scientific Committee, it is facing an extremely high risk of extinction in New South Wales in the immediate future, as determined in accordance with the following criteria as prescribed by the *Threatened Species Conservation Regulation* 2002:

Clause 25
The ecological community has undergone, is observed, estimated, inferred or reasonably suspected to have undergone or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:
(a) a very large reduction in geographic distribution.

Clause 27
The ecological community has undergone, is observed, estimated, inferred or reasonably suspected to have undergone or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:
(a) a very large reduction in ecological function, as indicated by any of the following:
(d) a change in community structure
(e) a change in species composition
(f) disruption of ecological processes
(g) invasion and establishment of exotic species
(h) degradation of habitat
(i) fragmentation of habitat.

No additional comments.

In conclusion:

- there were limited areas of semi-intact vegetation adjoining the site meeting the criteria for C*umberland Plain Woodland in the Sydney Basin Bioregion,* being mainly offsite to the north-east adjoining Prospect Highway (sampled in Plot 2) and on the road verge of Flushcombe Road to the north-west (sampled in Plot 7).
- at least part of the approximately 2 ha of vegetation with regrowth native canopy trees in the western drainage swale meets the criteria for highly degraded *Cumberland Plain Woodland* (sampled in Plots 4, 5, 8, 9);
- part of the vegetation in the western drainage swale is growing on dumped building material, especially in Plots 8, 9;
- dense woody weed occurrence was widespread in the western drainage swale; and
- following more than 150 years of intensive agriculture, none of the paddock meets the criteria for *Cumberland Plain Woodland*.

3.0 Comparison with the Listing Advice for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Table 1 of the Commonwealth Listing Advice outlines the condition thresholds for *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest.*

On page 8 it states:

> ***Condition Thresholds***
> *The condition thresholds only apply to patches of native vegetation that meet the description of the national ecological community, including the key diagnostic characteristics, as outlined above. Derived grasslands and shrublands are not included in the EPBC-listed ecological community, but if they are contiguous with the ecological community they may be considered under Condition category C in Table 1.*

Note: The threshold requirements for Categories A to D relate to:

- patch sizes (≥ 0.5 ha, ≥5 ha);
- contiguous patches;
- percentage of the perennial understorey vegetation cover that is made up of native species (≥ 50%, ≥30%); and
- presence of large mature trees or trees with hollows (habitat).

From the data recorded onsite, no patches were ≥5 ha in size. There were patches ≥ 0.5 ha, namely:

- the patch along the drainage swale >0.5 ha (sampled in Plots 4, 5, 8, 9);
- the patch extending offsite in the NE >0.5 ha (sampled in Plot 2);
- the patch adjoining the M4 Motorway >0.5 ha (Spot K).

Percentage of perennial understorey vegetation cover made up of native species varied across the site from 1% to 59% (data in Table 1 of the BDAR), namely:

Percent perennial understorey cover being native species:

Percent understorey cover by	Plot 2	Plot 4	Plot 5	Plot 7	Plot 8	Plot 9
Native species	30.9	27.1	0.9	18.2	3.5	32.3
Exotic species	21.5	62.5	78.9	46.9	29.7	33.3
% cover by native of total cover	**59%**	**30%**	**1%**	**28%**	**11%**	**49%**

There was one hollow bearing tree recorded onsite and several larger dbh trees.

Table 1. Condition Thresholds for Patches[3] that meet the Description for the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community.

Category and rationale	Thresholds	Met by native vegetation onsite
A. Core thresholds that apply under most circumstances: patches with an understorey dominated by natives and a minimum size that is functional	Minimum patch[3] size is ≥0.5ha; **AND** ≥50% of the perennial	Yes. No,

Category and rationale	Thresholds	Met by native vegetation onsite
and consistent with the minimum mapping unit size applied in NSW.	understorey vegetation cover[4] is made up of native species.	though met in the patch which is mainly offsite in the NE (sampled in Plot 2). **Conclusion:** **No for vegetation onsite, but Yes to patch offsite to the NE adjoining Prospect Highway.**
OR		
B. Larger patches which are inherently valuable due to their rarity.	The patch size is ≥5ha; **AND** ≥30% of the perennial understorey vegetation cover is made up of native species.	No. **Conclusion:** **No, patches are not ≥5 ha**
OR		
C. Patches with connectivity to other large native vegetation remnants in the landscape.	The patch size is ≥0.5 ha; **AND** ≥30% of the perennial understorey vegetation cover is made up of native species; **AND** The patch is contiguous[5] with a native vegetation remnant (any native vegetation where cover in each layer present is dominated by native species) that is ≥5ha in area.	Yes. Yes. Sampled in Plots 2 (mainly offsite), 4, 9. No. **Conclusion:** **No for vegetation onsite.**
OR		
D. Patches that have large mature trees or trees with hollows (habitat) that are very scarce on the Cumberland Plain.	The patch size is ≥0.5 ha in size; **AND** ≥30% of the perennial understorey vegetation cover is made up of native species; **AND** The patch has at least one tree with hollows per hectare or at least one large tree (≥80 cm dbh) per hectare from the upper tree layer species outlined in the Description and Appendix A.	Yes. Yes. Hollow bearing trees recorded - one in Plot 3. Trees > 80 cm recorded in Plots 3, 4, 5, 7. However, density of at least one large tree (≥80 cm dbh) per hectare not met. **Conclusion:** **No. Large mature trees sparse and only one hollow bearing tree recorded.**

[3] A *patch* is defined as a discrete and continuous area that comprises the ecological community, outlined in the Description. Patches should be assessed at a scale of 0.04 ha or equivalent (e.g. 20m x 20m plot). The number of plots (or quadrats or survey transects) per patch must take into consideration the size, shape and condition across the site. Permanent man-made structures, such as roads and buildings, are typically excluded from a patch but a patch may include small-scale disturbances, such as tracks or breaks or other small-scale variations in native vegetation that do not significantly alter the overall functionality of the ecological community, for instance the easy movement of wildlife or dispersal of spores, seeds and other plant propagules.

[4] *Perennial understorey vegetation cover* includes vascular plant species of the ground and shrub layers (as outlined in the Description and Appendix A) with a life-cycle of more than two growing seasons (Australian Biological Resources Study, 2007). Measurements of perennial understorey vegetation cover exclude annuals, cryptogams, leaf litter or exposed soil (although these are included in a patch of the ecological community when they do no alter functionality as per footnote 3 and the Description and Condition Thresholds are met).

[5] *Contiguous* means the woodland patch is continuous with, or in close proximity (within 100 m), of another patch of vegetation that is dominated by native species in each vegetation layer present.

In conclusion, from applying the threshold criteria in Table 1:

- the condition thresholds were <u>not</u> met for vegetation onsite, nor for the road reserve (sampled in Plot 7); and
- the patch sampled in Plot 2, mainly offsite to the northeast adjoining the Prospect Highway, appears to satisfy the thresholds.

Appendix 11

Reports generated by the online BAM calculator

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00046893/BAAS17088/24/00046894

Assessor Name
Anne Clements

Proponent Names

Assessment Revision
2

BOS entry trigger
BOS Threshold: Biodiversity Values Map and area clearing threshold

Proposal Name
Augusta_St_Complex

Assessor Number
BAAS17088

Report Created
21/03/2024

Assessment Type
Part 4 Developments (General)

BAM data last updated *
14/03/2024

BAM Data version *
67

BAM Case Status
Finalised

Date Finalised
21/03/2024

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	3319-Cumberland Shale Hills Woodland

Species
Nil

BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo
Ephippiorhynchus asiaticus / Black-necked Stork
Pandion cristatus / Eastern Osprey

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3319-Cumberland Shale Hills Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	23.0	0	14	14

BAM Biodiversity Credit Report (Like for like)

3319-Cumberland Shale Hills Woodland	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_Predom_exotic	Yes	0	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_Less_Degraded	No	3	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_Degraded	No	11	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

BAM Biodiversity Credit Report (Like for like)

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00046893/BAAS17088/24/00046894

Proposal Name

Augusta_St_Complex

BAM data last updated *

14/03/2024

Assessor Name

Anne Clements

Assessor Number

BAAS17088

BAM Data version *

67

Proponent Name(s)

Report Created

21/03/2024

BAM Case Status

Finalised

Assessment Revision

2

Assessment Type

Part 4 Developments (General)

Date Finalised

21/03/2024

BOS entry trigger

BOS Threshold: Biodiversity Values Map and area clearing threshold

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	3319-Cumberland Shale Hills Woodland

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

BAM Biodiversity Credit Report (Variations)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo
Ephippiorhynchus asiaticus / Black-necked Stork
Pandion cristatus / Eastern Osprey

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3319-Cumberland Shale Hills Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	23.0	0	14	14.00

3319-Cumberland Shale Hills Woodland

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_Predom_exotic	Yes	0	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_Less_ Degraded	No	3	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_Degr aded	No	11	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like options

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00046893/BAAS17088/24/00046894	Augusta_St_Complex	14/03/2024
Assessor Name	**Report Created**	**BAM Data version ***
Anne Clements	21/03/2024	67
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17088	Part 4 Developments (General)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
2	21/03/2024	BOS Threshold: Biodiversity Values Map and area clearing threshold

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

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	3319_Predom_exotic	3319-Cumberland Shale Hills Woodland	Predom_exotic	20.58	3	Cleared (20.58 ha)
2	3319_Less_Degraded	3319-Cumberland Shale Hills Woodland	Less_Degraded	0.34	1	Cleared (0.07 ha) Retained (0.27 ha)
3	3319_Degraded	3319-Cumberland Shale Hills Woodland	Degraded	2.03	2	Cleared (0.64 ha) Retained (1.39 ha)

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00046893/BAAS17088/24/00046894	Augusta_St_Complex	14/03/2024
Assessor Name	Report Created	BAM Data version *
Anne Clements	21/03/2024	67
Assessor Number	Assessment Type	BAM Case Status
BAAS17088	Part 4 Developments (General)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
2	BOS Threshold: Biodiversity Values Map and area clearing threshold	21/03/2024

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Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Black Falcon	Falco subniger	3319-Cumberland Shale Hills Woodland
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	3319-Cumberland Shale Hills Woodland
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	3319-Cumberland Shale Hills Woodland
Diamond Firetail	Stagonopleura guttata	3319-Cumberland Shale Hills Woodland
Dusky Woodswallow	Artamus cyanopterus cyanopterus	3319-Cumberland Shale Hills Woodland
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	3319-Cumberland Shale Hills Woodland
Gang-gang Cockatoo	Callocephalon fimbriatum	3319-Cumberland Shale Hills Woodland
Grey-headed Flying-fox	Pteropus poliocephalus	3319-Cumberland Shale Hills Woodland
Large Bent-winged Bat	Miniopterus orianae oceanensis	3319-Cumberland Shale Hills Woodland

Little Bent-winged Bat	Miniopterus australis	3319-Cumberland Shale Hills Woodland
Little Eagle	Hieraaetus morphnoides	3319-Cumberland Shale Hills Woodland
Little Lorikeet	Glossopsitta pusilla	3319-Cumberland Shale Hills Woodland
Regent Honeyeater	Anthochaera phrygia	3319-Cumberland Shale Hills Woodland
Scarlet Robin	Petroica boodang	3319-Cumberland Shale Hills Woodland
Speckled Warbler	Chthonicola sagittata	3319-Cumberland Shale Hills Woodland
Spotted Harrier	Circus assimilis	3319-Cumberland Shale Hills Woodland
Spotted-tailed Quoll	Dasyurus maculatus	3319-Cumberland Shale Hills Woodland
Square-tailed Kite	Lophoictinia isura	3319-Cumberland Shale Hills Woodland
Swift Parrot	Lathamus discolor	3319-Cumberland Shale Hills Woodland
Varied Sittella	Daphoenositta chrysoptera	3319-Cumberland Shale Hills Woodland
White-bellied Sea-Eagle	Haliaeetus leucogaster	3319-Cumberland Shale Hills Woodland
White-throated Needletail	Hirundapus caudacutus	3319-Cumberland Shale Hills Woodland
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	3319-Cumberland Shale Hills Woodland

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Black-necked Stork	Ephippiorhynchus asiaticus	3319-Cumberland Shale Hills Woodland
Eastern Osprey	Pandion cristatus	3319-Cumberland Shale Hills Woodland
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	3319-Cumberland Shale Hills Woodland

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Black-necked Stork	Ephippiorhynchus asiaticus	Habitat constraints

Eastern Osprey	Pandion cristatus	Refer to BAR
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	Habitat constraints

BAM Candidate Species Report

Proposal Details

Assessment Id 00046893/BAAS17088/24/00046894	Proposal Name Augusta_St_Complex	BAM data last updated * 14/03/2024
Assessor Name Anne Clements	Report Created 21/03/2024	BAM Data version * 67
Assessor Number BAAS17088	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 2	Date Finalised 21/03/2024	BOS entry trigger BOS Threshold: Biodiversity Values Map and area clearing threshold

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

List of Species Requiring Survey

Name	Presence	Survey Months
Acacia pubescens Downy Wattle	No (surveyed)	☑ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Grevillea juniperina subsp. juniperina Juniper-leaved Grevillea	No (surveyed)	☑ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Litoria aurea Green and Golden Bell Frog	No (surveyed)	☐ Jan ☑ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Marsdenia viridiflora subsp. viridiflora - endangered population Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Meridolum corneovirens Cumberland Plain Land Snail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Miniopterus orianae oceanensis Large Bent-winged Bat	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pimelea spicata Spiked Rice-flower	No (surveyed)	☑ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Pultenaea parviflora Pultenaea parviflora	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat constraints
Bush Stone-curlew	Burhinus grallarius	Habitat constraints
Camden White Gum	Eucalyptus benthamii	Refer to BAR
Dillwynia tenuifolia	Dillwynia tenuifolia	Refer to BAR
Eastern Osprey	Pandion cristatus	Habitat constraints
Eastern Pygmy-possum	Cercartetus nanus	Refer to BAR
Gang-gang Cockatoo	Callocephalon fimbriatum	Habitat constraints
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Koala	Phascolarctos cinereus	Refer to BAR
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Masked Owl	Tyto novaehollandiae	Habitat constraints
Powerful Owl	Ninox strenua	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	Habitat constraints
Southern Myotis	Myotis macropus	Habitat constraints
Square-tailed Kite	Lophoictinia isura	Habitat constraints

Squirrel Glider	Petaurus norfolcensis	Refer to BAR
Swift Parrot	Lathamus discolor	Habitat constraints
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints

BAM Credit Summary Report

Proposal Details

Assessment Id 00046893/BAAS17088/24/00046894	Proposal Name Augusta_St_Complex	BAM data last updated * 14/03/2024
Assessor Name Anne Clements	Report Created 21/03/2024	BAM Data version * 67
Assessor Number BAAS17088	BAM Case Status Finalised	Date Finalised 21/03/2024
Assessment Revision 2	Assessment Type Part 4 Developments (General)	BOS entry trigger BOS Threshold: Biodiversity Values Map and area clearing threshold

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Cumberland Shale Hills Woodland												
1	3319_Predom_exotic	Cumberland Plain Woodland in the Sydney Basin Bioregion	7.6	7.6	20.6	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0

2	3319_Less_Degraded	Cumberland Plain Woodland in the Sydney Basin Bioregion	59.2	12.2	0.34	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	3
3	3319_Degraded	Cumberland Plain Woodland in the Sydney Basin Bioregion	27.1	8.3	2	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	11
											Subtotal	**14**
											Total	**14**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits

Appendix 12

Likelihood tables for Predicted species and Candidate species

Likelihood of Predicted threatened species (Ecosystem credit species):

Note: CE = Critically Endangered; E = Endangered; V = Vulnerable; EP = Endangered Population; N/A = not listed

Species	BC Act listing status	EPBC Act listing	OEH species profile descriptions	Sensitivity to gain Class	Habitat constraints	Geographic limitations	Likelihood / Reason for exclusion from further assessment
Anthochaera phrygia Regent Honeyeater (Foraging)	CE	CE	*a generalist forager, although it feeds mainly on the nectar ... Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important. For example the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events. Flowering of associated species such as Thin-leaved Stringybark* Eucalyptus eugenioides *and other Stringybark species, and Broad-leaved Ironbark* E. fibrosa *can also contribute* i*mportant nectar flows at times. Nectar and fruit from the mistletoes* Amyema miquelii, A. pendula *and* A. cambagei *are also utilised. When nectar is scarce lerp and honeydew can comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings.*	High	--	--	**Possible.**
Artamus cyanopterus cyanopterus Dusky Woodswallow	V	N/A	*Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.*	Moderate	--	--	**Possible**, grassy woodland onsite.
Callocephalon fimbriatum Gang-gang Cockatoo (Foraging)	V	E	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.	Moderate	--	--	**Possible**, moves to drier more open eucalypt forests and woodlands at lower altitudes in autumn & winter.

Species	BC Act listing status	EPBC Act listing	OEH species profile descriptions	Sensitivity to gain Class	Habitat constraints	Geographic limitations	Likelihood / Reason for exclusion from further assessment
Calyptorhynchus lathami lathami South -eastern Glossy Black-Cockatoo (Foraging)	V	V	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (Allocasuarina littoralis) and Forest Sheoak (A. torulosa) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, Allocasuaraina diminuta, and A. gymnathera. Belah is also utilised and may be a critical food source for some populations.	High	-Presence of *Allocasuarina* and *Casuarina* species	--	**Not likely**, no *Allocasuarina littoralis* nor *A. torulosa* recorded onsite
Chthonicola sagittata Speckled Warbler	V	N/A	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies.	High	--	--	**Possible,** eucalypt woodland onsite.
Circus assimilis Spotted Harrier	V	N/A	*Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.*	Moderate	--	--	**Possible,** eucalypt woodland onsite.
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	V	N/A	*endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges.* *...mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species;*	High	--	--	**Possible,** eucalypt woodland onsite.

Species	BC Act listing status	EPBC Act listing	OEH species profile descriptions	Sensitivity to gain Class	Habitat constraints	Geographic limitations	Likelihood / Reason for exclusion from further assessment
Daphoenositta chrysoptera Varied Sittella	V	N/A	*Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.*	Moderate	--	--	**Possible,** eucalypt woodland onsite.
Dasyurus maculatus Spotted-tailed Quoll	V	E	*Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.* *use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. hunt possums and gliders in tree hollows and prey on roosting birds.*	High	--	--	**Possible**, inhabits a range of habitats including woodlands.
Ephippiorhynchus asiaticus Black-necked Stork	E	N/A	Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	Moderate	Swamps Shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands within 300m of these swamps.| Waterbodies Shallow lakes, lake margins and estuaries within 300m of these waterbodies	--	**Not likely**, the site is not floodplain wetlands, sandplain wetland nor estuary.

Species	BC Act listing status	EPBC Act listing	OEH species profile descriptions	Sensitivity to gain Class	Habitat constraints	Geographic limitations	Likelihood / Reason for exclusion from further assessment
Falco subniger Black Falcon	V	N/A	Widely but sparsely distributed.	Moderate	--	--	**Possible.**
Glossopsitta pusilla Little Lorikeet	V	N/A	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards	High	--	--	**Possible,** Eucalypt woodland onsite
Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	V	N/A	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).	High	Waterbodies Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	--	**Possible**, the site is within 1km of Prospect Reservoir.
Hieraaetus morphnoides Little Eagle (Foraging)	V	N/A	a medium-sized bird of prey … Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Moderate	--	--	**Possible,** woodland onsite.

Species	BC Act listing status	EPBC Act listing	OEH species profile descriptions	Sensitivity to gain Class	Habitat constraints	Geographic limitations	Likelihood / Reason for exclusion from further assessment
Hirundapus caudacutus White-throated Needletail	N/A	V	Migratory and usually seen in eastern Australia from October to April. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. These conditions are often used by insects to swarm (eg termites and ants) or tend to lift insects away from the surface which favours sighting of White-throated Needletails as they feed. More common in coastal areas, less so inland.	High	--	--	**Possible**.
Lathamus discolor Swift Parrot (Foraging)	E	CE	*On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Forest Red Gum E. tereticornis, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Inland Grey Box E. microcarpa, Grey Box E. moluccana, Blackbutt E. pilularis, and Yellow Box E. melliodora.*	Moderate	--	--	**Possible**, winter flowering trees onsite. Important Habitat mapped to the north in Timbertop Reserve.
Lophoictinia isura Square-tailed Kite (Foraging)	V	N/A	a reddish, medium-sized, long-winged raptor. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. ... Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.	Moderate	--	--	**Possible**, woodland onsite.
Melithreptus gularis gularis Black- chinned Honeyeater (eastern subspecies)	V	N/A	It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence River areas. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (Eucalyptus sideroxylon), White Box (E. albens), Inland Grey Box (E. microcarpa), Yellow Box (E. melliodora), Blakely's Red Gum (E.	Moderate	--	--	**Possible**, woodland onsite.

Species	BC Act listing status	EPBC Act listing	OEH species profile descriptions	Sensitivity to gain Class	Habitat constraints	Geographic limitations	Likelihood / Reason for exclusion from further assessment
			blakelyi) and Forest Red Gum (E. tereticornis)				
Micronomus norfolkensis Eastern Coastal Free- tailed Bat	V	N/A	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	High	--	--	**Possible**, previously recorded onsite (Ecoplanning 2020)
Miniopterus australis Little Bent- winged Bat	V	N/A	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	High	--	--	**Possible**, previously recorded onsite (Ecoplanning 2020)
Miniopterus orianae oceanensis Large Bent-winged Bat (Foraging)	V	N/A	Hunt in forested areas, catching moths and other flying insects above the tree tops.	High	--	--	**Possible**, previously recorded onsite (Ecoplanning 2020)
Pandion cristatus Eastern Osprey (Foraging)	V	N/A	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	Moderate	--	--	**Unlikely**, no open water onsite.

Species	BC Act listing status	EPBC Act listing	OEH species profile descriptions	Sensitivity to gain Class	Habitat constraints	Geographic limitations	Likelihood / Reason for exclusion from further assessment
Petroica boodang Scarlet Robin	V	N/A	occurs from the coast to the inland slopes... lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs... habitat usually contains abundant logs and fallen timber:	Moderate	--	--	**Possible** habitat onsite.
Pteropus poliocephalus Grey-headed Flying-fox (Foraging)	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.	High	--	--	**Possible**, flowering eucalypts recorded onsite.
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	V	N/A	When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	High	--	--	**Possible**.
Stagonopleura guttata Diamond Firetail	V	N/A	widely distributed in NSW, ...Not commonly found in coastal districts, though there are records from near Sydney,..Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands.	Moderate	--	--	**Possible**.

Likelihood of candidate threatened species (Species credit species):

Note: CE = Critically Endangered; E = Endangered; V = Vulnerable; EP = Endangered Population; N/A = not listed

Species	BC Act listing	EPBC Act listing	OEH habitat descriptions	Sensitivity to gain	Habitat constraints (from TBDC)	Geographic limitations	BioNet records within 10km grid	Likely habitat onsite
Acacia pubescens Downy Wattle	V	V	Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone….Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	High	--	--	21 (closest record within 1 km S of site, dated 6/12/1990)	**Possible,** occurs in Cumberland Plain Woodland.
Anthochaera phrygia Regent Honeyeater (Breeding)	CE	CE	three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. Distribution - mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. … also found in drier coastal woodlands and forests in some years.	High	As per Important Habitat Map	--	13 (closest is 5 km to the NW, dated 20/12/2009)	**Unlikely**. Not a known breeding area.
Burhinus grallarius Bush Stone-curlew	E	N/A	inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	High	Fallen/standing dead timber including logs	--	0	**Unlikely**, the site does not have a sparse grassy understorey. No BioNet records nearby.
Callocephalon	V	E	Favours old growth forest and	High	Hollow bearing trees	--	0	**Unlikely**, the site is

Species	BC Act listing	EPBC Act listing	OEH habitat descriptions	Sensitivity to gain	Habitat constraints (from TBDC)	Geographic limitations	BioNet records within 10km grid	Likely habitat onsite
fimbriatum Gang-gang Cockatoo (Breeding)			woodland attributes for nesting and roosting.		Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger			not in an old growth forest but on disturbed land with sparse occurrence of hollows
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo (Breeding)	V	V	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	High	Hollow bearing trees Living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground	--	0	**Unlikely**, absence of important food resources onsite including *Allocasuarina littoralis* and *A. torulosa.* Sparse occurrence of hollows
Cercartetus nanus Eastern Pygmy-possum	V	N/A	prefers habitat with a rich shrub understory. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; soft fruits are eaten when flowers are unavailable.	High	--	--	0	**Unlikely**, no banksias or bottlebrushes recorded onsite. No BioNet records in the area.
Chalinolobus dwyeri Large-eared pied bat	V	V	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Petrochelidon ariel), frequenting low to mid- elevation dry open forest and woodland close to these features.	Very High	Cliffs. Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	--	1 (5.5 km to the NE, dated 20/10/2000)	**Unlikely,** no preferred habitat (cliffs, caves, overhangs..) onsite.
Dillwynia tenuifolia Dillwynia tenuifolia	V	N/A	In western Sydney, may be locally abundant particularly within scrubby/dry heath areas	Moderate	--	--	0	**Unlikely,** absence of preferred habitat or dominant canopy

Species	BC Act listing	EPBC Act listing	OEH habitat descriptions	Sensitivity to gain	Habitat constraints (from TBDC)	Geographic limitations	BioNet records within 10km grid	Likely habitat onsite
			within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. ….Eucalyptus fibrosa is usually the dominant canopy species. Eucalyptus globoidea, E. longifolia, E. parramattensis, E.sclerophylla and E. sideroxylon may also be present or codominant, with Melaleuca decora frequently forming a secondary canopy layer					species, *E. fibrosa*
Eucalyptus benthamii – Camden White Gum	CE	V	Requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment...The recorded elevation range for the species is from 30m ASL at Bents Basin to 750m ASL in the Kedumba population...Occurs in open forest.	High	--	--	0	**Unlikely,** no deep alluvial soils and required flooding regime
Grevillea juniperina subsp. juniperina - Juniper-leaved Grevillea	V	N/A	Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels...Recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest.	Moderate	--	--	8 (closest record is 3 km to NW, dated 8/5/2018)	**Possible.**
Haliaeetus leucogaster	V	N/A	Breeding habitat … close to foraging habitat. Feed mainly	High	Living or dead mature trees within suitable	--	0	**Unlikely**, no large stick nest onsite,

Species	BC Act listing	EPBC Act listing	OEH habitat descriptions	Sensitivity to gain	Habitat constraints (from TBDC)	Geographic limitations	BioNet records within 10km grid	Likely habitat onsite
White-bellied Sea-Eagle (Breeding)			on fish and freshwater turtles. … Nests are large structures built from sticks and lined with leaves or grass.		vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines			
Hieraaetus morphnoides Little Eagle (Breeding)	V	V	It occurs as a single population throughout NSW. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	Moderate	Other Nest trees - live (occasionally dead) large old trees within vegetation)		12 (closest record is 300 m south of site dated 14/9/2010)	**Unlikely**, no stick nest observed onsite.
Lathamus discolor Swift Parrot (Breeding)	E	CE	breeds in Tasmania.	Moderate	As per Important Habitat Map	--	32 (closest record is 374 m to the NW dated 16/9/2001)	**No**, the site is not in Tasmania.
Litoria aurea Green and Golden Bell Frog	E	V	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and diurnal sheltering sites available.	High	Within 1km of wet areas. Within 1km of swamp. Within 1km of waterbody.		10 (closest record 870 m S, dated 1/1/1967)	**Possible,** Blacktown Creek and drainage swale onsite.
Lophoictinia isura Square-tailed Kite (Breeding)	V	N/A	A raptor with preference for timbered watercourses. Nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	Moderate	Nest trees	--	0	**Unlikely,** No nest sites observed onsite. No Bionet records in the area.
Marsdenia viridiflora subsp.	EP	N/A	Recent records are from Prospect, Bankstown,	Moderate	--	Fairfield, Liverpool and	36 (closest record is 3.5	**Possible,** degraded open shale

Species	BC Act listing	EPBC Act listing	OEH habitat descriptions	Sensitivity to gain	Habitat constraints (from TBDC)	Geographic limitations	BioNet records within 10km grid	Likely habitat onsite
viridiflora - endangered population Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas			Smithfield, Cabramatta Creek and St Marys. Grows in vine thickets and open shale woodland.			Penrith local government areas (as amended from the Determination)	km S of site, dated 27/1/1993)	woodland present onsite. Site located in the Blacktown LGA.
Meridolum corneovirens Cumberland Plain Land Snail	E	N/A	Primarily inhabits Cumberland Plain Woodland..Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.	High	--	--	85 (several records within 1 km of site, closest 65 m S of site dated 3/7/2018)	**Possible,** degraded Cumberland Plain Woodland present onsite.
Miniopterus australis Little Bent-winged Bat (Breeding)	V	N/A	Only five nursery sites /maternity colonies are known in Australia.	Very High	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature.	--	5 (likely flyover record by ultrasonic dated 8/4/2020)	**Unlikely,** no maternity colonies onsite
Miniopterus orianae	V	N/A	Caves are the primary roosting	Very High	Cave, tunnel, mine,	--	42 (likely	**Possible**, within

Species	BC Act listing	EPBC Act listing	OEH habitat descriptions	Sensitivity to gain	Habitat constraints (from TBDC)	Geographic limitations	BioNet records within 10km grid	Likely habitat onsite
oceanensis Large Bent-winged Bat (Breeding)			habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.		culvert or structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave " observation type code "E nest- roost " with numbers of individuals >500		flyover record by ultrasonic dated 8/4/2020)	culverts under the motorways.
Myotis macropus Southern Myotis	V	N/A	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow- bearing trees, storm water channels, buildings, under bridges and in dense foliage.Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	High	Waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the site.	--	10 (closest record 1 km S of site, dated 17/2/1999)	**Unlikely** as no open waterbodies.
Ninox connivens Barking Owl	V	N/A	in hollows of large, old trees. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators (e.g. goannas).	High	Hollow bearing trees Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground	--	2 (closest record 2.84 km NEE of site, dated 1/6/1996)	**Unlikely**, no nest sites recorded onsite, no hollows greater than 20 cm diameter recorded onsite.
Ninox strenua Powerful Owl	V	N/A	nests in large tree hollows (at least 0.5 m deep), at least 150 years old.	High	Hollow bearing trees Living or dead trees with hollow greater than 20cm diameter	--	4 (closest record 1.27 km W of site, dated 18/4/2018)	**Unlikely**, no large diameter hollows observed onsite.

Species	BC Act listing	EPBC Act listing	OEH habitat descriptions	Sensitivity to gain	Habitat constraints (from TBDC)	Geographic limitations	BioNet records within 10km grid	Likely habitat onsite
Pandion cristatus Eastern Osprey (Breeding)	V	N/A	Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Moderate	Presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting)	--	0	**Unlikely,** no large stick nests observed.
Petaurus norfolcensis Squirrel Glider	V	N/A	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt- Bloodwood forest with heath understorey in coastal areas.	High	--	--	0	**Unlikely**, the site does not support Blackbutt-Bloodwood forest nor heath understorey.
Phascolarctos cinereus Koala	E	E	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non- eucalypt species, but in any one area will select preferred browse species.	High	Presence of koala use trees - refer to Survey Comments field in TBDC	--	0	**Unlikely,** despite the Koala use trees for the Central Coast Koala Management Area (Schedule 2 of Koala SEPP 2021) recorded onsite, *Eucalyptus moluccana, Eucalyptus tereticornis* and a non-local planted *Eucalyptus robusta*
Pimelea spicata Spiked Rice- flower	E	E	In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland	High	--	--	187 (multiple records within 1 km S of site)	**Possible,** degraded *Cumberland Plain Woodland* onsite and co-occuring species *Eucalyptus moluccana, E. tereticornis* and

Species	BC Act listing	EPBC Act listing	OEH habitat descriptions	Sensitivity to gain	Habitat constraints (from TBDC)	Geographic limitations	BioNet records within 10km grid	Likely habitat onsite
			variants and Moist Shale Woodland) and in areas of ironbark. The co-occurring species in the Cumberland Plain sites are grey box (Eucalyptus moluccana), forest red gum (E. tereticornis) and narrow-leaved ironbark (E. crebra). Blackthorn (Bursaria spinosa) is often present at sites (and may be important in protection from grazing) and kangaroo grass (Themeda australis) is usually present in the groundcover (also indicative of a less intense grazing history).					*Bursaria spinosa.*
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	V	V	Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	High	Breeding camps	--	318 (several records within 1 km of site)	**No**, no camp onsite.
Pultenaea parviflora Pultenaea parviflora	E	V	May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	Moderate	--	--	26 (several records within 1 km S of site)	**Possible.**

Species	BC Act listing	EPBC Act listing	OEH habitat descriptions	Sensitivity to gain	Habitat constraints (from TBDC)	Geographic limitations	BioNet records within 10km grid	Likely habitat onsite
			Eucalyptus fibrosa is usually the dominant canopy species. Eucalyptus globoidea, E. longifolia, E. parramattensis, E. sclerophylla and E. sideroxylon may also be present or co-dominant, with Melaleuca decora frequently forming a secondary canopy layer.					
Tyto novaehollandiae Masked Owl	V	N/A	Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	High	Hollow bearing trees Living or dead trees with hollows greater than 20cm diameter	--	3 (closest record 365 m W of site, dated 18/4/2018)	**Unlikely**, no large diameter hollows or caves onsite. The site is not a moist gully.

Appendix 13

Applying the *Guidance to assist a decision-maker to determine a serious and irreversible impact* for the proposed Augusta Street warehouse and distribution centre in Huntingwood

Applying the *Guidance to assist a decision-maker to determine a serious and irreversible impact* for the proposed Augusta Street warehouse and distribution centre in Huntingwood

1.0 Reason for applying the Guidance

The vegetation onsite that is likely to be affected by the proposal has been assessed in the BDAR as best fit Plant Community Type *PCT 3319 Cumberland Shale Hills Woodland. PCT 3319* has the following associated Threatened Ecological Communities (TECs) (from the online PCT profile, Vegetation Classification public application):

PCT	Associated TEC
PCT 3319 *Cumberland Shale Hills Woodland*	• *Listed BC Act: Critically Endangered Ecological Community: Cumberland Plain Woodland in the Sydney Basin Bioregion (Part);* • *Listed EPBC Act: Critically Endangered: Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Part).*

Listed TECs under the BC Act are legally defined by the Final Determinations. The listed TECs under the EPBC Act are defined in the Listing Advice. From comparisons of the vegetation onsite with the criteria in the Final Determination the mapped PCT 3319 vegetation zones onsite meet the criteria for *Cumberland Plain Woodland in the Sydney Basin Bioregion* under the BC Act. None of the vegetation onsite met the condition thresholds for the Commonwealth listed TEC.

In the BAM Credit Summary Report, the clearing of *PCT 3319 Cumberland Shale Hills Woodland* is flagged as a potential Serious and Irreversible Impact (SAII).

2.0 Background to the *Guidance*

Under the *BC Act,* a determination of whether an impact is serious and irreversible must be made in accordance with the principles prescribed in section 6.7 of the *BC Regulation*.

In the explanatory information of *Guidance to assist a decision-maker to determine a serious and irreversible impact* (DPIE 2019, page 1), it states that:

> *The concept of serious and irreversible impacts (SAII) is a central component of the NSW biodiversity offsets scheme. It is fundamentally about protecting threatened species[1] and threatened ecological communities that are most at risk of extinction from potential development impacts or activities.*
>
> *([1]References to threatened species in this document include threatened populations listed in schedules under the BC Act).*

The purpose and scope of the guidance is clarified on page 2:

> *This guidance is intended to assist decision-makers[2] in determining whether a proposed impact on biodiversity values is likely to be serious and irreversible.*

([2] The term 'decision-maker' includes: consent authorities for development applications under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act); the Minister for Planning and Public Spaces for activities under Part 5.1 of the EP&A Act; determining authorities for activities under Part 5 of the EP&A Act; the Native Vegetation Panel for approvals for clearing native vegetation under s.60ZF of the LLS Act 2013 and clause 14 of the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017; the Minister for Environment and Energy in relation to biodiversity certification under Part 8 of the BC Act).

Under the *Principles for determining serious and irreversible impacts* on page 3, it is stated that:

> *The principles have been designed to capture those impacts which are likely to contribute* ***significantly to the risk of extinction of a threatened species or ecological community in New South Wales.*** *These are impacts that:*
>
> - *will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline*
> - *will further reduce the population size of the species that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or will further degrade or disrupt an ecological community that is already observed, inferred or reasonably suspected to be severely degraded or disturbed*
> - *impact on the habitat of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution*
> - *impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.*
>
> *The first three principles broadly align with the IUCN (2017) (see also Bland et al. (2016)) criteria used to identify entities at the greatest risk of extinction (i.e. critically endangered entities) and the fourth principle captures impacts on entities that cannot be offset.*

In the Guidelines, the risk of extinction is at a State level (that is, in the State of New South Wales).

The *Guidelines* outline the Criteria to interpret the principles. *The criteria ... enable the identification of threatened species and ecological communities that:*

- *are in a rapid rate of decline*
- *have a very small population size*
- *are severely degraded or disrupted*
- *have a very limited geographic distribution*
- *are unlikely to respond to measures to improve habitat.*

These criteria enable identification of threatened species and ecological communities most at risk of serious and irreversible impacts.

3.0 Applying the *Guidance*

Considering the four principles in terms of the impacts of the proposal on *Cumberland Plain Woodland*, it was found that:

Principle 1
These are impacts that will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline

In the 1790s, the relatively fertile shale-derived soils of the Cumberland Plain were discovered and these arable lands cleared to feed the colony (Hazelton and Clements 2011). The Huntingwood site is a typical example of former extensive agricultural land use.

The vegetation on the Huntingwood site is largely regrowth *Cumberland Plain Woodland* occurring mainly in a drainage swale and on and close to road reserves (see landform on Figure 1d-2, vegetation mapping on Figure 6c).

Within the drainage swale, there are:
- local native canopy trees;
- dense weedy understorey;
- soil disturbance; and
- building and rubble dumpings.

Close to the road reserve, the most intact of regrowth Cumberland Plain Woodland is offsite to the east adjoining Prospect Highway.

From the Final Determination, paragraph 14:

> *Some areas of Cumberland Plain Woodland subjected to a history of partial clearing and grazing have undergone a change in management to conserve the community. Examples include* ..., Western Sydney Regional Park [approximately 5 km to the south], ...

The proposal is a change in management to conserve, enhance and re-establish the community (see Figure 1f).

Existing threats to *Cumberland Plain Woodland (CPW)* observed onsite include:

Listed threats (from the *Cumberland Plain Woodland in the Sydney Basin Bioregion – profile,* accessed May 2023)	**Threats observed onsite**
Weed and foreign plant invasion, particularly African Olive and exotic grasses.	Yes. Particularly in the drainage swale in the west of the site.
Death of trees caused by fungus, following borers.	No. Not observed onsite.
Bell miner associated dieback.	No. Not observed onsite.
Urban heat island effect and persistent dry/low rainfall conditions.	Yes. The site is mainly historically cleared, formerly productive farmland, now reduced to an approximately 270 m wide site zoned IN1 – General Industrial and bounded by the major highways to the north, south and east. The proposal is directed to reduce urban heat island effect by conservation management.
Lack of awareness and appreciation of Cumberland	No comment.

Listed threats (from the *Cumberland Plain Woodland in the Sydney Basin Bioregion – profile,* accessed May 2023)	**Threats observed onsite**
Plain Woodland, with the perception that the community is unattractive.	
Inappropriate fire regimes, which have altered the appropriate floristic and structural diversity.	The floristic and structural diversity has been altered by the intense historic agricultural use of the site, not by fire regimes.
Disturbance and damage by recreational users being litter, arson, trail & motorbikes, 4WDs, firewood collection, and removal of woody debris.	No. Not observed onsite.
Threat of further clearing for urban or rural development, and the subsequent impacts from fragmentation including increased roadkill of fauna.	Yes, however the proposal is to conserve and enhance as part of an ecologically sustainable development.
Inappropriate water run-off, which leads to increased nutrients and sedimentation.	Yes. Stormwater runoff from the M4 Motorway is directed to Blacktown Creek in the east and to the drainage swale in the west of the site. Both drainage areas are heavily weed infested.
Predation of native fauna by cats and foxes.	No. Not observed onsite.
Grazing and mowing, which stops regrowth of the community.	No. Grazing and mowing not observed onsite.

The Threats listed in the Final Determination paragraphs 19, 20, include:

> *19. Weed invasion also poses a major threat to Cumberland Plain Woodland.*
>
> *20. Moderate to heavy grazing of Cumberland Plain Woodland by livestock and rabbits results in the decline and disappearance of palatable plant species, including shrubs and herbs, and compaction and erosion of topsoil, making re-establishment of a diverse native understorey problematic.*

In terms of Principle 1, the proposal is not likely to cause a further decline of CPW especially with the proposed establishment of conservation areas onsite.

Principle 2
These are impacts that will further reduce the population size of the species that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or will further degrade or disrupt an ecological community that is already observed, inferred or reasonably suspected to be severely degraded or disturbed

The proposal is not likely to have impacts that are likely to further degrade or disrupt CPW. The establishment of the conservation areas as part of the proposal will reduce the risk of any potential Serious and Irreversible Impacts.

Principle 3
These are impacts that impact on the habitat of a species or ecological community

that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.

CPW does not have a very limited geographic distribution. It is distributed in the Sydney Basin Bioregion (sensu Thackway and Cresswell) and is currently known to occur within the local government areas of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly, but may occur elsewhere within the bioregion (paragraph 11 of the Final Determination).

The map of its distribution is shown in *Cumberland Plain Woodland in the Sydney Basin Bioregion – profile.*



The areas shown in pink and/purple are the sub-regions where the species or community is known or predicted to occur. They may not occur throughout the sub-region but may be restricted to certain areas. ... The information presented in this map is only indicative and may contain errors and omissions.

The proposal will not impact an ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.

Principle 4
These are impacts that impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

CPW is known to respond to conservation measures to improve habitat and vegetation integrity, such as the removal of African Olive and careful bush regeneration.

The proposal will not impact an ecological community that is *unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.*

In conclusion, from applying the *Guidance to assist a decision-maker to determine a serious and irreversible impact,* the proposal with its conservation areas is unlikely to result in a Serious and Irreversible Impact. The proposal is unlikely to contribute significantly to the risk of extinction of the *Cumberland Plain Woodland* ecological community in New South Wales.

Appendix 13a

PCT 3319 Profile

BioNet Vegetation Classification - Community Profile Report

Plant Community Type ID (PCT ID): 3319

PCT Name: Cumberland Shale Hills Woodland
Classification Confidence Level: 2-High
Total Number of Replicates: 133
Number of Primary Replicates: 106
Number of Secondary Replicates: 27
Vegetation Description: A tall to very tall sclerophyll woodland to open forest with a mid-stratum of soft-leaved shrubs and small trees with a grassy ground cover that is extensive on rises and upper slopes of hills south from Cecil Hills, in the south-western part of the Cumberland Plain to the west of Sydney. It is most extensive in Campbelltown, Camden and Wollondilly local government areas. The canopy commonly includes Eucalyptus moluccana and Eucalyptus tereticornis, with a sparse shrub to small tree layer which very frequently includes Bursaria spinosa and at least one species of Acacia, of which Acacia implexa is most frequent. The presence of Acacia implexa helps distinguish this PCT from PCT 3320, which has a similar assemblage and structure. The mid-dense ground layer typically includes forbs, grasses and twiners. Dichondra repens is almost always present and Microlaena stipoides, Desmodium varians, Brunoniella australis and Aristida ramosa are very frequent. This PCT typically occurs in a warm, moist climate between 90-300 metres asl. It has been heavily cleared and now occurs in small remnants with varying levels of disturbance within a rural landscape. The canopy in these remnants often comprises immature cohorts of trees that have regenerated after thinning or clearing. The distribution of this PCT overlaps with PCT 3320 between Cecil Hills and the Nepean River, in which area of overlap PCT 3319 typically occurs on higher elevation hills and ridges. This PCT grades into PCT 3318 on lower protected slopes in the more dissected hills around Cecil Hills and the Razorback Range, and into PCT 3321 near the interface with the sandstone plateaus on the edge of the Cumberland Plain. PCT 3318 includes shrubs, ferns and vines typical of sheltered habitats that are rare in this PCT. Ironbark eucalypts are very frequent and Eucalyptus punctata is common in the canopy of PCT 3321, and Eucalyptus moluccana and Eucalyptus tereticornis are both rare.
Vegetation Formation: Grassy Woodlands;
Vegetation Class: Coastal Valley Grassy Woodlands;
IBRA Bioregion(s): Sydney Basin;
IBRA Sub-region(s): Burragorang; Cumberland;
LGA: CAMDEN; CAMPBELLTOWN; FAIRFIELD; LIVERPOOL; PENRITH; WOLLONDILLY;
Elevation (m) (Min, Median, Max): 53.7 179.1 363.0
Annual Rainfall (mm) (Min, Median, Max): 735 827 880
Annual Mean Temperature (deg C) (Min, Median, Max): 14.50 15.43 16.67
Median Native Species Richness per plot: 34
TEC Assessed: Has associated TEC
TEC List: Listed BC Act,CE: Cumberland Plain Woodland in the Sydney Basin Bioregion (Part); Listed EPBC Act,CE: Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Part);
TEC Comments: (Comment TEC1) Relates to the NSW Cumberland Plain Woodland TEC. (Comment TEC2) Relates to the Commonwealth Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest TEC where a patch satisfies key diagnostic characteristics and condition thresholds as per Sections 4 and 5 of the Listing Advice.
PCT Percent Cleared: 81.74
PCT Definition Status: Approved

Species By Growth Form Group

Growth Form Group	Species	Median cover score	Frequency
Unassigned (UA)	Leptochloa asthenes	3	2
Unassigned (UA)	Wurmbea dioica	2	1
Fern (EG)	Cheilanthes sieberi subsp. sieberi	2	48
Fern (EG)	Cheilanthes distans	2	25
Fern (EG)	Pellaea falcata	1	17
Fern (EG)	Adiantum aethiopicum	2	15
Fern (EG)	Cheilanthes austrotenuifolia	2	2
Fern (EG)	Adiantum hispidulum	2	1
Fern (EG)	Blechnum spinulosum	2	1
Forb (FG)	Dichondra repens	2	94
Forb (FG)	Brunoniella australis	2	76
Forb (FG)	Oxalis perennans	2	65
Forb (FG)	Oxytes brachypoda	2	55
Forb (FG)	Asperula conferta	2	53
Forb (FG)	Wahlenbergia gracilis	2	44

Forb (FG)	Einadia nutans	2	42
Forb (FG)	Solanum prinophyllum	1	42
Forb (FG)	Sida corrugata	2	38
Forb (FG)	Sigesbeckia orientalis subsp. orientalis	2	37
Forb (FG)	Plectranthus parviflorus	2	34
Forb (FG)	Einadia trigonos	2	31
Forb (FG)	Euchiton sphaericus	1	31
Forb (FG)	Einadia hastata	2	30
Forb (FG)	Plantago debilis	2	30
Forb (FG)	Galium leiocarpum	2	29
Forb (FG)	Geranium homeanum	2	28
Forb (FG)	Rumex brownii	1	28
Forb (FG)	Hypericum gramineum	1	24
Forb (FG)	Veronica plebeia	2	24
Forb (FG)	Ajuga australis	2	23
Forb (FG)	Commelina cyanea	2	23
Forb (FG)	Crassula sieberiana	1	23
Forb (FG)	Vittadinia cuneata	1	22
Forb (FG)	Arthropodium milleflorum	2	20
Forb (FG)	Geranium solanderi	1	19
Forb (FG)	Einadia polygonoides	2	18
Forb (FG)	Nyssanthes diffusa	2	18
Forb (FG)	Galium leptogonium	2	17
Forb (FG)	Lobelia purpurascens	2	15
Forb (FG)	Solanum pungetium	1	14
Forb (FG)	Cotula australis	2	13
Forb (FG)	Lagenophora gracilis	2	11
Forb (FG)	Poranthera microphylla	1	11
Forb (FG)	Senecio hispidulus	2	11
Forb (FG)	Lagenophora stipitata	2	10
Forb (FG)	Senecio quadridentatus	2	10
Forb (FG)	Calotis lappulacea	1	9
Forb (FG)	Galium gaudichaudii	2	9
Forb (FG)	Phyllanthus virgatus	2	9
Forb (FG)	Desmodium gunnii	2	8
Forb (FG)	Desmodium rhytidophyllum	2	8
Forb (FG)	Tricoryne elatior	1	8
Forb (FG)	Brunoniella pumilio	2	7
Forb (FG)	Cymbonotus lawsonianus	1	7
Forb (FG)	Dianella longifolia	1	7
Forb (FG)	Hypoxis hygrometrica	2	7
Forb (FG)	Oxalis exilis	1	7
Forb (FG)	Verbena gaudichaudii	1	7

Forb (FG)	Vernonia cinerea	1	7
Forb (FG)	Wahlenbergia communis	1	7
Forb (FG)	Daucus glochidiatus	2	6
Forb (FG)	Dichondra sp. Inglewood	2	6
Forb (FG)	Mentha satureioides	2	6
Forb (FG)	Plantago varia	1	6
Forb (FG)	Centella asiatica	2	5
Forb (FG)	Scutellaria humilis	2	5
Forb (FG)	Solenogyne bellioides	1	5
Forb (FG)	Wahlenbergia stricta	2	5
Forb (FG)	Goodenia hederacea	1	4
Forb (FG)	Portulaca oleracea	1	4
Forb (FG)	Stackhousia viminea	1	4
Forb (FG)	Stellaria flaccida	2	4
Forb (FG)	Veronica calycina	1	4
Forb (FG)	Caesia parviflora	1	3
Forb (FG)	Euchiton involucratus	2	3
Forb (FG)	Opercularia diphylla	1	3
Forb (FG)	Phyllanthus similis	1	3
Forb (FG)	Plantago gaudichaudii	2	3
Forb (FG)	Schenkia spicata	1	3
Forb (FG)	Sida cunninghamii	1	3
Forb (FG)	Wahlenbergia luteola	1	3
Forb (FG)	Alternanthera angustifolia	2	2
Forb (FG)	Alternanthera sp. A	1	2
Forb (FG)	Arthropodium minus	2	2
Forb (FG)	Cynoglossum australe	2	2
Forb (FG)	Dysphania carinata	1	2
Forb (FG)	Dysphania pumilio	2	2
Forb (FG)	Euphorbia drummondii	1	2
Forb (FG)	Hydrocotyle sibthorpioides	2	2
Forb (FG)	Hypericum japonicum	1	2
Forb (FG)	Mentha diemenica	2	2
Forb (FG)	Nyssanthes erecta	1	2
Forb (FG)	Polygala japonica	2	2
Forb (FG)	Pseuderanthemum variabile	1	2
Forb (FG)	Ranunculus pumilio	2	2
Forb (FG)	Scaevola albida	2	2
Forb (FG)	Senecio diaschides	1	2
Forb (FG)	Sigesbeckia australiensis	2	2
Forb (FG)	Trachymene incisa subsp. incisa	2	2
Forb (FG)	Vittadinia sulcata	2	2
Forb (FG)	Zornia dyctiocarpa var. dyctiocarpa	2	2

Forb (FG)	Alternanthera denticulata	1	1
Forb (FG)	Alternanthera nana	1	1
Forb (FG)	Arthropodium sp. South-east Highlands	1	1
Forb (FG)	Bossiaea prostrata	1	1
Forb (FG)	Brachyscome angustifolia	1	1
Forb (FG)	Brachyscome spathulata	2	1
Forb (FG)	Cardamine paucijuga	1	1
Forb (FG)	Chrysocephalum apiculatum	1	1
Forb (FG)	Dianella caerulea	1	1
Forb (FG)	Eclipta platyglossa	1	1
Forb (FG)	Euchiton japonicus	1	1
Forb (FG)	Euphorbia dallachyana	1	1
Forb (FG)	Galium binifolium	1	1
Forb (FG)	Geranium potentilloides	1	1
Forb (FG)	Geranium retrorsum	1	1
Forb (FG)	Glossocardia bidens	1	1
Forb (FG)	Gonocarpus teucrioides	1	1
Forb (FG)	Hydrocotyle laxiflora	1	1
Forb (FG)	Hydrocotyle tripartita	1	1
Forb (FG)	Malvastrum coromandelianum	1	1
Forb (FG)	Opercularia aspera	1	1
Forb (FG)	Oxalis chnoodes	1	1
Forb (FG)	Oxalis rubens	2	1
Forb (FG)	Plantago cunninghamii	1	1
Forb (FG)	Plantago hispida	1	1
Forb (FG)	Poranthera ericifolia	2	1
Forb (FG)	Scaevola aemula	1	1
Forb (FG)	Schenkia australis	2	1
Forb (FG)	Scutellaria mollis	1	1
Forb (FG)	Solenogyne dominii	1	1
Forb (FG)	Stackhousia monogyna	1	1
Forb (FG)	Urtica incisa	2	1
Forb (FG)	Veronica brownii	1	1
Grass & grasslike (GG)	Microlaena stipoides	3	86
Grass & grasslike (GG)	Aristida ramosa	2	77
Grass & grasslike (GG)	Cyperus gracilis	2	71
Grass & grasslike (GG)	Carex inversa	2	55
Grass & grasslike (GG)	Chloris ventricosa	2	55
Grass & grasslike (GG)	Themeda triandra	2	51
Grass & grasslike (GG)	Sporobolus creber	2	50
Grass & grasslike (GG)	Eragrostis leptostachya	2	43
Grass & grasslike (GG)	Rytidosperma racemosum	2	38
Grass & grasslike (GG)	Bothriochloa macra	2	37

Grass & grasslike (GG)	Poa labillardierei var. labillardierei	2	34
Grass & grasslike (GG)	Oplismenus aemulus	2	33
Grass & grasslike (GG)	Echinopogon ovatus	2	31
Grass & grasslike (GG)	Lomandra filiformis	2	30
Grass & grasslike (GG)	Dichelachne micrantha	2	28
Grass & grasslike (GG)	Oplismenus imbecillis	2	28
Grass & grasslike (GG)	Cymbopogon refractus	2	25
Grass & grasslike (GG)	Scleria mackaviensis	2	23
Grass & grasslike (GG)	Chloris truncata	2	17
Grass & grasslike (GG)	Panicum effusum	1	17
Grass & grasslike (GG)	Sporobolus elongatus	2	17
Grass & grasslike (GG)	Aristida vagans	2	14
Grass & grasslike (GG)	Fimbristylis dichotoma	2	13
Grass & grasslike (GG)	Rytidosperma tenuius	2	13
Grass & grasslike (GG)	Panicum simile	2	12
Grass & grasslike (GG)	Austrostipa ramosissima	2	11
Grass & grasslike (GG)	Bothriochloa decipiens var. decipiens	2	11
Grass & grasslike (GG)	Cynodon dactylon	2	11
Grass & grasslike (GG)	Dichanthium sericeum	2	11
Grass & grasslike (GG)	Paspalidium distans	2	11
Grass & grasslike (GG)	Entolasia stricta	2	8
Grass & grasslike (GG)	Eragrostis brownii	2	8
Grass & grasslike (GG)	Eriochloa pseudoacrotricha	2	8
Grass & grasslike (GG)	Poa sieberiana	2	8
Grass & grasslike (GG)	Paspalidium criniforme	2	7
Grass & grasslike (GG)	Rytidosperma bipartitum	2	7
Grass & grasslike (GG)	Dichelachne parva	2	6
Grass & grasslike (GG)	Entolasia marginata	2	6
Grass & grasslike (GG)	Juncus usitatus	1	6
Grass & grasslike (GG)	Bolboschoenus caldwellii	1	5
Grass & grasslike (GG)	Chloris divaricata var. divaricata	2	5
Grass & grasslike (GG)	Cyperus imbecillis	2	5
Grass & grasslike (GG)	Elymus multiflorus	2	5
Grass & grasslike (GG)	Lomandra multiflora subsp. multiflora	1	5
Grass & grasslike (GG)	Rytidosperma caespitosum	2	5
Grass & grasslike (GG)	Carex breviculmis	2	4
Grass & grasslike (GG)	Carex longebrachiata	2	4
Grass & grasslike (GG)	Echinopogon caespitosus	2	4
Grass & grasslike (GG)	Elymus scaber	1	4
Grass & grasslike (GG)	Juncus homalocaulis	1	4
Grass & grasslike (GG)	Rytidosperma longifolium	2	4
Grass & grasslike (GG)	Austrostipa setacea	2	3
Grass & grasslike (GG)	Cyperus laevis	2	3

Grass & grasslike (GG)	Lachnagrostis filiformis	1	3
Grass & grasslike (GG)	Leptochloa decipiens	1	3
Grass & grasslike (GG)	Lomandra confertifolia	1	3
Grass & grasslike (GG)	Rytidosperma pilosum	2	3
Grass & grasslike (GG)	Schoenus apogon	2	3
Grass & grasslike (GG)	Sporobolus laxus	1	3
Grass & grasslike (GG)	Aristida calycina	2	2
Grass & grasslike (GG)	Austrostipa pubescens	2	2
Grass & grasslike (GG)	Austrostipa scabra	2	2
Grass & grasslike (GG)	Austrostipa verticillata	2	2
Grass & grasslike (GG)	Cyperus enervis	2	2
Grass & grasslike (GG)	Digitaria brownii	2	2
Grass & grasslike (GG)	Digitaria parviflora	3	2
Grass & grasslike (GG)	Panicum decompositum	2	2
Grass & grasslike (GG)	Paspalidium gracile	2	2
Grass & grasslike (GG)	Austrostipa nodosa	2	1
Grass & grasslike (GG)	Austrostipa rudis	2	1
Grass & grasslike (GG)	Carex appressa	2	1
Grass & grasslike (GG)	Cyperus fulvus	1	1
Grass & grasslike (GG)	Dactyloctenium radulans	1	1
Grass & grasslike (GG)	Dichelachne rara	2	1
Grass & grasslike (GG)	Digitaria diffusa	3	1
Grass & grasslike (GG)	Digitaria ramularis	2	1
Grass & grasslike (GG)	Eleocharis acuta	2	1
Grass & grasslike (GG)	Enteropogon acicularis	2	1
Grass & grasslike (GG)	Imperata cylindrica	2	1
Grass & grasslike (GG)	Juncus subsecundus	1	1
Grass & grasslike (GG)	Lomandra gracilis	2	1
Grass & grasslike (GG)	Lomandra longifolia	1	1
Grass & grasslike (GG)	Paspalidium albovillosum	3	1
Grass & grasslike (GG)	Poa affinis	1	1
Grass & grasslike (GG)	Rytidosperma fulvum	2	1
Grass & grasslike (GG)	Rytidosperma laeve	1	1
Grass & grasslike (GG)	Rytidosperma setaceum	2	1
Other (OG)	Desmodium varians	2	77
Other (OG)	Glycine tabacina	2	59
Other (OG)	Glycine clandestina	2	42
Other (OG)	Pandorea pandorana subsp. pandorana	2	30
Other (OG)	Clematis glycinoides	2	27
Other (OG)	Glycine microphylla	2	25
Other (OG)	Cayratia clematidea	2	24
Other (OG)	Geitonoplesium cymosum	1	16
Other (OG)	Clematis aristata	1	13

Other (OG)	Hardenbergia violacea	1	9
Other (OG)	Convolvulus erubescens	1	8
Other (OG)	Amyema miquelii	1	5
Other (OG)	Trophis scandens subsp. scandens	1	5
Other (OG)	Celastrus australis	1	4
Other (OG)	Passiflora herbertiana subsp. herbertiana	1	4
Other (OG)	Eustrephus latifolius	1	3
Other (OG)	Stephania japonica var. discolor	1	3
Other (OG)	Amyema pendula	2	2
Other (OG)	Aphanopetalum resinosum	1	2
Other (OG)	Parsonsia straminea	1	2
Other (OG)	Polymeria calycina	1	2
Other (OG)	Cassytha glabella	1	1
Other (OG)	Glycine tomentella	2	1
Other (OG)	Gynochthodes jasminoides	1	1
Other (OG)	Kennedia rubicunda	2	1
Other (OG)	Marsdenia flavescens	2	1
Other (OG)	Marsdenia viridiflora subsp. viridiflora	1	1
Other (OG)	Smilax glyciphylla	2	1
Shrub (SG)	Bursaria spinosa	3	83
Shrub (SG)	Acacia implexa	2	57
Shrub (SG)	Rubus parvifolius	1	24
Shrub (SG)	Breynia oblongifolia	1	23
Shrub (SG)	Eremophila debilis	1	14
Shrub (SG)	Myoporum montanum	1	13
Shrub (SG)	Indigofera australis	2	9
Shrub (SG)	Melaleuca styphelioides	3	9
Shrub (SG)	Abutilon oxycarpum	2	8
Shrub (SG)	Olearia viscidula	1	7
Shrub (SG)	Melicytus dentatus	1	5
Shrub (SG)	Solanum cinereum	1	5
Shrub (SG)	Dodonaea viscosa	1	4
Shrub (SG)	Ozothamnus diosmifolius	2	4
Shrub (SG)	Calotis dentex	2	3
Shrub (SG)	Leucopogon juniperinus	2	3
Shrub (SG)	Notelaea venosa	1	3
Shrub (SG)	Solanum stelligerum	2	3
Shrub (SG)	Acacia falcata	1	2
Shrub (SG)	Acacia floribunda	1	2
Shrub (SG)	Dillwynia sieberi	2	2
Shrub (SG)	Exocarpos cupressiformis	3	2
Shrub (SG)	Myrsine variabilis	1	2
Shrub (SG)	Phyllanthus gunnii	1	2

Shrub (SG)	Pittosporum undulatum	1	2
Shrub (SG)	Acacia elongata	1	1
Shrub (SG)	Acacia irrorata	1	1
Shrub (SG)	Atriplex semibaccata	1	1
Shrub (SG)	Backhousia myrtifolia	4	1
Shrub (SG)	Cassinia uncata	1	1
Shrub (SG)	Coprosma quadrifida	3	1
Shrub (SG)	Duboisia myoporoides	1	1
Shrub (SG)	Gynatrix pulchella	1	1
Shrub (SG)	Hibbertia aspera	2	1
Shrub (SG)	Pimelea spicata	1	1
Shrub (SG)	Platysace lanceolata	2	1
Shrub (SG)	Trema tomentosa var. aspera	1	1
Tree (TG)	Eucalyptus moluccana	3	65
Tree (TG)	Eucalyptus tereticornis	3	53
Tree (TG)	Eucalyptus crebra	3	34
Tree (TG)	Clerodendrum tomentosum	1	21
Tree (TG)	Notelaea longifolia	1	12
Tree (TG)	Corymbia maculata	2	10
Tree (TG)	Acacia decurrens	1	8
Tree (TG)	Acacia parramattensis	3	8
Tree (TG)	Brachychiton populneus	1	7
Tree (TG)	Eucalyptus eugenioides	3	6
Tree (TG)	Melia azedarach	1	4
Tree (TG)	Acacia melanoxylon	1	1
Tree (TG)	Allocasuarina littoralis	1	1
Tree (TG)	Angophora floribunda	1	1
Tree (TG)	Angophora subvelutina	1	1
Tree (TG)	Casuarina glauca	2	1
Tree (TG)	Eucalyptus paniculata	1	1
Tree (TG)	Eucalyptus punctata	3	1
Tree (TG)	Ficus rubiginosa	1	1
Tree (TG)	Streblus brunonianus	1	1