

Lot 37 Prospect Highway, Greystanes Biodiversity Development Assessment Report

Hannas Contracting Services



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Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by Hannas Contracting Services to prepare a Biodiversity Development Assessment Report (BDAR) for a proposed industrial development within Lot 18 DP 270644 located at Prospect Highway, Prospect (the Development Site) in the Cumberland Local Government Area (LGA).

The State Significant Development Application (SSD 6801 MOD 6) involves modification to an existing SSD. Due to additional impacts on the Critically Endangered Ecological Community (CEEC) Cumberland Plain Woodland (CPW), which will result from the development modification, a BDAR was requested by the Office of Environment and Heritage (OEH). Proposed impacts to threatened species must be assessed under the new NSW Biodiversity Conservation Act 2016 (BC Act) enacted on the 25 August 2017.

This report has been prepared to meet the requirements of the Biodiversity Assessment Method 2016 (BAM) established under Section 6.7 of the NSW BC Act 2016.

The Development Site is an area of 2.3 ha and bounded by Prospect Highway to the east, native and exotic vegetation to the south and west, and industrial development to the north. The Development Site was subject to vegetation disturbance as a result of past clearing and is degraded by weed infestation. There is one Plant Community Type (PCT) in a degraded condition on the Development Site. This PCT has been mapped within the Development Site as *849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*.

PCT 849 conforms to the CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion, listed under the BC Act. CPW is also listed as a CEEC under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) however the CPW within the Development Site did not meet the condition threshold required for listing under the EPBC Act.

This assessment mapped 0.07 ha of this PCT on the 2.3 ha Development Site. The remaining area of the Development Site comprised of predominantly exotic vegetation and some native planted trees. No threatened flora or fauna species were recorded on the Development Site. All vegetation in the Development Site will be removed, resulting in the removal of 0.07 ha of CPW. Compensatory plantings will be undertaken within the Development Site, utilising species from CPW. An area of 0.24 ha will be replanted with CPW species, which will result in an overall increase in the total area of native vegetation. An area of 0.18 ha will be utilised as maintained lawn.

This BDAR outlines the measures taken to avoid, minimise and mitigate impacts to the vegetation and species habitat present within the Development Site and methodologies to minimise impacts during construction and operation of the development. Following consideration of all the above aspects, the residual unavoidable impacts of the project were calculated in accordance with the BAM by utilising the Biodiversity Assessment Method Credit Calculator (BAMC).

For the single native vegetation community present within the study area (PCT 849), the BAMC generated a vegetation integrity score of 11.1. Under the BAM, CEECs with a vegetation integrity score of less than 15 do not require offset. Hence no ecosystem credits are required to offset by the

development. Because no habitat for candidate species credit species was recorded in the study area, no species credits are required to offset the development.

Serious and Irreversible Impacts (SII) values have been considered as part of this assessment. CPW is a listed SII. The SII threshold for CPW is yet to be published by OEH. Given the small area (0.07 ha) and poor condition of CPW to be impacted, it is considered unlikely that the development would result in an SII.

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Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
CPW	Cumberland Plain Woodland
DoEE	Commonwealth Department of Environment and Energy
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FM Act	NSW Fisheries Management Act 1994
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
NSW	New South Wales
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development

Abbreviation	Description
TEC	Threatened Ecological Community
VI	Vegetation Integrity
VIS	Vegetation Information System
WM Act	NSW Water Management Act 2000

1. Stage 1: Biodiversity assessment

1.1 Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Mike Lawrie and Matthew Dowle who is an Accredited Person under the NSW Biodiversity Conservation Act 2016 (BC Act). The contents of this BDAR complies with the minimum requirements outlined in Table 25 of the Biodiversity Assessment Methodology (BAM: OEH, 2017).

1.1.1 General description of the Development Site

The Development Site is located within Lot 18 DP 270644 at Prospect Highway, Prospect in the Cumberland LGA. This report includes two base maps, the Site Map (



Figure 1) and the Location Map (Figure 2)

The development site comprises an area of 2.3 ha and is bounded by Prospect Highway to the east, vegetation to the south and west and industrial developments to the north. The Development Site has been subject to native vegetation disturbance as a result of past clearing and is degraded by severe weed infestation. The majority of the development site comprises exotic vegetation. One Plant Community Type (PCT) in a single condition state is present in the Development Site. The PCT has been mapped within the Development Site as 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.

PCT 849 conforms to the Critically Endangered Ecological Community (CEEC) 'Cumberland Plain Woodland in the Sydney Basin Bioregion' listed under the NSW BC Act. While PCT 849 also conforms to 'Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest' listed under the Commonwealth EPBC Act, the condition of this PCT in the Development Site did not meet the minimum condition thresholds under the EPBC Act.

1.1.2 Development Site footprint

The Development Site proposed footprint comprises of several industrial buildings, internal roads, parking spaces and landscaped batters with planted vegetation. The Development Site boundary (Figure 3) includes both the operational and construction footprint associated with all temporary construction facilities and infrastructure.

1.1.3 Sources of information used

- Biodiversity Assessment Methodology Calculator
- BioNet Vegetation Classification
- BioNet / Atlas of NSW Wildlife 5 km database search (OEH 2018a)
- EPBC Act Protected Matters Search Tool 5 km database search (DotEE 2018)
- The Native Vegetation of the Sydney Metropolitan Area (OEH 2016)
- Aerial mapping (SIXMaps)
- Additional GIS datasets including soil, topography, geology and drainage

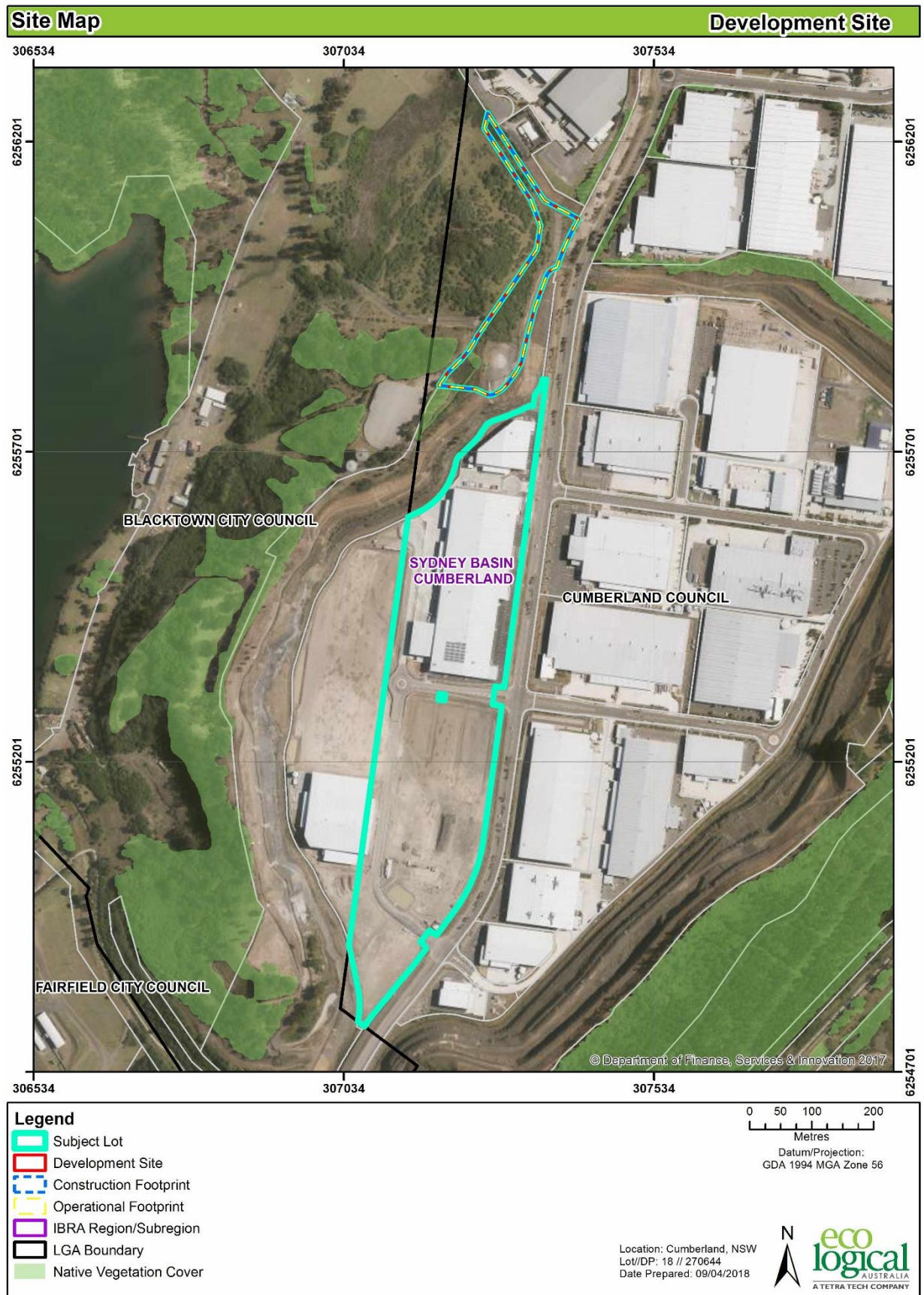


Figure 1: Site Map

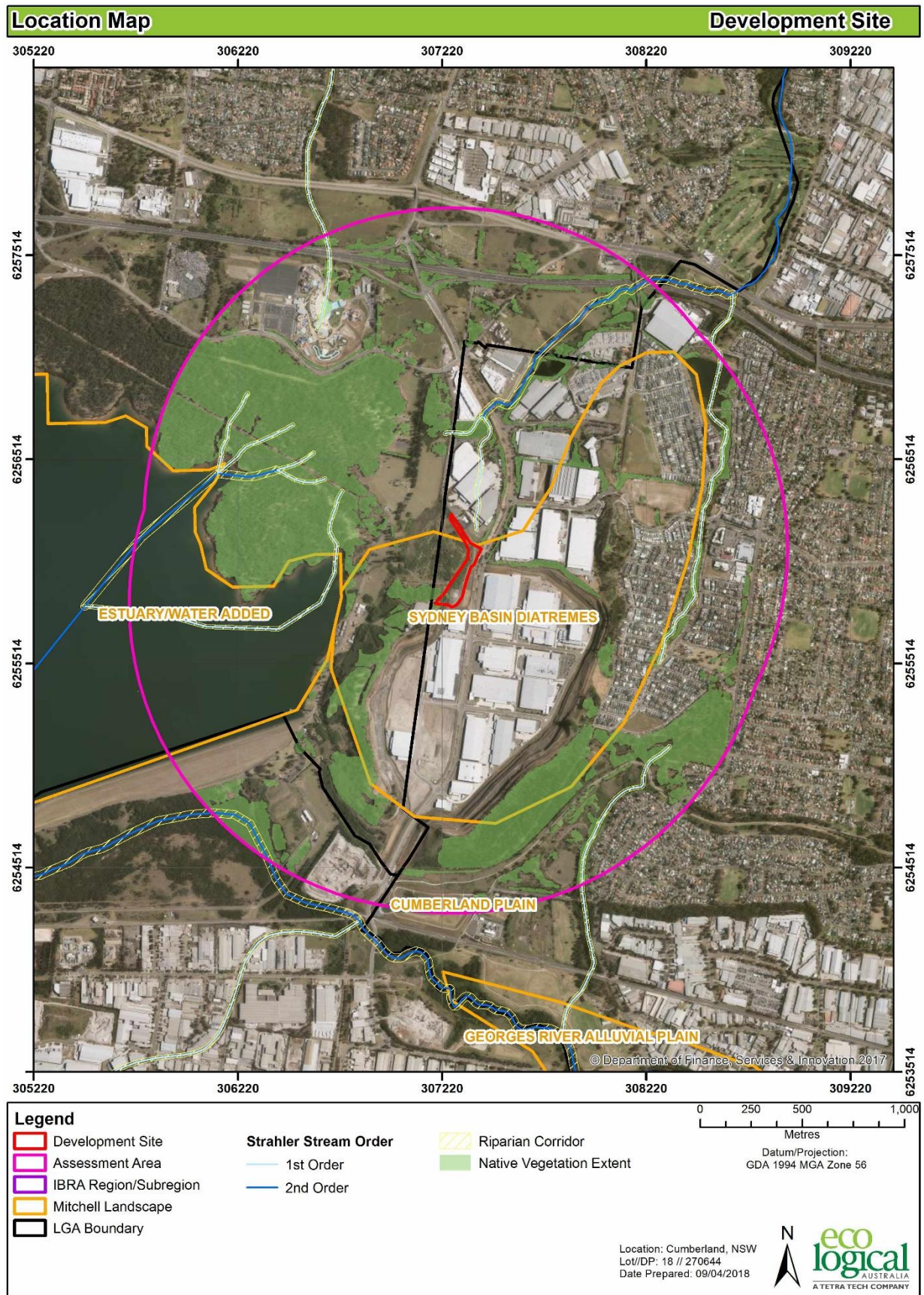


Figure 2: Location Map

1.2 Legislative context

Table 1: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environmental Protection and Biodiversity Conservation Act 1999	Matters of national Environmental Significance have not been identified on the Development Site. This report does not further assess impacts to MNES.	
NSW		
Environmental Planning and Assessment Act 1979	The proposed development requires consent under the EP&A Act.	
Biodiversity Conservation Act 2016	The proposed development requires submission of a Biodiversity Development Assessment Report (i.e. this report).	Stage 1 & 2
Fisheries Management Act 1994	The development does not involve impacts to Key Fish Habitat, does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is not required.	
Local Land Services Amendment Act 2016	The LLS Act does not apply to this development.	
Water Management Act 2000	The project does not involve works on waterfront land. A Controlled Activity Approval under s91 of the WM Act is not required.	
Planning Instruments		
SEPP Coastal Management 2018	This SEPP does not apply to the Development Site	
SEPP 44 – Koala Habitat Protection	SEPP 44 - Koala Habitat does not apply to Cumberland LGA.	
Holroyd Local Environment Plan 2013	The subject site is zoned IN2 - Light Industrial under the Holroyd LEP.	
Holroyd Development Control Plan (DCP)	The Holroyd DCP has been reviewed for additional provisions that may relate to the Development Site. No additional provisions are required.	

1.3 Landscape features

1.3.1 IBRA regions and subregions

The development site falls within the Sydney Basin IBRA region and Cumberland Plain subregion.

1.3.2 Mitchell Landscapes

The Development Site falls within two Mitchell Landscapes as outlined in Table 2.

Table 2: Mitchell Landscapes

Mitchell landscape	Description	Area within Development Site (ha)
Sydney Basin Diatremes	Widely distributed across the Sydney Basin and distinguished as an ecosystem because they always contain locally different landform, soil	2.04

Mitchell landscape	Description	Area within Development Site (ha)
	and vegetation. Diatremes are circular volcanic vents filled with layered, brecciated country rock cemented by a fine-grained basaltic matrix. Some contain a core of basalt. In shale country the breccia is more resistant than the shale and the diatremes form a low rounded hill with red-brown gradational profiles of clay loam and structured clay with moderate to high fertility. General elevation varies considerably across the basin, local relief of positive landforms up to 25m, negative landforms ('craters') 180m.	
Cumberland Plain	Low rolling hills and valleys in a rain shadow area between the Blue Mountains and the coast on horizontal Triassic shales and lithic sandstones forming a down-warped block on the coastal side of the Lapstone monocline. Intruded by a small number of volcanic vents and partly covered by Tertiary river gravels and sands (Hawkesbury-Nepean Terrace Gravels ecosystem). Quaternary alluvium along the mains streams. General elevation 30 to 120m, local relief 50m. and sometimes affected by salt in tributary valley floors. Pedal uniform red to brown clays on volcanic hills. Red and brown texture-contrast soils on crests grading to yellow harsh texture-contrast soils in valleys Woodlands and open forest of grey box, forest red gum, narrow-leaved ironbark, thin-leaved stringybark, cabbage gum and broad-leaved apple. Grassy to shrubby understorey often dominated by blackthorn, poorly drained valley floors, often salt affected with swamp oak and paperbark.	0.26

1.3.3 Rivers and streams

The development Site does not contain any rivers or streams.

1.3.4 Wetlands

The Development Site does not contain any wetlands.

1.3.5 Connectivity features

The Development is at the eastern extent of a corridor of vegetation which has contiguous connection to a large area of vegetation surrounding Prospect Reservoir. Connectivity of vegetation is disrupted by cleared areas. Vegetation within the study is of low value on a local scale.

1.3.6 Areas of geological significance and soil hazard features

The development site contains the areas of geological significance and soil hazard features as outlined in Table 3. The Development Site falls under the Volcanic (vo) residual soil landscape. This landscape is characterised by volcanic intrusions into Hawkesbury Sandstone and Wianamatta Shales, for this site it intrudes into Wianamatta Shale. This soil group has high water erosion hazard, dispersible sub soils and are strongly acidic with very low fertility (Murphy et al 1993).

Table 3: Areas of geological significance and soil hazard features

Area of geological significance or soil hazard feature	Feature type
Erosion Hazard	Localised erosion hazard, mass movement hazards on steep slopes
Surface Movement Potential	Slight to moderate reactivity with increase in soil depth with a low to moderate shrink-swell potential

1.3.7 Site context

1.3.7.1 Method applied

The site based method has been applied to this development.

1.3.7.2 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from SIX Maps (LPI 2015). The percent native vegetation cover in the Development Site is 0.07 ha and 23% (200.91 ha) within the 1,500 buffer area.

1.3.7.3 Patch size

Patch size was calculated using mapping specifically developed for this project that enabled vegetation to be mapped for all patches of intact native vegetation on and adjoining the Development Site. There is one patch on and adjoining the Development Site which falls within the class of 5-24 ha.

1.4 Native vegetation

Vegetation survey was undertaken within the development site on 28 March and 06 April 2018 by Matthew Dowle and Mike Lawrie.

One full-floristic vegetation plot was undertaken to identify PCTs on the Development Site in accordance with the BAM (Table 4). An additional full-floristic/vegetation plot was also undertaken outside of the Development Site, in the adjacent lot to the south as a means of aiding the determination of PCTs.

Table 4: Full-floristic and vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Condition	Area (ha)	Plots required	Plots surveyed
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland	Low	0.07	1	1

Veg Zone	PCT ID	PCT Name	Condition	Area (ha)	Plots required	Plots surveyed
		Plain, Sydney Basin Bioregion				

1.4.1 Plant Community Types present

One PCT was identified on the Development Site (Table 5, Table 6). Justification for the selection of PCT occurring on the Development Site was based on a quantitative analysis of full-floristic plot data and is provided in Table 6. The PCT in the Development Site contained one condition class, and was delineated into a single vegetation zone (Figure 4).

Table 5: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area	Percent cleared
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Coastal Valley Grassy Woodlands	Grassy Woodlands	0.07	93%

Table 6: PCT selection justification

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	IBRA region, landform, soils vegetation formation and vegetation class	<i>Eucalyptus tereticornis</i> present within canopy. <i>Acacia implexa</i> present in mid-storey. Groundcover species <i>Microlaena stipoides</i> , <i>Oxalis perennans</i> , <i>Lomandra filiformis</i> present in groundcover.

1.4.1.1 PCT selection justification

In determining the PCT for the Development Site, various attributes were considered in combination to assign vegetation to the best fit PCT. Attributes included dominant species in each stratum, community composition, soils and landscape position. Reference was made to the PCT descriptions in the Bionet Vegetation Classification, the final scientific determination and other published documents describing the vegetation community.

ELA considered all that all remnant native vegetation within the Development Site comprised the community PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.

The PCT within the Development Site was highly disturbed, with the mid-storey and ground-layer species diverging considerably from species originally present in this PCT due to past land clearing and the high degree of weed incursion. However, several species typical of PCT 849 were present within Plot 1. The canopy was composed of *Eucalyptus tereticornis* (Forest Red Gum). The mid-storey was sparsely distributed and contained *Acacia implexa* (Hickory Wattle). The groundcover was highly disturbed and composed predominantly of exotic species such as *Chloris gayana* (Rhodes Grass), *Bidens pilosa* (Cobbler's Pegs) and *Eragrostis curvula* (African Love Grass). Several native species were present in the groundcover however they had low cover and abundance. Native groundcover species present

included *Microlaena stipoides* (Weeping Meadow Grass), *Einadia trigonos* (Fishweed) and *Einadia polygonoides*.

The IBRA region location of the Development Site and vegetation formation and class of the vegetation on site conforms with PCT 849. While these are fairly broad criteria and there are several PCTs that have the same criteria, they are still useful determining factors to assist with PCT selection.

PCT 849 has several similarities with PCT 850 (*Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion*). Vegetation within the development site was distinguished from 850 due to its position in the landscape and reference to surrounding vegetation mapping (OEH, 2016). While the Development site is at the edge of a steep quarry, the position in the landscape would have been on a relatively flat extensive plain. This is in comparison to PCT 850 which occurs on hills, typically of the southern Cumberland Plain.

1.4.1.2 Threatened Ecological Communities Justification

BioNet VIS lists PCT 849 as comprising the CEEC, 'Cumberland Plain Woodland in the Sydney Basin Bioregion' listed under the NSW BC Act.

Justification of PCT 849 within the Development Site comprising Cumberland Plain Woodland is based on the presence of diagnostic species in the upper and lower stratum, vegetation structure and characteristic soil of Cumberland Plain Woodland.

While the community was degraded and the under-storey vegetation dominated by exotic species, several characteristic CPW species were present including *Eucalyptus tereticornis* (Forest Red Gum) in the canopy, *Acacia implexa* (Hickory Wattle) in the mid-storey and several species in the ground layer including *Einadia trigonos* (Fishweed), *Einadia polygonoides*, *Microlaena stipoides* (Weeping Meadow Grass) and *Oxalis perennans*.

While the vegetation structure is degraded by weed incursion and past clearing, it retains an open grassy woodland structure typical of CPW.

CPW is associated with soils derived from Wianamatta Shale. The Development Site is located on a volcanic intrusion into the Wianamatta Shale Group.

1.4.2 Vegetation integrity assessment

A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 7. The entire 2.3 ha Development Site will be cleared for the building footprint and associated facilities impacting 0.07 ha of native vegetation. As shown in Table 7, the BAMC calculated a vegetation integrity score of 11.1. In accordance with section 3.1.1.3 of the BAM, if a vegetation zone has a VI score of < 15 where a PCT is an EEC or CEEC then an offset requirement in the form of ecosystem credits is not required.

Table 7: Vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	849	Degraded	0.07	11.4	2.9	41.9	11.1

1.4.3 Use of local data

Use of local data instead of benchmark integrity scores is not proposed.

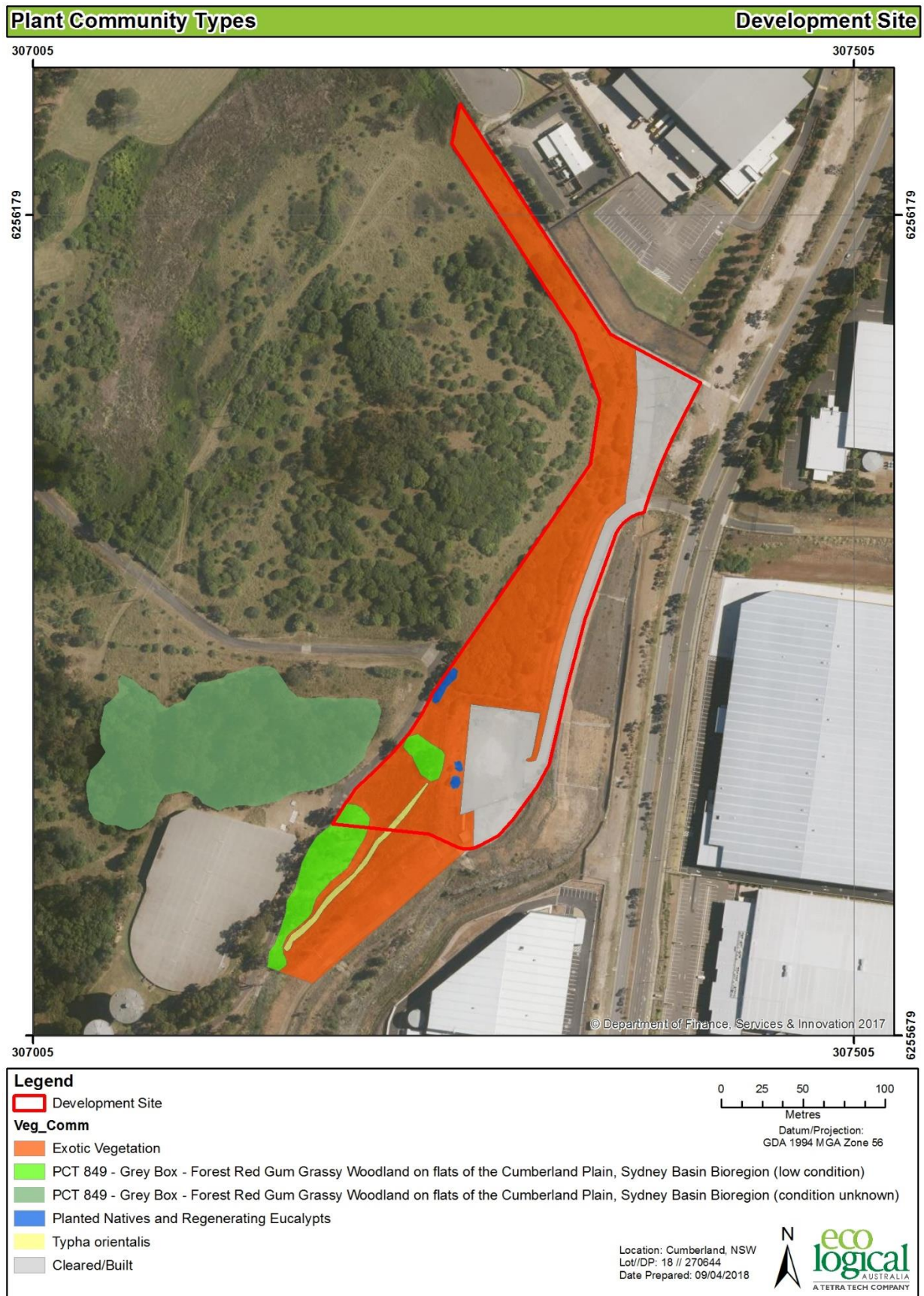


Figure 3: Plant Community Type and other vegetation

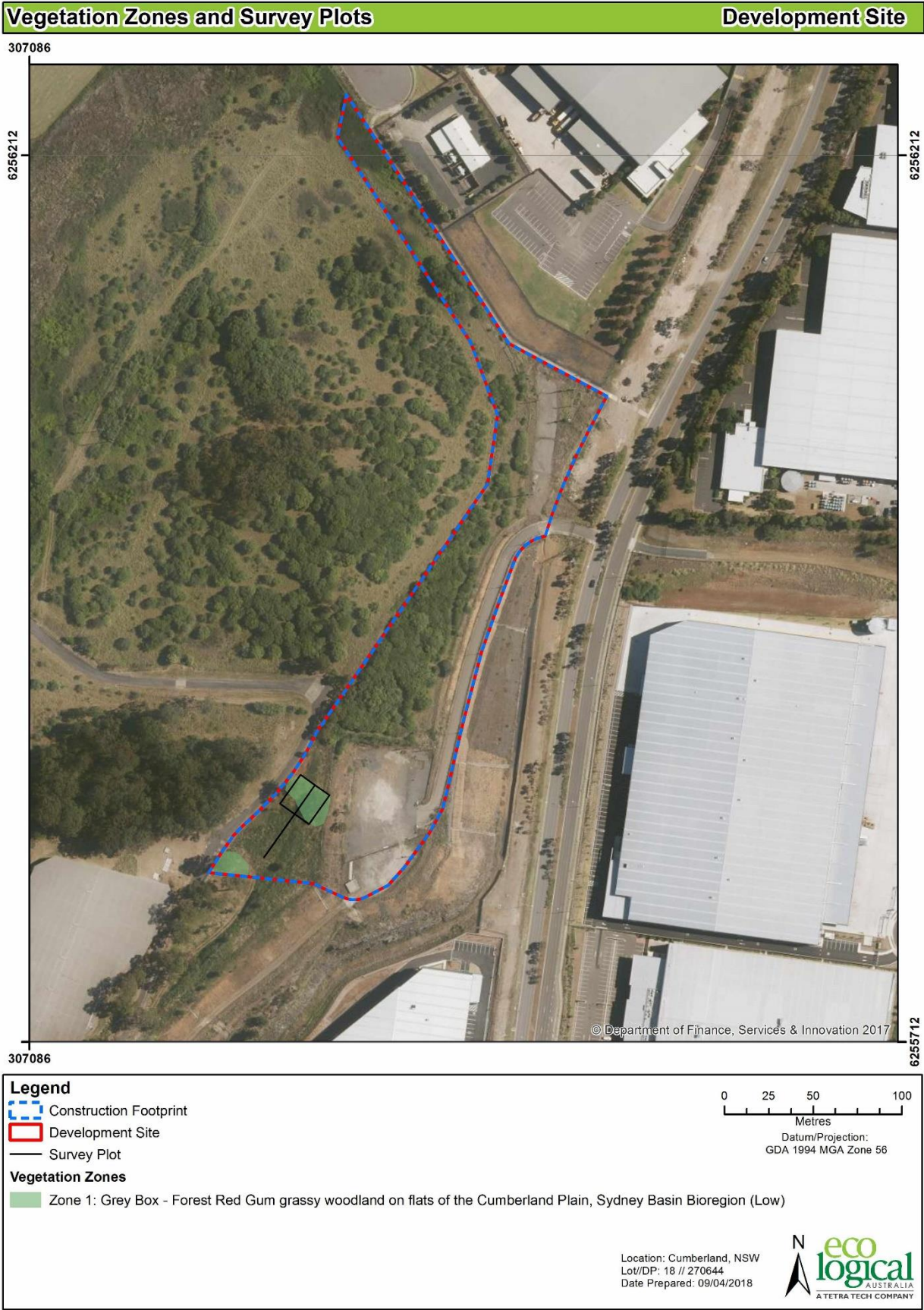


Figure 4: Vegetation Zone and Survey Plot

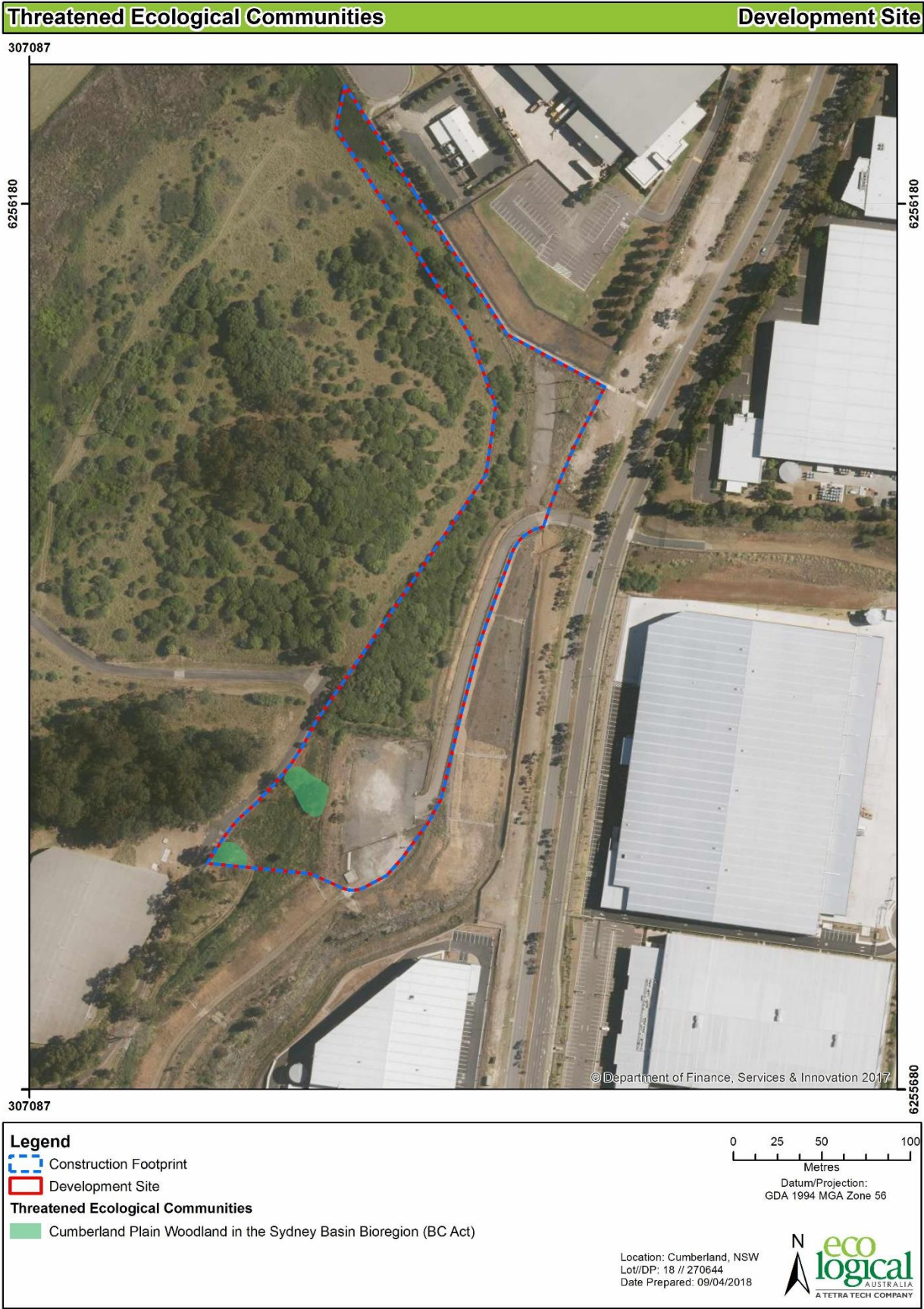


Figure 5: Threatened Ecological Communities

1.5 Threatened species

1.5.1 Ecosystem credit species

In accordance with section 3.1.1.3 of the BAM if a vegetation zone has a VI score of < 15 where a PCT is an EEC or CEEC then an assessment of predicted threatened species is not required.

1.6 Species credit species

1.6.1 Candidate Species credit species

Species credit species predicted to occur at the Development Site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class are shown in Table 8.

Table 8: Candidate Species Credit Species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act
<i>Acacia bynoeana</i>	Bynoe's Wattle			High	Endangered	Vulnerable
<i>Acacia pubescens</i>	Downy Wattle			High	Vulnerable	Vulnerable
<i>Caladenia tessellata</i>	White-flowered Wax Plant			Moderate	Endangered	Vulnerable
<i>Cynanchum elegans</i>	White flowered Wax Plant			High	Endangered	Endangered
<i>Dillwynia tenuifolia</i>	Dillwynia tenuifolia			Moderate	Vulnerable	Not Listed
<i>Dillwynia tenuifolia</i> , Kemps Creek <i>Dillwynia tenuifolia</i> - endangered population			the area bounded by western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area	N/A	Endangered Population	Not Listed
<i>Eucalyptus benthamii</i>	Camden White Gum			High	Vulnerable	Vulnerable
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Small-flower Grevillea			High	Vulnerable	Vulnerable

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas		Those LGAs named in the population's listing	High	Endangered Population	Not Listed
<i>Persoonia bargoensis</i>	Bargo Geebung			High	Endangered	Not Listed
<i>Pimelea curviflora</i> var. <i>curviflora</i>	Pimelea curviflora var. curviflora			High	Vulnerable	Vulnerable
<i>Pimelea spicata</i>	Spiked Rice-flower			High	Endangered	Endangered
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood			High	Endangered	Endangered
<i>Pultenaea pedunculata</i>	Matted Bush-pea			N/A	Endangered	Not Listed
<i>Thesium australe</i>	Austral Toadflax			Moderate	Vulnerable	Vulnerable
<i>Anthochaera phrygia</i>	Regent Honeyeater			High	Critically Endangered	Critically Endangered
<i>Burhinus grallarius</i>	Bush Stone-curlew	Fallen/standing dead timber including logs		High	Endangered	Not Listed
<i>Cercartetus nanus</i>	Eastern Pygmy-possum			High	Vulnerable	Not Listed
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo			High	Vulnerable	Not Listed
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Cliff lines. Within 2km of rocky areas containing caves, overhangs, escarpments, outcrops, or		Very High	Vulnerable	Vulnerable

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act
		crevices, or within two km of old mines or tunnels				
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle			High	Vulnerable	Vulnerable
<i>Hieraaetus morphnoides</i>	Little Eagle			Moderate	Vulnerable	Not Listed
<i>Lathamus discolor</i>	Swift Parrot			Moderate	Endangered	Endangered
<i>Litoria aurea</i>	Green and Golden Bell Frog	Semi-permanent/ephemeral wet areas, within 1km of wet areas/swamps, within 1 km of waterbody,		High	Endangered	Endangered
<i>Lophoictinia isura</i>	Square-tailed Kite			Moderate	Vulnerable	Vulnerable
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail			High	Endangered	Not Listed
<i>Miniopterus australis</i>	Little Bentwing Bat			Very High	Vulnerable	Not Listed
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat			Very High	Vulnerable	Not Listed
<i>Myotis macropus</i>	Southern Myotis	Hollow bearing trees Within 200 m of riparian zone Other Bridges, caves or artificial structures within 200 m of riparian zone		High	Vulnerable	Not Listed
<i>Ninox connivens</i>	Barking Owl			High	Vulnerable	Not Listed
<i>Ninox strenua</i>	Powerful Owl			High	Vulnerable	Not Listed
<i>Petaurus norfolcensis</i>	Squirrel Glider			High	Vulnerable	Not Listed
<i>Phascolarctos cinereus</i>	Koala			High	Vulnerable	Vulnerable

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act
<i>Pommerhelix duralensis</i>	Dural Woodland Snail	Leaf litter and shed bark or within 50m of litter of bark, Rocks or within 50m of rocks, Fallen/standing dead timber including logs, Including logs and bark or within 50m of logs or bark, Other		High	Endangered	Endangered
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox			High	Vulnerable	Vulnerable
<i>Tyto novaehollandiae</i>	Masked Owl			High	Vulnerable	Not Listed

An assessment of those candidate Species credit species identified in Table 8 was undertaken to determine likelihood of those species to occur based on the absence of necessary habitat components or habitat constraints. The justification for exclusion of these species is presented in Table 9.

Table 9: Justification for exclusion of candidate species credit species

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
<i>Caladenia tessellata</i>	White-flowered Wax Plant	Endangered	Vulnerable	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Cynanchum elegans</i>	White-flowered Wax Plant	Endangered	Endangered	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Dillwynia tenuifolia</i> , Kemps Creek <i>Dillwynia tenuifolia</i> - endangered population		Endangered Population	Not Listed	The Development Site is outside of the geographic limitations for this Endangered Population
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Marsdenia viridiflora Br. subsp.	Endangered Population	Not Listed	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
- endangered population	viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas			lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	Endangered	Endangered	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Pultenaea pedunculata</i>	Matted Bush-pea	Endangered	Not Listed	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Thesium australe</i>	Austral Toadflax	Vulnerable	Vulnerable	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Critically Endangered	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Burhinus grallarius</i>	Bush Stone-curlew	Endangered	Not Listed	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
				substantially degraded such that this species is unlikely to utilise the subject land.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.10, habitat constraints identified Threatened Biodiversity Data Collection have been used to assess habitat on the Development Site for this species. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No hollow-bearing trees are present in the development site, therefore no breeding habitat is available.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable	Vulnerable	In accordance with BAM section 6.4.1.10, habitat constraints identified Threatened Biodiversity Data Collection have been used to assess habitat on the Development Site for this species. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No cliffs, rocky areas containing caves, overhangs, escarpments, outcrops or crevices are present in the Development Site.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Vulnerable	Vulnerable	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Hieraaetus morphnoides</i>	Little Eagle	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Endangered	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Litoria aurea</i>	Green and Golden Bell Frog	Endangered	Endangered	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Lophoictinia isura</i>	Square-tailed Kite	Vulnerable	Vulnerable	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
				substantially degraded such that this species is unlikely to utilise the subject land.
<i>Miniopterus australis</i>	Little Bentwing Bat	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.10, habitat constraints identified Threatened Biodiversity Data Collection have been used to assess habitat on the Development Site for this species. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding cliffs are present in the Development Site.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.10, habitat constraints identified Threatened Biodiversity Data Collection have been used to assess habitat on the Development Site for this species. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding cliffs are present in the Development Site.
<i>Myotis macropus</i>	Southern Myotis	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.10, habitat constraints identified Threatened Biodiversity Data Collection have been used to assess habitat on the Development Site for this species. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No hollow-bearing trees, bridges, caves or artificial structures within 200 m of riparian zone are present in the Development Site.
<i>Ninox connivens</i>	Barking Owl	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.10, habitat constraints identified Threatened Biodiversity Data Collection have been used to assess habitat on the Development Site for this species. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground are present in the study area.
<i>Ninox strenua</i>	Powerful Owl	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.10, habitat constraints identified Threatened Biodiversity Data Collection have been used to assess habitat on the Development Site for this species. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No living or dead trees with

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
				hollows greater than 20 cm diameter and greater than 4m above the ground.
<i>Petaurus norfolcensis</i>	Squirrel Glider	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Vulnerable	In accordance with BAM section 6.4.1.17, after carrying out a field assessment of the habitat constraints and microhabitats on the subject lands, it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the subject land.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Vulnerable	In accordance with BAM section 6.4.1.10, habitat constraints identified Threatened Biodiversity Data Collection have been used to assess habitat on the Development Site for this species. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. Suitable breeding habitat was not available within the Development Site.
<i>Tyto novaehollandiae</i>	Masked Owl	Vulnerable	Not Listed	In accordance with BAM section 6.4.1.10, habitat constraints identified Threatened Biodiversity Data Collection have been used to assess habitat on the Development Site for this species. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.

Although the above species were not included in the assessment, surveys throughout the Development Site did not identify these species.

1.6.1.1 Targeted surveys

A targeted survey for species credit species considered likely to occur based on suitable habitat was undertaken at the Development Site on the date outlined in Table 10. Targeted surveys involved a meander of the suitable habitat (PCT 849) for threatened flora. Targeted survey for invertebrates involved searching under leaf litter and at the bases of eucalypts within PCT 849.

Table 10: Targeted surveys

Date	Surveyors	Target species
28/03/2018	Matthew Dowle & Mike Lawrie	<i>Acacia bynoeana</i> , <i>Acacia pubescens</i> , <i>Dillwynia tenuifolia</i> , <i>Eucalyptus benthamii</i> , <i>Grevillea juniperina</i> subsp. <i>juniperina</i> , <i>Persoonia bargoensis</i> , <i>Pimelea curviflora</i> var. <i>curviflora</i> , <i>Pimelea spicata</i> , <i>Meridolum corneovirens</i> , <i>Pommerhelix duralensis</i>

Date	Surveyors	Target species
28/03/2018	Mike Lawrie	<i>Acacia bynoeana</i> , <i>Acacia pubescens</i> , <i>Dillwynia tenuifolia</i> , <i>Eucalyptus benthamii</i> , <i>Grevillea juniperina</i> subsp. <i>juniperina</i> , <i>Persoonia bargoensis</i> , <i>Pimelea curviflora</i> var. <i>curviflora</i> , <i>Pimelea spicata</i>

Weather conditions during the targeted survey are outlined in Table 11.

Table 11: Weather conditions

Date	Rainfall (mm)	Minimum temperature 0C	Maximum temperature 0C
28/03/2018	0	14.0	29.0
06/04//2018	0	16.0	28.1

Survey effort undertaken at the development is outlined in Table 12.

Table 12: Survey effort

Method	Habitat (ha)	Total effort	Target species
Area search	0.07	30 minutes search	<i>Acacia bynoeana</i> , <i>Acacia pubescens</i> , <i>Dillwynia tenuifolia</i> , <i>Eucalyptus benthamii</i> , <i>Grevillea juniperina</i> subsp. <i>juniperina</i> , <i>Persoonia bargoensis</i> , <i>Pimelea curviflora</i> var. <i>curviflora</i> , <i>Pimelea spicata</i> , <i>Meridolum corneovirens</i> , <i>Pommerhelix duralensis</i>
Area search	0.07	30 minutes search	<i>Acacia bynoeana</i> , <i>Acacia pubescens</i> , <i>Dillwynia tenuifolia</i> , <i>Eucalyptus benthamii</i> , <i>Grevillea juniperina</i> subsp. <i>juniperina</i> , <i>Persoonia bargoensis</i> , <i>Pimelea curviflora</i> var. <i>curviflora</i> , <i>Pimelea spicata</i>

1.6.1.2 Targeted Survey results

No threatened flora or fauna species were recorded during targeted surveys.

1.6.2 Use of local data

The use of local data is not proposed.

1.6.3 Expert reports

Expert reports have not been prepared as part of this BDAR.

2. Stage 2: Impact Assessment

2.1 Avoiding impacts

The Development Site is small and contains a small fragmented patch of degraded vegetation. Locating the development footprint to avoid and minimise impacts on vegetation habitat would severely compromise the viability of the proposed development and is considered impractical. A summary of the avoid and minimise considerations are provided in Table 13 and Table 14.

2.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat

Table 13: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
locating the project in areas where there are no biodiversity values	All areas of cleared land or exotic vegetation containing no biodiversity values have been utilised. A small area of CPW (0.07 ha, a CEEC,) will be impacted.	Impacts to CPW are unavoidable within the scope of the project. The project will have impacts on a small amount of native vegetation. 0.24 ha of compensatory plantings utilising CPW species will be undertaken, which will result in a larger area of native vegetation than is currently present.
locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	All native vegetation on site is in poor condition.	Native vegetation within the study area is in poor condition with a vegetation integrity score of 11.1. Adjacent areas of native vegetation outside of the Development Site to the south and west appeared to be in better condition and will not be impacted by the proposal
locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	The Development Site cannot avoid impacts to areas containing CEEC. 0.07 ha of CPW will be removed.	The Development Site is predominantly located in areas containing no biodiversity values. The area of CPW to be impacted is in low condition
locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The Development Site footprint does not impact on connectivity values surrounding the Development Site.	The Development Site is located within a fragmented landscape. Land directly to the east has been highly developed and no habitat connectivity exists. Land adjacent to the west contains fragmented native vegetation between exotic and cleared vegetation. Given its location between highly development land and fragmented native vegetation, the movement of species and genetic material between areas of adjacent or nearby habitat will be maintained

2.1.2 Designing a project to avoid and minimise impacts on vegetation and habitat

Table 14: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
reducing the clearing footprint of the project	The clearing footprint cannot be reduced, as the development will utilise the entirety of the lot.	While the clearing footprint could not be reduced, compensatory plantings will be undertaken utilising CPW species. The total area to be replanted is 0.24 ha, resulting in a net increase in the area of native vegetation.
locating ancillary facilities in areas where there are no biodiversity values	Ancillary features are located in areas where there are no biodiversity values.	The project will result in impacts to 0.07 ha of CPW, a CEEC.
locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	All vegetation on the site has a low vegetation integrity score.	Ancillary features are located in areas where native vegetation has a low vegetation integrity score (11.1), and in areas containing predominantly exotic vegetation.
locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	Ancillary features are not located in areas containing habitat for species in high threat status categories but will impact a CEEC in poor condition	Ancillary features will be located in areas that impact vegetation with high threat status (CEEC), however the condition of this vegetation is poor and only a small amount will be impacted (0.07 ha).
providing structures to enable species and genetic material to move across barriers or hostile gaps	Vegetation will be replanted along the western boundary allowing movement of species and genetic material adjacent to the Development Site.	The western edge of the development will be replanted utilising species from Cumberland Plain Woodland. This will enable species to move along the boundary of the site. Adjacent to the east of the site is a large industrial development. Providing structures for species to move in an east-west direction is not practicable.
making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the Development Site.	Ecological restoration will be undertaken in the west of the site utilising species from the native vegetation community CPW.	The proponent will rehabilitate and replant 0.24 ha with species consistent with native vegetation communities removed.

2.1.3 Prescribed biodiversity impacts

The Development Site does not have prescribed biodiversity impacts.

2.2 Assessment of impacts

2.2.1 Direct impacts

The direct impacts on native vegetation and threatened ecological communities are outlined in Table 15 and Table 16.

Table 15: Direct impacts to native vegetation

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
849	<i>Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.</i>	Coastal Valley Grassy Woodlands	Grassy Woodlands	0.07

Table 16: Direct impacts on threatened ecological communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Direct impact (ha)	Listing status	Name	Direct impact (ha)
849	CEEC	Cumberland Plain Woodland	0.07	N/A	N/A	N/A

2.2.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 17. The future vegetation integrity score of 0 for the 0.07 ha portion of the Development Site reflects the clearing of all native vegetation on the site.

Table 17: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	849	Low	0.07	11.1	0	-11.1

2.2.3 Indirect impacts

The indirect impacts of the development are outlined in Table 18.

Table 18: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
sedimentation and contaminated and/or nutrient rich run-off	Construction	Runoff during construction works	Downhill (east) from Development Site.	During heavy rainfall or storm events	During rainfall events	Short-term impacts
inadvertent impacts on adjacent habitat or vegetation	Construction	Damage to adjacent habitat or vegetation	10 m from Development Site boundary	Daily, during construction works	Throughout construction period	Short-term impacts
transport of weeds and pathogens from the site to adjacent vegetation	Construction	Spread of weed seed or pathogens	Potential for spread into adjacent habitat	Daily, during construction works	Sporadic throughout construction period	Short-term impacts
trampling of threatened flora species	Construction / operation	No threatened flora present	N/A	N/A	N/A	N/A
bush rock removal and disturbance	Construction / operation	No bush rock present	N/A	N/A	N/A	N/A
increase in predatory species populations	Construction / operation	Negligible likelihood of impact occurring because only a small degraded area of native vegetation will be removed	N/A	N/A	N/A	N/A
increase in pest animal populations	Construction / operation	Negligible likelihood of impact occurring because only a small degraded area of native vegetation will be removed	N/A	N/A	N/A	N/A

2.2.4 Prescribed biodiversity impacts

The development does not have any prescribed biodiversity impacts.

2.2.5 Mitigating and managing impacts

Measures proposed to minimise impacts at the Development Site before, during and after construction are outlined in Table 19.

Table 19: Measures proposed to minimise impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Displacement of resident fauna	Minor	Negligible	Pre-clearance survey of trees to be removed and identification/location of habitat trees by a suitably qualified ecologist Supervision by a qualified ecologist/licensed wildlife handler during tree removal in accordance with best practise methods	Relocation of fauna in a sensitive manner	Prior to and during clearing works	Project Manager
timing works to avoid critical life cycle events such as breeding or nursing	Minor	Negligible	Avoid clearing works in late winter/early spring during breeding/nesting period for birds	impacts to fauna during nesting/nursing avoided	During clearing works	Project Manager
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Minor	Minor	Pre-clearance survey of trees to be removed and identification/location of habitat/nests by a suitably qualified ecologist All trees identified for retention should be clearly flagged with surveyors flagging tape / paint Supervision by a qualified ecologist/licensed wildlife handler during tree removal in accordance with best practise methods Any tree removal is to be undertaken by a suitably qualified and insured arborist	Any fauna utilising habitat within the Development Site will be identified and managed to ensure clearing works minimise the likelihood of injuring resident fauna	Prior to and during clearing works	Project Manager
installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures	Negligible	Negligible	No hollows/hollow trunks/fissures present in the development site. Replacement not required.	Replacement of habitat features not required	N/A	N/A

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
to replace the habitat resources lost and encourage animals to move from the impacted site, e.g. nest boxes						
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance	Moderate	Minor	Install No Go fencing prior to construction works around entire development site to prevent impacts to adjacent vegetation. Fencing and signage will be placed around those areas of vegetation to be maintained to prevent any accidental construction damage and provide a permanent barrier between the Development Site and retained areas The type of fencing during construction may be of a temporary nature and scale that is robust enough to withstand damage during this phase of work	Vegetation to be retained outside of the Development Site boundary (northern portion of Lot) and retained vegetation within the Development Site will not be disturbed/impacted	Fencing to be set up prior to any works occurring on site and to remain throughout duration of construction works	Project Manager
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Minor	Negligible	Appropriate controls will be utilised to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways Ensure all works within proximity to the drainage lines have adequate sediment and erosion controls	Erosion and sedimentation will be controlled	For the duration of construction works	Project Manager
noise barriers or daily/seasonal timing of construction and operational activities to	Minor	Negligible	Timing of construction works should be planned to occur outside of the winter/spring breeding season for both Squirrel glider and nesting birds. Daily timing of construction activities is recommended in accordance with Table 1 of Interim Noise Guidelines (2009)	Noise impacts associated with the development will be managed in accordance with guidelines	For the duration of construction works	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
reduce impacts of noise			Monday to Friday 7.00am to 6.00pm Saturday 8.00am to 1.00pm No work on Sunday or public holidays			
adaptive dust monitoring programs to control air quality	Minor	Negligible	Dust suppression measures will be implemented during construction works to limit dust on site Commence revegetation as soon as practicable to minimise areas likely to create dust	Mitigate dust created during construction activities	For the duration of construction works	Project Manager
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Minor	Vehicles, machinery and building refuse associated with the development construction should remain only within construction footprint areas and not impinge on areas of retained native vegetation outside of the Development Site. Weeds present within the Development Site listed under the NSW Biosecurity Act 2015 should be managed. Weeds present include 1. <i>Lantana camara</i> (Lantana) 2. <i>Olea europaea subsp. cuspidata</i> (African Olive) 3. <i>Rubus fruticosus</i> species <i>aggregate</i> (Blackberry) 4. <i>Nassella neesiana</i> (Chilean Needlegrass) 5. <i>Senecio madagascariensis</i> (Fireweed) All weeds are to be managed/removed by a qualified Bush Regenerator	Prevent spread of weeds or pathogens	For the duration of construction works	Project Manager
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	All staff working on the development will undertake an environmental induction as part of their site familiarisation. This induction will include items such as: 1. Importance of No Go zones 2. Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and noxious weeds)	All staff entering the Development Site are fully aware of the presence of native vegetation adjacent to the site what to do in case of any	To occur for all staff entering/working at the Development Site. Site briefings should be updated based on phase of the work and when	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			3. What to do in case of environmental emergency (chemical spills, fire, injured fauna)	environmental emergencies	environmental issues become apparent.	
			4. Key contacts in case of environmental emergency			
development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on pet ownership, rubbish disposal, wood collection, fire management and disturbance to nests and other niche habitats	Minor	Negligible	Temporary fencing to be placed around the perimeter of the Development Site to prevent impacts to adjacent vegetation.	Protect vegetation and habitat adjacent to Development Site.	During operational phase	Client
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the Development Site	Minor	Negligible	Landscaping in the Development Site is to use locality derived native species and those found within CPW. At total area of 0.24 ha will be planted utilising CPW species. Details of plantings are provided in the Landscape Plan.	Areas within the Development Site will be landscaped using appropriate species	Following completion of construction activities.	Project Manager

2.2.6 Serious and Irreversible Impacts (SAII)

The Development Site contains one Serious and Irreversible Impact (SAII) candidate entity identified in Table 20. Detailed consideration of whether impacts on candidate TECs are serious and irreversible is included in Table 21.

Table 20: Candidate Serious and Irreversible Impacts

Species / Community		Common Name		Principle		Direct impact individuals / area (ha)		Threshold
Cumberland Woodland Sydney Bioregion	Plain in the Basin	Cumberland Woodland Sydney Bioregion	Plain in the Basin	Principle 1 and Principle 2		Removal 0.07 ha		Not yet published

Table 21: Evaluation of an impact on a TEC

Impact Assessment Provisions	Assessment
1. the area and condition of the TEC to be impacted directly and indirectly by the proposed development	The development will remove 0.07 ha of CPW in low condition with an integrity score of 11.1 in the BAMC.
2. the extent and overall condition of the TEC within an area of 1500 metres, and then 5000 metres, surrounding the proposed development footprint. In the case of strategic biodiversity certification projects, the extent and overall condition of the TEC may be assessed across the IBRA sub region	Within 1500 metres of the development site there is an estimated 315.69 ha of CPW (OEH, 2016). Within 5,000 metres of the development site there is an estimated 579.13 ha. While the condition of CPW in these areas is unknown, the occurrence is extensive in this area.
3. an estimate of the extant area and overall condition of the TEC remaining before and after the impact of the proposed development has been taken into consideration	The proposal will reduce the extant area of the TEC by 0.07 ha. Considering the very small area and poor quality of the vegetation to be removed, it is considered that the development will have a negligible impact on the extant area and overall condition of the TEC on a broad scale with a loss of 0.02% of CPW within 1,500 m of the development site and 0.01% within 5,000 m of the development site.
4. the development proposal's impact on:	
a. abiotic factors critical to the long-term survival of the TEC; for example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns; will it alter natural disturbance regimes that the TEC depends upon, e.g. fire, flooding etc.?	The development will not impact abiotic factors critical to the long-term survival of the TEC.
b. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of under-storey species or harvesting of plants	The development will not impact characteristic and functionally important species outside of the proposed impact area.
c. the quality and integrity of an occurrence of the TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the TEC	The development has the potential to assist the spread of invasive flora in CPW adjacent to the study area. This potential impact will be controlled during the construction phase. The development will not have additional impacts to the quality and integrity of the occurrence of CPW outside of the proposed impact area.
5. direct or indirect fragmentation and isolation of an area of the TEC	The development will not cause direct or indirect fragmentation or isolation of any area of CPW.

Impact Assessment Provisions	Assessment
	Compensatory plantings of CPW species along the western edge of the development site will overall improve connectivity of vegetation to the west.
6. the measures proposed to contribute to the recovery of the TEC in the IBRA subregion.	The proposed development involves landscaping and replanting using species consistent with CPW.

2.3 Risk Assessment

A risk assessment has been undertaken for any residual impacts likely to remain after the mitigation measures (Section 2.2.5, Table 19) have been applied. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 22, Table 23 and Table 24 respectively and the risk assessment outcome is presented in Table 25.

Table 22: Likelihood criteria

Likelihood criteria	Description
Almost certain (Common)	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
Likely (Has occurred in recent history)	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
Possible (Could happen, has occurred in the past, but not common)	The event could occur. There is likely to be an event on average every five to twenty years.
Unlikely (Not likely or uncommon)	The event could occur but is not expected. A rare occurrence (once per one hundred years).
Remote (Rare or practically impossible)	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

Table 23: Consequence criteria

Consequence category	Description
Critical (Severe, widespread long-term effect)	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
Major (Wider spread, moderate to long term effect)	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.
Moderate (Localised, short-term to moderate effect)	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
Minor (Localised short-term effect)	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.

Consequence category	Description
Negligible (Minimal impact or no lasting effect)	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Table 24: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
Critical	Very High	Very High	High	High	Medium
Major	Very High	High	High	Medium	Medium
Moderate	High	Medium	Medium	Medium	Low
Minor	Medium	Medium	Low	Low	Very Low
Negligible	Medium	Low	Low	Very Low	Very Low

Table 25: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)		Risk (post mitigation)	
sedimentation and contaminated and/or nutrient rich run-off	Construction	Medium		Very Low	
inadvertent impacts on adjacent habitat or vegetation	Construction	Medium		Low	
transport of weeds and pathogens from the site to adjacent vegetation	Construction	Medium		Low	
trampling of threatened flora species	N/A	N/A		N/A	
bush rock removal and disturbance	N/A	N/A		N/A	
increase in predatory species populations	Construction and operational	Low		Very Low	
increase in pest animal populations	Construction and operational	Low		Very Low	

2.4 Adaptive management strategy

This section is required for those impacts that are infrequent, cumulative or difficult to predict. Impacts associated with the proposed development have been considered and addressed Section 2.2.5 and no further impacts are required to be addressed.

2.5 Impact Summary

2.5.1 Serious and Irreversible Impacts (SAIL)

As discussed in Section 2.2.6, because the thresholds for a SAIL on CPW have not yet been published by the OEHL, it cannot be determined with certainty if the proposed development will have SAIL. Considering the degraded nature of CPW in the development site (integrity score 11.1) and small area to be removed (0.07 ha), it is unlikely that the development would have a SAIL.

2.5.2 Impacts not requiring offsets

The BAMC determined that the development does not require any offsets for native vegetation. One PCT (849) was present in the Development Site, which the BAMC determined a vegetation integrity score of 11.1. As outlined in Part 3.1.1.3 of the BAM, if a vegetation zone has a vegetation integrity score of <15 where the PCT is representative of an endangered or critically endangered ecological community, then for that vegetation zone: assessment of native vegetation is not required beyond Section 5.4 of the BAM and an assessment of threatened species habitat according to Section 6.2 and Paragraph 6.2.1.4 of the BAM is not required. Areas containing impacts which do not require offsets are shown in Figure 6.

2.5.3 Areas not requiring assessment

The Development Site contains areas not requiring assessment (Figure 7) which included cleared/exotic vegetation and planted native vegetation that did not form a part of any native PCT. These areas have been described below. As discussed in Section 2.5.2, PCT 849 also does not require offset as it does not meet the required vegetation integrity score.

2.5.3.1 Planted Natives and Regenerating Eucalypts

A small stand of planted native *Eucalyptus crebra* (Narrow-leaved Ironbark) occurs within the study area and a small number of juvenile eucalyptus trees were located on the batter (0.02 ha). This vegetation is not consistent with any listed native Plant Community Type (PCT).

2.5.3.2 Typha Orientalis

A narrow linear patch of the native reed *Typha orientalis* (Broad-leaf Cumbungi) (0.04 ha) extended through the south of the study area. This area also contained exotic species *Ageratina adenophora* (Crofton Weed) and *Solanum* sp. This vegetation is not consistent with any listed native Plant Community Type (PCT).

2.5.3.3 Exotics/Cleared

The majority of the Development Site (1.95 ha) was composed of exotic vegetation. Shrub species present included *Olea europaea* subsp. *cuspidata* (African Olive), *Rubus fruticosus* (Blackberry), *Lantana camara* (Lantana) and *Ageratina adenophora* (Crofton Weed). Dominant groundcovers present were *Eragrostis curvula* (African Love Grass), *Verbena bonariensis* (Purple Tops), *Chloris gayana* (Rhodes Grass), *Senecio madagascariensis* (Fireweed), *Ehrharta erecta* (Panic Veldt Grass), *Sida rhombifolia* (Paddy's Lucerne) and *Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush). This vegetation is not consistent with any listed native Plant Community Type (PCT).

2.5.4 Credit summary

A summary of the credit report generated by the BAMC is outlined in Table 26.

The vegetation integrity score for PCT 849 was lower than the threshold required for offsetting a CEEC (<15). Hence, no ecosystem credits are required to offset the proposed development.

No candidate species credit species or likely habitat was recorded within the Development Site, hence no species credits are required to offset the proposed development.

A full biodiversity credit report is included in Appendix D.

Table 26: Ecosystem credits required

PCT ID	PCT Name	Vegetation Formation			Direct impact (ha)	Credits required
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Coastal	Valley	Grassy Woodlands	Grassy Woodlands	0

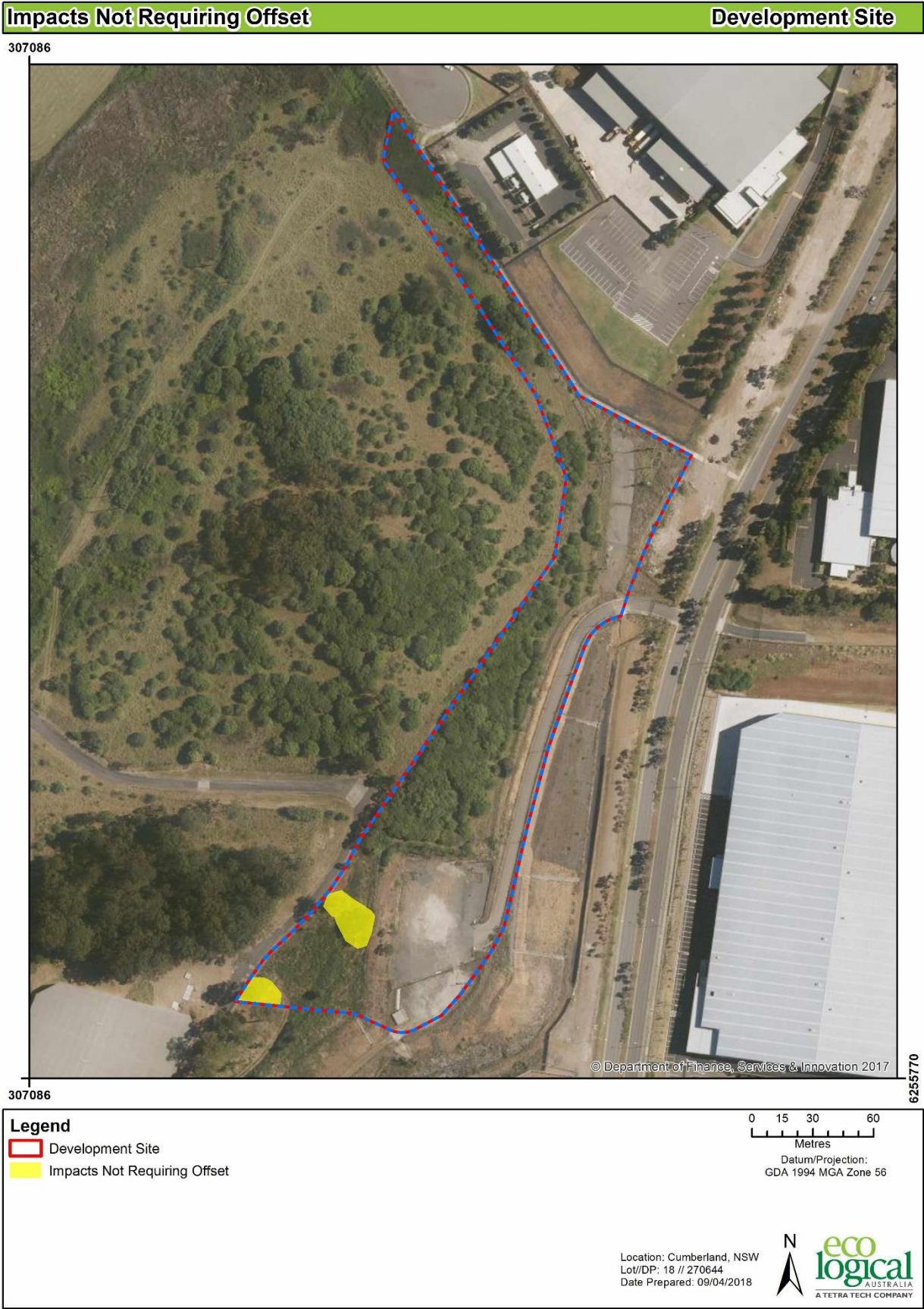


Figure 6: Impacts not requiring offset

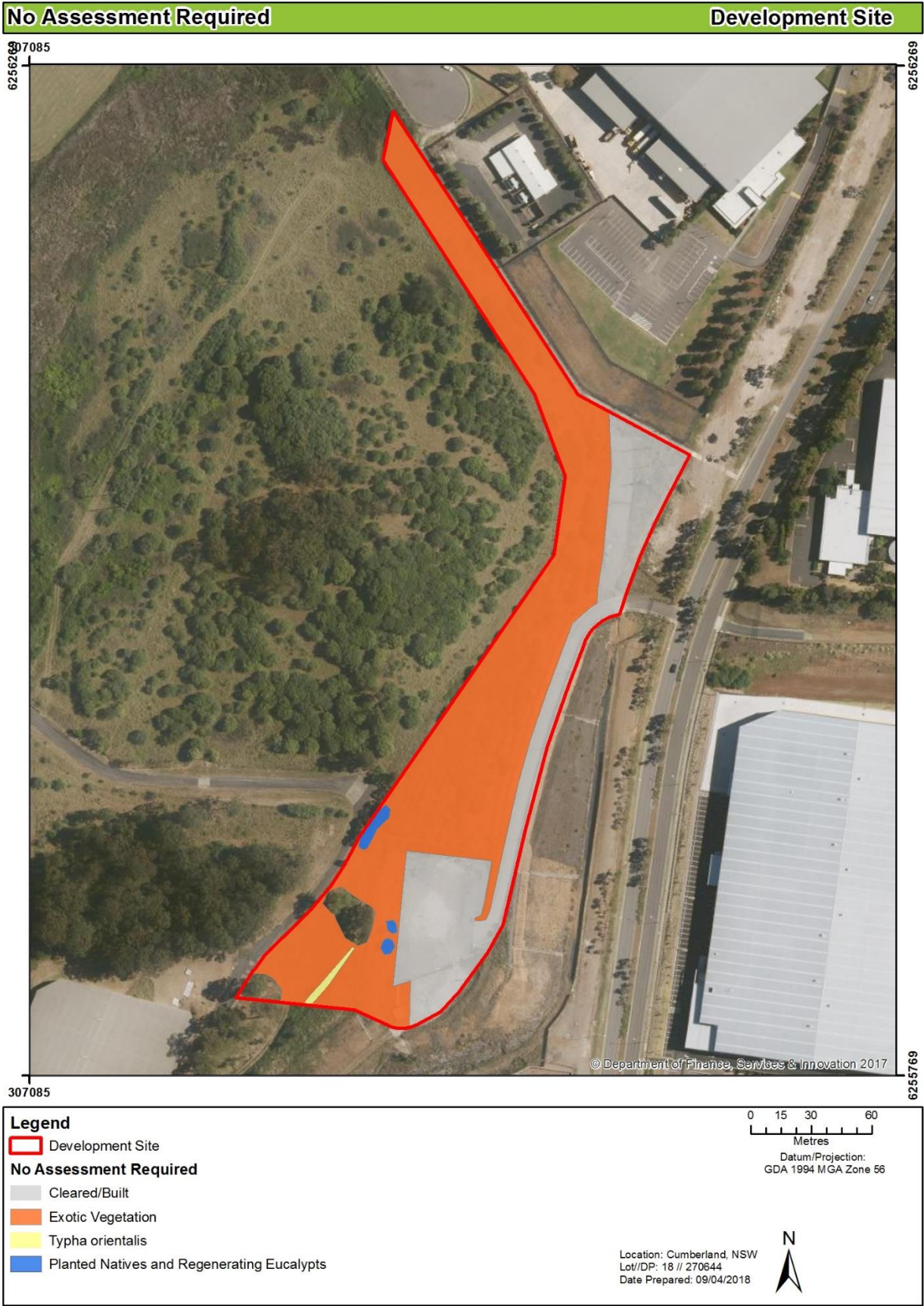


Figure 7: Impacts not requiring assessment

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Appendix A: Definitions

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Multiple fragmentation	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines

Terminology	Definition
impact development	
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤ 30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site..
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height < 5 cm within a vegetation zone.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.

Terminology	Definition
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B: Vegetation plot data

Table 27: Species matrix (species recorded by plot)

Stratum	Form	Species name	Common name	Exotic	High Threat Weed	PCT 849	
						Plot 1	
						Cover	Abundance
U	TG	<i>Eucalyptus tereticornis</i>	Forest Red Gum			10	2
M	SG	<i>Acacia implexa</i>	Hickory Wattle			0.2	2
G	OG	<i>Cayratia clematidea</i>	Native Grape			0.3	20
G	FG	<i>Centella asiatica</i>	Indian Pennywort			0.1	2
G	GG	<i>Cyperus gracilis</i>	Slender Flat-sedge			0.2	20
G	FG	<i>Einadia trigonos</i>	Fish weed			0.2	20
G	FG	<i>Oxalis perennans</i>				0.3	100
G	FG	<i>Einadia polygonoides</i>				0.1	2
G	GG	<i>Lomandra filiformis</i>	Wattle Mat-rush			0.2	1
G	GG	<i>Microlaena stipoides</i>	Weeping Meadow Grass			2	100
G		<i>Bidens pilosa</i>	Cobbler's Pegs	*	1	35	1000
G		<i>Chloris gayana</i>	Rhodes Grass	*	1	20	1000
G		<i>Cirsium vulgare</i>	Spear Thistle	*		0.2	20
G		<i>Conyza bonariensis</i>	Flax-leaf Fleabane	*		0.2	10
G		<i>Ehrharta erecta</i>	Panic Veldtgrass	*	1	3	100
G		<i>Eragrostis curvula</i>	African Love Grass	*	1	3	100
G		<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush	*		0.2	5
G		<i>Lantana camara</i>	Lantana	*	1	1	10
G		<i>Modiola caroliniana</i>	Red-flowered Mallow	*		0.5	50
G		<i>Senecio pterophorus</i>		*		10	100
G		<i>Sida rhombifolia</i>	Paddy's Lucerne	*		2	100
G		<i>Solanum linnaeanum</i>	Apple of Sodom	*		0.3	10
G		<i>Verbena bonariensis</i>	Purple Tops	*		15	200
G		<i>Vicia spp.</i>		*		0.1	5
G		<i>Melinis repens</i>	Red Natal Grass	*		2	100
G		<i>Ageratina adenophora</i>	Crofton Weed	*	1	0.5	5

Stratum	Form	Species name	Common name	Exotic	High Threat Weed	PCT 849
G		<i>Plantago lanceolata</i>	Plantain	*		0.2 20
G		<i>Trifolium repens</i>	White Clover	*		0.1 5
G		<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	*		0.1 2
G		<i>Nassella neesiana</i>	Chilean Needlegrass	*	1	1 50

- Tree (TG), Shrub (SG), Grass & Grasslike (GG), Forb (FG), Fern (EG), Other (OG)

Table 28: Vegetation integrity data (Composition, Structure and function)

Plot location					
Plot no.	PCT	Condition	Eastings	Northings	Bearing
1	849	Degraded	307247	6255862	210

Composition (number of species)

Tree	Shrub	Grass	Forb	Fern	Other
1	1	3	4	0	1

•

Structure (Total cover)

Tree	Shrub	Grass	Forb	Fern	Other
10	0.2	2.4	0.7	0	0.3

•

Function

Large Trees	Hollow trees	Litter Cover	Length Fallen Logs	Tree							High Weed	Threat Cover	
				5-		10-		20-		30-			
				Stem 9	Stem 19	Stem 29	Stem 49	Stem 79	Stem Regen				
1	0	42	0	0	1	0	0	1	1	63.5			

Appendix C: Plot photos



Plate 1: Plot 1 transect start



Plate 2: Plot 1 transect end

Appendix D: Biodiversity credit report



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id

00010404/BAAS17043/18/00010406

Assessor Name

Matthew Dowle

Proponent Names

Proposal Name

Greystanes

Assessor Number

0

Report Created

13/04/2018

Candidate Serious and Irreversible Impacts

No Data

No Data

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

BAM Biodiversity Credit Report (Like for like)

No Changes

Ecosystem Credit Summary

PCT	TEC	Area	Credits
849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.1	0.00

Credit classes for 849	Like-for-like options		
	Any PCT with the below TEC	Containing HBT	In the below IBRA subregions
	Cumberland Plain Woodland in the Sydney Basin Bioregion (including PCT's 849, 850)	Yes	Cumberland,Burraborang, 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

