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Biodiversity Assessment Report

Framework for Biodiversity Assessment

Lot 2 // DP 520158, 480 Argyle Street, Picton

Proposed Picton High School Redevelopment (SSD 8640)

Prepared for Billard Leece Partnership Pty Ltd

11 April 2018

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Glossary and abbreviations

Acronym	Description
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act 2016*
BCF	Biodiversity Conservation Fund
BCT	Biodiversity Conservation Trust
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DA	Development Application
DNG	Derived Native Grassland
DPE	NSW Department of Planning and Environment
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FBA	Framework for Biodiversity Assessment
ha	hectare(s)
IBRA	Interim Bioregionalisation of Australia
km	kilometre
masl	Metres above sea level
OEH	NSW Office of Environment and Heritage
PCT	Plant community type, as defined by OEH (2018)
SEARs	Secretary's Environmental Assessment Requirements
SPW	Shale Plains Woodland
SSD	State Significant Development
SSTF	Shale Sandstone Transition Forest
TEC	Threatened Ecological Community, listed as vulnerable, endangered or critically endangered under either the BC Act and/or EPBC Act
VIS	Vegetation Information System

1. Introduction

1.1 Background

This Biodiversity Assessment Report (BAR) has been undertaken to accompany a Development Application (DA) relating to the redevelopment of Picton High School, Argyle Street, Picton. The reconstruction will provide an additional capacity for 1500 students, with core facilities incorporated to accommodate 2000 students from Year 7 to Year 12. The building will be organised around the expansion and construction of core facilities as well as the construction of a new administration and special education facility. There will be a gymnasium, science labs, canteen, food technology kitchen, media and performing arts, design and technology & agricultural hubs.

The subject site for this BAR covers an area of 5.83 ha, which includes Lot 2 // DP 520158 (excluding the 0.075 ha of Roads and Maritime Services land) and the land within the proposed Wonga Road extension (**Figure 1.1**). An additional area of 0.438 ha is contained within the Argyle Street upgrade area. The RMS land within Lot 2 // DP 520158 and within the proposed Argyle Street upgrade area consist exclusively of infrastructure, including roads and a carpark and have been included as part of this assessment. However, these areas are not subsequently incorporated into the impact area calculations, as they will not result in the removal of native vegetation.

The proposed development is a State Significant Development (SSD), and as such Secretary's Environmental Assessment Requirements (SEARS) have been issued by the Department of Planning and Environment (DPE). The SEARs state the following regarding the assessment of biodiversity impacts:

> *Biodiversity impacts related to the proposed development are to be assessed and documented in accordance with the Framework for Biodiversity Assessment, by a person accredited in accordance with section 142B(1)(c) of the Threatened Species Conservation Act 1995.*

This BAR has been prepared by Lucas McKinnon, an Accredited BioBanking Assessor (No. 76) under Part 7A of the TSC Act, and is consistent with the Framework for Biodiversity Assessment (FBA) Office of Environment and Heritage (OEH 2014). This BAR, therefore, satisfies the requirements of the SEARs.

One native vegetation type was identified in the subject site and is consistent with Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain (PCT849). This community is a threatened ecological community (TEC) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) (NSW SC 2014) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (CoA 2010). Grey Box - Forest Red Gum grassy woodland is found along the eastern perimeter and in north eastern corner of the subject site. A majority of the site consist of cleared land 'exotic pasture/infrastructure', including ovals, buildings, footpaths and carparks. The vegetation present onsite mostly consists of planted 'non-indigenous', particularly surrounding the buildings in the west of the subject site.

Direct impacts to the ecological values of the development site are limited, as a majority of the development is associated with the refurbishment and construction of buildings in developed areas or will directly impact on cleared land 'exotic pasture/infrastructure' or planted 'non-indigenous' vegetation. Native vegetation along the southern and south-eastern boundary will be removed during construction of the temporary school in Stage 1 and as a result of the Wonga Road extension. The total amount of native vegetation proposed for removal to accommodate the temporary school and the Wonga Road extension is 0.16 ha.

The majority of vegetation along the eastern school boundary will be retained and protected during construction of adjacent structures for the temporary school. The native vegetation in the northeast will be modified through use of an education trail, playing fields and Agricultural Plot. The educational trail is proposed to meander through the native vegetation in the north east of the subject site. The education trail, playing fields and Agricultural Plot will not require the removal of native canopy species, although will modify the native groundlayer. The total impact area of the partially clearing for these components is 0.46 ha, which has been assessed using the FBA (OEH 2014).

The future management of the remaining native vegetation within the subject site is likely to be consistent with current management activities of grazing and/or mowing. This is likely to result in further impacts to the ecological values of the site, which may reduce the species richness, cover and abundance native groundlayer species. Furthermore, with an increased number of students, this area may be subject to increased foot traffic and trampling of native groundlayer and germinating midstorey species. As such, credits have been calculated based on a reduction in vegetation quality, rather than complete clearing.

Sources of information for this report included:

- NSW Planning Viewer (NSW Dept. of Planning and Environment 2018)
- BioNet Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2017x)
- Protected Matters Search Tool (Commonwealth Dept. of the Environment and Energy 2017)
- Native vegetation of the Cumberland Plain (NPWS 2002)
- Native Vegetation of South East NSW (Tozer et al. 2010)
- Remnant Vegetation of the western Cumberland subregion (OEH 2015)
- Soil Landscapes of Central and Eastern NSW (OEH 2017b).
- SIX Maps (LPI 2018)

Plot based vegetation survey data, which was collected in accordance with FBA (OEH 2014), were captured and used for this assessment. Targeted threatened species survey was not necessary due to the small amount of native vegetation onsite, which occurs in a degraded condition.

1.2 Location and site identification

This subject site for this BAR covers a total area of 5.83 ha and consists of Lot 2 // DP 520158, Argyle Street, Picton (**Figure 1.1**). The subject site includes the full extent of the planned building redevelopment works known as Picton High School (**Figure 1.2**). This includes the proposed works along Wonga Road, which will include the construction of a roundabout to allow access to the temporary school during the redevelopment. The subject site is bounded

by the Old Hume Highway to the west and Wonga Road to the east. It is situated approximately 215 metres above sea level (masl). The highest point of the site occurs on the south-western boundary. **Figure 1.3** contains the footprint of the proposed development.

Regional scale soil landscape mapping (OEH 2017b) maps the subject site within the Blacktown (bt) Residual (z) soil landscape. Soils of the Blacktown soil landscape are derived from Wianamatta Group shales, which occur extensively on the Cumberland Lowlands around Blacktown, Mount Druitt and Leppington. The Blacktown soil landscape has been mapped extensively through the suburb of Picton, where it transitions into the Hawkesbury formation in close proximity to major watercourses, such as the Nepean River (OEH 2017b).

1.3 Land use history

The subject site consists predominantly of cleared land 'exotic pasture/infrastructure' and planted 'exotic/non-indigenous' vegetation on land zoned R2 – Low Density Residential. The eastern perimeter and the north eastern corner of the subject site contains underscrubbed native vegetation with a *Eucalyptus* spp canopy. The native vegetation remaining onsite has been subject to underscrubbing, including the removal of shrubs species and the management of the groundlayer through ongoing grazing and/or mowing. This has reduced the resilience of the small amount of remaining native vegetation identified onsite.

To the north east of the subject site is Redbank Creek, which flows in Stonequarry Creek, and subsequently into the Nepean River. A habitat corridor runs from the subject site along the east of Coachwood Crescent and joins with the vegetation along Redbank Creek. The corridor consists of underscrubbed vegetation and provides minimal value for native fauna dispersing through the landscape. The land use surrounding the subject site consists of land zoned as R2 – Low Density Residential, RU2 – Rural Landscape, IN2 – Light Industrial and RE1 – Public Recreation.

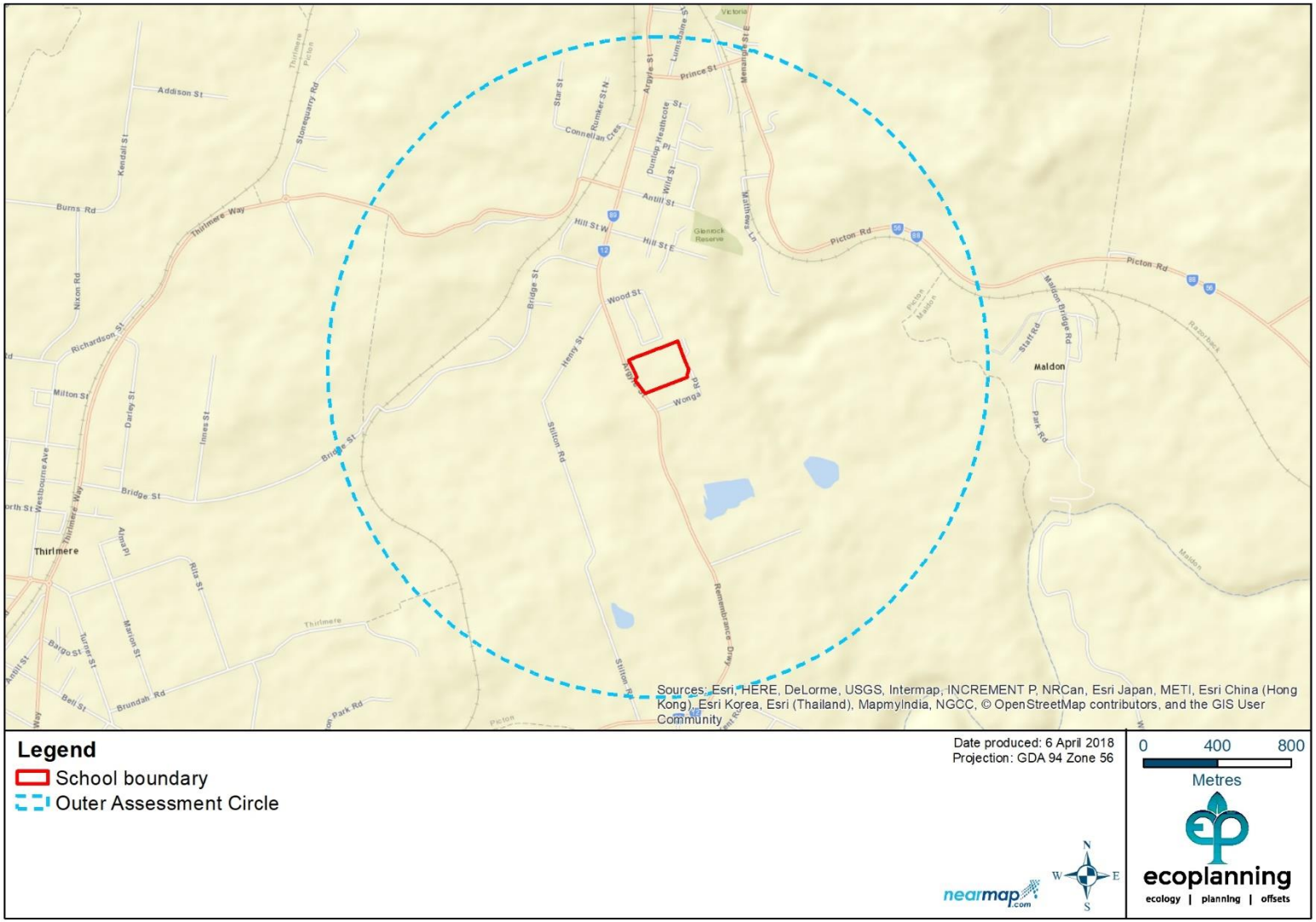

Figure 1.1: Subject site location.

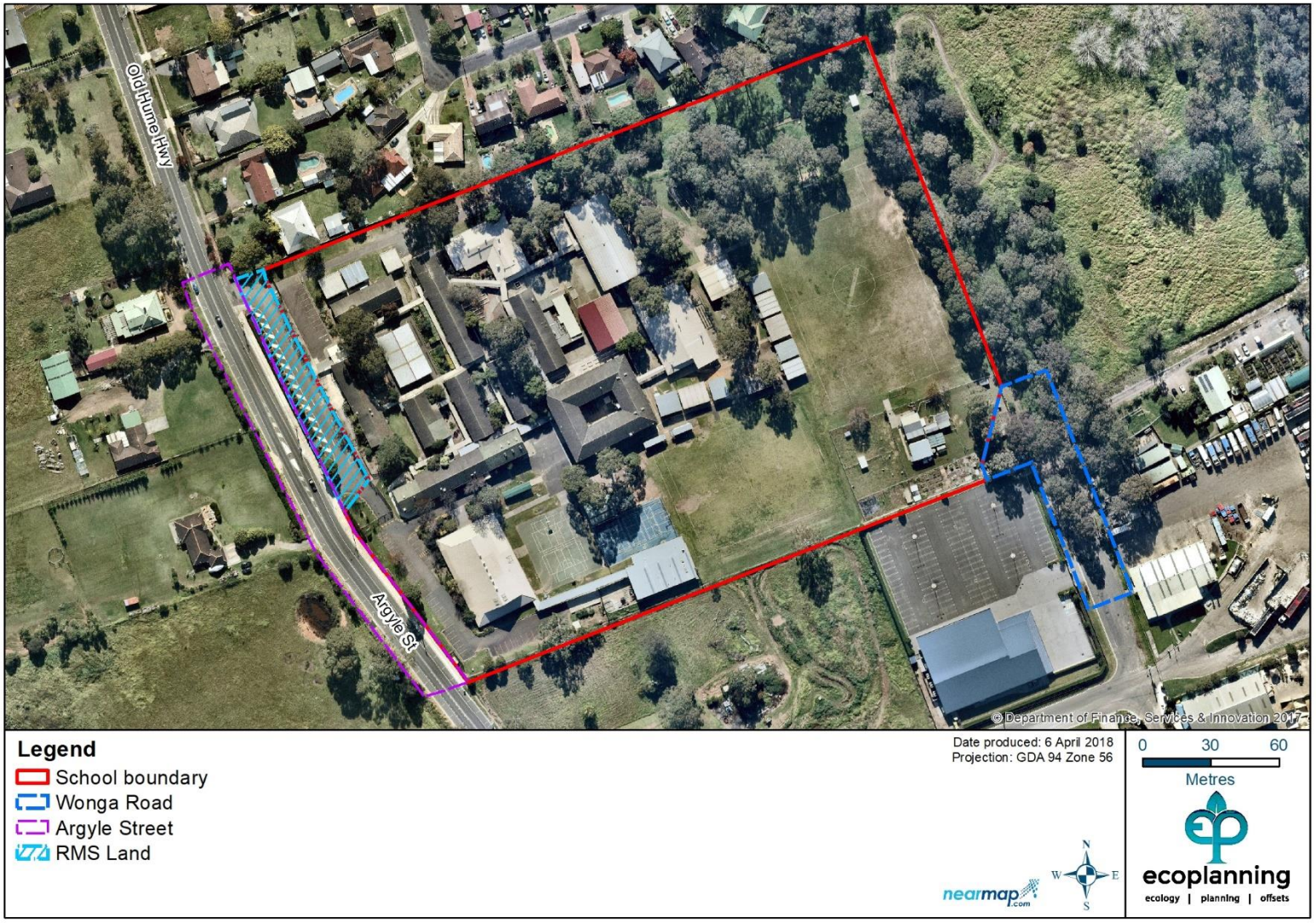

Figure 1.2: Site map.

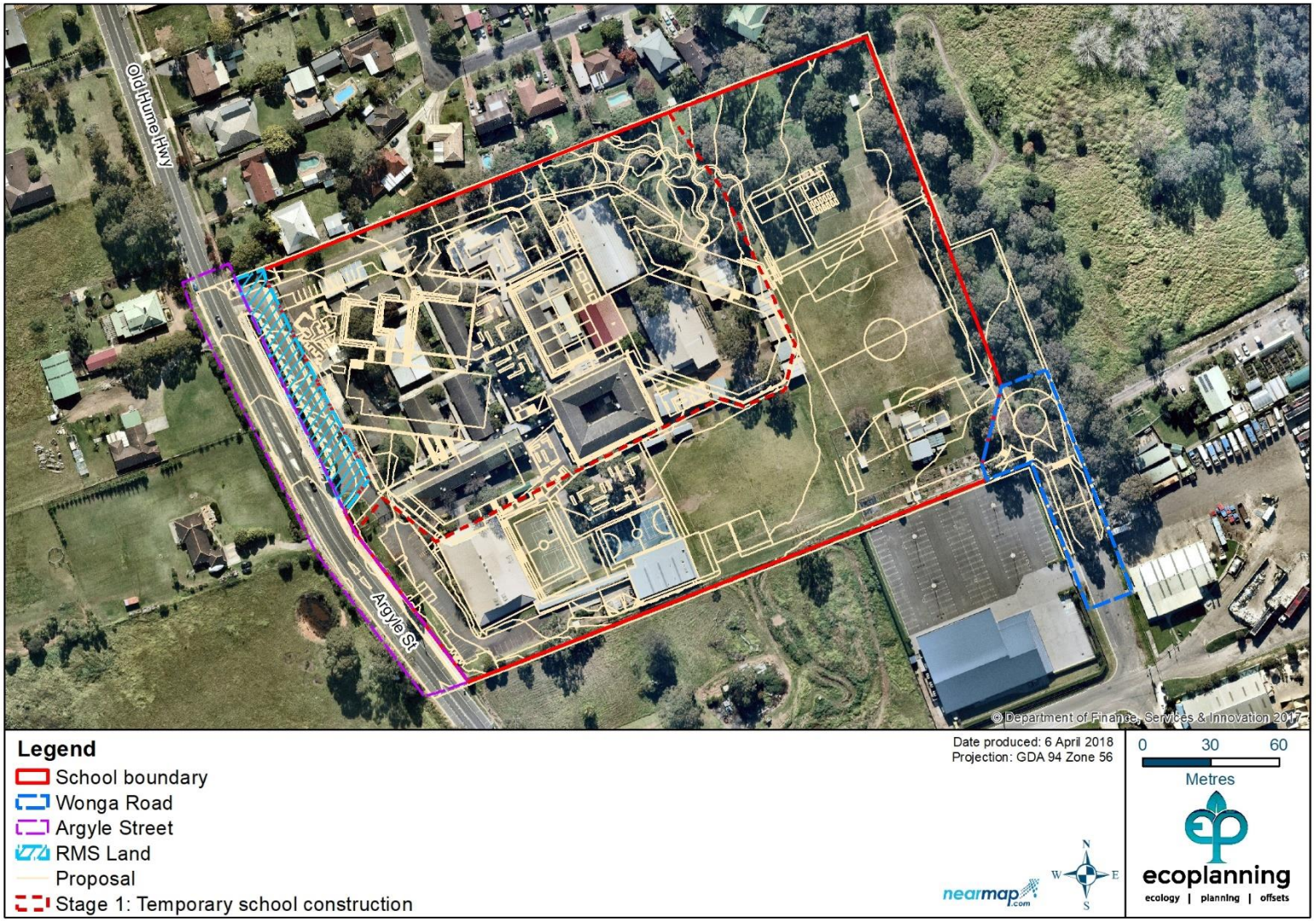

Figure 1.3: Proposed development footprint.

2. Landscape features

In accordance with the FBA, a number of features are assessed within and surrounding the subject site in order to describe the landscape features and to calculate the final landscape score. Provided below are details related to the Interim Bioregionalisation of Australia (IBRA) region and subregion, NSW landscape regions (Mitchell Landscapes), rivers, streams, estuaries and wetlands, surrounding native vegetation extent and the existence of state or regionally significant biodiversity values.

2.1.1 IBRA bioregions and IBRA subregions

The subject site and outer assessment circle is located entirely within the Cumberland IBRA subregion (Version 7) and within the NSW Sydney Basin IBRA region (version 7).

The Cumberland IBRA subregion was entered into the credit calculator.

2.1.2 NSW landscape regions (Mitchell Landscapes)

The subject site occurs in only one NSW Mitchell Landscape, being the Kurrajong Fault Scarp landscape (Mitchell Landscapes V3.1).

The landscapes Picton – Razorback Hills, Upper Nepean Gorges and Cumberland Plain also occur within the outer assessment circle. This is shown on the Locality Map (**Figure 2.1**) and area calculations for each landscape are shown in **Table 2.1**.

The Kurrajong Fault Scarp Mitchell Landscape was entered into the credit calculator due to it being the dominant Mitchell Landscape within the subject site – occupying 100.0% of the subject site.

Table 2.1: Mitchell Landscapes and areas.

Mitchell Landscape (ML)	Area of ML within outer assessment circle (ha)	Area of ML within subject site (ha)	% of subject site
Kurrajong Fault Scarp	564	5.83	100
Picton – Razorback Hills	163	0	0
Upper Nepean Gorges	207	0	0
Cumberland Plain	66	0	0
Total	**1000**	**5.83**	**100**

2.1.3 Rivers, streams and estuaries

There are no rivers, streams or estuaries identified within the subject site. A riparian assessment was conducted for the subject site using both desktop and field based methods.

An initial desktop assessment of mapped waterways was conducted for the subject site and surrounding lands. This assessment found that no mapped waterways are present on the subject site. The closest mapped waterway is Redbank Creek, situated approximately 250 m to the north of the subject site. Redbank Creek flows east into Stonequarry Ck which flows

east of the subject site into the Nepean River. Redbank Creek is a 4th order stream using the Strahler stream classification system (Strahler 1952). The site inspection identified no waterways or waterbodies within the subject site. A further assessment of waterfront or riparian land is, therefore, not required.

2.1.4 Local and important wetlands

There are no local or important wetlands within the 1,000 ha assessment circle.

2.1.5 Native vegetation extent

A layer of native vegetation cover is required for each assessment circle (100 ha and 1,000 ha) to assess the impact of the development to native vegetation. The extent of native vegetation on the subject site and immediate surrounds was mapped using the Remnant Vegetation of the western Cumberland subregion, 2013 Update (OEH 2015). Only high quality vegetation (category A, B or C) was used to assess vegetation in the assessment circles.

The native vegetation cover was mapped for both the 100 ha and 1,000 ha circles (**Figure 2.1**). The proposed footprint of the development will impact on 0.62 ha of native vegetation, and the calculations related to future native vegetation cover include this proposed impact.

2.1.6 State, regional and local biodiversity links

The site does not incorporate a state, regional or local biodiversity link.

2.1.7 Other landscape features

There are no other landscape features identified in the SEARs.

2.2 Landscape value score components

2.2.1 Percent native vegetation cover in the landscape

Consideration of the native vegetation within the inner and outer circles (**Figure 2.1**) and the impact of the development which would require the removal of 0.16 ha and partial impact of 0.46 ha of native vegetation, Table 9 in FBA (OEH 2014) was used to determine current and future scores for the percent native vegetation cover component of the landscape score. The results of the analysis are shown in **Table 2.2**. Due to the relatively minor amount of clearing proposed, no change in future score is recorded for this variable.

Table 2.2: Estimates of native vegetation and scores in the inner and outer assessment circles.

Assessment circle	Current (ha)	Current (%)	Current (score)	Future (ha)	Future (%)	Future (score)
Inner (100 ha)	22.87	21–25	3.75	22.25	21–25	3.75
Outer (1,000 ha)	182.48	16-20	5	181.86	16-20	5

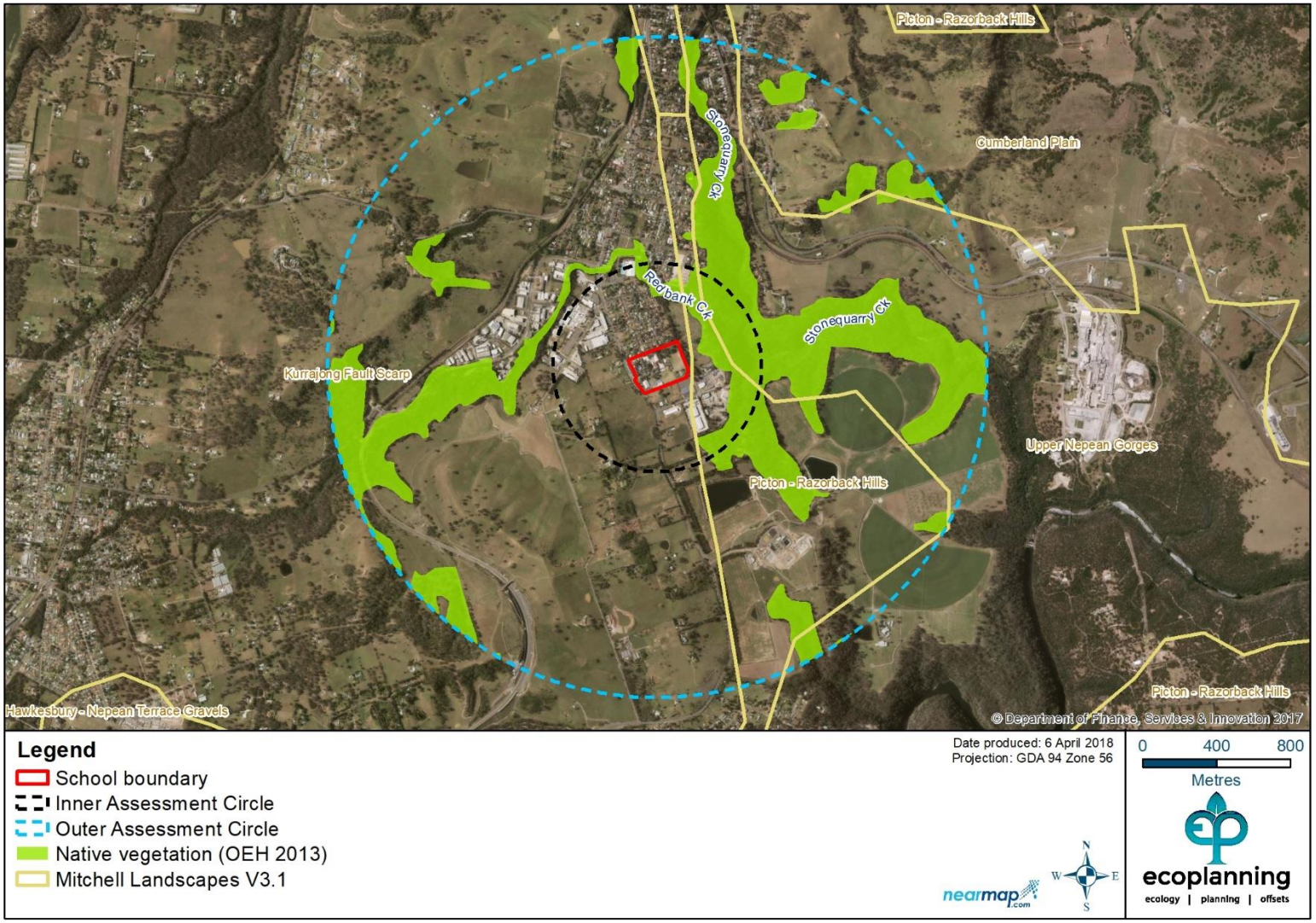

Figure 2.1: Location map.

2.2.2 Connectivity value

The subject site is not part of a State or Regionally Significant Biodiversity Link, as identified by the 'connectivity value classes' in Table 10 of Appendix 4 in the FBA (OEH 2014).

The subject site is poorly connected with a thin vegetation link running along the northern and eastern boundaries. This vegetation link connects to the riparian corridors along Redbank Creek and Stonequarry Creek which provide important vegetative links through the otherwise highly cleared and fragmented landscape. As no native canopy trees are proposed to be removed, no impacts to connectivity are expected. This includes no changes to either the minimum width, or the overall condition, of the link.

Based on the above the following was entered into the credit calculator:

- **Connectivity width:** < 5 m – 30 m before development and after development;
- **Connectivity over storey condition:** PFC at benchmark before development and after development;
- **Connectivity mid storey/ground cover condition:** PFC of mid-storey/ground cover at benchmark before development and after development.

As there was no change in the current or future connectivity scores, no score was recorded for this variable.

2.2.3 Patch size

Patch size as defined by the FBA as *'an area of native vegetation that:*

a) Occurs on the development site or offset site, and
b) Is in moderate to good condition, and
c) Includes native vegetation that has a gap of <100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody vegetation)

Patch size may extend onto adjoining land that is not part of the development site.'

Patch size was calculated for the vegetation on the development site using the field validated vegetation map, the regional vegetation mapping (OEH 2015) and aerial photography.

As the subject site is connected, albeit through degraded vegetation, to a large amount of contiguous vegetation extending along the riparian corridors, the total patch size calculated was the maximum required by the FBA (OEH 2014), being 1,001 ha. 1,001 ha was entered into the credit calculator resulting in a total patch size score of 12.

2.3 Landscape value score

Using the above data, the final landscape score was calculated to be **12** (**Table 2.3**).

Table 2.3: Landscape score components.

Landscape score component	Score Awarded
Change in connectivity score	0
Decrease in native vegetation cover (inner assessment circle) score	0
Decrease in native vegetation cover (outer assessment circle) score	0
Patch size area score	12
Total	**12**

3. Native vegetation

3.1 Plant community types (PCTs) and threatened ecological communities

Desktop assessment determined that the subject site is not mapped under the regional vegetation mapping by OEH (2013) (**Figure 3.1**) and Tozer et al. (2006) (**Figure 3.2**). Shale Sandstone Transition Forest (SSTF) (High Sandstone Influence) (MU2) and Western Sandstone Gully Forest (MU33) are mapped approximately 100-200 m to the east of the subject site (OEH 2015). The extent of SSTF mapped by OEH (2013) reflects the extent of Cumberland Shale Sandstone Transition Forest mapped by Tozer et al. 2010 (p.2). These two communities are comparable, and both constitute the Critically Endangered Ecological Community (CEEC) Shale Sandstone Transition Forest in the Sydney Basin Bioregion listed under the EPBC and the BC Act.

Field assessment identified the native vegetation in the subject site as Shale Plains Woodland (SPW) (**Figure 3.3**). The community was mapped to occur along the eastern perimeter and in the north eastern corner of the subject site. Shale Plains Woodland is a component of 'Cumberland Plain Woodland in the Sydney Basin Bioregion' ecological community, which is listed as a CEEC under the EPBC and the BC Acts. Shale Plains Woodland is equivalent to the Plant Community Type (PCT), *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain* (HN528, PCT849) (OEH 2018).

Two distinct condition classes of SPW occur in the subject site, including 'underscrubbed' and 'derived native grassland' (DNG). Due to past clearing, grazing and mowing the 'underscrubbed' SPW consists of scattered mature – over mature canopy trees with no midstorey and a modified groundlayer. Nevertheless, the 'underscrubbed' vegetation retains a reasonable richness of native plants and a high cover of native grasses, such as *Microlaena stipoides* subsp. *stipoides* (Weeping Grass). The SPW in a 'DNG' condition has no established canopy or midstorey species and mostly consists of heavily grazed *Microlaena stipoides* var. *stipoides.*

Planted 'exotic/non-indigenous' and cleared land/infrastructure constitute 5.21ha, or 89.30% of the development site. Native vegetation occupies 10.70% of the site, with Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain mapped over 0.62 ha. The two condition classes of this native vegetation community are displayed in **Table 3.1**.

Table 3.1: Vegetation types and zones, a description and the total area within the development site.

Vegetation type (NPWS 2002)	Plant community type (OEH 2016)	Threatened ecological communities	Condition	Area (ha)	Proportion of development site (%)
Shale Plains Woodland	PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain	Y	Underscrubbed	0.51	8.79%
			DNG	0.11	1.91%

Vegetation type (NPWS 2002)	Plant community type (OEH 2016)	Threatened ecological communities	Condition	Area (ha)	Proportion of development site (%)
Other vegetation	N/A	N/A	Planted 'non-indigenous/exotic'	0.76	13.07%
	N/A	N/A	Cleared land 'exotic pasture/ infrastructure'	4.44	76.23%
Total				**5.83**	**100**

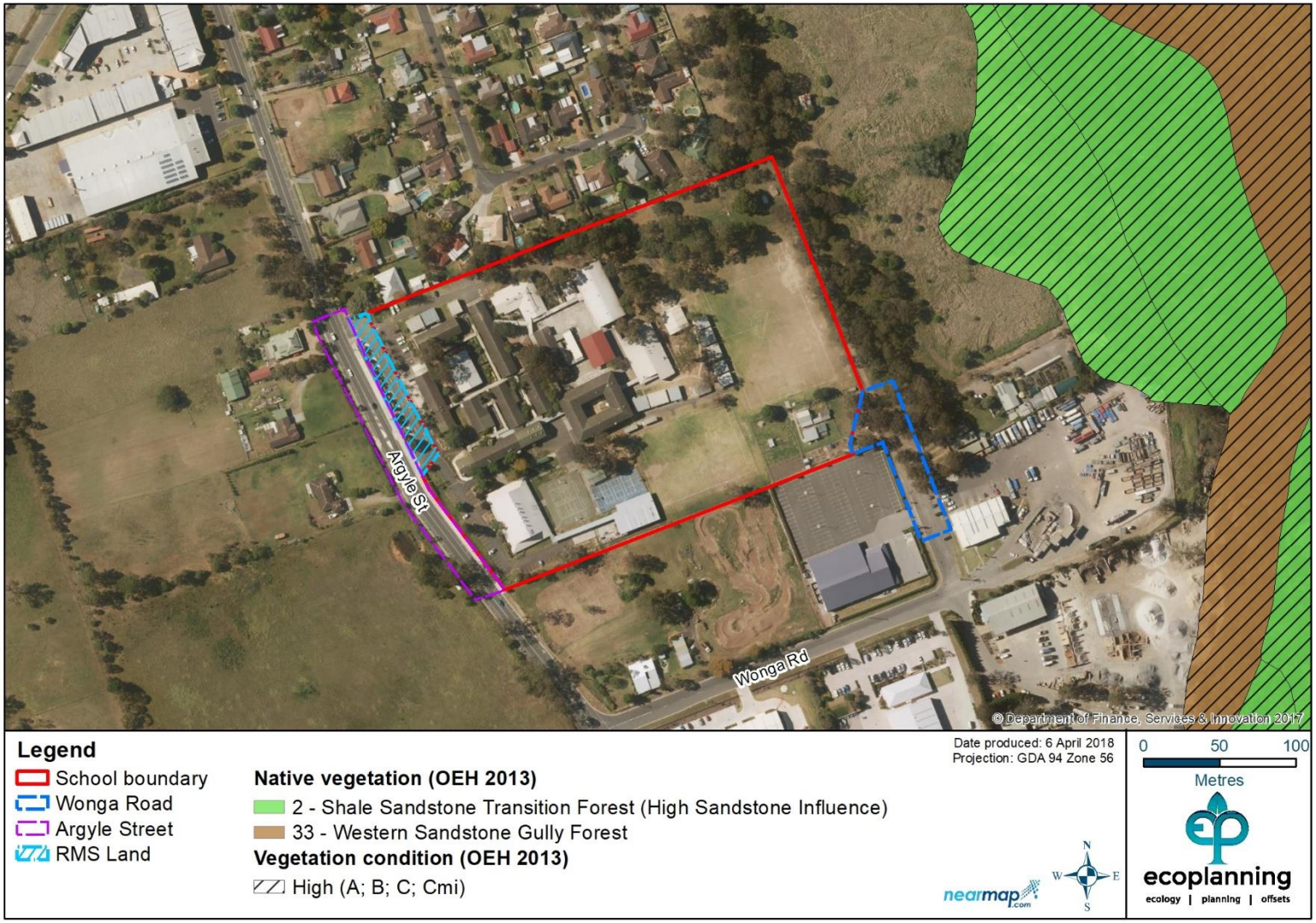

Figure 3.1: Vegetation communities (OEH 2013).

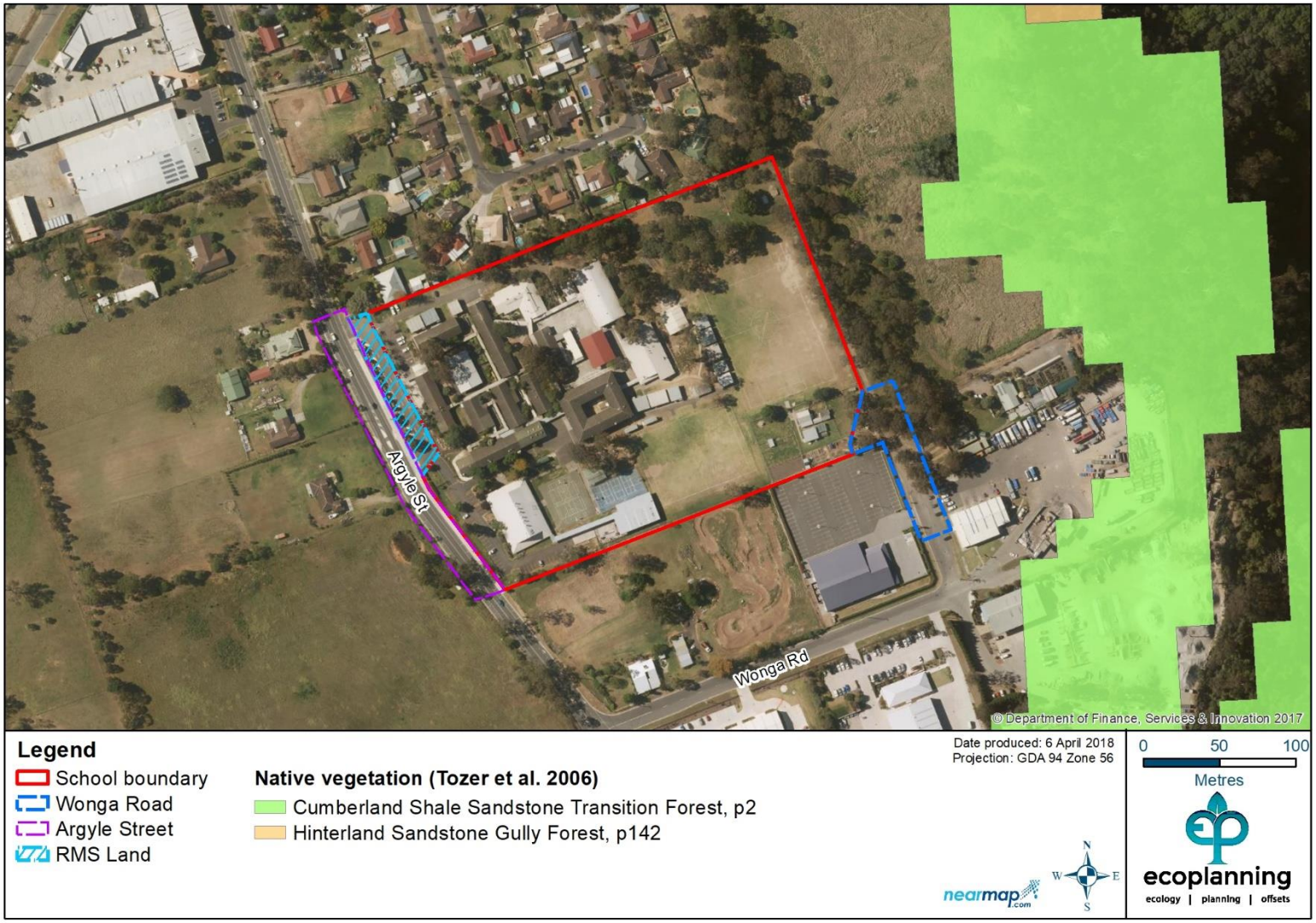

Figure 3.2: Vegetation communities (Tozer et al 2006).

Figure 3.3: Field validated vegetation (Ecoplanning 2017).

3.1.1 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (HN528; PCT849)

This vegetation type is located in the north eastern corner and along the eastern boundary of the development site (**Figure 3.3**). It is characterised by mature and over-mature canopy species, including *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus eugenioides* (Thin-leaved Stringybark). Past vegetation clearing and ongoing mowing and/or grazing has removed the midstorey and suppressed the establishment of native groundlayer species. This is the only native vegetation type within the development site and has been mapped in two condition classes, 'underscrubbed' (**Figure 3.4**).and 'DNG' (**Figure 3.5**).

The two condition classes of the vegetation type both lack midstorey species, such as *Bursaria spinosa* subsp. *spinosa*, which is typically a common species in the vegetation type. The groundlayer contains native groundcovers and grasses, including *Carex inversa*, *Convolvulus erubescens* (Blushing Bindweed), *Dichondra repens* (Kidney Weed), *Microlaena stipoides* var. *stipoides* (Weeping Grass) and *Solanum prinophyllum* (Forest Knightshade). Exotic grasses and herbaceous weeds are abundant and constitute a reasonable proportion of the groundlayer, particularly in the 'underscrubbed' vegetation along the eastern boundary of the subject site. Dominant exotics species include *Axonopus fissifolius** (Carpet Grass), *Senecio madagascariensis** (Fireweed), *Paronychia brasiliana** (Chilean Whitlow Wort), *Sporobolus africanus** (Parramatta Grass), *Paspalum dilatatum** (Paspalum) and *Modiola caroliniana** (Red-flowered Mallow).

A summary of the PCT profile for this vegetation type in the Vegetation Information System (VIS) (OEH (2018) is provided in **Table 3.2**. Species recorded onsite within this patch are highlighted in **bold text**. It is noted that the assemblage of native species in the upper, lower and ground stratum is less species rich than what is typical of Grey Box - Forest Red Gum. This is mostly due to the fragmented condition of the vegetation in the subject site and ongoing disturbances, including with mowing, trampling and grazing of livestock.

Figure 3.4: Shale Plains Woodland 'underscrubbed' along the eastern boundary of the subject site.

Figure 3.5: Shale Plains Woodland 'DNG' in the north east of the subject site.

Table 3.2: VIS plant community type profile (OEH 2018) – Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (HN528; PCT849).

Plant community type (PCT)	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
PCT and BioMetric veg type (BVT) ID	PCT 849 / BVT: HN528
Vegetation formation	Grassy Woodlands
Vegetation class	Coastal Valley Grassy Woodlands
Upper stratum	*Eucalyptus moluccana* (Grey Box) and ***Eucalyptus tereticornis*** **(Forest Red Gum)**
Middle stratum	*Bursaria spinosa* subsp. *spinosa* (Native Blackthorn)
Ground stratum	***Dichondra repens*** **(Kidney Weed)**, *Cheilanthes sieberi* subsp. *sieberi* (Rock Fern), *Aristida vagans* (Threeawn Speargrass), ***Microlaena stipoides*** **var. *stipoides* (Weeping Grass)**, *Themeda australis* (Kangaroo Grass), *Brunoniella australis* (Blue Trumpet), *Desmodium gunnii* (Slender Tick-trefoil), *Opercularia diphylla* (Stinkweed), ***Wahlenbergia gracilis*** **(Sprawling Bluebell)**, *Dichelachne micrantha* (Shorthair Plumegrass), *Paspalidium distans, Eragrostis leptostachya* (Paddock Lovegrass), *Lomandra filiformis* (Wattle Matt-rush), *Lomandra multiflora* (Many-flowered Mat-rush), *Dianella longifolia* (Blueberry Lilly), ***Oxalis perennans***, *Euchiton sphaericus* (Star Cudweed), *Goodenia hederacea* (Ivy Goodenia), *Aristida ramosa* (Purple Wiregrass), *Arthropodium milleflorum* (Pale Vanilla-lilly), *Austrodanthonia tenuior* (Wallaby Grass), *Cymbopogon refractus* (Barbed Wire Grass) and *Echinopogon caespitosus* (Bushy Hedgehog-grass)
Landscape position	Occurs on clay/loam soils derived from Wianamatta Shales on the Cumberland Plain at low altitudes (mainly below 150m).
Profile source	GW p29 (Tozer et al. 2006)
Full reference details	Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C., 2010. Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0.
Estimate remaining pre-European extent rounded to nearest 5%	5
TEC Name (Listing status)	BC Act: Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC) EPBC Act: Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC)

3.1.2 Other vegetation

Two other distinct vegetation assemblages are recorded within the development site, but none are remnant native vegetation types. These vegetation assemblages include:

Cleared land 'exotic pasture/infrastructure'

This zone consists of cleared land dominated by exotic grasses and herbaceous weeds, including *Cynon dactylon** (Cooch), *Sporobolus africanus** and *Axonopus fissifolius** (**Figure 3.6**). A majority of the zone consists of the two ovals that are situated in the east of the. All 'hard' surfaces within the development site, including buildings, roads, parking lots and all additional infrastructure associated with the campus are included in this zone.

Planted 'exotic/non-indigenous'

Also included in this zone are areas consisting of non-indigenous plantings and exotic species, which are either planted or have self-recruited (**Figure 3.7**). Dominant canopy species include *Eucalyptus microcorys*# (Tallowwood), *Eucalyptus citriodora*# (Lemon-scented Gum), *Lophostemon confertus*# (Brush Box) and *Quercus robur** (English Oak). Shrub species, including *Westringia fruticosa*# (Coastal Rosemary), *Callistemon viminalis*# (Weeping Bottlebrush), *Juniperinus conferta** (Japanese Shore Juniper) and *Photinia serratifolia** (Chinese Photinia) are planted through the site, particularly in close proximity to the buildings.

Figure 3.6: Cleared land 'exotic pasture/infrastructure' in the development site.

Figure 3.7: Planted 'exotic/non-indigenous' vegetation in the development site.

3.2 Vegetation zones

3.2.1 Condition classes, subcategories and areas

The PCT identified within the development site was classified into vegetation zones for credit calculation purposes. Based on the condition of the native vegetation in the development site, two vegetation zones were initially mapped for the Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain*, Sydney Basin Bioregion*, which has been mapped in the north east of the subject site and along the site eastern perimeter. The two vegetation zones were 'underscrubbed' and derived native grassland (DNG). Due to the total area of DNG mapped being than <0.25 ha (total is 0.11 ha), and the fact a plot and transect could not be located within the zone due to its shape and size, the DNG condition has been combined with the underscrubbed condition into a single vegetation zone and was assessed as Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate / Good) for credit calculation purposes.

The vegetation zone was then split into two management zones, based on the future management of the native vegetation (refer to **Section 6.2.2**). **Figure 3.8** shows the spatial arrangement of the vegetation zone within the development site and associated plots and transects. **Table 3.3** describes the vegetation zone mapped and total impacts.

Figure 3.8: Vegetation zones and plot and transect locations.

Table 3.3: Vegetation zones.

Plant community type	Condition	Ancillary code	Total impact on vegetation zone (ha)	Total impact entered into credit calculator (ha)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate / Good	Underscrubbed and DNG	0.62	0.62

^ Note: due to the total area of DNG mapped being than <0.25 ha (total is 0.11 ha), the DNG condition has been combined with the underscrubbed condition into a single zone and was assessed as Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain , Sydney Basin Bioregion (Moderate / Good) for credit calculation purposes.

3.2.2 Plots and transects

Two plot and transects surveys were completed on site to cover the variation in native vegetation condition within the site. Only one plot was required to satisfy the requirements of the FBA (see **Appendix A** for field data sheet). One plot and transect was situated in the north eastern patch of Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain*, Sydney Basin Bioregion* 'underscrubbed' condition class, and the other was situated along the sites eastern boundary (also mapped as the 'underscrubbed' condition class) (**Figure 3.8**, **Table 3.4**).

Table 3.4: Plot and transect results.

Plot ID	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing
BB01	15	13.50	0.00	90.00	0.00	24.00	6.00	0	0.00	0.00	279661	6213782
BB02	12	23.50	0.00	16.00	0.00	10.00	78.00	0	0.00	0.00	279764	6213713

3.2.3 Current and future site value scores

The site value score recorded for the vegetation zone assessed is 21.01 / 100. This vegetation zone has been divided into two management zones to address the different future use of the native vegetation in the subject site. For details of management zones, refer to **Section 6.2.2**.

4. Threatened species

4.1 Identifying threatened species for assessment

4.1.1 Ecosystem credit species

Ecosystem credit species are predicted based on habitat surrogates, and a number of ecosystem credit species are predicted on site. The ecosystem credit species predicted on site are provided in **Table 4.1**.

Table 4.1: Ecosystem credit species predicted on site.

Common name	Scientific name	Threatened species offset multiplier
Barking Owl	*Ninox connivens*	3
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis* subsp. *gularis*	1.3
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus* subsp. *victoriae*	2
Bush Stone-curlew	*Burhinus grallarius*	2.6
Diamond Firetail	*Stagonopleura guttata*	1.3
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	2.2
Eastern Freetail-bat	*Mormopterus norfolkensis*	2.2
Flame Robin	*Petroica phoenicea*	1.3
Gang-gang Cockatoo	*Callocephalon fimbriatum*	2
Greater Broad-nosed Bat	*Scoteanax rueppellii*	2.2
Hooded Robin (south-eastern form)	*Melanodryas cucullata* subsp. *cucullata*	1.7
Little Eagle	*Hieraaetus morphnoides*	1.4
Little Lorikeet	*Glossopsitta pusilla*	1.8
Masked Owl	*Tyto novaehollandiae*	3
Painted Honeyeater	*Grantiella picta*	1.3
Powerful Owl	*Ninox strenua*	3
Scarlet Robin	*Petroica boodang*	1.3
Speckled Warbler	Chthonicola sagittata	2.6
Spotted Harrier	*Circus assimilis*	1.4
Spotted-tailed Quoll	*Dasyurus maculatus*	2.6
Square-tailed Kite	*Lophoictinia isura*	1.4

Common name	Scientific name	Threatened species offset multiplier
Swift Parrot	*Lathamus discolor*	1.3
Turquoise Parrot	*Neophema pulchella*	1.8
Varied Sittella	*Daphoenositta chrysoptera*	1.3
Yellow-bellied Glider	*Petaurus australis*	2.3
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	2.2

4.1.2 Species credit species

Geographic and habitat features

Species credit species are predicted following assessment of geographic and habitat features in the credit calculator, such as site location (IBRA subregion), PCTs and condition, patch size and the area of surrounding vegetation within the 1,000 ha circle. **Table 4.2** provides the answer to each question for the development site. Where the answer is 'yes', the species is retained in the assessment.

Question: *Do any of the following features occur on the area to be assessed? Tick the box wherever the feature occurs, or is likely to occur in the area to be assessed. Leave blank if the feature does not occur*.

Table 4.2: Assessment of geographic/habitat features.

Common name	Scientific name	Feature	Impact?
Cumberland Plain Land Snail	Meridolum corneovirens	land containing bark or leaf litter accumulation	no
Large-eared Pied Bat	Chalinolobus dwyeri	land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels	no
Green and Golden Bell Frog	Litoria aurea	land within 100 m of emergent aquatic or riparian vegetation	yes
Hypsela sessiliflora	Hypsela sessiliflora	Wet and damp areas only.	no
Camden White Gum	Eucalyptus benthamii	alluvial soils	no

Table 4.3 provides the list of species credit species identified by the Tool as 'candidate species'. In accordance with Section 6.5.1.3(a) of the FBA, each species was assessed to determine whether the species is likely to occupy the site based on habitat features and quality.

To do this threatened species, populations and migratory species recorded within 5 km of the development site (the locality) were obtained from a search of the Atlas of NSW Wildlife (OEH 2017) and their likelihood of occurrence was assessed by:

- review of location and date of recent (<5 years) and historical (>5-20 years) records
- review of available habitat within the development site and surrounding areas
- review of the scientific literature pertaining to each species and population
- applying expert knowledge of each species

The potential for each threatened species, population and/or migratory species to occur was then considered following review of available habitat within the development site. The potential for species to utilise the site and to be affected directly or indirectly by the proposed action were considered as either:

- "Recent record" = species has been recorded in the development site within the past 5 years
- "High" = species has previously been recorded in the development site (>5 years ago) or in close proximity (for mobile species), and/or habitat is present that is likely to utilised by a local population
- "Moderate" = suitable habitat for a species is present onsite but no evidence of a species detected and relatively *high* number of recent records (5-20 years) in the locality or species is highly mobile
- "Low" = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively *low* number of recent records in the locality
- "Not present" – suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the development site

The likelihood of occurrence assessment (**Appendix B**) determined all of the candidate species (listed in **Table 4.3**) as "not present" or to have a 'low' likelihood of occurring in the subject site. The assessment of likelihood corresponds to 6.5.1.4 of the FBA (OEH 2014), which states that "*a candidate species that is not considered to be present on the development site in accordance with Paragraph 6.5.1.3 does not require further assessment*".

Only four of the 18 candidate species have been recorded in the locality (5 km) in the past 20 years, including *Phascolarctos cinereus* (Koala), *Cynanchum elegans*, *Persoonia bargoensis* (Bargo Geebung) and *Pimelea curviflora* subsp. *curviflora*. Therefore, the remaining 14 candidate species are not considered to present on the development site in accordance with 6.5.1.3 (d) of the FBA (OEH 2014).

Field assessment determined the subject site to contain a small amount of native vegetation in a substantially degraded condition to determine that the candidate species as 'not present' or having a low likelihood of occurring in the subject site, including the four candidate species recorded in the locality (consistent with Section 6.5.1.3 (a) of the FBA (OEH 2014). Nevertheless, inspections for threatened flora species were conducted in the areas of the site containing native vegetation, all of which are heavily modified and grazed/mown (**Figure 4.1**). No individuals were identified.

Table 4.3: Species credit species requiring further assessment.

Common name	Scientific name	TS offset multiplier	Candidate species for further assessment (Y/N)?
Flora			
Bargo Geebung	*Persoonia bargoensis*	7.7	N – Removed consistent with Section 6.5.1.3 (a) of the FBA
Bynoe's Wattle	*Acacia bynoeana*	7.7	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Dillwynia tenuifolia	*Dillwynia tenuifolia*	1.8	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Dillwynia tenuifolia (a shrub) population, Kemps Creek	*Dillwynia tenuifolia* - endangered population Kemps Creek	1.4	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Downy Wattle	*Acacia pubescens*	1.9	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Juniper-leaved Grevillea	*Grevillea juniperina* subsp. *juniperina*	2	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Marsdenia viridiflora subsp. *viridiflora* in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	*Marsdenia viridiflora* subsp. *viridiflora* - endangered population	4	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Matted Bush-pea	*Pultenaea pedunculata*	1.5	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Pimelea curviflora subsp. *curviflora*	*Pimelea curviflora* subsp. *curviflora*	7.7	N – Removed consistent with Section 6.5.1.3 (a) of the FBA
Spiked Rice-flower	*Pimelea spicata*	2.6	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Sydney Plains Greenhood	*Pterostylis saxicola*	4	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
White-flowered Wax Plant	*Cynanchum elegans*	1.4	N – Removed consistent with Section 6.5.1.3 (a) of the FBA
Fauna			
Eastern Pygmy-possum	*Cercartetus nanus*	2	N – Removed consistent with Section 6.5.1.3 (d) of the FBA

Common name	Scientific name	TS offset multiplier	Candidate species for further assessment (Y/N)?
Gang-gang Cockatoo population, Hornsby and Ku-ring-gai Local Government Areas	*Callocephalon fimbriatum* population in the Hornsby and Ku-ring-gai Local Government Areas	2	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Green and Golden Bell Frog	*Litoria aurea*	2.6	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Koala	*Phascolarctos cinereus*	2.6	N– Removed consistent with Section 6.5.1.3 (a) of the FBA
Regent Honeyeater	*Anthochaera phrygia*	7.7	N – Removed consistent with Section 6.5.1.3 (d) of the FBA
Squirrel Glider	*Petaurus norfolcensis*	2.2	N – Removed consistent with Section 6.5.1.3 (d) of the FBA

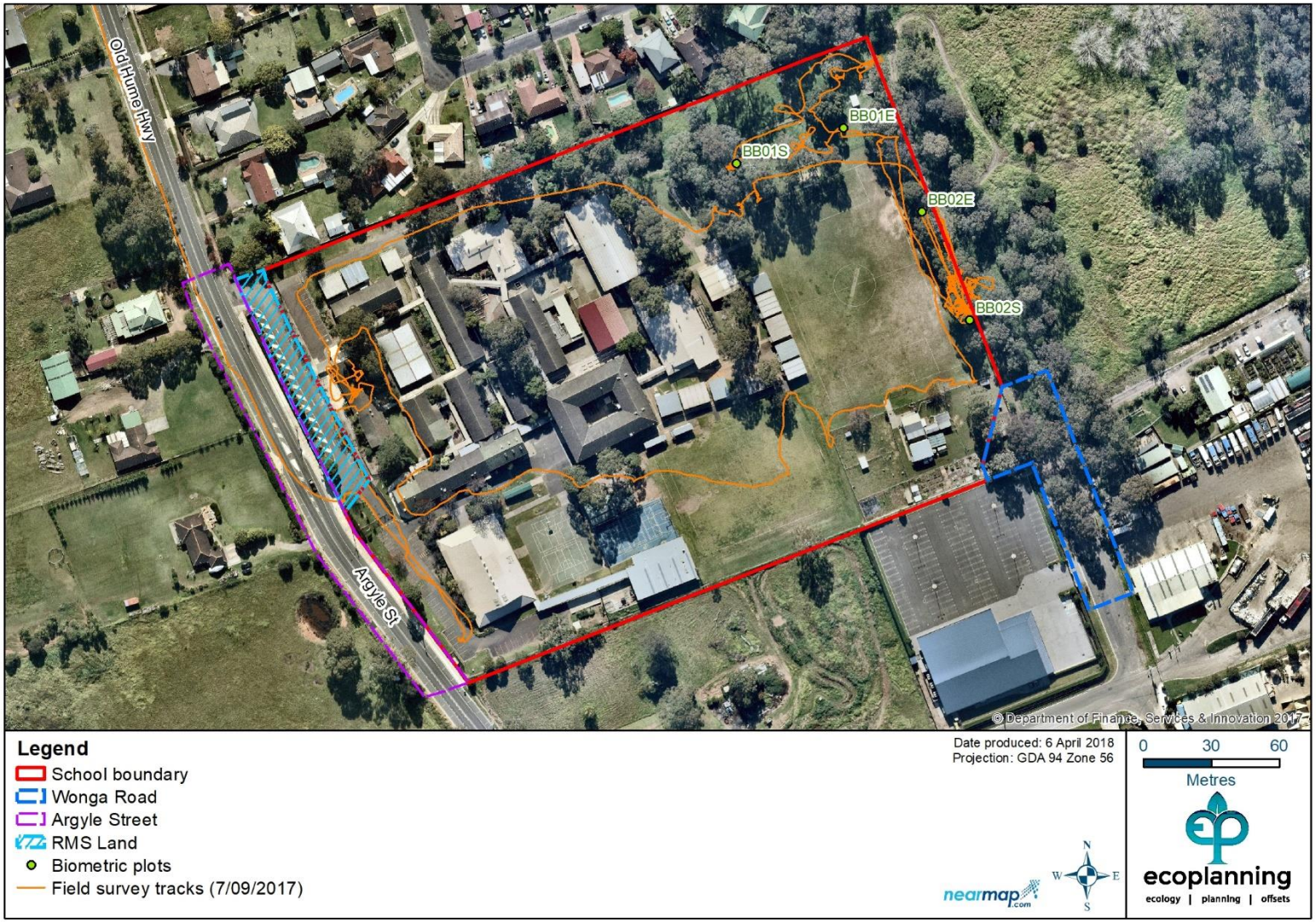

Figure 4.1: Targeted survey effort.

5. Avoid and minimise impacts on biodiversity values

The following section sets out the assessment of direct and indirect impacts on biodiversity values at the development site. This is set out in accordance with Section 8 of the FBA (OEH 2014). The reporting requirements are set out in accordance to Appendix 9 of the FBA (OEH 2014).

5.1 Assessment of direct and indirect impacts

5.1.1 Direct impact – vegetation clearing

The proposed development will mostly consist of the demolition of various existing buildings and the construction of new core facilities and will mostly be confined to the western portion of the subject site (**Figure 5.1**). Therefore, the development will not require the removal of native vegetation located in the north eastern corner or along the eastern perimeter of the site.

A temporary schooling area will be established in the south east of the subject site during the construction stage. The removal of 0.16 ha of native vegetation will be necessary to accommodate the temporary schooling structures and the Wonga Road extension, which will include a roundabout extending into the school boundary. This area has been given a future site score of 0.

A modification of vegetation condition will occur to native vegetation as a result of the installation of a proposed educational trail, Agricultural Plot and playing fields. Approximately 0.46 ha of native vegetation would be modified through loss of native groundcover and a potential increase in weed species. No native midstorey species are present in the area and the removal of canopy trees will not be necessary.

The native vegetation in the north east of the subject sites has been designated as an agricultural and environmental learning area. Historically, this area has been heavily underscrubbed and has been grazed by livestock, including sheep. As such, it is anticipated that the future management of this area will be consistent with past uses and is unlikely to substantially reduce the overall condition of the vegetation. Nevertheless, the condition class of several of the metrics have been reduced to account for the potential reduction of number of native species and native groundcover and the increase in weed species, which is likely to be impacted as a result of increased use of the area.

The underscrubbed native vegetation along the eastern and southern boundaries of the subject site is situated adjacent to the oval. This area has been managed by regular mowing, which has prevented the establishment of a native midstorey. The future management of this area will likely include regular mowing, which is consistent with past practices. However, it is anticipated that the area may be subject to regular foot traffic and disturbances as a result of the proposed redevelopment, and therefore increased student numbers. Therefore, the condition class of several of the metrics have been reduced to the same values discussed above.

Table 5.1 Area of each vegetation type directly impacted within the development site.

Vegetation type	Vegetation zone (condition class)	Total area partially impacted (ha)	Total area directly impacted (ha)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Underscrubbed	0.35	0.16
	DNG	0.11	0
	Total	**0.46**	**0.16**

Completely avoiding impacts to native vegetation within the development site is, in this case, not considered feasible. The educational trail, Agricultural Plot and playing fields will not require the removal of native canopy species and will mostly result in the modification of a disturbed ground layer, which contains a low species richness of native grasses and forbs. Furthermore, the current location of the educational trail is situated in such a way to increase the student's interaction with the natural environment.

5.1.2 Direct impact – Loss of fauna habitat

The proposal will require the removal of approximately seven native canopy trees, therefore potential foraging, perching and sheltering habitat will be largely retained within the subject site. The likelihood of threatened fauna utilising the study is low based on site assessment, expert opinion and analysis of the likelihood of occurrence from Atlas records over the past 20 years (see **Section 4.1** and **Appendix B**).

5.1.3 Indirect impacts

It is difficult to quantify indirect impacts of the proposed development, but these may include impacts such as erosion and water quality impacts that may be associated with the construction phase of the project. These impacts will be managed through the development of a Construction Environmental Management Plan. Given the already highly modified nature and present land use of the subject site, indirect impacts from the proposal are minor and, with appropriate controls in place, have a very low likelihood to occur.

The site is already predominantly developed with significant areas of buildings, concrete walkways and car parks already in place. As this proposal predominantly involves the refurbishment and reconstruction of existing buildings, indirect impacts to native vegetation are not expected and are considered to be negligible or non-existent.

Figure 5.1: Field validated vegetation (Ecoplanning 2017) and proposed footprint.

5.2 Onsite measure to avoid and minimise direct and indirect impacts

As described above, the complete avoidance of impacts is considered impractical. The educational trail, Agricultural Plot and playing fields will impact on a small amount of native vegetation, which will be limited to the modification of the groundlayer and will not require the removal of native canopy species. The educational trail has been situated in a position that will maximise the students environmental and educational learning. Modifications to the location of the proposed educational trail to include cleared, or predominantly non-indigenous vegetation may reduce the students' capacity to interact with the native landscape and the agricultural components. Indirect impacts from the proposal are negligible or non-existent. Several measures will be implemented to reduce impacts where possible. Details are provided below.

5.2.1 Loss of fauna habitat

A number of non-threatened fauna species such as birds, arboreal mammals and amphibians are likely to be present at the development site. Only seven canopy trees will be removed as a result of the proposal; therefore, the loss of fauna habitat is minimal. Nevertheless, appropriate pre-clearance protocols will be put in place at the time of construction to avoid and mitigate any potential harm or injury to these individuals. These protocols are discussed below and should be included as a component of the Construction Environmental Management Plan (CEMP) (see **Section 5.2.2**).

5.2.2 Construction Environmental Management Plan

To avoid potential indirect impacts during construction, an appropriate erosion and sedimentation control plan (ESCP) should be in place following best practice protocols, such as those detailed in Landcom (2004). It is recommended that the ESCP and a site-specific CEMP, prior to any construction works taking place. The CEMP will be required to span the pre, during and post-construction period, and will include the above pre-clearance and fauna management protocols.

6. Impact summary

6.1 Thresholds for assessment and offsetting of unavoidable impacts of development

Section 9 of the FBA (OEH 2014) defines thresholds to be applied by the accredited assessor related to the assessment and offsetting of unavoidable impacts caused by development. A number of thresholds are defined, including:

1. impacts that the assessor is required to identify for further consideration by the consent authority;
2. impacts for which the assessor is required to determine an offset;
3. impacts for which the assessor is not required to determine an offset;
4. impacts that do not require further assessment by the assessor.

Point (1) applies due to the proposed impacts to a PCT associated with a CEEC (Cumberland Plain Woodland). An offset must, therefore, be determined for the 0.623 ha impact to Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain and, consistent with Section 9.2 of the FBA (OEH 2014), the proposed impacts to the Cumberland Plain Woodland CEEC also require further consideration by the consent authority.

6.1.1 Impacts on biodiversity that require further consideration

Certain impacts on biodiversity values require further consideration by the consent authority. These are impacts that are considered to be complicated or severe (OEH 2014).

Due to the small amount of clearing proposed by this project, and the current degraded condition of the vegetation on-site, the project is considered unlikely to cause the extinction of Cumberland Plain Woodland CEEC from the Cumberland IBRA subregion, and will not significantly reduce the viability of the Cumberland Plain Woodland CEEC. This is demonstrated by the information in **Table 6.1** below, which is provided for further consideration by the consent authority.

Table 6.1: Additional information provided for CPW CEEC for further consideration by the consent authority.

Additional information required (Section 9.2.4.2 of FBA)	Response
a) *the area and condition of the CEEC or EEC to be impacted directly and indirectly by the proposed development*	Direct impacts to the ecological values of the development site are limited. The total direct impact area to Cumberland Plain Woodland CEEC is 0.16 ha. Additional partial impacts will occur through the use of the area as education trail, playing fields and Agricultural Plot. These areas will not require the removal of native canopy species, although will modify native the groundlayer. The total impact of the partial clearing for these components is 0.46 ha.
b) *the extent and overall condition of the CEEC or EEC within an area of 1,000 ha and then 10,000 ha surrounding the proposed development footprint.*	A GIS was used to determine the amount of CPW CEEC in the 1,000 ha and 10,000 ha surrounding the proposed development footprint. The most recent data available on the extent of CPW across the Cumberland IBRA subregion was used, being Tozer 2003. The total area of Cumberland Plain Woodland CEEC within the 1,000ha surrounding the proposed development footprint is 31.22 ha The total area of Cumberland Plain Woodland CEEC within the 10,000ha surrounding the proposed development footprint is 349.25 ha
c) *an estimate of the extant area and overall condition of the CEEC or EEC remaining in the IBRA subregion after the impact of the proposed development has been taken into consideration*	A GIS was used to determine the amount and condition of CPW CEEC in the IBRA subregion (Cumberland IBRA subregion). The most recent data available on the extent of CPW across the Cumberland IBRA subregion was used, being Tozer 2003. The total area of CPW CEEC mapped within the IBRA subregion is 27,539 ha, which includes: • 10,877 ha of vegetation mapped in 'A', 'B' and 'C' categories (generally considered to be in good condition) • 13,545 ha of vegetation mapped in 'Tx', 'Txr' and 'Cmi' categories (generally considered to be in moderate / poor condition) • 3,117 ha of vegetation mapped in the 'Txu' category (generally considered to be in poor condition) An impact of 0.16 ha represents an impact of 0.00058% of the total area of the CPW CEEC. The partial impact to 0.46 ha represents an impact of 0.0017% of the total area of the CPW CEEC. It is important to note that Tozer 2003 did not identify the vegetation within the subject site as CPW CEEC.

d) the development proposal's impact on: *i. abiotic factors critical to the long-term survival of the CEEC or EEC. For example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns?* *ii. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants* *iii. the quality and integrity of an occurrence of the CEEC or EEC 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 CEEC or EEC.*	The development proposal will not impact on abiotic factors critical to the long-term survival of the CPW CEEC, characteristic and functionally important species or the quality and integrity of an occurrence of the CEEC. As already stated, the condition of the vegetation is already substantially degraded, and the impact proposed relatively small in the context of the surrounding region.
e) direct or indirect fragmentation and isolation of an important area of the CEEC or EEC.	The vegetation contained on the subject site is substantially degraded through on-going land use and management. This is demonstrated by the site value score of 21.01 / 100. The site, whilst connected to vegetation to the east, is surrounded by developed land to the north, and largely cleared agricultural land to the south and west. The proposed development will not further fragment this vegetation.
f) the measures proposed to contribute to the recovery of the CEEC or EEC in the IBRA subregion.	The proposed development will be fully offset according to the credit calculations provided in this report. The offset site will be managed and protected in-perpetuity, and will therefore lead to the improvement and protection of the CPW CEEC at another location.

6.2 Ecosystem credits and species credits

6.2.1 Change in landscape value score

The loss in landscape score following the proposed development is **12** (**Table 6.2**). See **Section 2** for more information.

Table 6.2: Landscape score components.

Landscape score component	Score Awarded
Change in connectivity score	0
Increase in native vegetation cover (inner assessment circle) score	0
Increase in native vegetation cover (outer assessment circle) score	0
Patch size area score	12
Total	**12**

6.2.2 Current and future site value score

The current and future site value scores were calculated for the proposal. The plot and transect data collected was entered into the credit calculator, and a site value score of **21.01 / 100** was recorded for the vegetation zone assessed. This vegetation zone was split into two management zones; Management Zone 1 is the area in the northeast that will form the Agricultural Plot, playing field and education trail. This area will have the canopy maintained but groundcover potentially impacted and will have a future site value score of **5.80**. Management Zone 2 is the area in the southeast within the temporary school construction area. This area will be directly impacted and will have a future site value score of **0** (**Table 6.2**, **Figure 6.1**).

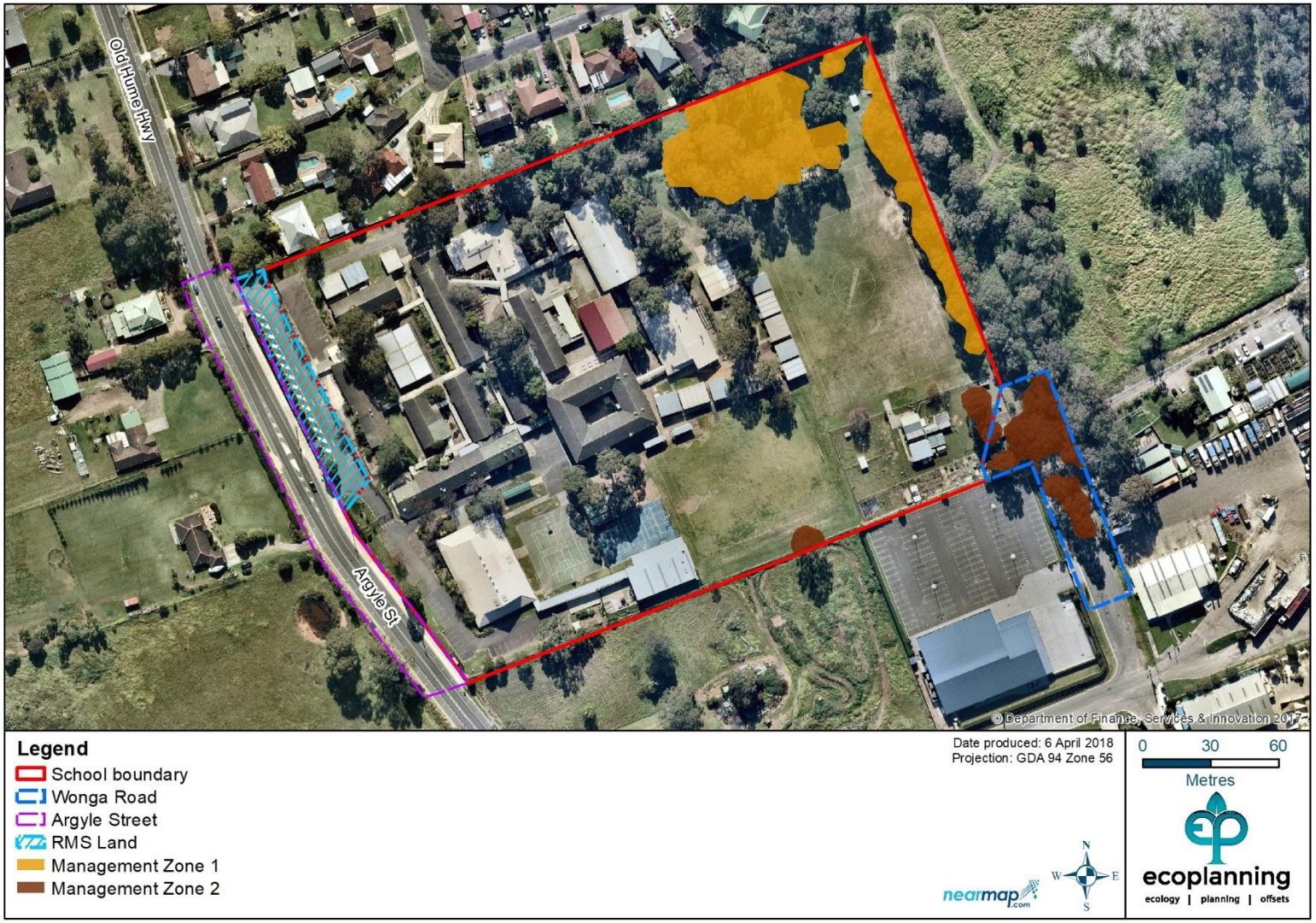

Figure 6.1: Management zones

Table 6.3: Site values before and after development.

Vegetation zone	Management zone	Total area impacted on development site (ha)	Site value score before development	Site value score after development
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain – underscrubbed/DNG	1 (retention of canopy)	0.46	21.01	5.80
	2 (complete removal of vegetation)	0.16	21.01	0.00

6.2.3 Required ecosystem credits

The total number of ecosystem credits required is **10 credits**.

6.2.4 Required species credits

There are no species credits required for the proposal.

7. Biodiversity Credit Report

7.1 Credit profiles

7.1.1 Ecosystem credits

The ecosystem credits required to offset the proposal are provided in **Table 7.1**. The final credit report produced by the credit calculator is provided in **Appendix D**.

Table 7.1: Ecosystem credits summary and credit profiles.

Plant community type (impact)	Vegetation zone (Condition Class)	Impact area (ha)	Credits required	Plant community type (offset options)	IBRA sub-region
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain (HN528)	Under-scrubbed/ DNG	0.62	10	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain (HN528)	Cumberland - Hawkesbury/ Nepean and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Total		**0.62**	**10**	**N/A**	**N/A**

7.1.2 Species credits

No species credits were required for this assessment.

7.2 Biodiversity Offset Strategy

As described in **Section 7.1**, 10 credits are required to offset the proposed development.

In general, between 9 – 11 credits / ha are generated at an offset site. Therefore, an offset site of approximately **0.91 ha – 1.11 ha** would be required to offset the impacts of the proposal. The current price of credits for PCT 849 in approximately $17,500 per credit. A credit transfer of 10 credits of PCT 849 would cost approximately **175,000**.

A number of options exist for the credit requirement to be satisfied, including:

- The purchase of matching credits from the Biobank market;
- Payment into the proposed Biodiversity Trust Fund. This option would allow the payment of funds to satisfy the offset obligation.

The proponent may seek to further investigate the Expression of Interest (EOI) register and may also utilise the Credits Wanted register to source the required credits. The final offset solution to be used will be determined as the development application process proceeds.

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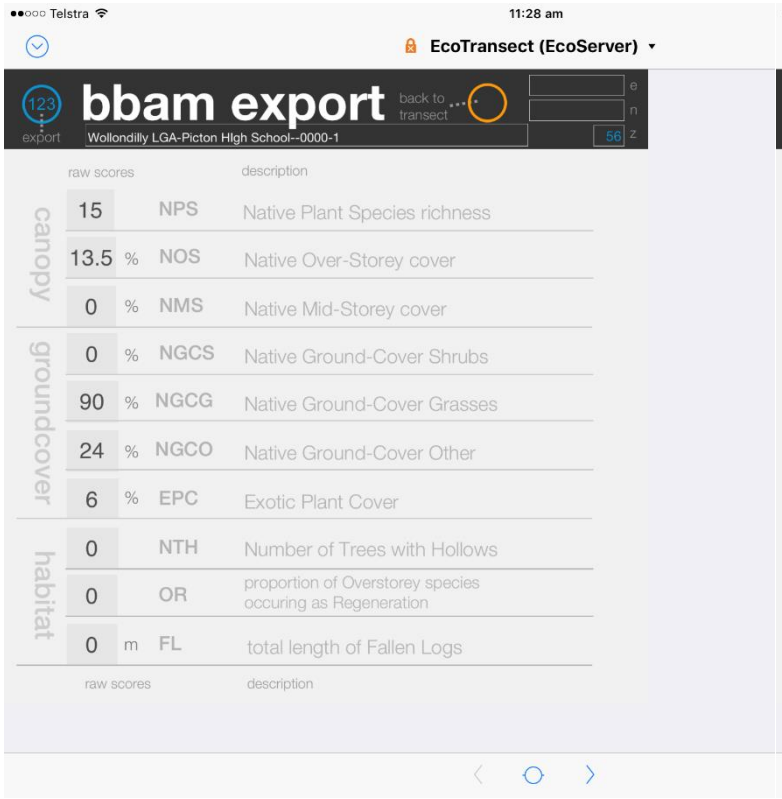
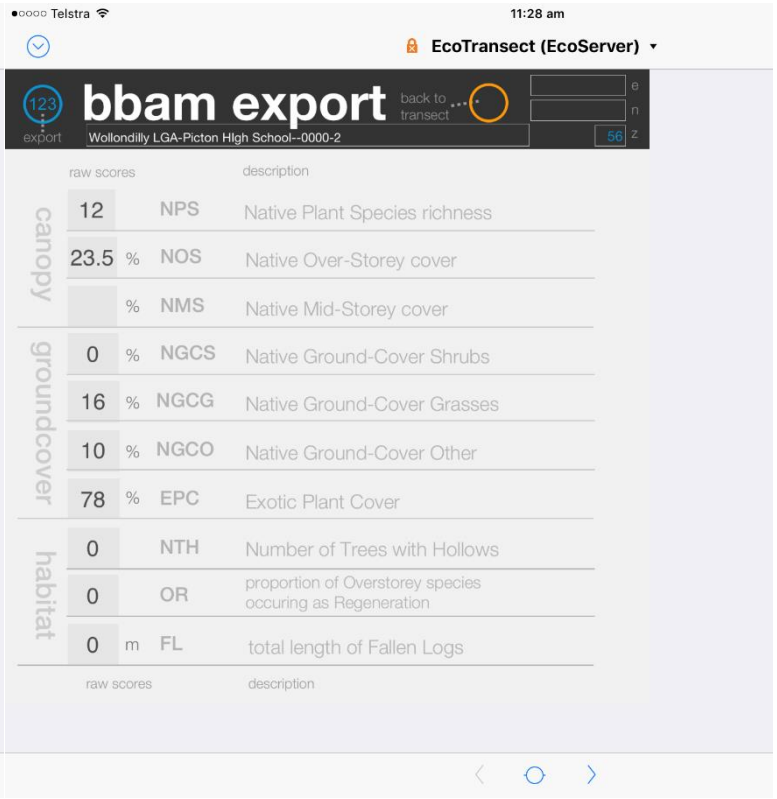
Appendix A: Field Data

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Plot ID	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing
2	BB01	15	13.5	0	90	0	24	6	0	0	0	279661	6213782
3	BB02	12	23.5	0	16	0	10	78	0	0	0	279764	6213713





Appendix B: Likelihood Table

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
KINGDOM: Animalia; CLASS: Amphibia						
Litoria aurea Green and Golden Bell Frog	BC Act: E EPBC Act: V	0	N/A	N/A	Not present	Not present
KINGDOM: Animalia; CLASS: Aves						
Anthochaera phrygia Regent Honeyeater	BC Act: CE EPBC Act: CE	0	N/A	N/A	Not present	Not present
Artamus cyanopterus cyanopterus Dusky Woodswallow	BC Act: V	3	1.78km (19/03/2009)	18/04/2012 (2.85km)	Moderate	Low
Callocephalon fimbriatum Gang-Gang Cockatoo	BC Act: V	3	1.28km (1/10/2009)	1/10/2009 (1.28km)	Low	Low
Callocephalon fimbriatum - endangered population in the Hornsby and Ku-ring-gai Local Government Areas	BC Act: E2	0	N/A	N/A	Not present	Not present
Calyptorhynchus lathami Glossy Black-Cockatoo	BC Act: V	5	0.52km (22/12/2008)	1/09/2014 (2.84km)	Low	Low
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	BC Act: V	1	2.48km (8/07/2010)	8/07/2010 (2.48km)	Low	Not present
Daphoenositta chrysoptera Varied Sittella	BC Act: V	2	2.85km (18/04/2012)	18/04/2012 (2.85km)	Moderate	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Hieraaetus morphnoides Little Eagle	BC Act: V	1	2.04km (30/07/2013)	30/07/2013 (2.04km)	Moderate	Low
Lophoictinia isura Square-tailed Kite	BC Act: V	1	1.33km (20/04/2010)	20/04/2010 (1.33km)	Moderate	Low
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies)	BC Act: V	1	3.58km (29/03/2010)	29/03/2010 (3.58km)	Low	Not present
Ninox strenua Powerful Owl	BC Act: V	1	3.75km (14/12/2008)	14/12/2008 (3.75km)	Low	Not present
Petroica boodang Scarlet Robin	BC Act: V	3	1.5km (14/11/2014)	14/11/2014 (1.5km)	Moderate	Low
KINGDOM: Animalia; CLASS: Gastropoda						
Meridolum corneovirens Cumberland Plain Land Snail	EPBC Act: E1	10	1.05km (11/05/2016)	11/05/2016 (1.05km)	Low	Not present
KINGDOM: Animalia; CLASS: Mammalia						
Cercartetus nanus Eastern Pygmy-possum	BC Act: V	0	N/A	N/A	Not present	Not present
Chalinolobus dwyeri Large-eared Pied Bat	BC Act: V EPBC Act: V	6	1.89km (19/02/2013)	2/12/2014 (4.3km)	Low	Low
Dasyurus maculatus Spotted-tailed Quoll	BC Act: V EPBC Act: E	1	3.48km (30/06/2006)	30/06/2006 (3.48km)	Low	Not present
Miniopterus australis Little Bentwing-bat	BC Act: V	1	2.15km (19/02/2013)	19/02/2013 (2.15km)	Moderate	Low
Miniopterus schreibersii oceanensis Eastern Bentwing-bat	BC Act: V	4	1.75km (1/10/2009)	1/09/2014 (3.37km)	Low	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Mormopterus norfolkensis Eastern Freetail-bat	BC Act: V	2	2.15km (19/02/2013)	1/09/2014 (3.37km)	Moderate	Low
Myotis macropus Southern Myotis	BC Act: V	4	2.15km (19/02/2013)	2/12/2014 (4.3km)	Moderate	Low
Petaurus australis Yellow-bellied Glider	BC Act: V	2	2.46km (1/10/2009)	11/08/2015 (4.22km)	Low	Not present
Petaurus norfolcensis Squirrel Glider	BC Act: V	0	N/A	N/A	Not present	Not present
Phascolarctos cinereus Koala	EPBC Act: V BC Act: V	13	0.86km (28/09/2009)	24/07/2017 (4.26km)	Moderate	Low
Scoteanax rueppellii Greater Broad-nosed Bat	BC Act: V	1	4.21km (17/12/2013)	17/12/2013 (4.21km)	Moderate	Low
KINGDOM: Plantae						
Acacia bynoeana Bynoe's Wattle	BC Act: EPBC Act:	0	N/A	N/A	Not present	Not present
Acacia pubescens Downy Wattle	BC Act: E EPBC Act: V	0	N/A	N/A	Not present	Not present
Cynanchum elegans	BC Act: E1 EPBC Act: E	1	4.08km (19/02/1999)	19/02/1999 (4.08km)	Low	Not present
Darwinia biflora	EPBC Act: V BC Act: V	1	3.31km (15/06/2015)	15/06/2015 (3.31km)	Low	Not present
Dillwynia tenuifolia	BC Act: V	0	N/A	N/A	Not present	Not present
Dillwynia tenuifolia - endangered population Kemps Creek	BC Act: E2	0	N/A	N/A	Not present	Not present

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Epacris purpurascens var. *purpurascens*	BC Act: V	1	3.31km (15/06/2015)	15/06/2015 (3.31km)	Low	Not present
Eucalyptus camfieldii Camfield's Stringybark	BC Act: V EPBC Act: V	1	3.31km (15/06/2015)	15/06/2015 (3.31km)	Low	Not present
Grevillea juniperina subsp. *juniperina* Juniper-leaved Grevillea	BC Act: V	0	N/A	N/A	Not present	Not present
Grevillea parviflora subsp. *parviflora* Small-flower Grevillea	EPBC Act: V BC Act: V	8	15/06/2015 (3.31km)	2.08km (19/05/2006)	Moderate	Not present
Leucopogon exolasius Woronora Beard-heath	BC Act: V EPBC Act: V	1	3.31km (15/06/2015)	15/06/2015 (3.31km)	Low	Not present
Marsdenia viridiflora subsp. *viridiflora* - endangered population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	BC Act: E2	0	N/A	N/A	Not present	Not present
Melaleuca deanei Deane's Paperbark	EPBC Act: V BC Act: V	1	3.31km (15/06/2015)	15/06/2015 (3.31km)	Low	Not present
Persoonia bargoensis Bargo Geebung	EPBC Act: V BC Act: E1	6	2.6km (19/05/2001)	8/12/2005 (2.68km)	Moderate	Not present
Persoonia hirsuta Hairy Geebung	EPBC Act: E BC Act: E1	1	3.31km (15/06/2015)	15/06/2015 (3.31km)	Low	Not present
Pimelea curviflora var. *curviflora*	BC Act: V EPBC Act: V	1	3.31km (15/06/2015)	15/06/2015 (3.31km)	Low	Not present
Pimelea spicata	BC Act: E EPBC Act: E	0	N/A	N/A	Not present	Not present

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Pterostylis saxicola Spiked Rice-flower	BC Act: E EPBC Act: E	0	N/A	N/A	Not present	Not present
Pultenaea pedunculata Matted Bush-pea	BC Act: E	0	N/A	N/A	Not present	Not present
Syzygium paniculatum Magenta Lilly Pilly	BC Act: E1 EPBC Act: V	1	2.96km (14/04/2016)	14/04/2016 (2.96km)	Low	Not present
Tetratheca glandulosa	BC Act: V	1	3.31km (15/06/2015)	15/06/2015 (3.31km)	Low	Not present

Unless other stated, text is taken from the OEH Threatened Species (http://www.environment.nsw.gov.au/threatenedspecies/); Legal Status codes from the Atlas of NSW Wildlife: V = Vulnerable, E1 = Endangered, E2 = Endangered Population, E4A = Critically Endangered, C = China and Australia Migratory Bird Agreement (CAMBA), J = Japan and Australia Migratory Bird Agreement (JAMBA); BC Act = Biodiversity Conservation Act 2016, EPBC Act = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

Appendix C: Flora and fauna species inventories

Flora

Family	Genus	Species	Common name	Native/Exotic	Form	BOS1		BOS2	
						C	A	C	A
Alliaceae	*Agapanthus*	*praecox*	African Lily	Planted	F				
Apiaceae	*Cyclospermum*	*leptophyllum*	Slender Celery	Exotic	F				
Asteraceae	*Bidens*	*pilosa*	Cobblers Peg	Exotic	F	1	1		
Asteraceae	*Cirsium*	*vulgare*	Spear Thistle	Exotic	F	1	1		
Asteraceae	*Conyza*	sp.		Exotic	F			1	5
Asteraceae	*Euchiton*	sp.		Exotic	F			1	20
Asteraceae	*Hypochaeris*	*radicata*	Catsear	Exotic	F	1	10	1	20
Asteraceae	*Senecio*	*madagascariensis*	Fireweed	Exotic	F			1	20
Asteraceae	*Solenogyne*	*bellioides*		Native	F			1	5
Asteraceae	*Soliva*	*sessilis*	Jo-jo	Exotic	F			1	100
Asteraceae	*Sonchus*	*oleraceus*	Common Sowthistle	Exotic	F			1	1
Asteraceae	*Taraxacum*	*officinale*	Dandelion	Exotic	F	1	1		
Campanulaceae	*Wahlenbergia*	sp.		Native	F			1	1
Caryophyllaceae	*Paronychia*	*brasiliana*	Chilean Whitlow Wort	Exotic	F	1	100	1	50
Chenopodiaceae	*Einadia*	*hastata*	Berry Saltbush	Native	F			1	1
Chenopodiaceae	*Einadia*	*nutans*	Climbing Saltbush	Native	F	1	1		
Convolvulaceae	*Convolvulus*	*erubescens*	Blushing Bindweed	Native	L			1	2
Convolvulaceae	*Dichondra*	*repens*	Kidney Weed	Native	F	2	1000	1	20
Cuppressaceae	*Juniperinus*	*conferta*	Japanese Shore Juniper	Planted	S				
Cyperaceae	*Carex*	*inversa*		Native	V	1	100		
Cyperaceae	*Cyperus*	*gracilis*	Slender Flat-sedge	Native	V	1	10		
Fabaceae - Faboideae	*Glycine*	*clandestina*		Native	L			1	5
Fabaceae - Faboideae	*Glycine*	*tabacina*		Native	L	1	1		
Fabaceae - Faboideae	*Hardenbergia*	*violacea*	Purple Coral Pea	Native	L			1	2
Fabaceae - Faboideae	*Medicago*	sp.		Exotic	F	1	1		

Family	Genus	Species	Common name	Native/Exotic	Form	BOS1		BOS2	
						C	A	C	A
Fabaceae - Faboideae	*Trifolium*	*repens*	White Clover	Exotic	F				
Fagaceae	*Quercus*	*robur*	English Oak	Planted	T				
Iridaceae	*Dietes*	sp.		Planted	F				
Lamiaceae	*Westringia*	*fruticosa*	Coastal Rosemary	Planted	S				
Lauraceae	*Cinnamomum*	*camphora*	Camphor Laurel	Exotic	T				
Lomandraceae	*Lomandra*	*longifolia*	Spiny-headed Mat-rush	Native	R				
Malvaceae	*Modiola*	*caroliniana*	Red-flowered Mallow	Exotic	R	1	50	1	1
Malvaceae	*Sida*	*rhombifolia*	Paddy's Lucerne	Exotic	F	1	20	1	5
Meliaceae	*Melia*	*azedarach*	White Cedar	Native	T				
Myrtaceae	*Callistemon*	*viminalis*	Weeping Bottlebrush	Planted	T				
Myrtaceae	*Corymbia*	*citriodora*	Lemon-scented Gum	Planted	T				
Myrtaceae	*Eucalyptus*	*crebra*	Narrow-leaved Ironbark	Native	T	2	1	10	2
Myrtaceae	*Eucalyptus*	*eugenioides*	Thin-leaved Stringybark	Native	T	5	2	5	1
Myrtaceae	*Eucalyptus*	*microcorys*	Tallowwood	Planted	T				
Myrtaceae	*Eucalyptus*	*tereticornis*	Forest Red Gum	Native	T	10	4	12	1
Myrtaceae	*Lophostemon*	*confertus*	Brush Box	Planted	T				
Oleaceae	*Jasminum*	*mesnyi*	Primrose Jasmine	Planted	S				
Oleaceae	*Ligustrum*	*lucidum*	Large-leaved Privet	Exotic	T	1	1	1	1
Oxalidaceae	*Oxalis*	*perennans*		Native	F	1	1000	1	20
Plantaginaceae	*Plantago*	*lanceolata*	Lamb's Tongue	Exotic	F	1	1	1	50
Poaceae	*Axonopus*	*fissifolius*	Carpet Grass	Exotic	G			2	100
Poaceae	*Bromus*	*catharticus*	Prairie Grass	Exotic	G				
Poaceae	*Cenchrus*	*clandestinus*	Kikuyu Grass	Exotic	G	1	5	1	5
Poaceae	*Cynodon*	*dactylon*	Couch	Exotic	G			2	50
Poaceae	*Ehrharta*	*erecta*	Panic Veldtgrass	Exotic	G	1	10	1	20
Poaceae	*Eragrostis*	*curvula*	African Lovegrass	Exotic	G				
Poaceae	*Lolium*	sp.	Ryegrass	Exotic	G			1	50
Poaceae	*Microlaena*	*stipoides*	Weeping Grass	Native	G	80	1000	1	100
Poaceae	*Paspalum*	*dilatatum*	Paspalum	Exotic	G			1	50
Poaceae	*Sporobolus*	*africanus*	Parramatta Grass	Exotic	G			1	50
Polygonaceae	*Rumex*	*crispus*	Curled Dock	Native	T	1	10		
Proteaceae	*Grevillea*	*robusta*	Silky Oak	Planted	T				
Rosaceae	*Photinia*	*serratifolia*	Chinese Photinia	Planted	S				
Salicaceae	*Salix*	sp.		Exotic	T				

Family	Genus	Species	Common name	Native/Exotic	Form	BOS1		BOS2	
						C	A	C	A
Solanaceae	*Solanum*	*nigrum*	Black-berry Knightshade	Exotic	F	1	20		
Solanaceae	*Solanum*	*prinophyllum*	Forest Knightshade	Native	F	1	1		
Solanaceae	*Solanum*	*seaforthianum*	Climbing Knightshade	Exotic	F				
Verbenaceae	*Verbena*	sp.		Exotic	F	1	1		
Vitaceae	*Cayratia*	*clematidea*	Native Grape	Native	L				

Form: (T) Tree; (S) Shrub; (G) Grass; (L) Vine/Climber/Scrambler; (V) Sedge; (F) Forb; (R) Rush.

Fauna

Class	Family	Scientific name	Common name	Native/ Exotic	Ecoplanning (10/11/17)
Aves	Artamidae	*Cracticus torquatus*	Grey Butcherbird	Native	W
Aves	Cacatuidae	*Cacatua roseicapilla*	Galah	Native	OW
Aves	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	Native	OW
Aves	Meliphagidae	*Manorina melanocephala*	Noisy Miner	Native	OW
Aves	Meliphagidae	*Manorina melanophrys*	Bell Miner	Native	W
Aves	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	Native	W
Aves	Psittacidae	*Platycercus eximius*	Eastern Rosella	Native	OW
Aves	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	Native	W
Aves	Sturnidae	*Sturnus tristis**	Common Myna*	Exotic	OW
Aves	Cuculidae	Eudynamys orientalis	Eastern Koel	Native	W

Observation type = O (seen); W (heard call); OW (seen and heard)

Appendix D: Biodiversity Credit Report

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 10/04/2018 Time: 12:04:08PM Calculator version: v4.0

Major Project details

Proposal ID:	0076/2018/4758MP
Proposal name:	Picton High School Redevelopment - FBA
Proposal address:	480 Argyle Street Picton NSW 2571
Proponent name:	Billard Leece Partnership Pty Ltd
Proponent address:	Billard Leece Partnership Pty Ltd
Proponent phone:	12345678
Assessor name:	Lucas McKinnon
Assessor address:	29 Munni Street Newtown NSW 2042
Assessor phone:	0421 603 549
Assessor accreditation:	0076

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.62	10.00
Total	0.62	10

Credit profiles

1. Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, (HN528)

Number of ecosystem credits created	10
IBRA sub-region	Cumberland - Hawkesbury/Nepean

Offset options - Plant Community types	Offset options - IBRA sub-regions
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, (HN528)	Cumberland - Hawkesbury/Nepean and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required