



EPBC Act Referral

Macarthur Gardens North

Australian Government
Department of the Environment and Energy

August 2017

For: **UrbanGrowth NSW**



**Urban
Growth**
NSW

1 Section 1

1.1 Project Industry Type

Residential development and associated infrastructure

1.2 Provide a detailed description of the proposed action, including all proposed activities

UrbanGrowth NSW (UrbanGrowth) are proposing to develop 9.8 ha of land located between Goldsmith Avenue and Menangle Road west of Macarthur Station, Macarthur (Attachment 1; Figure 1). The proposed development forms part of the Macarthur Gardens North development and is the last stage of the Macarthur Regional Centre Masterplan. The proposed residential development is centrally located allowing future residents to utilise Macarthur Railway Station, Macarthur Shopping Centre, Western Sydney University and numerous retail and ancillary services in the area. The proposed development will provide strategically located housing which will contribute towards meeting the housing demand within the South West Sydney region. Specifically, the development includes:

- a contribution of 72 residential lots towards the Greater Macarthur Priority Growth Area within walking distance to the Macarthur train station precinct
- a medium density superlot containing 411 dwellings with 241 of these to be residential and remaining yield to be medium density, a ground level commercial premises and underground parking
- realignment of Bow Bowing creek and re-establishment of an 80m wide vegetated riparian corridor which will include bushland management and revegetation, construction of cycle ways, pedestrian bridges, seats, signage and rain gardens. Works will also include creek line stabilisation and construction of weirs, pools and riffles as required. The creek realignment is considered necessary to manage stormwater flows and mitigate flooding for upstream and adjacent urban development that drains through the Bow Bowing Creek corridor.
- the western boundary of the site will contain a stormwater basin. This Basin one of three basins and is part of the adjacent Macarthur Heights development. The structure will control flood events along the Bow Bowing Creek corridor by restricting the upstream stormwater flows. The structure will hold flood waters then release the stormwater in a controlled manner to prevent downstream flooding. The basin on the western boundary is a circular depression that holds stormwater, it has concrete stormwater structures that control the flows and will be landscaped with native vegetation once constructed.
- a conservation area between the realigned Bow Bowing Creek and the rail line which runs along the southern boundary of the site
- a park and open spaces to encourage active living, walking and cycling
- landscaped boulevards with tree lines footpath areas
- on-road cycle-ways

The proposed action (Figure 2), forms part of the Macarthur Gardens North development which is part of the Masterplan for the Macarthur Regional Centre. The existing Macarthur Gardens to the south of the rail line is complete. Macarthur Gardens North is the next and last stage of the masterplan.

1.3 What is the extent and location of your proposed action? Use the polygon tool on the map below to mark the location of your proposed action

Use the map tool to define boundary. (for ELA internet portal entry)

1.5 Provide a brief physical description of the property on which the proposed action will take place and the location of the proposed action (e.g. proximity to major towns, or for off-shore actions, shortest distance to mainland)

The site refers to the entire Macarthur Gardens North Development. The referral area refers to the portion of the site that is to be referred to the Commonwealth as a controlled activity. The referral area is located within the Greater Macarthur Priority Growth Area and is approximately 2 km south of Campbelltown in the Campbelltown Local Government Area. The land is bound by Goldsmith Avenue to the north and Menangle Road to the south and is adjacent to Macarthur Station. Immediately north of the site is Western Sydney University Campbelltown Campus and immediately south is low density residential development.

The majority of the referral area contains regrowth vegetation with small areas of cleared land which show signs of ongoing disturbance associated with agricultural land uses. The patch of native vegetation in the referral area is isolated from other local patches due to residential development, rail and roads. Bow Bowling Creek runs through the site and joins Keanes Gully about 4 km to the west. The north of the site is currently used as a car park. An informal access road traverses the western boundary. No significant ecological values were identified along the western extent of the site and as such this area does not form part of the referral.

The site is gently undulating with the lower points in the south of the site associated with the creek and offshoots of Bow Bowling Creek.

Existing overhead powerlines run through the site.

There is an existing pedestrian bridge and pathway running through the site. This links the Macarthur railway station to the University and TAFE.

Surrounding land use to the north is the University of Western Sydney and Campbelltown TAFE. A new residential development is currently being built to the west, east and north. This development is called Macarthur Heights and is around 40% complete. To the south is the main southern train line and Macarthur shopping and commercial area. The site is currently zoned as a deferred matter under the Campbelltown Local Environmental Plan (LEP) 2015, Macarthur Regional City Centre. It was previously zoned as 10(a) Regional Comprehensive Centre.

1.6 What is the size of the development footprint or work area

The referral area is 9.8 ha

1.7 Is the proposed action a street address or lot?

The proposed action is referred as a Lot.

1.7.1 Describe the lot number and title

Lot 1097 DP 1182558.

1.8 Primary Jurisdiction

Campbelltown LGA.

1.9 Has the person proposing to take the action received any Australian Government funding to undertake this project

No.

1.10 Is the proposed action subject to local government planning approval

A number of Development Applications have been submitted to Campbelltown Council in relation to the Macarthur Gardens North project.

1.11 Provide an estimated start and estimated end date for the proposed action

The anticipated date to commence the proposed action is mid-2018. Residential development of the site will continue for approximately two years after the proposed action.

1.11.1 Provide details of the context, planning framework and State and/or Local government requirements

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation that relates to the proposed development. It provides a framework for the overall environmental planning and assessment of development proposals. Various legislative instruments, such as the NSW *Threatened Species Conservation Act*, *Water Management Act 2000* (WM Act) and *Rural Fires Act 2007* (RF Act) are integrated with EP&A Act and have been reviewed separately.

A substantial array of legislation, policies and guidelines apply to the subject site as listed below;

State

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Rural Fires Act 1997* (RF Act)
- *Native Vegetation Conservation Act 1997* (NVCA Act)
- *Noxious Weeds Act 1993* (NW Act)
- *Threatened Species Conservation Act 1995* (TSC Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *National Parks and Wildlife Act 1974* (NPW Act)
- *Heritage Act 1977*
- *Water Management Act 2000* (WM Act)
- *Contaminated Land Management Act 1997* (CLM Act)
- *Catchment Management Act 1989* (CM Act)
- *Local Government Act 1993* (LG Act)
- *Fisheries Management Act 1994* (FM Act)
- *Soil Conservation Act 1938*
- Major Development SEPP 2005

Local

- Campbelltown Local Environmental Plan 2015
- Campbelltown (Sustainable City) Development Control Plan 2015

1.12 Describe any public consultation that has been, is being or will be undertaken, including with Indigenous stakeholders

Consultation has been undertaken with Council and the Department of Planning and Infrastructure (DoPI). Relevant public authorities have been consulted as part of the planning process. The proposed action sits within the Greater Macarthur Priority Growth Area and has been advertised publicly within the plan. UrbanGrowth has engaged an Archaeological Consultant that has conferred with OEH and Aboriginal Stakeholders regarding the proposed development.

1.13 Describe any environmental impact assessments that have been or will be carried out under Commonwealth, State or Territory legislation including relevant impacts of the project.

The biodiversity values of the project area have been documented in a number of ecological studies relevant to the site. The previous documentation includes the following:

- Flora and Fauna Assessment Macarthur Gardens North, Travers Bushfire and Ecology 2016
- Biodiversity Assessment Report Macarthur Gardens North, Travers Bushfire and Ecology 2017
- Red Flag Variation Report, Macarthur Gardens North Travers Bushfire and Ecology 2017
- Tree Assessment Macarthur Gardens North, Travers Bushfire and Ecology 2016

1.14 Is this action part of a staged development (or a component of a larger project)

The current proposal (the Action) seeks approval for the creek works, development subdivision, early site establishment works and subsequent residential development. This referral has been written to consider the overall (total) impact on the referral areas environmental values for all phases of work and is based on the preferred indicative layout plan shown in Figure 2. It is not a component of a larger project, however it does contribute towards the Greater Macarthur Priority Growth Area, and more locally the Macarthur Gardens Regional Masterplan.

1.15 Is the proposed action related to other actions or proposals in the region

No.

2 Section 2 – Matters of National Environmental Significance

2.1 Is the proposed action likely to impact on the values of any World Heritage properties

No.

2.2 Is the proposed action likely to impact on the values of any National Heritage places?

No.

2.3 Is the proposed action likely to impact on the ecological character of a Ramsar wetland

No.

2.4 Is the proposed action likely to impact on the members of any listed threatened species (except a conservation dependant species) or any threatened ecological community, or their habitat

This Action will impact on MNES. This referral has been prepared to ensure the Action is assessed accordingly. One threatened ecological community has been recorded in the referral area. The referral area is also considered to be potential habitat for the following threatened species:

- *Anthochaera phrygia* (Regent Honeyeater)
- *Apus pacificus* (Fork-tailed Swift)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Hirundapus caudacutus* (White-throated Needle-tail)
- *Lathamus discolor* (Swift Parrot)
- *Litoria aurea* (Green and Golden Bell Frog)
- *Pimelea spicata* (Spiked Rice-flower)
- *Pomaderris brunnea* (Brown Pomaderris)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Rhipidura rufifrons* (Rufous Fantail).

The following information and data were reviewed to determine potential flora and fauna values within the referral area:

- BioNet / Atlas of NSW Wildlife (OEH2017a)
- EPBC Act Protected Matters Search Tool (DotEE 2017)
- NSW Threatened Species Profiles (OEH 2017b)
- SEPP 19- Bushland in Urban Areas (SEPP 19)
- SEPP 44 Koala Habitat
- Flora and Fauna Assessment Macarthur Gardens North (Travers Ecology 2016) (Attachment 4)
- Biodiversity Assessment Report Macarthur Gardens North (Travers Ecology 2016) (Attachment 5)
- Red Flag Variation Report Macarthur Gardens North (Travers Ecology 2016)
- Campbelltown City Council Development Control Plan 2015 (DCP)
- The Native Vegetation Maps of the Cumberland Plain Western Sydney (NPWS 2002).

Aerial photography of the referral area and surrounds were also used to investigate the extent of native vegetation cover and landscape features in the referral area.

The BioNet / Atlas of Wildlife (10 km radius) and Protected Matters Search Tool (5 km radius) searches were performed around the coordinates -34.07144, 150.79323 on 24 July 2017 (Attachment 2). The results of these searches were combined to produce a list of threatened flora, fauna and ecological communities considered likely to occur or utilise the referral area. The likelihood of occurrence for each species was determined using recent records, the likely presence of suitable habitat and knowledge of the species ecology. Attachment 3 provides the likelihood table for species potentially occurring within the referral area. The following impact table presents an assessment of the impact from the proposed action on species with **potential or known** to occur in the referral.

2.4.1 Impact table

Table 1: Threatened ecological communities, flora and fauna impact table

Species	Impact
Ecological Communities	
<p>Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest</p>	<p>Known</p> <p>Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (CPW) is listed as critically endangered under the EPBC Act. The CPW complex represents occurrences of the coastal plain grassy eucalypt woodlands that are endemic to shale hills and plains of the Sydney Basin Bioregion and predominantly occupies the Cumberland Sub-region.</p> <p>Cumberland Plain Woodland is an open eucalypt forest with an open shrub layer and grassy groundcover. It occurs in clay-loam soils derived from Wianamatta shale and is restricted to the Cumberland Plain, western Sydney. The canopy typically consists of <i>Eucalyptus moluccana</i> (Grey Box), <i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>Eucalyptus fibrosa</i> (Red Ironbark) and <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), with <i>Eucalyptus eugenioides</i> (Thin-leaved Stringybark) and <i>Corymbia maculata</i> (Spotted Gum) occurring less frequently. The midstorey contains <i>Acacia decurrens</i> (Black Wattle), <i>Acacia falcata</i> (Sally Wattle), <i>Acacia parramattensis</i> (Parramatta Wattle), <i>Melaleuca decora</i> (Paperbark), <i>Bursaria spinosa</i> (Blackthorn), <i>Dillwynia sieberi</i>, <i>Daviesia ulicifolia</i> (Gorse Bitter Pea), <i>Indigofera australis</i> (Native Indigo) and <i>Rubus parvifolius</i> (Native Raspberry). Typical groundcover species include <i>Aristida ramosa</i> (Three awn Speargrass), <i>Cymbopogon refractus</i> (Barbed Wire Grass), <i>Dichelachne micrantha</i> (Short-hair Plume Grass), <i>Microlaena stipoides</i> (Weeping Grass), <i>Themeda triandra</i> (Kangaroo Grass), <i>Cyperus gracilis</i> (Slender Flat-sedge), <i>Lomandra filiformis</i> subsp. <i>filiformis</i> (Wattle Mat-rush) and <i>Lomandra multiflora</i> subsp. <i>multiflora</i> (Many-flowered Mat-rush). <i>Brunoniella australis</i> (Blue Trumpet), <i>Dichondra repens</i> (Kidney Weed), <i>Glycine</i> spp., <i>Goodenia hederacea</i> subsp. <i>hederacea</i> (Ivy Goodenia) and <i>Oxalis perennans</i> (Wood Sorrel) are also known to occur.</p> <p>The original extent of CPW has been significantly reduced since the introduction of agricultural and urban uses across the Cumberland Plain following European settlement. A field survey undertaken by Tozer (2003) coupled with detailed interpretation of colour aerial photography from between 1997 and 1998, determined that only 9% of the original extent (pre-1750) of the community remained with greater than 10% canopy cover, with a further 14% remaining as scattered trees across the landscape (NPWS, 2002a; NPWS, 2002b).</p> <p>A more recent study by the NSW Scientific Committee and Simpson (2008) re-assessed the status of the community in order to determine changes in distribution since November 1998. Comparing the 1997-1998 mapping undertaken by Tozer (2003) with ortho-rectified digital photography obtained in 2007, it was found that the remaining extent of the community had declined by approximately 442 ha or around 5.2% of its distribution nine years ago. Such clearing is likely to be a consequence of dispersed, small-scale clearing associated with urban development.</p> <p>As of 2008 the remaining community existed as around 1,857 fragmented patches with an average patch size of 3.3 ha. The largest remaining patch was 126 ha (NSWSC & Simpson, 2008) with an approximate remaining total of 11,000 ha (DECC, 2008). These patches are distributed among both private and public lands. Security from land clearing is provided</p>

for approximately 720 ha of the community through conservation in nature reserves, national parks, state conservation areas and regional parks.

Field surveys were conducted by Travers Ecology (Attachment 4; Travers 2016). Cumberland Plain Woodland was found in three condition states within the study area; Moderate – Good, Derived Native Grassland and Regrowth (Figure 3). Where this community occurred in moderate to good condition, native species were present in all structural layers. The canopy contained *Eucalyptus tereticornis*, *Eucalyptus moluccana* and *Eucalyptus crebra*. The midstorey contained *Acacia parramattensis*, *Acacia implexa*, *Bursaria spinosa*, *Acacia decurrens*, *Dodonaea viscosa* and *Allocasuarina littoralis*. The groundcover was comprised of native grasses and forbs including *Microlaena stipoides*, *Themeda triandra*, *Austrostipa pubescens*, *Aristida vagans*, *Brunoniella pumillo*, *Clematis glycinoides*, *Daviesia ulicifolia*, *Dichondra repens*, *Cheilanthes sieberi*, *Lomandra longifolia*, *Cyperus gracilis*, *Dianella revoluta*, *Oxalis perennans*, *Glycine clandestina*, *Goodenia hederacea* and *Einadia hastata*.

Where this community occurred as Derived Native Grassland, the canopy and midstorey was absent. The groundcover was comprised of >50% native perennial species comprised of those listed above. Where this community occurred as regrowth, the *Eucalypt* spp. were absent and was dominated by *Acacia* spp.

All CPW mapped by Travers (2016) was determined to fulfil the definition for CPW under the EPBC Act for the following reasons:

- The patch includes mostly River-flat Eucalypt Forest or Swamp Oak Floodplain Forest to almost 20 ha for adjoining native vegetation within 100m and of that, CPW occupies 3.1 ha within the site.
- the perennial understorey contains a vegetation cover of >50% native species
- the patch does have tree hollows and some with a DBH of 80cm or greater

Field investigation confirmed the existence of approximately 3.1 ha of EPBC Act condition CPW within the site (Travers Ecology 2016).

The proposed development will impact on 2.3 ha of CPW as recognised under the EPBC Act (Figure 4). This represents less than 0.02% of the total CPW vegetation (11,000 ha) estimated to be remaining on the Cumberland Plain. This impact is considered to be very small in the context of the remaining CPW.

The Significant Impact Guidelines were reviewed to assist in the impact assessment of the 2.3 ha of CPW that would be introduced from the proposed action.

The proposed action will reduce the extent of the ecological community by a very small amount of 2.3 ha.

The proposed clearance will not further fragment the existing three patches of CPW as they already exist in a fragmented context when considering the train line to the south and the encroaching urban development on all sides. The stream works and re-vegetation will ensure that the remaining patches will be linked within the site.

The patches to be impacted represent patches of CPW that are surrounded by encroaching urban development, resulting in isolation of the patch, and is not considered an area of vegetation critical for the survival of the community.

The proposed action will impact on the soil and potentially the soil seed bank within the 2.3 ha impacted. The 2.3 ha of soil impacted is unlikely to contain a significant amount of seeds. No ground water extraction is likely to impact on this community. Surface water changes are likely to occur as part of the stream realignment however the changes are considered to be positive when considering the vegetation restoration and management that is to occur as part of the works.

The proposed action will result in the removal of 2.3 ha of CPW. As above, this is less than 0.02% of the total estimated remaining CPW. The removal of this relatively small area would not remove any specific functionally important species from the site. The 0.8 ha of CPW to be retained consists of a similar species assemblage of the areas to be impacted and therefore there will be no loss of species diversity from the proposed action.

The proposed action is not considered likely to cause a substantial reduction in the quality or integrity of an ecological community by assisting any invasive species harmful to the ecological community becoming established. A Construction Environmental Management Plan will be developed and implemented to minimise the risks associated with the introduction of any invasive weeds or pathogens to the remaining vegetation.

	<p><input type="checkbox"/>The removal of 2.3 ha of CPW is considered to be very minor in area, however, the loss of 2.3 ha is not consistent with the recovery of the ecological community. 0.8 ha of CPW will be retained and revegetation of the riparian corridor will utilise CPW planting schedules.</p> <p>Considering the above, the impact to EPBC Act listed CPW is considered to be minimal in area and is not considered to represent a significant impact to the community (when considering the above and below justification).</p> <p>Unavoidable biodiversity impacts to CPW as listed under both the TSC and EPBC Acts from the project are being addressed through a range of mitigation and management actions to be carried out before development, alongside all development, and into the future. These are outlined in more detail in section 4 and 5 and include:</p> <p><input type="checkbox"/>Retention and management of 0.8 ha of on-site EPBC Act listed CPW</p> <p><input type="checkbox"/>Restoration of the riparian corridor which will be restored via landscape plantings, and will link retained vegetation</p> <p><input type="checkbox"/>Offsetting all impacts through acquiring equivalent ecosystem credits from a BioBank site in accordance with the DotEE endorsed NSW BioBanking methodology for delivering biodiversity offsets (<i>EPBC 1999 Condition Setting Policy January 2016</i>)</p>
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Birds	
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<p><i>Lathamus discolor</i> – Swift Parrot</p>	<p>The Swift Parrot is a small, brightly coloured bird with a thin tail. The Swift Parrot breeds in Tasmania during the Australian summer and migrates north as a single population to mainland Australia (NSW, ACT and VIC) during winter. In NSW the Swift Parrot typically forages in forests and woodlands and tends to prefer mature trees. When on mainland Australia this species feeds on flowers and lerps in <i>Eucalyptus</i> spp. and will often forage widely. This species requires hollow bearing trees in proximity to foraging resources that are in flower and producing nectar.</p> <p>Field survey identified 6.7 ha of potential habitat for the Swift Parrot within the study area in the form of 3.1 ha of CPW, 3.5 ha of River-flat Eucalypt Forest and 0.3 ha of Dams/Aquatic Macrophytes (Travers 2016).</p> <p>Five (5) diurnal bird census points (Figure 5) were undertaken within the Travers field survey over three days; 6 July, 7 July and 29 July 2016 (Travers 2016). A minimum of 20 minutes of survey was undertaken at each census point in an area radiating out to between 30-50m. Bird census points were selected to give an even spread and representation across the site and its communities. Census points were also commenced in locations where bird activity was apparent, as often different small bird species are found foraging together. Opportunistic diurnal bird survey was conducted between census points and whilst undertaking other diurnal surveys.</p> <p>The Swift Parrot was not identified during targeted survey. The proposed action would lead to the loss of 4.9 ha of potential foraging habitat for this species, however, a large portion of the removed vegetation is for stream realignment works which will include revegetation and conservation management. Within a regional context the area to be removed constitutes a small disturbance to the remaining habitat within the Campbelltown LGA, particularly when considering 1.8 ha will be retained and the majority of the removed vegetation will be replaced during the creek restoration.</p> <p>Based on the above description of potential foraging habitat within the site, the site is not considered to contain habitat critical to the survival of the species. Habitat critical to the survival of the species refers to areas that are necessary:</p> <ul style="list-style-type: none"> ● for activities such as foraging, breeding, roosting or dispersal ● for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the ecological community, such as pollinators) ● to maintain genetic diversity and long term evolutionary development ● for the reintroduction of populations or recovery of the species or ecological community. <p>Critical habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical to the survival of the species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act. A National Recovery Plan has been approved for the Swift Parrot. The recovery plan does not identify any critical habitat for this species. There is no critical habitat within the site.</p> <p>A significant impact to the Swift Parrot is considered unlikely given the following:</p>
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	<ul style="list-style-type: none"> ● the area of potential habitat to be removed is considered minor given the wide foraging behaviour of this species and presence of suitable habitat within the Campbelltown LGA ● the Swift Parrot has not been recorded on site and the area is not recognised as providing habitat critical to the survival of the species ● the Swift Parrot is a highly mobile species that is able to utilise a variety of habitat resources over large areas, making them less sensitive to fragmentation ● no breeding habitat would be impacted ● there is one single, interbreeding population of Swift Parrots and as such the proposal would not fragment or disrupt any populations of this species <p>Given the above, it is considered unlikely that any significant impacts, either direct or indirect would be likely to occur to the Swift Parrot from the proposed action.</p>
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<p><i>Anthochaera phrygia</i> – Regent Honeyeater</p>	<p>The Regent Honeyeater is a striking and distinctive medium sized bird with a sturdy, curved bill. This species is endemic to mainland south-east Australia and has been recorded from south-east Queensland, NSW, ACT and VIC. Due to its highly mobile nature, the distribution of this species is patchy and only occurs irregularly across most sites. Within its current distribution there are four known breeding sites where the species is frequently recorded including Bundarra-Barraba, Capertee Valley and Hunter Valley in NSW and Chiltern in VIC.</p> <p>The Regent Honeyeater typically utilises box-ironbark eucalypt woodland, dry sclerophyll forest, riparian vegetation and lowland coastal forest. This species relies mainly on nectar but will also feed on invertebrates. The species comprises a single population with sporadic fidelity to breeding sites. Some individuals return to the same sites with others switching between seasons (spring – summer). The use of other sites for breeding appears to depend on the availability of foraging resources and flowering events. Critical habitat has been declared for this species. Critical habitat is defined as:</p> <ul style="list-style-type: none"> ● breeding or foraging areas where the species is likely to occur ● newly discovered breeding or foraging locations <p>Threats to the long-term survival of the Regent Honeyeater include habitat loss, fragmentation and degradation and competition for foraging resources. The study area contains 6.7 ha of potential foraging habitat for the Regent Honeyeater in the form of 3.1 ha of CPW, 3.5 ha of River-flat Eucalypt Forest and 0.3 ha of Dams/Aquatic Macrophytes (Travers 2016). Five (5) diurnal bird census points (Figure 5) were undertaken within the study area over three days; 6 July, 7 July and 29 July 2016. A minimum of 20 minutes of survey was undertaken at each census point in an area radiating out to between 30-50m. Bird census points were selected to give an even spread and representation across the site and its communities. Census points were also commenced in locations where bird activity was apparent, as often different small bird species are found foraging together. Opportunistic diurnal bird survey was conducted between census points and whilst undertaking other diurnal surveys.</p> <p>The Regent Honeyeater was not identified during targeted survey. While the species was not recorded during field surveys, potential foraging habitat does occur on site in the form of 6.7 ha of woodland.</p> <p>The proposed action would result in the removal of 4.9 ha of potential foraging habitat. No known breeding sites would be directly or indirectly impacted. Habitat critical to the survival of the species refers to areas that are necessary:</p> <ul style="list-style-type: none"> ● for activities such as foraging, breeding, roosting or dispersal ● for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the ecological community, such as pollinators) ● to maintain genetic diversity and long term evolutionary development ● for the reintroduction of populations or recovery of the species or ecological community. <p>Critical habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical to the survival of the species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act. The National Recovery Plan for the Regent Honeyeater lists the following as habitat critical to the survival of the Regent Honeyeater:</p>
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	<ul style="list-style-type: none"> • any breeding or foraging areas where the species is likely to occur • any newly discovered breeding or foraging locations. <p>As no Regent Honeyeaters were identified in the study area during survey, it is unlikely that the study area can be defined as a new foraging or breeding location. Regent Honeyeaters typically forage on <i>Eucalyptus sideroxylon</i>, <i>E. melliodora</i>, <i>E. albens</i>, <i>E. leucoxyton</i>, <i>E. robusta</i> and <i>Corymbia maculata</i>. <i>Amyema cambagei</i> and <i>A. miquelli</i> are also used. The study area did not contain any of these species. Other Eucalypt species such as <i>Eucalyptus eugenioides</i> and <i>E. fibrosa</i> are also used but mainly when associated with the species listed above. Most of the records for this species are also associated with highly fertile sites on creek flats, broad river valleys and lower slopes. Given the study area did not contain any of the species listed above and contained a small riparian corridor with a long history of disturbance the species would more likely utilise more suitable habitat such as the gorges along the nearby Georges River. This species is unlikely to forage on the limited resources within the study area thus it is unlikely that the proposed action would result in a reduction of occupancy area for this species, decrease the size of the population or remove habitat such that the species is likely to decline. Given the above, it is considered unlikely that any significant impacts, either direct or indirect would be likely to occur to the Regent Honeyeater within the proposed development.</p>
Mammals	
<p><i>Pteropus poliocephalus</i> – Grey-headed Flying-fox</p>	<p>The Grey-headed Flying-fox is typically medium to dark grey with many light-tipped hairs with fur extending to the feet. Its defining feature is an orange or russet-coloured collar which encircles the neck. This species occupies the coastal lowlands and slopes of south-eastern Australia from Bundaberg to Geelong and inland NSW to the tablelands and western slopes. The Grey-headed Flying-fox is a highly mobile partially migratory species with a distribution that is highly varied between seasons and years. The Grey-headed Flying-fox forms part of one single, interbreeding population.</p> <p>This species feeds primarily on blossom and fruit in the canopy vegetation and occasionally supplement this with leaves. This species tends to favour <i>Eucalyptus</i>, <i>Corymbia</i>, <i>Angophora</i>, <i>Melaleuca</i>, <i>Banksia</i> and <i>Ficus</i> species and will migrate in response to flowering events and the availability of food.</p> <p>Grey-headed Flying-foxes typically roost in areas of dense <i>Melaleuca</i> or <i>Casuarina</i> close to rivers or creeks across both large and small (1 ha) patches. Rates of occupation vary from continuous to occasional with fluctuations in numbers over time. The reasons for fluctuations in camp occupation and number of individuals is still not clear. Threats to the grey-headed Flying-fox include loss of foraging and roosting habitat, competition with Black Flying-foxes, negative public attitude and conflict with humans, electrocution, entanglement in netting and on barbed-wire, climate change and disease.</p> <p>The draft National Recovery Plan for the Grey-headed Flying-fox defines habitat critical to the survival of the species as natural habitat that is :</p> <ol style="list-style-type: none"> 1. productive during winter and spring when food bottlenecks have been identified 2. that is known to support populations of >30,000 individuals within an area of a 50 km radius 3. productive during the final weeks of gestation, during birth, lactation and conception 4. productive during the final stages of fruit development and ripening in commercial crops affected by the Grey-headed Flying-fox 5. known to support a continuously occupied camp. <p>The plan also defines critical roosting habitat as the following:</p> <ol style="list-style-type: none"> 1. is used as a camp either continuously or seasonally in >50% of years 2. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained >10,000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months) 3. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 2 500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May). <p>Targeted survey for the Grey-headed Flying-fox was conducted on 6 July 2016 for three person hours and involved spotlighting and passive monitoring at two locations (Travers Ecology 2016). Several hundred Grey-headed Flying-fox were observed in flight heading west over the site during the survey. There were no tree flowering within the study area at this</p>

	<p>time and subsequently there were no observations of the species foraging within the site. There is no likelihood of this species utilising the site for roosting and subsequent breeding habitat. The woodland within the site is considered potential, marginal foraging habitat which, during the certain times of the season, may be opportunistically utilised by the species.</p> <p>The proposal would remove 4.9 ha of potential foraging habitat for the Grey-headed Flying-fox. The proposed action would not impact on any known Grey-headed Flying-fox camps. The nearest grey-headed Flying-fox camp is approximately 2 km north east of the study area and contains <10,000 individuals. The patch of native vegetation in the study area is separated from the known camp by development and does not form part of the patch. The proposed action would not impact on any critical roosting habitat. The study area contained a limited number of mature trees that would be likely to provide foraging resources for this species when in flower. These trees would not flower every year and would not provide adequate resources to be relied upon by the entire population. As such, the resources would be used only occasionally and would form part of a wider collection of foraging resources within the locality. The proposed action would cause a decrease in the availability of foraging habitat but not to the point that the species is likely to decline, reduce the area of occupancy or disrupt the breeding cycle. The proposed action is unlikely to constitute a significant impact on the grey-headed Flying-fox. Travers (2016) concluded that as the subject does not contain any likely roosting or subsequent breeding habitat and foraging habitat will remain well represented within the locality, there will not be any significant impact on this species.</p>
<p><i>Chalinolobus dwyeri</i> - Large-eared Pied Bat</p>	<p>The Large-eared Pied bat is an insectivorous bat with a distribution from Shoalwater Bay in Queensland through to around Ulladulla in NSW. The species is largely restricted to the interface of sandstone escarpment for roosting habitat, and relatively fertile forests supporting woodlands and forests for foraging habitat. The species forages for insects in and around forest canopies. Important populations for this species occur in the Hunter Valley, Sydney Basin and Southern Tablelands of NSW.</p> <p>There are no sandstone escarpments or caves within or nearby the site – which would provide the required roosts for the species. The site does contain a riparian corridor, which could be used as a foraging resource by the species, however this is unlikely given the absence of nearby potential roost sites. Targeted survey for the Large-eared Pied-bat was conducted on 6 July 2016 for three person hours and involved spotlighting, recording using an anabat and passive monitoring at two locations (Travers 2016) (Figure 5). No Large-eared Pied-bats were identified in the study area during survey.</p> <p>While the site does contain hollow-bearing trees which may be utilised by the Large-eared Pied Bat for roosting, this would be marginal at best, as the species tends to use caves, sandstone overhangs, tunnels and culverts for roosting and breeding – none of which have been recorded within the study area.</p> <p>The proposed action would lead to the loss of 0.1 ha of potential foraging habitat in the form of dams/creeks. Within a regional context, this loss comprises a very small proportion of the potential foraging habitat available for the Large-eared Pied Bat, particularly when considering the large expanses of woodland surrounding the site and to the south-east. About 1.8 ha of the highest quality woodland and the creek will be realigned and retained within the development footprint.</p> <p>Based on the above description of potential foraging habitat within the site, the site does not contain habitat critical to the survival of the species. Habitat critical to the survival of the species refers to areas that are necessary:</p> <ul style="list-style-type: none"> ● for activities such as foraging, breeding, roosting, or dispersal ● for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the ecological community, such as pollinators) ● to maintain genetic diversity and long term evolutionary development ● for the reintroduction of populations or recovery of the species or ecological community. <p>Critical habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical to the survival of the species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act. There is no critical habitat within the site.</p> <p>Significant impacts to the Large-eared Pied Bat from the proposed development are therefore considered unlikely for the following reasons:</p> <ul style="list-style-type: none"> ● the loss of native vegetation on site will be relatively small, particularly within a regional context, and is already highly disturbed;

	<ul style="list-style-type: none"> the Large-eared Pied Bat has not been recorded on site and the area is not recognised as providing habitat critical to the survival of the species; the Large-eared Pied Bat is able to utilise a variety of vegetation types over large areas, making them less sensitive to fragmentation.
Frogs	
<p><i>Litoria aurea</i> – Green and Golden Bell Frog</p>	<p>In NSW, the Green and Golden Bell Frog (GGBF) has been found in a wide range of water bodies except fast flowing streams. The nearest known GGBF population is located about 3.5 km north west of the referral area near Hephher Road, Campbelltown. It inhabits many disturbed sites, including abandoned mines and quarries. Breeding habitat in NSW includes water bodies that are shallow, still, ephemeral, unshaded, with aquatic plants and free of Plague Minnow (<i>Gambusia holbrooki</i>) and other predatory fish, with terrestrial habitats that consist of grassy areas and vegetation no higher than woodlands, and a range of diurnal shelter sites. Breeding occurs in a significantly higher proportion of sites with ephemeral (temporary) ponds, rather than sites with fluctuating or permanent ponds, and where predatory fish are absent.</p> <p>GGBF need various habitats for different aspects of their life cycle including foraging, breeding, over-wintering and dispersal. They will also use different habitats or habitat components on a temporal or seasonal basis.</p> <p>The major threats to the GGBF include habitat removal and fragmentation, habitat degradation, disease such as from the chytrid fungus and predation.</p> <p>Travers (2016) identified that the riparian corridor located within the study area generally had a mix of native and exotic cover with areas containing low cover. Travers conducted targeted GGBF surveys that involved diurnal habitat searches, listening for call males after dark, spotlight and call-playback techniques. An assessment of potential habitat for threatened frog species on the site was also carried out primarily along the drainage line and dam area near the eastern boundary of the development site. Breeding call imitation and sound stimulation was used to try evoke calling by sheltering frogs. A listening period followed each calling session. It is noted that the breeding season for the species generally lies between September and December. Surveys were undertaken during winter outside of the breeding season. However, based on an assessment of the habitat on site and the lack of nearby recent records it is considered that the survey effort was appropriate and that the species is unlikely to occur.</p> <p>It is considered unlikely that the proposed action will lead to a significant impact on this species for the following reasons:</p> <ul style="list-style-type: none"> the potential habitat is unremarkable, within a disturbed environment with a lack of crucial over-wintering habitat there are no records on site and the area is unlikely to support important habitat or an ecologically significant population of the species there are a number of larger areas of suitable habitat within the surrounding area which reduces the risk of isolating or fragmenting any individuals that may occur onsite the creek will be realigned and retained therefore ensuring provision of similar potential habitat into the future.
Flora	
<p><i>Pimelea spicata</i> – Spiked Rice-flower</p>	<p><i>Pimelea spicata</i> is a slender, erect shrub containing flowers in racemes that are often white, tinged with pink and sparsely hairy. The species has a scattered distribution, occurring in two disjunct locations; the Cumberland Plain and the Illawarra region. There are 30 known sub populations of the species which are estimated to total 4,300 individuals. The species occupies undulating topography of well-structured clay soils derived from Wianamatta Shale (Western Sydney) and coastal headlands, or close proximity to the coast on a range of soil types including siltstone, sandstone and latite (Illawarra Region). <i>Pimelea spicata</i> has the ability to survive periods of stress i.e. drought by dying back to the root stock below ground and returning when favourable conditions are present. Seed dispersal mechanisms, if any, are unknown.</p> <p>Threats to <i>Pimelea spicata</i> include habitat loss due to clearing for development, weed invasion, inappropriate fire regimes, mowing and slashing, intensive grazing, dumping of rubbish and garden waste and direct and indirect impacts of road construction. No critical habitat has been declared for this species. No critical habitat for <i>Pimelea spicata</i> has been declared.</p>

	<p>Flora survey was undertaken on July 19th and 20th, 2016 (Travers 2016). A random meander search was undertaken in accordance with Cropper (1993) to create a broad species list. Targeted searches for <i>Pimelea spicata</i> were also undertaken during the random meander searches and whilst undertaking transect plot surveys. Twelve (12) 20x20m / 50x20m floristic transect plots were assessed within vegetated portions of the study area consistent with the BioBanking Assessment methodology BBAM. No <i>Pimelea spicata</i> was identified during survey. The study area is unlikely to provide potential habitat for this species given the long history of disturbance and age of the community. Travers (2016) concluded that the patch of native vegetation was about 50 years old. The ongoing disturbance would have disturbed the soil profile such that any individuals remaining would not have survived. There are no previous records within the study area, with the closest >2.5 km away. The proposal is unlikely to constitute a significant impact on <i>Pimelea spicata</i> given:</p> <ul style="list-style-type: none"> ● the species is unlikely to occupy the area given the history of disturbance and lack of records. ● no individuals were found within the study area, the habitat would not be critical to the survival of the species ● the proposal would not decrease the availability of habitat available.
<p><i>Pomaderris brunnea</i> – Brown Pomaderris</p>	<p><i>Pomaderris brunnea</i> is a small shrub whose stems are covered in simple hairs. It has small, cream flowers that cluster into pyramidal panicles. The species is endemic to south-eastern Australia and occurs in eastern NSW, the North Coast and New England Tablelands. <i>Pomaderris brunnea</i> grows in moist woodland and forest on clay and alluvial soils, generally of floodplains and creek lines. The species has been recorded across 16 sites in NSW with an estimation of the population at about 600 plants. The majority of these are located in the Wollondilly and Camden LGAs.</p> <p>Potential threats to <i>Pomaderris brunnea</i> include sand extraction, weed invasion, browsing by cattle, disturbance and destruction from increase human access to sites, stormwater runoff, timber harvesting operations and altered fire regimes. As yet, no critical habitat has been declared for this species. One of the proposed recovery actions is to determine critical habitat.</p> <p>Flora survey was undertaken on July 19th and 20th, 2016 (Travers 2016). A random meander search was undertaken in accordance with Cropper (1993) to create a broad species list. Target searches for <i>Pomaderris brunnea</i> were also undertaken during the random meander searches and whilst undertaking transect plot surveys. Twelve (12) 20x20m / 50x20m floristic transect plots were assessed within vegetated portions of the study area consistent with the BioBanking Assessment methodology 9BBAM. No <i>Pomaderris brunnea</i> was identified during survey. The study area is unlikely to provide potential habitat for this species given the long history of disturbance and age of the community and the absence of records within a 5 km radius of the study area. Travers (2016) concluded that the likelihood of occurrence of <i>Pomaderris brunnea</i> in the study area is very low, given the history of disturbance, no records within the study area and absence of the species during targeted survey. The proposal would be unlikely to constitute a significant impact given the following:</p> <ul style="list-style-type: none"> ● no species were identified in the study area, nor are there previous records within a 5 km radius of the site ● there is a very low chance the species would be present along a lower tributary, with most records along the banks of the Nepean River ● the proposal would not isolate, fragment or reduce the area of occupancy of the species ● the proposal would not affect habitat critical to the survival of <i>Pomaderris brunnea</i>.

2.4.2 Do you consider this impact to be significant?

The proposal is not considered likely to present significant impacts to MNES listed under EPBC Act for the reasons outlined in section 4.

2.5 Is the proposed action likely to impact on the member of any listed migratory species, or their habitat

While the Action is unlikely to significantly impact on any MNES, this referral has been prepared to ensure the Action is assessed accordingly. No migratory species have been recorded on site. The site was considered to provide marginal habitat for three (3) migratory species.

Targeted migratory bird surveys were not undertaken as part of the site inspection. Instead, previous records for the study areas were obtained and a habitat assessment was conducted to determine the likely presence of any migratory species (Travers 2016). The following impact table presents an assessment of the impact from the proposed action on species potential or known to occur on site.

2.5.1 Impact table

Table 2: Migratory birds impact table

Species	Impact
<p><i>Apus pacificus</i> – Fork-tailed Swift</p>	<p>The Fork-tailed Swift is a medium sized bird with a forked tail and is known to occur across all of Australia. In NSW the species is recorded across all regions and a majority of recordings east of the Great Divide. The species is almost exclusively aerial occurring over dry and open habitats including riparian woodland, tea tree swamps, low scrub, heath and saltmarsh. They also occur over open farmland and coastal sand dunes. The Fork-tailed Swift forages aerially and search along low pressure systems which are said to assist with flight. The species does not breed in Australia, tend to breed in small colonies during April – July and produce two or three eggs per brood. The species leaves Siberia in August arriving in Australia around October. The Fork-tailed Swift leaves Australia from mid-April to return to its breeding grounds. There are no significant threats to the Fork-tailed Swift. Travers (2016) identified that suitable habitat was present within the study area, however no targeted survey for this species was undertaken and none were identified in the study area during survey. The proposal would not impact upon any breeding habitat for this species or disrupt other lifecycle stages. The species occupies a large home range, forages widely and utilises a range of habitats for foraging purposes. The study area is unlikely to form part of an important habitat for this species.</p> <p>The proposal is unlikely to constitute a significant impact on this species.</p>
<p><i>Hirundapus caudacutus</i> – White-throated Needle-tail</p>	<p>The White-throated Needle-tail is a large bird and are generally gregarious when in Australia. They are often found in large flocks of hundreds or thousands of birds sometimes with other aerial insectivores such as the Fork-tailed Swift and <i>Hirundo ariel</i> (Fairy Martin). This species is wide spread in eastern and south-eastern Australia, extending to the inland slopes of the Great Divide in NSW. The extent of the occurrence in Australia is unknown with the global extent estimated at 1,000,000 – 10,000,000 km². The White-throated Needle-tail breeds across Asia and Russia and migrates to Australia after breeding.</p> <p>In Australia the species is almost exclusively aerial and are generally recorded above wooded / forested areas, heathland, farmland and occasionally over beaches or mudflats. They rely on low pressure systems to feed and are insectivorous. There are few known threats to the White-throated Needle-tail. No critical habitat has been declared for this species. Travers Ecology (2016) identified that suitable habitat was present within the study area, however no targeted survey for this species was undertaken and none were identified in the study area during survey. The proposal would not impact upon any breeding habitat for this species or disrupt other lifecycle stages. The species occupies a large home range, forages widely and utilises a range of habitats for foraging purposes. The study area is unlikely to form part of an important habitat for this species.</p> <p>The proposal is unlikely to constitute a significant impact on this species.</p>
<p><i>Rhipidura rufifrons</i> - Rufous Fantail</p>	<p>The Rufous Fantail is a small – medium sized bird generally found near coastal districts of northern and eastern Australia. Rufous Fantail breeds in Australia with populations occurring from South Australia-Victoria border through south and central Victoria east of the Great Dividing Range. There is limited change in the distribution of the species with some decline to the south-east Queensland population.</p> <p>Rufous Fantail mainly inhabits wet sclerophyll forests, gullies dominated by Eucalypts and a shrubby and heathy understorey. This species is usually seen singly or in pairs and occasionally in small groups. They breed in Australia from September to February and from November to January in South east Australia. Two – four eggs are laid in small nests</p>

generally in a tree, shrub or vine. Eggs take 15 – 17 days to incubate. The Rufous Fantail forages in low to middle strata of forests, sometimes in or below the canopy and on the ground for insects.

Some of the populations are migratory and are absent from south-east Australia in winter. The species leaves the breeding areas in March – April. Threats to the Rufous Fantail include fragmentation of habitat, loss of core moist breeding habitat, land clearing, urbanisation and logging. No critical habitat has been declared for this species. Travers Ecology (2016) identified that suitable habitat was present within the study area, however no targeted survey for this species was undertaken and none were identified in the study area during survey. There are no records within a 5 km radius of the study area and the likelihood of occurrence was deemed as very low (Travers Ecology 2016). The proposal would not impact upon any breeding habitat for this species or disrupt other lifecycle stages. The species occupies a large home range, forages widely and utilises a range of habitats for foraging purposes. The study area is unlikely to form part of an important habitat for this species.

The proposal is unlikely to constitute a significant impact on this species.

2.5.2 Do you consider this impact to be significant

No.

2.6 Is the proposed action to be undertaken in a marine environment (outside Commonwealth marine areas)?

No.

2.7 Is the proposed action likely to impact on any part of the environment in the Commonwealth land?

No. The nearest Commonwealth Land is the Commonwealth Bank of Australia Commonwealth Branch located within the Macarthur Square Shopping Centre about 600 m east of the referral area.

2.8 Is the proposed action taking place in the Great Barrier Reef Marine Park?

No.

2.9 Will there be any impact on a water resource related to coal / gas / mining?

No.

2.10 Is the proposed action a nuclear action?

No.

2.11 Is the proposed action to be taken by the Commonwealth agency?

No

2.12 Is the proposed action to be undertaken in a Commonwealth Heritage Place Overseas?

No

2.13 Is the proposed action likely to impact on any part of the environment in the Commonwealth marine area?

No

3 Section 3 – Description of the project area

3.1 Describe the flora and fauna relevant to the project area.

The site shows a history of disturbance and management for agricultural uses. The Flora and Fauna Assessment (Travers 2016) identified the following six vegetation communities in the site:

- Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
- River-flat Eucalypt Forest
- Exotic Vegetation
- Planted Vegetation
- Cleared / managed land.

The site has a history of clearing for agricultural use with the remaining patches of native vegetation classified as approximately 50 year old regrowth. The flora survey (Travers 2016) identified 154 flora species of which 67 were exotic. There were no threatened flora species identified during survey and the site was considered to have very low habitat potential for any threatened flora species considered likely to occur.

Bow Bowing Creek runs through the site. The condition of the creek line varied and in some areas was highly disturbed whilst other areas contained River-flat Eucalypt Forest. The habitat assessment deemed the creek line to be of moderate – low quality with still to low flowing water (Travers 2016). Fauna surveys by Travers (2016) identified 58 fauna species of which eight (8) were exotic species. One (1) threatened fauna species listed under the EPBC Act was recorded during survey flying overhead and not landing within the site:

- *Pteropus poliocephalus* (Grey-headed Flying-fox) – listed as Vulnerable.

A conservative approach was applied during surveys in the context of potential habitat for threatened / migratory fauna species that had records in proximity to the site. The site was considered to be of very low potential foraging habitat for this species.

3.2 Describe the hydrology relevant to the project area (including water flows)

Bow Bowing Creek runs eastward through the study area and onwards into lower portions of this creek which has been subject to channel alignments and flood mitigation works. Bow Bowing Creek flows into Bunbury Curran Creek and eventually into the Georges River. This creek has at least one tributary running off it to the south under the main southern railway line in the west, and there is an offshoot along the southern side of the creek which does not extend beyond the site. There is one dam and two stormwater basins in the upper catchment of the creek and to the west of the study area. The dam and basins lie within the adjacent Macarthur Heights development.

Bow Bowing Creek is relatively natural throughout its meandering across the site, however it is connected immediately upstream and downstream to concrete channels. Water is not flowing regularly in the concrete channels, thereby limiting any fish movement to that on site. As the area of the natural creek line has been reduced to a small section, species like *Gambusia* have potential to invade and reduce the viability of maintaining a population of small fish species. Thus in terms of the creek providing regional importance for riparian ecology, it is low and isolated.

3.3 Describe the soil and vegetation characteristics relevant to the project area

The geology of the site is characterised by Quaternary Alluvium near the southern boundary of the site which relates to Bow Bowing Creek, otherwise Ashfield Shale dominates. The soil present at the site is the Blacktown Soil Landscape.

3.4 Describe any outstanding natural features and/or any other important or unique values relevant to the project area

The site is not considered to contain any outstanding natural features.

3.5 Describe the status of native vegetation relevant to the project

A large portion of the referral area vegetation consists of limited native species and does not contain extensive mature trees. There are extensive areas of weed invasion that currently reduce the extent of contiguous native vegetation. Aerial photographs from 1969 indicated that the site was once extensively cleared with the exception of a few trees along the creek edges.

3.6 Describe the gradient (or depth range if action is to be taken in a marine area relevant to the project area

The referral area is gently undulating with the lower contours near the southern boundary (creek line) and some incised areas for drainage lines which are offshoots of Bow Bowing Creek. The elevation varies from 70-80m AHD.

3.7 Describe the current condition of the environment relevant to the project area

The natural vegetation throughout a majority of the referral area is a result of regrowth since the 1960s where historic aerials depict an almost cleared patch. Thus, many of the existing trees have a smaller girth than a mature forest. The current vegetation is of mixed aged with several stands of Acacia only vegetation or juvenile Eucalypts less than 10 m in height.

The referral area is currently not in use for residential purposes, commercial or industrial but is subject to ongoing residential development in accordance with the Macarthur North Masterplan permissible under the current LEP. The eastern portion of the site has been heavily modified for drainage management. The far western end of the site has mown grass that may be occasionally used for recreational pursuits and is the proposed location of the flood detention basin. A car park for the adjoining university occurs along a portion of the northern boundary. Some bulk earthworks have occurred on the site under an approved Development Application.

3.8 Describe any Commonwealth Heritage Places or other places recognised as having heritage values relevant to the project area

A search of the DotEE Australian Heritage Database returned one (1) listed place within the Campbelltown LGA. There are no listed places within the site. The nearest listed place is the Cubbitch Barta National Estate area at Old Illawarra Road, Menai which is located approximately 48 km east of the referral area. The proposed action would not indirectly or directly impact upon this listed Heritage item.

3.9 Describe any Indigenous heritage values relevant to the project area

There are no known indigenous heritage values within the project area.

3.10 Describe the tenure of the action area (e.g. freehold, leasehold) relevant to the project area

The current tenure of the land is vacant, but currently zoned as a deferred matter under the Campbelltown Local Environmental Plan (LEP), 2015, Macarthur Regional City Centre. It was previously zoned as 10(a) Regional Comprehensive Centre.

The current land use to the north is educational. To the east is recreational. To the west is recreational with new residential lands occurring 250m west. To the south is the main southern railway and extensive commercial premises (Macarthur Square).

3.11 Describe any existing or any proposed uses relevant to the project area

The site has a history of clearing for agricultural uses including cattle grazing. In the past 50 year areas adjacent to the site have been cleared for residential and commercial development associated with the neighbouring Macarthur Gardens development. There are no structures in the referral area.

4 Section 4 – Measures to avoid or reduce impacts

4.1 Describe the measures you will undertake to avoid or reduce impact from your proposed action

The following mitigation measures are proposed to minimise the potential ecological impacts, address threatening processes and to create a positive ecological outcome for fauna, their habitats and endangered ecological communities. They include:

- A vegetation management plan which will identify restoration measures and stipulate all habitat enrichment and fauna relocation protocols. The VMP will set parameters and goals for achievements, with validation through a monitoring program over a number of years. If goals are not met, then contingency or supplementary works will be engaged
- vegetation connectivity will be improved within the site by restoring the riparian corridor for the full length of the site from west to east
- pre-clearance habitat searches and relocation of any wildlife in affected habitat areas under the supervision of a fauna ecologist in accordance with a restoration and relocation protocol
- targeted weed control in revegetation areas and retained vegetation areas, focussing on invasive and noxious weed species
- sediment erosion and control measures will be installed immediately prior to the commencement of demolition, construction and earthworks
- loss of vegetation will be compensated by planting of vegetation along the reconstructed drainage line. Revegetation will enhance or replace lost foraging trees for birds and bats, including the placement of hollow logs and nest boxes
- inspection and removal of any aquatic fauna from the existing dams and affected waterbodies
- installation of protective fencing around drip zone of trees that interface with the development site to be retained
- sediment will be effectively retained within the site to minimise deterioration of surface runoff during construction works
- sediment control measures will specifically target the restriction of migration of silt and sediment, embankments and soil mounds, and will be undertaken in accordance with the guidelines described in the Blue Book – Managing Urban Stormwater: Soils and Construction (Landcome 2004). Stabilisation measures will include open weave jute mesh
- sediment basins will be established to collect any sediment mobilised from the site

A large portion of the creek embankment vegetation is severely affected by exotic weeds. The application of suitable revegetation and ongoing weed control to be managed by a vegetation management plan will provide an onsite replacement for the loss of native vegetation. The reinstatement of this riparian vegetation will not form part of any offsetting calculations for the proposal, noting the site will be formally offset through a BioBanking scheme. The vegetation to remain throughout the action is not greater than 5 ha, therefore despite being retained and enhanced, it is not considered suitable as a future BioBanking site. Funding of all onsite restoration works and offsite offsets will come through revenue from the proposed development.

Other measures include the installation of temporary and permanent protective fencing, implementation of Phytophthora hygiene protocols and implementation of disease control protocols for the handling of

wildlife, procedures for the harvesting and control of pest species. An environmental induction will be prepared for the construction crews involved in the clearance for vegetation, habitat enrichment works, sediment and erosion control works and ongoing construction activities.

Further mitigation measures will be controlled through the imposition of conditions of consent for the multiple DAs relative to the proposed action.

A Construction Environmental Management Plan will be prepared for the project and will incorporate all mitigation measures required for retained vegetation and fauna habitat, including buffer zones and delineation fencing. The plan will span the project duration and be adaptive to subsequent building stages to allow for phased removal of vegetation where appropriate. This should draw on the requirements listed in *Soils and Construction (2004 – the Bluebook)* and should be submitted to council prior to the commencement of construction. These are to remain in place until the site is completely revegetated. Disturbed areas must be revegetated within seven days after the disturbance in accordance with the Bluebook.

Tree protection fencing will be placed around all trees to be retained within 5 m of the bulk earthworks area. High visibility orange safety mesh is to be used at a distance of 1 m radius from the trunk of the tree. Clear “No Go Area” signage will be attached to the fencing. Any threatened species (flora or fauna) discovered during vegetation clearance works will result in all work stopping immediately and the Project Manager notified. Works will only recommence once the impact of the species has been assessed and appropriate control measures provided.

A hollow bearing tree protocol will be developed prior to the commencement of construction. The felling of hollow-bearing trees is to be conducted under the supervision of a suitably qualified ecologist to ensure appropriate animal welfare procedures are taken, particularly for threatened species. Hollows of high quality or with fauna recorded residing within should be sectionally dismantled for relocation and all hollows should be inspected for occupation, signs of previous activity and potential for reuse. Any hollows selected for reuse, particularly with consideration to Little Lorikeet and threatened microbats, should be reattached to an appropriately selected recipient trees within the retained habitat areas. Hollow bearing trees should be felled outside of microbat and Little Lorikeet breeding season.

4.2 For matters protected by the EPBC Act that may be affected by the proposed action, describe the proposed environmental outcomes to be achieved

The proposed action will remove 2.3 ha of CPW. Avoidance of impacts has been given consideration where possible, with areas of retention along the southern boundary and around a portion of the riparian zone on the western extent. Avoidance of all of the existing CPW is not considered feasible due to the way Bow Bowing Creek bisects the referral area, and the social / economic values on the land in relation to major shopping centres, education areas and transport hubs. The development of the land is important to meet the social and economic needs for Sydney’s continued growth.

Onsite significant revegetation works will be undertaken to provide an integrated outcome in accordance with a VMP for the 80m wide vegetated riparian corridor of the proposed realigned Bow Bowing Creek. Furthermore, impacts of the proposed action will be offset through the BioBanking Scheme. All biodiversity offsets will be secured through the purchase of appropriate credits as per the BBAM (2014). It is understood the EPBC Act *Condition-setting Policy (January 2016)* endorses the NSW BioBanking methodology for delivering biodiversity offsets.

A BioBanking Assessment Report has been undertaken by Travers (2017) to quantify the ecosystem credits required to offset the impacts to CPW (ecosystem credits ME020). It was calculated that 74.03 CPW credits are required to offset the proposed action in accordance with the State BioBanking Scheme. This assessment considered the landscape values, patch size, quality of vegetation and potential fauna habitat. Subject to approval, these ecosystem credits will be acquired from a BioBank site within the required IBRA sub-region.

The use of BioBanking will ensure that the project is consistent with Commonwealth environmental policy in that the project will result in an overall 'no net loss to biodiversity' and therefore the project is not considered to result in a significant impact to MNES, in particular CPW.

5 Section 5 – Conclusion on the likelihood of significant impacts

A checkbox tick identifies each of the matters of National Environmental Significance you identified in section 2 of this application as likely to be a significant impact. Review the matters you have identified below. If a matter ticked below has been incorrectly identified you will need to return to Section 2 to edit.

Client Note: *all following are No (for internet entry)*

5.1.1 World Heritage Places

5.1.2 National Heritage Places

5.1.3 Wetlands of International Importance (declared Ramsar Wetlands)

5.1.4 Listed threatened species or any threatened ecological community

5.1.5 Listed migratory species

5.1.6 Commonwealth marine environment

5.1.7 Protection of the environment from actions involving Commonwealth land

5.1.8 Great Barrier Reef Marine Park

5.1.9 A water resource, in relation to coal/gas/mining

5.1.10 Protection of the environment from nuclear actions

5.1.11 Protection of the environment from Commonwealth actions

5.1.12 Commonwealth Heritage places overseas

- 5.2 If no significant matters are identified, provide the key reasons why you think the proposed action is not likely to have a significant impact on a matter protected under the EPBC Act and therefore not a controlled action**

The proposed action IS NOT considered a controlled action for the reasons listed in section 2 and 4.

6 Environmental record of the person proposing to take the action

Provide details of any proceedings under Commonwealth, State or Territory law against the person proposing to take the action that pertain to the protection of the environment or the conservation and sustainable use of natural resources.

6.1 Does the person taking the action have a satisfactory record of responsible environmental management? Please explain in further detail

Yes. UrbanGrowth NSW is established as a State owned Corporation under the Landcom Corporation Act 2001. The Principal Objectives of the corporation set out in Part 2 of the enabling legislation, among other things, is to protect the environment by conducting its operations in compliance with the principles of ecologically sustainable development. The UrbanGrowth NSW sustainability strategy identifies its commitment to delivering low carbon, resource efficient and environmentally sensitive places. Specifically relating to biodiversity, UrbanGrowth NSW's objective is to respect, conserve and regenerate the natural environment. The target set for UrbanGrowth NSW projects is to enhance the local habitat, biodiversity or ecological communities, from the site's condition pre-existing condition. UrbanGrowth NSW seeks to establish its projects as environmental performance leaders, setting a "new normal" across NSW and Australia. The objective is that the highest level of performance becomes the "business as usual" for a sustainable future.

6.2 Provide details of any proceeding under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources

Not applicable.

6.3 Will the action be taken in accordance with the corporation's environmental policy and planning framework?

Yes, they are committed to the implementation of industry leading environmental practices.

6.3.1 If the person taking the action is a corporation, please provide details of the corporation's environmental policy and planning framework

UrbanGrowth NSW operates as ISO14001-certified Environmental Management System. The organisation's environmental policy and framework is articulated through the Sustainability Strategy published on the UrbanGrowth NSW website (<http://www.urbangrowth.nsw.gov.au/sustainability/>).

6.4 Has the person taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?

Yes.

7 Section 7 – Information Sources

You are required to provide the references used in preparing the referral including the reliability of the source.

7.1 List references used in preparing the referral (please provide the reference source reliability and any uncertainties of source).

Reference Source	Reliability	Uncertainties
Department of the Environment (2017). <i>Species Profile and Threats Database</i> , Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat . Accessed Mon, 20 June 2017 14:40:00 +1100	High. All information on this site is from peer reviewed journals and provided by DotEE.	Nil.
Landcom (2004) Managing Urban Stormwater: Soils and Construction.	High.	Nil.
BioBanking Assessment Methodology (September 2014) State of NSW and Office of Environment and Heritage.	High. Has been peer reviewed by ELA.	Nil.
Travers Bushfire & Ecology (2016) Biobanking Assessment Report - Macarthur Gardens North Precinct prepared for Urban Growth NSW.	High. Has been peer reviewed by ELA.	Nil.
Department of the Environment and Energy <i>Protected Matters Search Tool</i> Accessed 24 July 2017	High. All information on this site is from peer reviewed journals and provided by DotEE.	Nil.

8 Section 8 – Proposed alternatives

You are required to complete this section if you have any feasible alternatives to taking the proposed action (including not taking the action) that were considered but not proposed.

8.1 Provide a description of the feasible alternative?

There are no alternative locations, time frames or activities that form part of the referred action.

The proposed action on the Macarthur Gardens North site is part of the larger Macarthur Regional Centre Masterplan and this area is the last development stage of the masterplan. It contains flood mitigation works for the Bow Bowling Creek catchment and these works are required under Voluntary Planning Agreements with Campbelltown Council and necessary to ensure the surrounding lands are not put at risk due to flooding. As a result, significant works are required in this location and no other viable alternative are achievable. The location of the creek re-alignment and reshaping, drainage works and associated impact area are in response to the existing topography and the required channel widths to carry predicted floodwaters.

The creek realignment allows the integration of residential development onto the subject land. There is limited opportunity to relocate the residential development to other areas within the site without causing significant loss in yield or further disturbance to Bow Bowling Creek.

Where possible, the proposed action was altered to reduce impacts to native ecological values. The proposed stormwater basin in the western portion of the site has been modified to retain a portion of CPW to minimise habitat loss.

The development of the land is important to meet the social and economic needs for Sydney's continued growth, development of the site is strategically important considering its close proximity to the University, TAFE, Campbelltown CBD and commercial centres, and Sydney's train network.

8.2 Select the relevant alternatives related to your proposed action

Not applicable

8.3 Do you have another alternative?

No

9 Section 9 – Contacts, signatures and declarations

Proponent information/signatures required

9.1 Is the person proposing to take the action an Organisation or an individual

9.2 Organisation- Urban Growth NSW

9.2.1 Job Title Senior Development Manager

9.2.2 First Name Andrew

9.2.3 Last Name Taylor

9.2.4 E-mail ataylor@urbangrowth.nsw.gov.au

9.2.5 Postal Address PO Box 237 Parramatta NSW 2124

9.2.6 ABN/ACN 41 163 782 371

9.2.7 Organisation Telephone 02 9841 8670

9.2.8 Organisation E-mail ataylor@urbangrowth.nsw.gov.au

9.2.9 I qualify for exemption from fees under section 520(4c)(e)(v) of the EPBC Act because I am: NOT EXEMPT

10 : Likelihood table

10.1 Likelihood assessment

Using databases or other records (i.e. Travers Ecology 2016; DotEE Protected Matters Search Tool 2017), presence or absence of suitable habitats, features of the proposed site, results of field surveys and professional judgement, the likelihood of occurrence for MNES has been determined and is presented in the tables below. MNES were assessed as 'known', 'likely', 'possible', 'unlikely' or 'no' according to the criteria below. This assessment is based on a number of factors including the species'/communities' distribution and habitat requirements, previous records in the vicinity of the Parklands, field assessment results and professional experience of this report's authors and their colleagues.

Likelihood of occurrence criteria include:

"known" = the species, population or ecological community was or has been observed on the site.

"likely" = suitable high quality habitat for a species, population or ecological community occurs on the site.

"potential" = suitable habitat for a species, population or ecological community occurs on the site, but there is insufficient information to categorise the species as likely, or unlikely to occur.

"unlikely" = a low to very low probability that a species, population or ecological community uses/occurs on the site.

"no" = the species will not occur on site e.g. marine species in a terrestrial study site.

An analysis of the likely level of impact of the proposed action on species with a likelihood of occurrence of "known", "likely" or "potential" (highlighted in blue below) were undertaken in the relevant referral Impact Tables.

Table 3: Likelihood of Occurrence Assessment

(Source: Office of Environment and Heritage and Department of the Environment and Energy)

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Impact Assessment Required
ECOLOGICAL COMMUNITIES					
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion		E	"Sydney Basin Bioregion, mostly in the Cumberland IBRA sub-region, with small occurrences in the Sydney Cataract, Wollemi and Burragorang sub-regions. It occurs primarily in the Castlereagh area in the north-west of the Cumberland Plain with other known occurrences near Holsworthy, Kemps Creek and Longneck Lagoon. Occurs primarily on Tertiary sands and gravels of the Hawkesbury-Nepean river system. At Agnes Banks it primarily occurs on aeolian (wind-blown) sands overlying Tertiary alluvium. Found on flat or gently undulating terrain in rain shadow areas typically receiving 700–900 mm annual rainfall. The ecological community occurs primarily at low elevations up to 80m above sea level (ASL), including old ridges, dunes and terraces.	Unlikely	No
Coastal Upland Swamps in the Sydney Basin Bioregion		E	Endemic to NSW and confined to the Sydney Basin Bioregion. It occurs in the eastern Sydney Basin from the Somersby district in the north (Somersby-Hornsby plateaux) to the Robertson district in the south (n the Woronora plateau). "Occur primarily on impermeable sandstone plateaux with shallow groundwater aquifers in the headwaters and impeded drainage lines of streams, and on sandstone benches with abundant seepage moisture. Generally associated with acidic soils."	No	No
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion		CE	Occurs in western Sydney, with the most extensive stands occurring in the Castlereagh and Holsworthy areas. Smaller remnants occur in the Kemps Creek area and in the eastern section of the Cumberland Plain. Mainly occurs on clay soils derived from the deposits of ancient river systems (alluvium), or on shale soils of the Wianamatta Shales.	Unlikely	No
Cumberland Plain Shale		CE	Endemic to the shale hills and plains of the Sydney Basin Bioregion in NSW, occurring primarily in, but not limited to, the Cumberland Sub-region. Flat to	Yes	Yes

Woodlands and Shale-Gravel Transition Forest			undulating or hilly terrain, at elevations up to approximately 350 metres above sea level. Predominantly associated with clay soils, that are derived from Wianamatta Shale geology. Minor occurrences may be present on other soil groups, notably Holocene Alluvium and soils derived from the Mittagong Formation.		
Shale Sandstone Transition Forest of the Sydney Basin Bioregion		CE	Occurs at the edges of the Cumberland Plain in western Sydney, most now occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas. Intergrade between clay soils from the shale rock and earthy and sandy soils from sandstone, or where shale caps overlay sandstone.	Unlikely	No
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion		E	"Generally confined to the Sydney Basin bioregion, including the Moss Vale, Ettrema, Burratorang, Sydney Cataract, and Wollemi IBRA sub-regions. However, some patches may extend into the Kanangra and Oberon IBRA sub-regions of the South Eastern Highlands bioregion. Found on igneous rock (predominately Tertiary basalt and microsyenite). Typically occurs at elevations between 650 and 1050 m above sea level.	No	No
Western Sydney Dry Rainforest and Moist Woodland on Shale		CE	Cumberland Plain Sub-region of the Sydney Basin Bioregion. It generally occurs in rugged terrain and other patches may occur on undulating terrain, with dry rainforest patches typically occupying steep lower slopes and gullies, and moist woodland patches typically occupying upper sections of the slope Occurs almost exclusively on clay soils derived from Wiannamatta Group shales."	Unlikely	No
FAUNA					
<i>Actitis hypoleucos</i>	Common Sandpiper	M	Summer migrant. In NSW, widespread along coastline and also occurs in many areas inland. Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	Unlikely	No
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley	Unlikely	No

			regions. Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of <i>Casuarina cunninghamiana</i> (River Oak).		
<i>Apus pacificus</i>	Fork-tailed Swift	M	Recorded in all regions of NSW. Riparian woodland, swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	Potential	Yes
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. (bullrushes) and Eleocharis spp. (spikerushes).	Unlikely	No
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M	Summer migrant. Widespread in most regions of NSW, especially in coastal areas, but sparse in the south-central Western Plain and east Lower Western Regions. Shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No	No
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	No	No
<i>Calidris melanotos</i>	Pectoral Sandpiper	M	Summer migrant to Australia. Widespread but scattered in NSW. East of the Great Divide, recorded from Casino and Ballina, south to Ulladulla. West of the Great Divide, widespread in the Riverina and Lower Western regions. Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	No	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Potential	Yes

<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	There are three main populations: Northern - southern Qld/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	Unlikely	No
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spotted-tailed Quoll	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld. Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	No
<i>Gallinago hardwickii</i>	Latham's Snipe	M	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW. Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	Unlikely	No
<i>Grantiella picta</i>	Painted Honeyeater	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	No	No
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	No	No
<i>Hirundapus caudacutus</i>	White-throated Needle-tail	M	Throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment. Open eucalypt forest, woodland or open woodland, including sheoak or Acacia woodlands and riparian woodlands of interior NSW.	Potential	Yes
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney. Dry and wet	No	No

			sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.		
<i>Lathamus discolor</i>	Swift Parrot	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes. Box-ironbark forests and woodlands.	Unlikely	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides, particularly those containing <i>Typha</i> spp. (bullrushes) or <i>Eleocharis</i> spp. (spikerushes). Some populations occur in highly disturbed areas.	Potential	Yes
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	Plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest south to Buchan in Victoria. The species has not been recorded in southern NSW within the last decade. Breeding habitat is the upper reaches of permanent streams and perched swamps. Non-breeding habitat is heath-based forests and woodlands	Unlikely	No
<i>Litoria raniformis</i>	Southern Bell Frog	V	In NSW, only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few recent unconfirmed records have also been made in the Murray Irrigation Area. Permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. Also found in irrigated rice crops.	No	No
<i>Monarcha melanopsis</i>	Black-faced Monarch	M	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland. Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	Unlikely	No

<i>Motacilla flava</i>	Yellow Wagtail	M	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA. Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	Unlikely	No
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	Unlikely	No
<i>Phascolarctos cinereus</i>	Koala	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands. Eucalypt woodlands and forests.	Unlikely	No
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	No	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Yes	Yes
<i>Rhipidura rufifrons</i>	Rufous Fantail	M	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW. Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	Potential	Yes
<i>Rostratula australis</i>	Australian Painted Snipe	E	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Swamps, dams and nearby marshy areas.	Unlikely	No
<i>Tringa nebularia</i>	Common Greenshank	M	Summer migrant to Australia. Recorded in most coastal regions of NSW; also widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and north-west regions. Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and	Unlikely	No

			bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).		
FLORA					
<i>Acacia bynoeana</i>	Bynoe's Wattle	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	Unlikely	No
<i>Acacia pubescens</i>	Downy Wattle	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	Unlikely	No
<i>Allocasuarina glareicola</i>		E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Castlereagh woodland on lateritic soil. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> .	Unlikely	No
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton. Coastal heathlands, margins of coastal swamps and sedgeland, coastal forest, dry woodland, and lowland forest.	Unlikely	No
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley. Dry rainforest; littoral rainforest; <i>Leptospermum laevigatum</i> - <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> (Coastal Tea-tree– Coastal Banksia) coastal scrub; <i>Eucalyptus tereticornis</i> (Forest Red Gum) or <i>Corymbia maculata</i> (Spotted Gum) open forest and woodland; and <i>Melaleuca armillaris</i> (Bracelet Honey-myrtle) scrub.	No	No

<i>Eucalyptus benthamii</i>	Camden White Gum	V	Alluvial flats of the Nepean River and its tributaries. Mainly Kedumba Valley of the Blue Mountains National Park and Bents Basin State Recreation Area. Also along the Nepean River around Camden and Cobbitty, at Werriberri (Monkey) Creek in The Oaks, and on the Nattai River in Nattai National Park. Occurs in open forest. Requires a combination of deep alluvial sands and a flooding regime.	No	No
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Dry sclerophyll forest and moss gardens over sandstone.	No	No
<i>Grevillea parviflora subsp. parviflora</i>	Small-flower Grevillea	V	Sporadically distributed throughout the Sydney Basin and in the Hunter in the Cessnock - Kurri Kurri area. Also known from Putty to Wyong and Lake Macquarie on the Central Coast. Heath and shrubby woodland to open forest on sandy or light clay soils usually over thin shales.	Unlikely	No
<i>Haloragis exalata subsp. exalata</i>	Square Raspwort	V	Disjunct distribution in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Protected and shaded damp situations in riparian habitats.	No	No
<i>Leucopogon exolasius</i>	Woronora Beard-heath	V	Upper Georges River area and in Heathcote National Park. Woodland on sandstone.	No	No
<i>Pelargonium sp. Striatellum</i> (G.W.Carr 10345)	Omeo Storksbill	E	Known from only 3 locations in NSW, with two on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. Irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and wetland or aquatic communities.	No	No
<i>Persoonia bargoensis</i>	Bargo Geebung	V	Restricted to a small area south-west of Sydney on the western edge of the Woronora Plateau and the northern edge of the Southern Highlands. Woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravelly soils of the Wianamatta Shale and Hawkesbury Sandstone.	No	No
<i>Persoonia hirsuta</i>	Hairy Geebung	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No	No

<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	Unlikely	No
<i>Pimelea spicata</i>	Spiked Rice-flower	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). Well-structured clay soils. Eucalyptus moluccana (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	Potential	Yes
<i>Pomaderris brunnea</i>	Brown Pomaderris	V	In NSW, found around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands. Moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Potential	Yes
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	No	No
<i>Thelymitra kangaloonica</i>	Kangaloon Sun Orchid	CE	Only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. Swamps in sedgeland over grey silty grey loam soils.	No	No
<i>Thesium australe</i>	Austral Toadflax	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Grassland on coastal headlands or grassland and grassy woodland away from the coast.	No	No

Key: V = vulnerable, E = endangered, CE = critically endangered, M = migratory under CAMBA, JAMBA, RoKAMBA and Bonn Convention.

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