



Commonwealth Ave Bridge Detailed Business Case

National Capital Authority

Ecology Report - Biodiversity Constraints Assessment

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 Project Manager: Lama Qasem
 Author: Lauren Ascah
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Jacobs Group (Australia) Pty Limited
 ABN 37 001 024 095
 Level 7, 177 Pacific Highway
 North Sydney NSW 2060 Australia
 PO Box 632 North Sydney
 NSW 2059 Australia
 T +61 2 9928 2100
 F +61 2 9928 2444
 www.jacobs.com

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Appendix A. Borehole location plan and inferred sections

1. Introduction

Jacobs was awarded the tender for Design Services for the Commonwealth Bridge Upgrade Detailed Business Case (Project No P19/659) by the National Capital Authority (NCA) on 13 June 2019. The services include the preparation of a Functional Design Brief and Concept Design Report for the proposed widening of Commonwealth Avenue Bridge in order to increase opportunities for Active Travel.

This report presents the results of the biodiversity constraints assessment undertaken for the existing Commonwealth Avenue bridge in Canberra ACT. The structure is a twin bridge constructed between 1961 and 1963 over the artificial Burly Griffin lake which was excavated at the same time as the bridge was constructed and filled with water shortly after.

It is understood that options are being reviewed for strengthening the existing bridge and increasing the width of the pedestrian and cycle-way by widening the outside edge of both bridges. The purpose of this assessment is to summarise the biodiversity constraints posed by the potential Commonwealth Avenue Bridge upgrade. The assessment is based on review of available online information, including threatened species sightings and government reports, as well as assessment of the immediate landscape based on aerial imagery and ground level imagery (Google Street-View).

2. Desktop Review

A background review of available online information was undertaken to identify the existing environment within 10km radius of the Bridge. The review focused on database searches, relevant reports pertaining to the study area, and spatial layers. The review was used to compile a list of threatened species and communities, including migratory species, known to have been recorded previously within the broader study area and surrounds.

The following database sources were consulted:

- ACTmap: Significant Species, Vegetation Communities and Registered Trees
- EPBC Protected Matters Search Tool: Matters of National Environmental Significance (MNES)
- Atlas of Living Australia
- Canberra Nature Map (NatureMapr database of public-submitted records)
- eBird Australia (Cornell Lab of Ornithology database of public-submitted records)

Once the species list was compiled, the Likelihood of Occurrence of each species was assessed based on the criteria described in **Table 1**. The Likelihood of Occurrence assessment considered the species' potential to utilize any habitat features or possible food sources within the immediate study area surrounding the bridge, including the Lake and foreshore habitat. The assessment considered the frequency of historical records for the species within Canberra. The complete assessments for all species identified can be found in Appendix A.

Table 1: Criteria for Assigning Likelihood of Occurrence

Likelihood of Occurrence	Criteria
Unlikely	• Species highly restricted to certain geographical areas not within the proposal footprint • Species has specific habitat requirements that are not present in the study area
Low	Species that fit into one or more of the following criteria: • Have not been recorded previously in the study area/surrounds, and for which the study area is beyond the current distribution range • Use specific habitats or resources not present in the study area. • Are non-cryptic perennial flora species that were targeted by surveys and were not recorded.
Moderate	Species that fit into one or more of the following criteria: • Have infrequently been recorded previously in the study area/surrounds • Use specific habitats or resources present in the study area but in poor or modified condition • Are unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration • Are cryptic flowering species that were not seasonally targeted by surveys and have not been recorded.
High	Species that fit into one or more of the following criteria: • Have frequently been recorded previously in the study area/surrounds • Use habitat types or resources that are present in the study area in abundance and/or in good condition • Are known or likely to maintain resident populations surrounding the study area • Are known or likely to visit the site during regular seasonal movements or migration

The potential impact area is assumed to be limited to the “indicative limits of the works”, as presented in the Design Services Brief (GHD 2019) and is mapped below in **Figure 1**.



Figure 1: Indicative Limits of the Works

Figures 2 through 5 show the existing Bridge structure, surrounding lake-side environments, and common plantings throughout the lake-side recreational areas.



Figure 2: View from below Commonwealth Avenue Bridge looking south. Image capture from Google Street View.



Figure 3: View from North side of Lake Burley Griffin facing west towards the Bridge. Image capture from Google Street View.

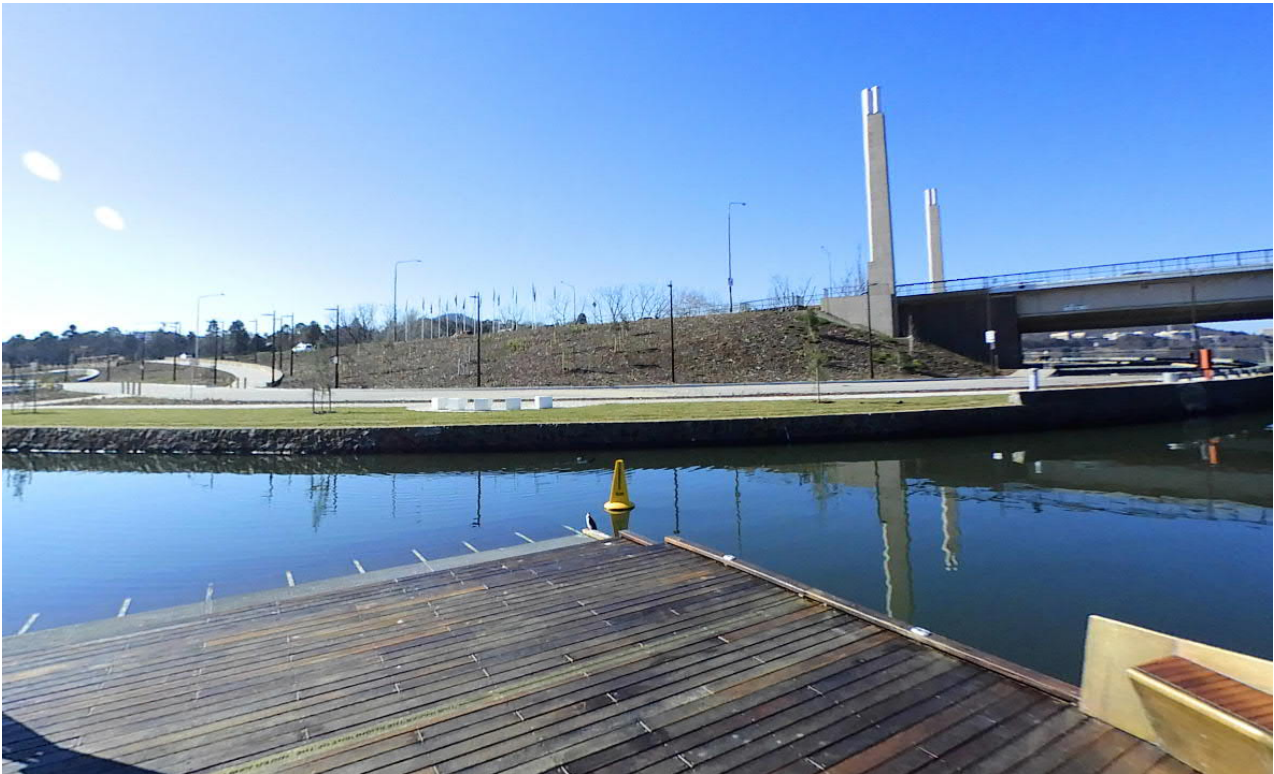


Figure 4: View from recreational area on the north side of Lake Burley Griffin, facing east towards bridge. New landscaping, including tree planting is visible in the background. Image capture from Google Street View.

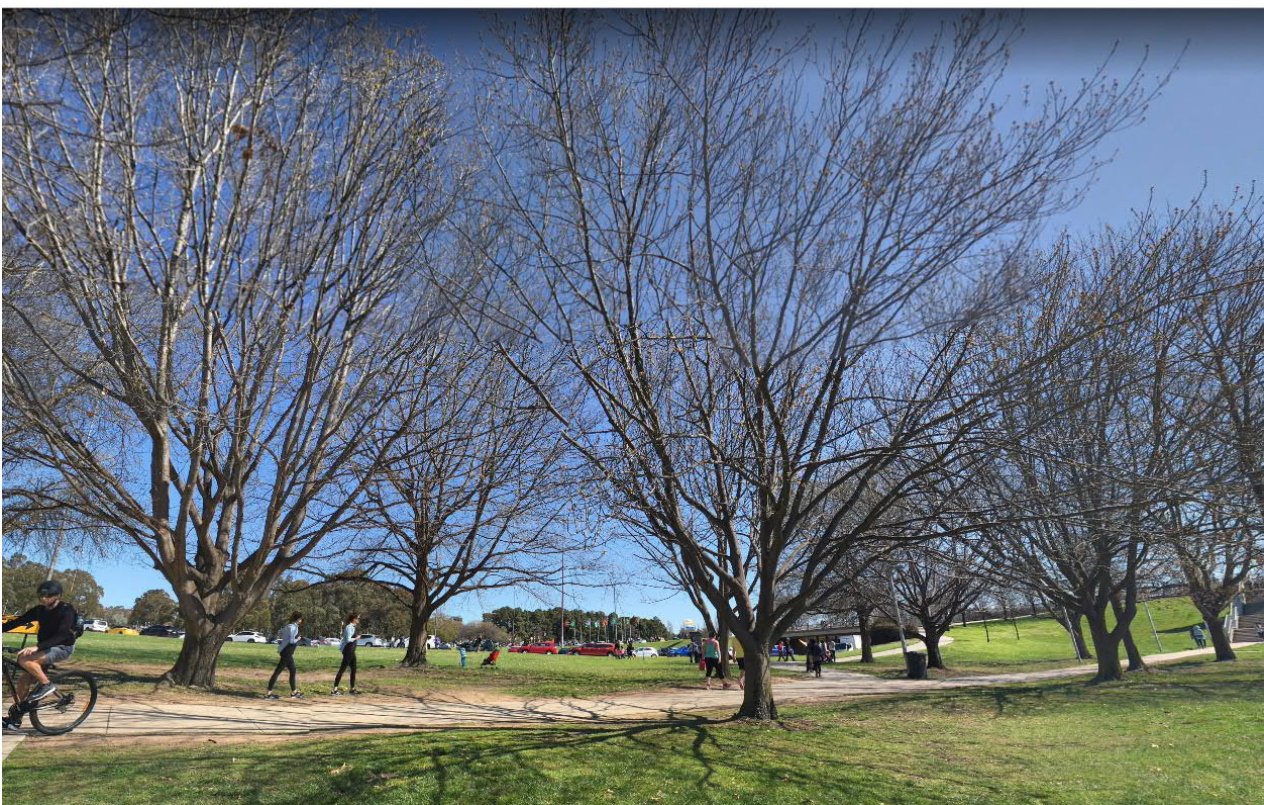


Figure 5: Planted trees on the south-east side of the Bridge. Image facing south towards mown grassy lawns. Image capture from Google Street View.

3. Results

3.1 Vegetation and habitat

Lake Burley Griffin is a man-made lake within the Molonglo River. The banks of the Lake have been concrete reinforced and there is no large woody riparian vegetation.

The terrestrial environment within the study area consists of mown grassy lawns, paved footpaths and roads, with some planted trees and shrubs. No native vegetation communities are mapped in the area. No registered trees are mapped in the area. The shoreline is man-made, with concrete and stone slabs directly abutting the lake's edge.

3.2 Threatened fauna

The desktop search indicated 25 threatened fauna with potential to occur in a 10km radius of the Bridge. Of these species, only Murray Cod was considered to be likely to occur in the area, as the species is known to be stocked into the Lake and is occasionally caught by recreational fishers. This species is discussed further in Section 3.2.1 below.

While other species such as the Swift Parrot and Grey-headed Flying Fox are known from records in proximity to the study area (<1km), there is no habitat or food sources for them within the study area. While these species may fly over the Bridge and surrounding area while moving between areas of suitable habitat, they are unlikely to land or forage within the study area. Any works on or nearby the Bridge are unlikely to create barriers to fauna movement throughout the area.

3.2.1 Murray Cod

Murray Cod are an ambush predator and require submerged large woody debris to provide camouflage from their prey. Such woody debris are typically introduced from distant sources, as much of their distribution occurs in streams that are—or once were—bounded by riparian stands of river red gum (*Eucalyptus camaldulensis*) (Llewellyn, 2005). Murray cod require hard surfaces on which to spawn and spawning often occurs within the hollows of submerged logs, where eggs are protected from predators or from being dislodged by increased flow velocities (Llewellyn, 2005).

Historically, heavy metals leaching from the Captains Flat mine killed all Murray Cod which inhabited the Molonglo River. As a result, when the Lake was formed in 1964 there were no large predatory fish species remaining. Stocking of Murray Cod into the Lake has occurred since 2000, in an effort to restore the ecological balance of the Lake and to increase the population size of the threatened species.

The specific section of the lake that is traversed by the Commonwealth Avenue Bridge appears to have little habitat value for Murray Cod, although it is probable that these fish use the lake for upstream-downstream movement during the breeding season. Given the potential for these fish to use the lake for migration there is a need to ensure works within the water column have minimal environmental disturbance. See section 4 below for suggested mitigation measures.

3.3 Threatened flora

The desktop search indicated 13 threatened flora species with potential to occur in a 10km radius of the Bridge. Of these species, none were considered likely to occur within the study area, due to the lack of suitable habitat.

3.4 Migratory Species

The Protected Matters Search Tool also indicated the potential for the 14 migratory species listed under the EPBC Act within the study area. These species were all assessed to have low likelihood of occurrence within the study area. While these species have the potential to fly over the Bridge while transiting from one area of habitat to another, it is unlikely these species would spend time resting or foraging on the mown grassy lawns within the study area. Higher quality habitat areas, such as the nearby Jerrabomberra Wetland, are likely to be preferred for foraging and nesting.

Jerrabomberra Wetland Nature Reserve is approximately 3 km southeast from the bridge. The wetland is not Ramsar listed, however, is considered a locally important site for many threatened and migratory wetland birds, in addition to be a popular recreational area. The wetlands lie upstream of the proposed bridge upgrade, where water from the Molonglo River enters Lake Burley Griffin.

The “Action Plan for Listed Migratory Species” was released by the ACT Government in 2018 and addresses threats to migratory birds in the ACT listed under both the NC and EPBC Acts. Some of the key threats listed in the Action Plan include habitat loss, habitat degradation, exotic plant and animal invasion, and general disturbance (includes impacts of light and noise pollution). In addition to the EPBC listed migratory species listed above, the Action Plan also noted that the following species have been historically recorded on or near the Lake: Latham’s Snipe, Ruddy Turnstone, Pacific Golden Plover, Bar-tailed Godwit, Common Sandpiper, Common Greenshank, Pectoral Sandpiper, Gull-billed Turn, Glossy Ibis and Caspian Tern. Of all these species, only the Latham’s Snipe is recorded with regularity, with most records falling within Jerrabomberra wetlands area, as well as Horse Park Drive Wetlands and the West Belconnen Ponds (located approximately 13 km and 15 km from the Bridge, respectively). There are occasional records of Latham’s Snipe at Lake Burley Griffin.

4. Conclusions and Mitigation Measures

This assessment is based on desktop review of the site only. A site visit is recommended to ground-truth the results of the desktop study, including an aquatic habitat assessment to assess the potential habitat values for threatened aquatic fauna species, including the Murray Cod.

The Commonwealth Avenue Bridge sits within a modified urban landscape with few natural features remaining, including an absence of native riparian vegetation and important habitat for threatened species of flora and fauna, including fish. Bridge upgrade activities are not likely to interfere with the flight paths of any protected or migratory species that may be transiting through the area. Any habitat connectivity currently provided by the lake and its shoreline would be maintained.

Mitigation measures to avoid and reduce environmental impacts should be developed before construction commences. At a minimum, these should include plans to minimize introduction and spread of weeds, maintain water quality and control potential sedimentation and run-off into the Lake, control any potential construction noise, vibration and light impacts, and minimize vegetation clearance as much as possible. Where it is necessary to remove vegetation to facilitate the upgrade, the area should be re-planted with native species.

Whilst there are several design options proposed for the Commonwealth Avenue Bridge upgrade, all these designs will require upgrading of the existing piers to support the weight of the proposed cantilevered walk/cycling paths, and as such, will require work above the water column of the lake. Strengthening works are proposed to be undertaken from scaffolding above the water underneath the bridge.

While there are no specific recommendations for the control of waste from under-bridge scaffolding in the "Environmental Protection Guidelines for Construction and Land Development in the ACT", it is necessary to ensure that any waste products from the construction work are prevented from entering the lake. Should the initial inspection find that more extensive works are required on the piers, it may be necessary to create a cofferdam around piers to prevent contamination of the lake.

5. References

ACT Government (2015). *Fish Stocking Plan for the Australian Capital Territory 2015-2020*.

ACT Government (2018). *Action Plan for Listed Migratory Species*.

GHD (2019). *Commonwealth Avenue Bridge Detailed Business Case – Design Service Brief*. Report prepared for the National Capital Authority.

Llewellyn, L. (2005). *Breeding biology, and egg and larval development of Galaxias rostratus Klunzinger, the Murray jollytail from inland New South Wales*. Australian Zoologist, 33, 141-165.

Appendix A. Borehole location plan and inferred sections

Species	NC Act	EPBC Act	Distribution and Habitat	Likelihood of Occurrence
Natural Temperate Grasslands of the South Eastern Highlands	E	CE	Natural Temperate Grassland is a natural grassland community dominated by a range of perennial grass species and, in highly intact sites, containing a large range of herbaceous species in many plant families, including daisies, peas, lilies, orchids. The community is often treeless, though trees of a range of species may occur in low densities, either as isolated individuals or in clumps.	Low
White Box-Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland	E	CE	The ecological community is usually characterised by a tree layer dominated by White Box (<i>Eucalyptus albens</i>), Yellow Box (<i>E. melliodora</i>) and/or Blakely's Red Gum (<i>E. blakelyi</i>), however, the community can still occur as a derived grassland in areas where the trees have been removed. It has a ground layer of native tussock grasses and a sparse, scattered shrub layer.	Low
Regent Honeyeater <i>Anthochaera phrygia</i>	CE	CE	The Regent Honeyeater is a rare, summer breeding visitor to Canberra. Usually attracted to flowering Yellow Box in the woodlands of the ACT region, or suburban Ironbarks. Also feeds on nectar from grevilleas and mistletoes.	Low
Curlew Sandpiper <i>Calidris ferruginea</i>	-	CE	The Curlew Sandpiper is a non-breeding vagrant, only rarely reported in the ACT. Habitat includes intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in salt works and sewage farms.	Low
Painted Honeyeater <i>Grantiella picta</i>	V	V	A rare breeding visitor to the ACT, the species favours eucalypt forests and woodlands, particularly those that are heavily infested with mistletoes. Prefers mistletoes of the genus <i>Amyema</i> .	Low
Swift Parrot <i>Lathamus discolour</i>	CE	CE	The Swift Parrot is a rare, non-breeding winter migrant from Tasmania. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. There are recent records of Swift Parrot at the National Gallery of Australia, approximately 1 km from Commonwealth Avenue Bridge.	Low
Bar-tailed Godwit <i>Limosa lapponica baueri</i>	-	V	Very rarely recorded in the ACT due to the species' preference for coastal habitats. Occurs on tidal mudflats, estuaries, sewage ponds, shallow river margins, brackish or saline inland lakes and flooded pastures. Sometimes found on inland wetlands or areas of short grass such as paddocks and airstrips.	Low
Northern Siberian Bar-tailed Godwit <i>Limosa lapponica menzbieri</i>	-	CE	Similar to the subspecies above, the Northern Siberian Bar-tailed Godwit is primarily recorded in coastal areas.	Low

Species	NC Act	EPBC Act	Distribution and Habitat	Likelihood of Occurrence
Eastern Curlew <i>Numenius madagascariensis</i>	-	CE	Very rarely recorded in the ACT as the species has a predominantly coastal distribution. The species occurs in estuaries, tidal mudflats, saltmarshes, mangroves, and occasionally in fresh or brackish lakes.	Low
Superb Parrot <i>Polytelis swainsonii</i>	V	V	Historically an uncommon visitor to Canberra, the species has recently been appearing with greater regularity. A summer breeding migrant, the Superb Parrot inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. There are Superb Parrot records throughout Canberra, including along the perimeter of Lake Burley Griffin. Recent records are from the National Gallery of Australia (approximately 1km from the Bridge), Commonwealth Park (approximately 300m from the Bridge) and the National Museum (approximately 500m from the Bridge).	Low
Australian Painted Snipe <i>Rostratula australis</i>	E	E	A very rare non-breeding visitor, the Australian Painted Snipe prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. It is primarily recorded in the Murray Darling Basin area.	Low
Murray Cod <i>Maccullochella peelii</i>	-	V	Murray Cod are endemic to the Murray Darling Basin. In the ACT, the species is found in the Murrumbidgee River and parts of the Molonglo River, the Cotter Rive, the Gudenby River and Ginninderra Creek. Murray Cod have been stocked into Lake Burley Griffin since the 1980's.	High - stocked
Macquarie Perch <i>Macquaria australasica</i>	E	E	Macquarie Perch is typically found in the cooler, upper reaches of the Murray Darling Basin. In the ACT, the species is currently restricted to the Murrumbidgee, lower Paddys and Cotter Rivers. It is a riverine, schooling species.	Low
Green and Golden Bell Frog <i>Litoria aurea</i>	V	V	Green and Golden Bell Frog appears to make use of a number of habitats, including both natural and man-made structures. The species has been recorded in coastal swamps, marshes, dune swales, lagoons, lakes and wetlands as well as riverine floodplain wetlands and billabongs. Green and Golden Bell Frogs are locally extinct in the ACT.	Low
Booroolong Frog <i>Litoria booroolongensis</i>	-	E	Occurs along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. They shelter under rocks near the ground on the stream edge. Species exists to the west of the Great Dividing Range, with sightings on the eastern side unconfirmed.	Low
Yellow-spotted Tree Frog <i>Litoria castanea</i>	CE	E	Require large permanent ponds or slow flowing streams with plenty of emergent vegetation such as bulrushes. There have been no sightings of the species in the ACT since the 1970's, and no confirmed records in the Southern Tablelands since 1980.	Low
Golden Sun Moth <i>Synemon plana</i>	E	CE	Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which the ground layer is dominated by wallaby grasses. Bare ground between the tussocks is thought to be an important microhabitat feature for the Golden	Low

Species	NC Act	EPBC Act	Distribution and Habitat	Likelihood of Occurrence
			Sun Moth. In the ACT the species occurs in lowlands next to Canberra and within small grassy sites in the city urban environment.	
Canberra Raspy Cricket <i>Cooraboorama canberrae</i>	-	-	The Canberra Raspy Cricket is a poorly understood species, which seems to be associated with Natural Temperate Grasslands or high-quality native pasture. The species is not currently a listed threatened species, however, it is believed to be endemic to the Canberra region and thus has considerable local significance.	Low
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	-	V	Forages over a broad range of open forest and woodland habitats, this species is a cave roosting bat which favours sandstone escarpment habitats for roosting, in the form of shallow overhangs, crevices and caves. Most of the species distribution is within NSW.	Low
Spotted-tail Quoll <i>Dasyurus maculatus</i>	V	E	Generally associated with large expansive areas of forested habitat to sustain territory size. Requires hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. The species suffered a sharp decline in the ACT after strychnine poison baits were introduced in 1861. The species is sighted rarely in Canberra, with most sighting restricted to the National Parks.	Low
Greater Glider <i>Petauroides Volans</i>	V	V	The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Occupy a relatively small home range with an average size of 1 to 3 ha. Sightings in the ACT restricted to Tidbinbilla and Namadgi National Park.	Low
Brush-trailed Rock-wallaby <i>Petrogale penicillata</i>	E	V	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Present in the ACT as a captive population at Tidbinbilla Nature Reserve.	Low
Koala <i>Phascolarctos cinereus</i>	V	V	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Restricted to Tidbinbilla Nature Reserve in the ACT.	Low
Grey-headed Flying Fox <i>Pteropus poliocephalus</i>	V	V	A roosting camp of approximately 3000 individuals is located at Commonwealth Park, approximately 300m from the Bridge, and Grey-headed Flying-fox are regularly observed flying over Lake Burley Griffin at dusk. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Grey-headed Flying Fox have been known to forage up to 50km from the camp each night.	Low
Pink-tailed Worm Lizard <i>Aprasia parapulchella</i>	V	V	Inhabits sloping, open woodland areas with a predominantly native grassy ground layer, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows	Low

Species	NC Act	EPBC Act	Distribution and Habitat	Likelihood of Occurrence
			below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites. Has a patchy distribution in the ACT, primarily along the slopes of the Molonglo and Murrumbidgee River.	
Striped Legless Lizard <i>Delma impar</i>	V	V	Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses. Populations in the ACT are isolated, found in the Gungahlin/Belconnen area, the Majura Valley, Yarrumundi Grassland and the Jerrabomberra Valley.	Low
Grassland Earless Dragon <i>Tympanocryptis pinguicolla</i>	E	E	Restricted to a small number of Natural Temperate Grassland sites, with introduced pasture grasses occurring at many of the sites supporting this species. Within its habitat, apparently prefers areas with a more open structure, characterised by small patches of bare ground between the grasses and herbs. In addition to tussocks, partially embedded surface rocks, and spider and insect holes are used for shelter. Historically a widely distributed species, in the ACT the Grassland Earless Dragon is now known only in the Majura Valley and Jerrabomberra Valley.	Low
Yass Daisy <i>Ammobium craspedioides</i>	-	V	Yass Daisy occurs in dry forest, box gum woodland and secondary grassland derived from the clearing of these communities. No populations currently known from the ACT.	Low
River Swamp Wallaby-grass <i>Amphibromus fluitans</i>	-	V	River Swamp Wallaby-grass grows mostly in permanent swamps; and also lagoons, billabongs, dams and roadside ditches. No populations currently known from the ACT.	Low
Canberra Spider Orchid <i>Caladenia actensis</i>	CE	CE	Endemic to the ACT and currently only known from two populations at Mt Ainslie and Mt Majura. Occurs amongst a ground cover of grasses, forbs, and low shrubs in the transitional zones between open woodland and forest.	Low
Trailing Hop-bush <i>Dodonaea procumbens</i>	-	V	This species grows in low-lying, often winter-wet areas in woodland, low open forests, heathland and grasslands. No populations currently known from the ACT.	Low
Black Gum <i>Eucalyptus aggregata</i>	V	V	<i>Eucalyptus aggregata</i> grows in low-lying areas in woodlands where the soils are generally poorly drained, alluvial or swampy. In the ACT, there are only a few scattered records from the Canberra area.	Low
Ginninderra Peppercress <i>Lepidium ginninderrense</i>	E	V	Occurs in natural temperate grassland in areas with low and sparse perennial grass cover. It is only known from two natural sites and two planted sites in the northern ACT.	Low
Basalt Pepper-cress <i>Lepidium hyssopifolium</i>	-	E	It is assumed the species originally grew predominantly in Eucalyptus woodlands, however, almost all remaining populations of Basalt Peppercress occur in heavily modified, non-natural environments, usually amongst exotic pasture	Low

Species	NC Act	EPBC Act	Distribution and Habitat	Likelihood of Occurrence
			grasses and weed species, sometimes with an overstorey of introduced tree species. No populations currently known from the ACT.	
Hoary Sunray <i>Leucochrysum albicans</i> var <i>tricolor</i>	-	E	Hoary Sunray occurs in a variety of grassland, grassy woodland and dry open forest habitats, in natural or semi-natural vegetation. Occurs at relatively high elevations, with sightings recorded throughout the ACT including within the Canberra area.	Low
Pale Pomaderris <i>Pomaderris pallida</i>	V	V	The Pale Pomaderris is found at numerous small sites along plateau edges and very steep upper slopes and cliffs of river valleys. The ACT sites are only on the eastern banks of the rivers, with records from the Murrumbidgee and Molonglo Rivers.	Low
Tarengo Leek Orchid <i>Prasophyllum petilum</i>	E	E	The Tarengo Leek Orchid occurs on relatively fertile soils in grassy woodland or natural grassland. Known only from five populations, with the vast majority of individuals located within the Tarengo Traveling Stock Route. In the ACT, the plant is only known from Hall Cemetery.	Low
Button Wrinklewort <i>Rutidosia leptorrhynchoidea</i>	E	E	Button Wrinklewort grows in Natural Temperate Grassland, Box-Gum Woodland, and derived grasslands; often in the ecotone between the woodland and grassland communities. It appears that the species was once widespread across south-eastern Australia, but it is now limited to approximately 29 populations, including populations in the Canberra region.	Low
Small Purple-pea <i>Swainsona recta</i>	E	E	The species is found in the grassy understorey of woodlands and open-forests. Once widespread across south-eastern Australia, it is now restricted to a few locations in the ACT, the central slopes of NSW and in the Mt Chiltern area of Victoria. The largest ACT population is on Mt Taylor.	Low
Austral Toadflax <i>Thesium australe</i>	V	V	Austral Toadflax is semi-parasitic on roots of a range of grass species, notably Kangaroo Grass (<i>Themeda triandra</i>) It occurs in shrubland, grassland or woodland, often on damp sites. In the ACT it is known from a single site at Kambah Pool.	Low