

APPENDIX 4 - ARTIFICIAL SHELTER MANAGEMENT STRATEGY



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Olympic Highway Intersection Upgrade, Wagga
Wagga

FINAL

December 2022



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Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Transport for NSW

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Acknowledgement of Country

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1.0 Introduction

1.1 Background

The Olympic Highway Intersection Upgrade Project (hereafter referred to as “the Project”) is a major intersection upgrade being undertaken by Transport for NSW (TfNSW). The Project includes a major upgrade of the existing road and construction/upgrade of highway infrastructure including installation of traffic lights, additional turning lanes and realignment of several existing road features.

The Project is located within northern Wagga Wagga and includes the intersections of the Olympic Highway with Old Narrandera Road and Travers Street, and several adjoining and satellite ancillary areas (**Figure 1.1**).

The Project is being assessed under Part 5, Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 Purpose and objectives

The Project vegetation disturbance footprint comprises the maximum extent of construction which covers about 22.57 hectares and contains about 2.61 hectares of native vegetation. The Project vegetation disturbance footprint represents a substantial contraction of the original Project Area assessed in the BAR (Umwelt, 2021). The Project vegetation disturbance footprint, and Project Area are shown in **Figure 1.1**.

The preparation of an artificial shelter management strategy was identified as a mitigation measure in the Biodiversity Assessment Report (BAR) (Umwelt, 2021) where vegetation clearance activities will impact fauna habitat within the construction footprint. Supplementary habitat features (such as artificial hollows or nest boxes) will be installed in suitable habitat nearby to mitigate impacts to fauna that may be displaced as a result of clearance of habitat. Such areas will also provide suitable release sites for any fauna captured during the vegetation clearance activities.

The objectives of this strategy are to:

- Identify and confirm the size and number of hollows that are to be removed by the Project
- identify the characteristics of the recorded hollows
- identify the type of artificial shelter to be installed to mitigate for habitat lost as a result of project disturbance – including the consideration of “Hollowhog” style augmented hollows
- identify appropriate locations for artificial shelters to be installed
- ensure artificial shelters will be installed in accordance with the relevant guidelines listed in **Section 1.3**
- document the installation process and monitoring requirements
- assess the suitability of alternative options for hollow replacement including hollow reclamation and hollow translocation

- develop an identification system for installed artificial shelters suitable to type of shelter installed.

The management of interaction with fauna and weeds during the construction phase and vegetation clearing works is detailed separately in the Olympic Highway Intersections Upgrade Flora and Fauna Management Plan (FFMP) (Umwelt, 2022).

The strategy has been prepared as part of response to submissions received following public exhibition of the review of environmental factors.

1.3 Relevant guidelines

This strategy is guided by the following documents:

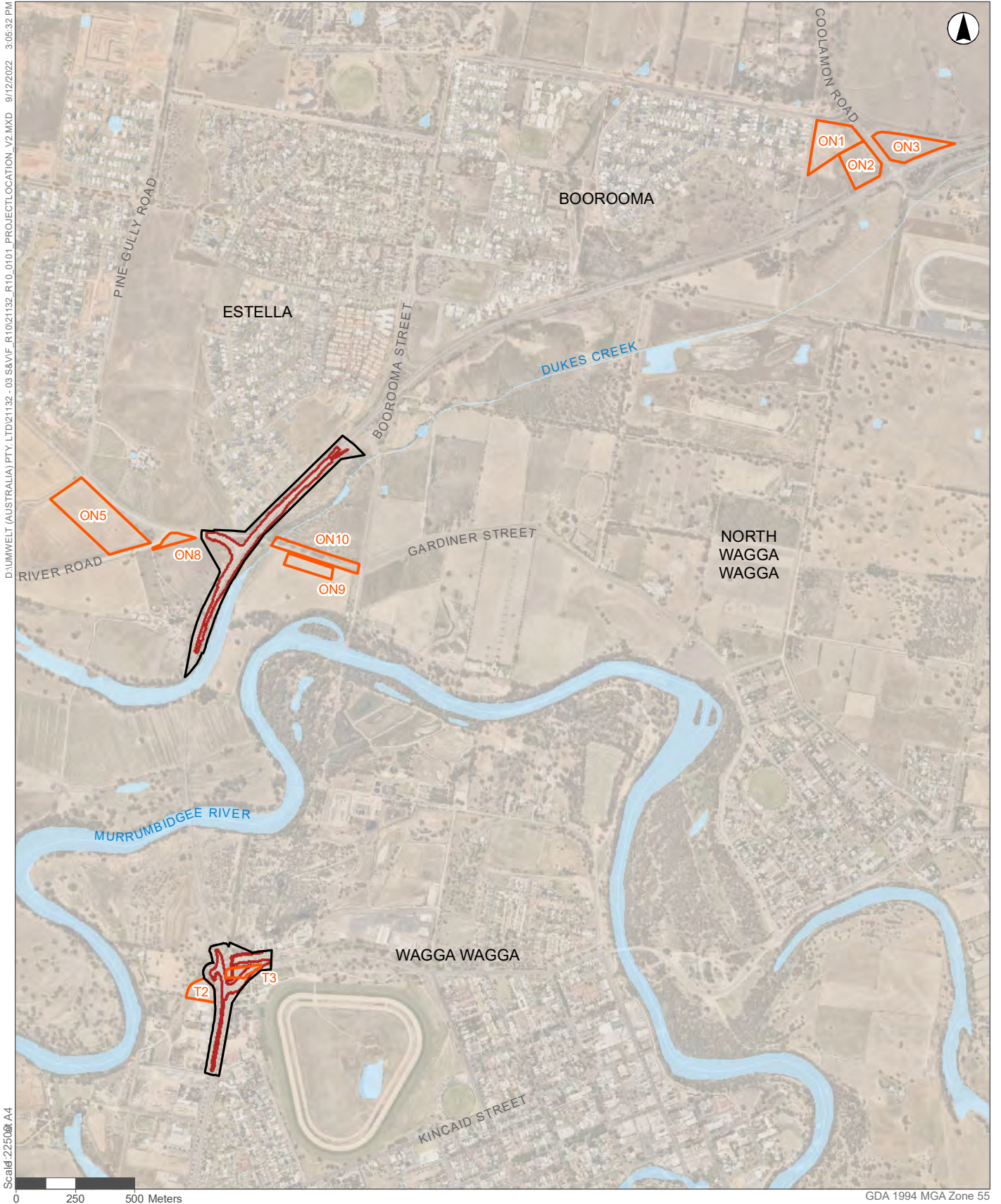
- Draft Biodiversity Guidelines (August 2022) (TfNSW, 2022a)
- Draft Artificial Shelter Guide (August 2022) (TfNSW, 2022b)
- Draft Tree and Hollow Replacement Guidelines (August 2022) (TfNSW, 2022c)
- Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).

In the first instance, the 2022 Draft Biodiversity Guidelines (TfNSW, 2022a), Draft Artificial Shelter Guide (TfNSW, 2022b) and Draft Tree and Hollow Replacement Guidelines (TfNSW, 2022c) will guide this strategy. Topics or areas which are not addressed by the draft guidelines will be guided by the 2011 Biodiversity Guidelines (RTA, 2011).

1.4 Limitations

There are a number of limitations relevant to this Artificial Shelter Management Strategy:

- Survey limitations:
 - In some circumstances, accessibility and density of vegetation may have obscured some hollows from view. This issue is mitigated by the application of a precautionary approach to identifying tree hollows (i.e. where a likely hollow was present but could not be confirmed due to screening by vegetation or the angle of visibility, this has been considered to be a hollow).
 - On occasion, visibility issues prevented the confident determination of hollow depth.
 - Mapping was conducted using a hand-held tablet/mobile phone using a field-based GIS application. The accuracy of uncorrected GPS data is subject to the accuracy of the unit and access to satellite information (generally less than 10 metres error). As such, these points should not be solely relied on for design purposes.
- Reporting limitations
 - This strategy has been prepared using both the 2011 Biodiversity Guidelines (RTA, 2011), and the 2022 Biodiversity Guidelines and associated guides (TfNSW, 2022a; TfNSW, 2022b; TfNSW, 2022c) to accompany the Response to Submissions Report. The strategy does not include a tree replacement strategy.



- Legend**
- Watercourses
 - Ancillary Sites
 - Vegetation Disturbance Footprint
 - Project Area

FIGURE 1.1
Project Location

2.0 Existing Environment

2.1 Vegetation characteristics and hollow density

The area within and surrounding the Project footprint consists of combination of agricultural land, remnant open woodland and open forest, waterbodies, and planted exotic and native vegetation. About 2.61 hectares of native vegetation is expected to be cleared comprising of the habitats and associated Plant Community Types (PCTs), listed in **Table 2.1**

Table 2.1 Habitats and vegetation within vegetation disturbance footprint of the Project

Vegetation	Area (ha)
Native Woodland	
PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplain in the lower slopes subregion of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion.	1.54
PCT 346 - White box - Blakely's Red Gum - White Cypress Pine Shrubby Woodland on Metamorphic Hills.	0.01
Derived Native Grassland	
PCT 277 - Blakelys Red Gum - Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion.	1.06
Mixed planted native and exotic vegetation	1.09
Exotic pasture	15.21
Cleared land, infrastructure, and water bodies	3.66
Total area within vegetation disturbance footprint	22.57

Vegetation characteristics are described in detail in the BAR (Umwelt, 2021). Hollow density data was compiled throughout the assessment process to capture data relevant to the initial assessment area. Hollow density data was reassessed, refined, and confirmed during surveys completed in October 2022 by Umwelt to inform this strategy.

Of the 392 hollows in 54 hollow bearing trees recorded in the Project Area, 58 hollows were recorded in the Project vegetation disturbance footprint from 11 hollow bearing trees (see

Table 2.2), located within the existing road corridor and ancillary site ON10 (see **Figure 2.1**). The main trunks of two of the five habitat trees in ancillary site ON10 may occur on the edge of the provided site boundary and/or are overhanging the site boundary. These trees have been included in this strategy however impacts to habitat values may be avoided through detailed design.

No hollow bearing trees recorded within the remaining confirmed ancillary sites for the Project (ON1, ON2, ON3, ON5, ON8, ON9, T2, T3) will be removed.

Table 2.2 Hollows and habitat trees in impact area

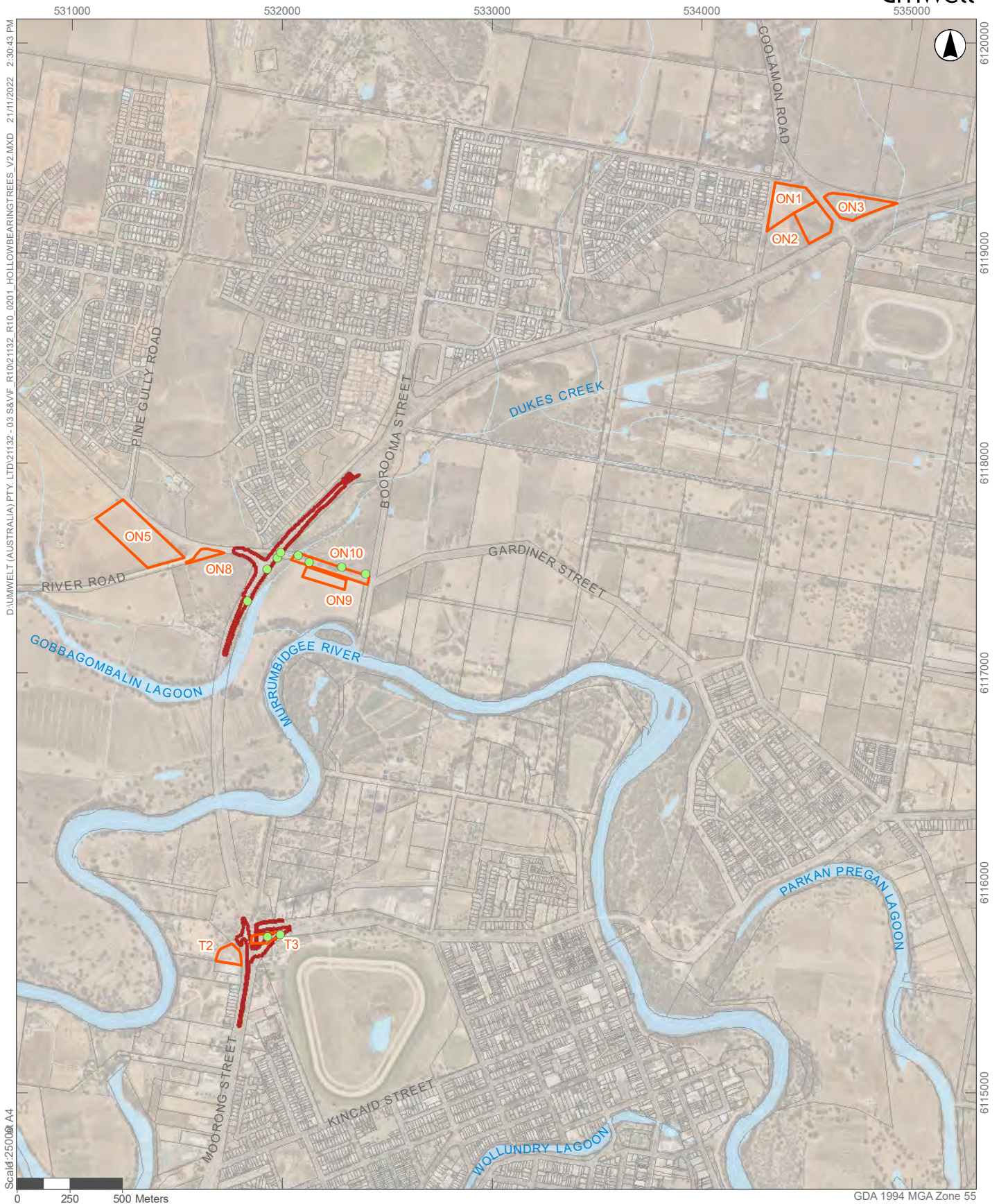
Hollow Size Class	Estimated number of hollows (BAR (Umwelt 2021))*			Estimated number of hollows (October 2022)**			Total estimated number of hollows per class (October 2022)	Total estimated number of hollows per class (excluding ancillary sites)	Habitat for targeted threatened species (Umwelt, 2021)
	Old Narrandera Road	Travers Street	Ancillary site (ON10)	Old Narrandera Road	Travers Street	Ancillary site (ON10)			
Tiny (< 2.5 mm)	9	9	4	11	7	3	21	18	Microbats****
Small (26 – 50 mm)	12	13	8	6	8	6	20	14	Squirrel Glider
Medium (51 – 100 mm)	1	7	4	2	7	5	14	9	Superb parrot
Large (100 – 300 mm)	0	0	4	0	1	2	3	1	Superb parrot
Extra-large (>30 mm)	0	0	0	0	0	0	0	0	No hollows identified
Total	22	29	20	19	23	16	58	42	
Total HBTs***	4	3	5	4	2	5			

* including classes of HBT excluded from hollow replacement i.e exotic species as per the TfNSW Draft Tree and hollow replacement guideline (2022c)

** excluding classes of HBT excluded from hollow replacement i.e exotic species as per the TfNSW Draft Tree and hollow replacement guideline (2022c)

*** number of hollow bearing trees within each area

**** TfNSW have advised that artificial hollow replacement for microbats is no longer undertaken by TfNSW due to limited evidence of utilization for breeding by threatened microbat species



- Legend**
- Hollow Bearing Trees
 - Property Boundaries
 - Ancillary Sites
 - Project Area

FIGURE 2.1

Hollow Bearing Trees Within Final Vegetation Disturbance Footprint

2.2 Hollow Dependant Threatened Fauna Species

The 3.7 hectares of remnant native vegetation and native planted trees which occur in the Project footprint provide potential foraging and/or breeding habitat for a number of threatened hollow dependant fauna species identified within the BAR (Umwelt, 2021) as having a moderate to high likelihood of occurrence, comprising:

- Superb parrot (*Polytelis swainsonii*)
- Barking owl (*Ninox connivens*)
- Brown treecreeper (*Climacteris picumnus*)
- Squirrel glider (*Petaurus norfolcensis*)
- Southern myotis (*Myotis macropus*)
- Large bent-winged bat (*Miniopterus orianae oceanensis*)
- Eastern false pipistrelle (*Falsistrellus tasmaniensis*).

Of the listed threatened hollow dependant fauna species, specific emphasis will be placed on replacement of suitable hollows for the following target species as per the mitigation measures recommended within the BAR (Umwelt, 2021), and as discussed from TfNSW:

- Superb parrot (*Polytelis swainsonii*)
- Squirrel glider (*Petaurus norfolcensis*).

3.0 Artificial Shelter Specifications

3.1 Required quantity/specifications

The proposed number of each artificial hollow type and target hollow class is outlined in **Table 3.1**.

The number of artificial hollows required and artificial shelter specifications for the squirrel glider were sourced from the 2022 Draft Artificial Shelter Guide (TfNSW, 2022b). Artificial shelter specifications for the superb parrot were sourced from the 2022 Draft Artificial Shelter Guide (TfNSW, 2022b) and a recent publication by Stojanovic et al. investigating specific nesting requirements for superb parrot (Stojanovic, 2021). The following equations and ratios supplied within the TfNSW Draft Artificial Shelter Guide (TfNSW, 2022b) and the RTA Biodiversity Guidelines (RTA, 2011) were applied to calculate required number of artificial shelters to be installed for both target species to mitigate for removal of natural hollows for the Project:

- Superb parrot*:
 - estimated occupancy = $(0.2) \times (\text{number of hollows to be removed})$
 - number of nest boxes required = $(\text{estimated occupancy}) \times (3)$
- Squirrel glider*:
 - number of nest box clusters required = $(0.2) \times (\text{number of hollows to be removed})$
 - number of nest boxes required = $(\text{number of nest box clusters required}) \times (3)$

*All calculations assume that about 20 percent of hollows are occupied by target species

Table 3.1 Proposed number, type and specifications for artificial hollows to be installed

Target species	Artificial shelter type	Number to be removed	Number to be installed	Number of clusters to be installed*	Target hollow class	Entrance diameter (mm)	Height above ground (metres)	Required spacing (metres)
Superb parrot	Hollow hog style augmented hollow	17	10	-	Medium-Large	80mm-150mm	5+	-
Squirrel glider	Hollow hog style augmented hollow	20	12	4	Small	40mm	3-6	200m
Total		37	22	4				

3.2 Design

It is recommended that preference be given to installation of the ‘HollowHog’ style augmented hollows as this style of artificial shelter closely replicates a natural hollow – an important consideration when targeting species with specialised shelter requirements. Where installation of HollowHog style augmented hollows is not practical, safe, or is otherwise unsuitable, installation of traditional nest boxes will be considered.

3.2.1 HollowHog style augmented hollow design

The design specifications for each class of augmented hollows comply with the requirements set out by TfNSW within the TfNSW Draft Artificial Shelter Guide (TfNSW, 2022b). The internal dimensions, entrance diameter and location within the tree in which HollowHog style augmented hollows are installed reflect the requirements of target fauna species intended to utilize the hollow and final designs per target species will be provided by the nominated installer and reviewed by a qualified ecologist prior to installation.

Where possible, practical, and safe (as judged by an AQF5 qualified arborist), existing voids and decaying areas of the tree will be augmented rather than carving into solid parts of the host tree to ensure minimal impact on tree health, and to increase likelihood of fauna modifying the hollow to their preference.

The following design considerations have been taken into account for the target species identified in **Section 3.1**:

- the entrance hole is no larger than required for the target species
- the entrance hole is positioned toward the top of the augmented hollow, so the void remains dark
- a suitable entry modifier is installed dependent on preference of target species, and to deter uptake by larger or generalist fauna as well as to prevent callous regrowth over the cavity entrance
- provide non-toxic nest material such as woodchips, wood shavings or sawdust, if necessary
- ensure interior texture of augmented hollow is sufficient to provide footholds for target fauna
- where monitoring is proposed, labelling of the augmented hollows is to be provided in such a way as to easily identify them from other augmented hollows and existing natural hollows (see **Section 5.1**).

3.2.2 Traditional nest box design

Nest boxes are to be specifically designed to target hollow dependant fauna species with known nesting or roosting habits. The specifications of nest boxes consider the size of hollows to be removed, the location of the hollow on the tree (trunk, fork, spout, or branch), as well as current guidelines and manufacturers considered to provide best practise design.

It is important to note that nest box suppliers may have their own dimensions per target species, suitability of which will be reviewed by an ecologist prior to installation. Installation heights may also vary depending on the availability of suitable surrogate trees.

The following design considerations have been taken into account for the variety of nesting habits of different fauna groups:

- target fauna species considerations:
 - the entrance hole is no larger required for the targeted species
 - the entrance hole is positioned toward the top of the nest box so the void remains dark
 - entrance design: front and rear entrance preferences of different fauna groups
 - deterrents for non-target species such as rear opening scansorial fauna, bats and gliders to avoid uptake by *Acridotheres tristis* (common myna) or common generalist birds such as parrots
 - provide non-toxic nest material such as woodchips, wood shavings or sawdust to aid insulation properties
 - provide toe holds to enable fauna (micro-bats or young) to climb from the nest box and
 - rough timber exterior to allow animals to grip and climb the exterior.
- associated climate considerations:
 - the use of thick timber to insulate against heat and cold
 - non-toxic, dark-coloured, outdoor, water-based acrylic paint used where painting of boxes is required
 - three (3) small holes drilled in the base to assist with drainage
 - the lid of the nest box over hanging by >25 mm to act as an awning to reduce moisture damage
 - extreme temperatures inside the nest box prevented by ensuring no metal lids or plates are used on the roof of the nest box.
- Where monitoring is proposed, labelling of the nest boxes is to be provided in such a way so as to easily identify them from other nest boxes (see **Section 5.1**).
- No sharp edges within or surrounding the nest box such as protruding nails or staples.

4.0 Artificial Shelter Installation Works

4.1 Timing

Nest boxes should be installed in the following stages:

- Stage 1 – At least 70% of nest boxes should be installed a minimum of one month prior to the commencement of removing habitat trees. This is to ensure that any displaced fauna have alternative habitat after trees have been cleared within the Project vegetation disturbance footprint.
- Stage 2 – Undertake preclearance surveys and complete tree felling supervision. Outcomes of the clearance supervision will identify the actual number of hollows that have been removed and confirm the total number of nest boxes required to satisfy the replacement ratios listed in **Section 3.1**.
- Stage 3 – The remaining 30% of nest boxes will be installed during or shortly before the conclusion of the construction phase to ensure that all compensatory habitat has been provided at the applicable ratio.

4.2 Location

Artificial shelter installation should target areas with tall woody vegetation as well as consider the following:

- the tree species, size and morphology of potential surrogate trees
- the abundance of existing natural and artificial hollows in retained areas
- whether the vegetation structure allows for suitable access for installation (for example areas frequent inundation/flooding, or presence of impassable flora in the lower or mid strata)
- artificial shelters should be placed as close as possible to trees removed during the Project
- artificial shelters for gliders and possums should be placed on rough-barked trees where possible. It is noted that a high proportion of trees within the candidate installation areas are smooth barked river red gums (*Eucalyptus camaldulensis*)
- artificial shelters should be installed close to potential food resources of the target species.

The land holdings on which the boxes are installed must be accessible for monitoring for at least three years post construction phase.

4.2.1 Candidate artificial shelter installation areas

Several candidate artificial shelter installation areas were inspected to inform this strategy (See **Figure 4.1**). Inspection of candidate installation areas identified by TfNSW were prioritised, followed by areas identified by Umwelt and incidental inspections and observations by ecologists while carrying out other works.

The following data was collected to inform assessments of suitability of candidate installation areas:

- Rapid vegetation assessment surveys to determine indicative PCT.
- General vegetation observations including dominant upper stratum species, presence of vegetation degradation and presence of weeds/other vegetation which may inhibit movement throughout the landscape.
- General notes on habitat connectivity, particularly in relation to vegetation being removed within the Project vegetation disturbance footprint.
- Observations and records of existing natural hollows and installed artificial hollows within the landscape.
- Observations of candidate individual or clusters of trees suitable for installation of either HollowHog style augmented hollows, or traditional nest boxes.

4.2.1.1 Candidate site 1 – Gobbagombalin Bridge

Candidate site 1 (CS1) occupies 3.74 hectares and is located about 200 metres north of the Travers Street intersection, between the Gobbagombalin Bridge to the west and the Wiradjuri Walking Track to the east (refer to **Figure 4.1**). The Murrumbidgee River corridor is 50 metres to the north of the north-east corner of CS1 and 150 metres to the north of the north-west corner of CS1. This site is owned by the Wagga Wagga City Council and is currently under private lease for cattle grazing.

The majority of the vegetative cover was assessed via multiple rapid vegetation assessments to conform to PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplain in the lower slopes subregion of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion. CS1 is dominated in the upper stratum by *Eucalyptus camaldulensis* (river red gum), with occasional river she-oak (*Casuarina cunninghamia*) and kurrajong (*Brachychiton populneus*). The mid stratum of this site is generally dominated by silver wattle (*Acacia dealbata*) and green wattle (*Acacia decurrens*) and the lower stratum is dominated by exotic grasses and forbs. A planted corridor of river red gum and river she-oak exists along the eastern boundary of CS1.

CS1 is located about 600 metres north of the nearest HBT to be removed for the Project. The location of the site provides adequate connectivity to the Project vegetation disturbance footprint through scattered trees, and to nearby river red gum forest to the east and river red gum forest within the Murrumbidgee River corridor to the north. Few existing naturally occurring hollows were recorded within CS1, with two HBTs recorded in the southern and eastern extents. Additionally, two existing Habitech style nest boxes were identified within CS1.

Several individual trees and clusters of trees were identified throughout CS1 as candidate host trees for HollowHog style augmented hollows, or alternatively, traditional nest boxes. Trees identified within this site as candidate host trees were river red gums over 40 centimetres diameter at breast height (DBH) in areas not containing high abundances of naturally occurring hollows or existing nest boxes. Final candidate trees and all suitability assessments for installation of HollowHog style augmented hollows pending assessment by an AQF5 qualified arborist.

Overall, CS1 is likely to possess adequate floristic, structural and geographical values to host artificial hollows installed to provide habitat to fauna potentially displaced by the removal of trees for the Project in the vicinity of the Travers Street intersection.

4.2.1.2 Candidate site 2 – Burilda St. West

Candidate site 2 (CS2) occupies 10.82 hectares and is located 640 metres from the northernmost extent of the Old Narrandera Road section of the Project vegetation disturbance footprint. The site is positioned to the west of Burilda Street and is bordered to the south by Dukes Creek. The Olympic Highway is located 340 metres west of the southwestern corner of CS2. CS2 is owned by Wagga Wagga City Council and is currently under private lease.

The vegetative cover within CS2 was assessed via multiple rapid vegetation assessments to conform to PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplain in the lower slopes subregion of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion. CS2 is dominated in the upper stratum by river red gum (*Eucalyptus camaldulensis*). The mid stratum is generally absent and the lower stratum in most areas is inundated, at the time of inspection, to about 30 centimetres and dominated by azolla (*Azolla sp.*), soft rush (*Juncus effusus*), nardoo (*Marsilea drummondii*) and curly dock (*Rumex crispus*).

At its westernmost point, CS2 is about 1100 metres from the nearest HBT to be removed for the Project. The location of CS2 provides some connectivity to the Project vegetation disturbance footprint through scattered trees and corridors, and to other patches of vegetation through existing roadside vegetation. Large HBTs scattered throughout the southern and north-eastern sections of CS2 provide a high density of existing naturally occurring hollows.

Due to abundance of existing natural hollows, limited numbers of individual trees and clusters of trees were identified throughout CS2 as candidate host trees for HollowHog style augmented hollows, or alternatively, traditional nest boxes. Trees identified within CS2 as candidate host trees were river red gums over 40 centimetres DBH. Final candidate trees and all suitability assessments for installation of HollowHog style augmented hollows pending assessment by an AQF5 qualified arborist.

Overall, CS2 is unlikely to constitute a suitable area for installation of artificial shelters due to difficulty of site access (private lease and subject to inundation), abundance of existing natural hollows and geographical distance from the nearest HBT to be removed for the Project.

4.2.1.3 Candidate site 3 – Dukes Creek

Due to time, scope, and access restrictions due to flooding, candidate site 3 (CS3) was primarily assessed using a combination of roadside/trackside observations and observations and vegetation data collected during previous surveys.

CS3 occupies 11.32 hectares and is located about 50 metres to the east of the Old Narrandera Road section of the Project vegetation disturbance footprint. CS3 is positioned directly to the east of the Olympic Highway and is bordered to the south by Gardiner Street and to the east by Boorooma Street. CS3 is owned by Wagga Wagga City Council and is currently under private lease.

The majority of the vegetative cover within CS3 conforms to PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplain in the lower slopes subregion of the NSW South Western

Slopes Bioregion and the Eastern Riverina Bioregion. Some areas within CS3 have been modified or had a significant amount of vegetation within the upper stratum removed and have been assessed as being exotic pasture. CS3 is dominated in the upper stratum by river red gum (*Eucalyptus camaldulensis*). The mid stratum is generally absent and at time of inspection, the lower stratum under the tree canopy was inundated to a depth of about 30 centimetres to one metre. In areas less affected by flooding, the lower stratum consisted primarily of Phalaris (*Phalaris aquatica*), rushes (*Juncus sp.*) and spear grasses (*Austrostipa sp.*).

At its western edge, CS3 is about 30 metres from the nearest HBT to be removed for the Project. The location of CS3 provides close connectivity to the Project vegetation disturbance footprint along the vegetated Dukes Creek corridor and existing roadside vegetation. Several large HBTs distributed through the centre of CS3 provide a high density of existing naturally occurring hollows.

Due to abundance of existing natural hollows, and extensive site access restrictions, a limited number of individual trees and clusters of trees were identified throughout CS3 as candidate host trees for HollowHog style augmented hollows, or alternatively, traditional nest boxes. Final candidate trees and all suitability assessments for installation of HollowHog style augmented hollows pending assessment by an AQF5 qualified arborist.

Overall, CS3 is unlikely to constitute a suitable area for installation of artificial shelters due to difficulty of access to suitable trees and abundance of existing natural hollows; however, areas in the north and surrounding the southern boundary of CS3 may constitute suitable areas for installation of artificial shelters.

4.2.1.4 Candidate site 4 – Existing road corridor beyond Project vegetation disturbance footprint

Candidate site 4 (CS4) has been considered within this strategy due to limited suitable options for artificial shelter installation in proximity to the Narrandera Road section of the Project vegetation disturbance footprint. CS4 was not assessed to the same level of detail as CS1, CS2 and CS3 and recommendations are based on site observations during hollow confirmation inspections, and observations and vegetation data collected during previous surveys.

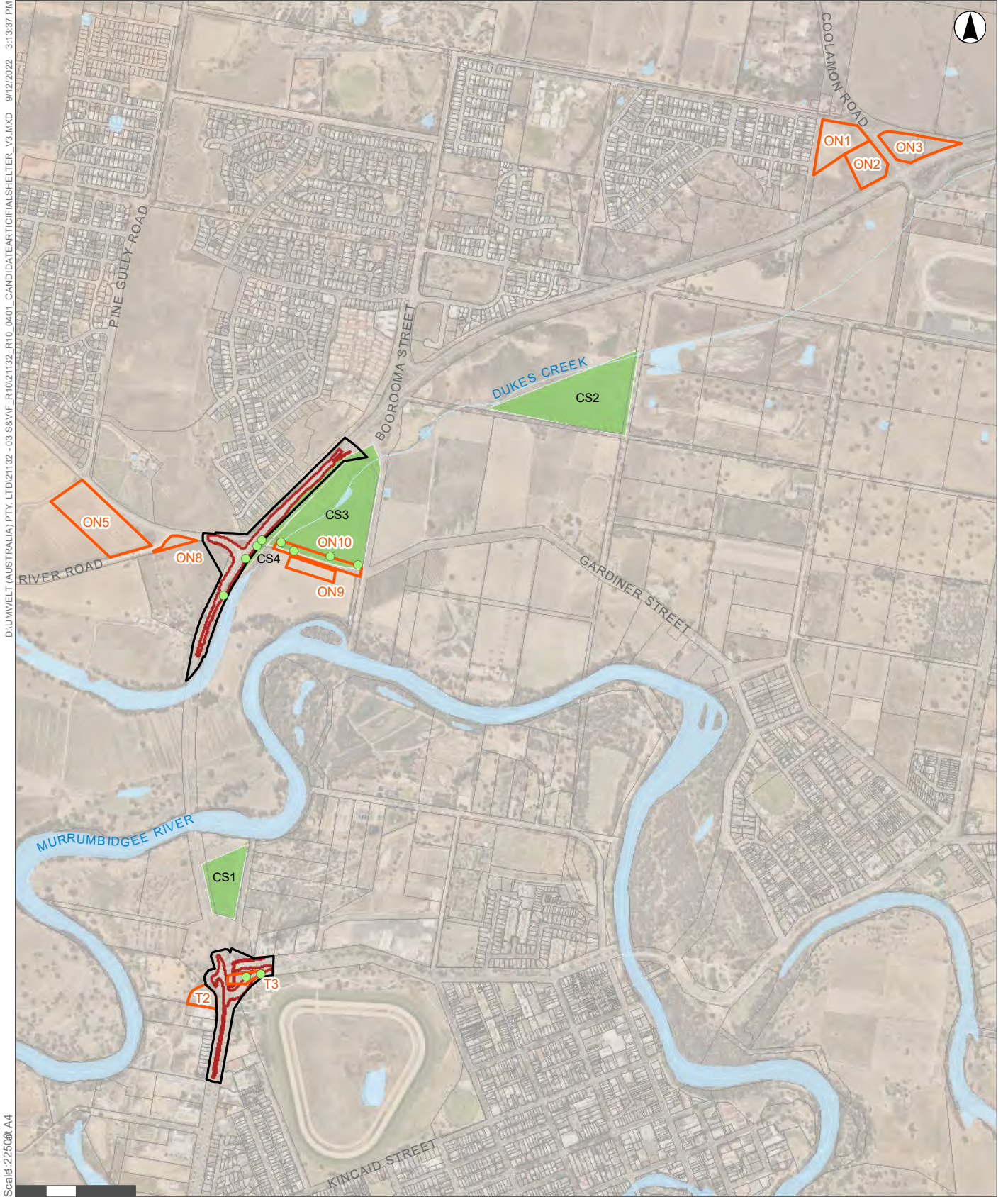
CS4 occupies about 1.81 hectares and is located directly east of the Project vegetation disturbance footprint, and directly west and south-west of CS3. The site is under tenure of TfNSW and is primarily within the existing road corridor.

The vegetative cover within CS4 consists of a combination of PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplain in the lower slopes subregion of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion, planted mixed native and exotic vegetation, and exotic pasture. In areas most suitable for artificial shelter installation, CS4 is dominated in the upper stratum by river red gum (*Eucalyptus camaldulensis*). The mid stratum is dominated primarily by silver wattle (*Acacia dealbata*), and the lower stratum is dominated by exotic grasses and forbs including oats (*Avena sp.*), prairie brome (*Bromus catharticus*) and spear thistle (*Cirsium vulgare*).

CS4 extends along the boundary of the Project vegetation disturbance footprint, and as such, maintains a high level of connectivity with HBTs to be removed within the Old Narrandera Road area of the Project. Additionally, some degree of connectivity exists between CS4 and vegetation within CS3, vegetation within the Murrumbidgee River corridor and vegetation surrounding the Gobbagombalin Lagoon.

Although a number of natural hollows exist within the southern section of CS4, many of these will be removed for the Project, and several potential host trees for HollowHog style augmented hollows, or traditional nest boxes, exist in the immediate vicinity of HBTs to be removed. Few natural hollows have been identified within the northern section of CS4, and this area may be suitable for the installation of artificial hollows.

Overall, CS4 may constitute a suitable area for installation of artificial shelters due to proximity to HBTs being removed for the Project, and presence of candidate trees to host artificial hollows installed to provide habitat to fauna potentially displaced by the removal of trees in the vicinity of the Old Narrandera Road section of the Project.



GDA 1994 MGA Zone 55

Legend

- Hollow Bearing Trees
- Property Boundaries
- Ancillary Sites
- Vegetation Disturbance Footprint
- Project Area
- Candidate Artificial Shelter Installation Areas

FIGURE 4.1

Candidate Artificial Shelter Installation Areas

4.3 Installation Procedures

Guidance has been taken from the TfNSW Draft Biodiversity Guidelines (2022a), TfNSW Draft Artificial Shelter Guide (2022b) and RTA Biodiversity Guidelines (2011) for this strategy. General guidance is provided, followed by specific procedures surrounding proposed artificial shelter installation methods.

General guidance:

- Install artificial shelters as close as possible to the location of the original hollow-bearing tree
- avoid (where practical) installing artificial shelters on/in trees with existing hollows as existing hollow-dependent fauna may act as a deterrent
- do not install artificial shelters in areas with a high density of common mynas (*Acridotheres tristis*) or install boxes lower in the canopy if this cannot be avoided.

4.3.1 HollowHog Style augmented hollow installation procedures

The HollowHog style augmented hollow utilizes a specialist carving tool operated by a qualified arborist to create an internal cavity through a small (50mm minimum) entry hole in live and dead wood within a host tree (**Photo 4.1**). The interior dimensions can be adjusted to suit target species. As this method is invasive to the tree, significant consideration must be placed on the health and structural integrity of the host tree by the installing arborist prior to commencing installation. Small entry holes, such as those which would be installed for the target species (**Section 3.1**), are generally fitted with an entry modifier such as a piece of hollow timber to ensure the hole does not close over, and to provide enhanced protection to the cavity and occupants from outside elements.

The placement of HollowHog style artificial shelters must be based on the requirements of the target species (see **Table 3.1**). Hollowhog style artificial shelters must be placed to ensure the nominated monitoring method is possible (see **Section 5.1**).

Photo 4.1 Informative diagram of the Hollowhog installation method (HollowHog, 2021)



The following special considerations must be taken into account when planning installation of HollowHog style augmented hollows:

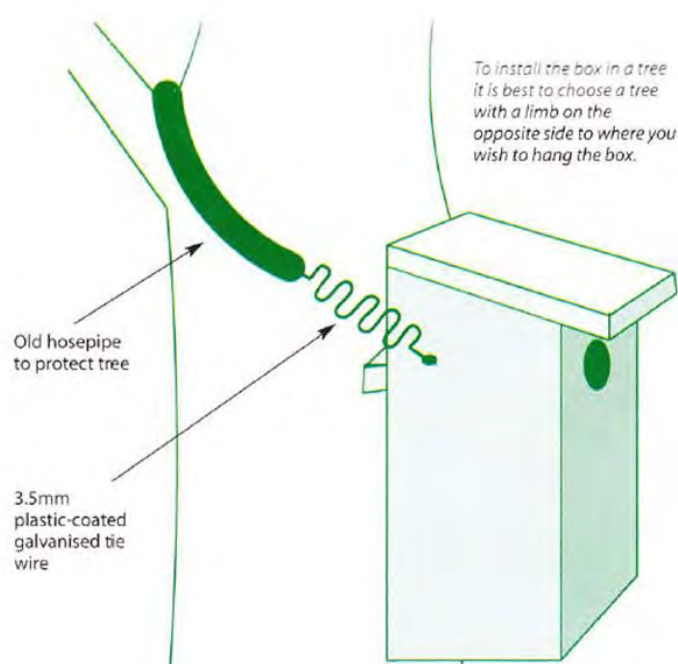
- Candidate host trees should be large, mature trees within size close to or on the main trunk at a height of 3-6m from the ground limitations as prescribed by the TfNSW Draft Artificial Shelter Guide (TfNSW, 2022b).
- Candidate host trees must be assessed by an AQF5 qualified arborist prior to undertaking installation works.
- Candidate host trees should be rough barked (where possible).
- artificial shelter entrances should face away from light sources and from a north-west to south-east position on the tree trunk/limb to provide additional shelter from rain and wind.

4.3.2 Traditional nest box installation procedures

The Habisure™ system (Hollow Log Homes Pty Ltd) would be used for installation of nest boxes. The Habisure(TM) system involves securing the nest box with expandable galvanised wire inside hose pipe to minimise damage to the tree (**Photo 4.2**). 'Zig-zag' bends incorporated into the wire near the tie-off point with the nest box, allow for expansion during tree growth. The height of the nest box is secured using a branch on the opposite side of the tree - this ensures that nest boxes are stable and allows at least 1 metre growth in the diameter of the host tree before adjustment is required. This is non-invasive to the tree and provides the required security.

The placement of the nest boxes must be based on the habitat preference of the targeted species and be guided by the TfNSW Draft Biodiversity Guidelines (2022a) and TfNSW Draft Artificial Shelter Guide (2022b). The nest boxes will be placed to ensure efficient and safe monitoring is possible (see **Section 5.1**).

Photo 4.2 Diagram of the Habisure nest box mounting system (Hollow Log Homes)



The following special considerations must be taken into account when planning the installation of traditional nest boxes:

- Install nest boxes for glider species on rough-barked trees (where possible)
- install nest boxes in proximity to potential food resources for each target species.

5.0 Artificial Shelter Monitoring and Maintenance

Following installation works, an artificial shelter monitoring program will be undertaken to ensure the longevity of installed artificial shelters, identify any maintenance needs, and confirm utilisation of the compensatory habitat features. The purpose of installing compensatory habitat is to provide supplementary breeding habitat and shelter for hollow-dependant fauna displaced by the Project, until a time where the fauna can disperse to surrounding remnant habitats or persist until natural habitat features form.

5.1 Monitoring Requirements

Artificial shelters will be monitored by a suitably qualified ecologist, with a pole-mounted camera. Artificial shelters should be monitored for both content and condition, meaning the contents/occupants of the nest boxes must be recorded in addition to notes around the wear and tear of the boxes and recommendations for maintenance actions.

The following will be recorded for each installed artificial shelter on a field data sheet proforma or similar:

- name of observer
- date
- prevailing weather conditions
- artificial shelter number
- artificial shelter type
- artificial shelter location (GPS co-ordinates)
- host tree species and diameter at breast height (DBH)
- approximate artificial shelter height
- artificial shelter orientation
- artificial shelter condition (structural integrity, placement in tree, signs of damage or excessive callousing in augmented hollows etc)
- evidence of fauna occupancy
- further notes on fauna occupancy (e.g., species, number/age of individuals, signs of breeding activity)
- evidence of pest occupancy
- changes in surrounding habitat.

A brief report will be provided at the conclusion of artificial shelter monitoring outlining:

- an overview of the contents and condition of the artificial shelters
- recommendations for management actions
- a spreadsheet or table containing the raw data collected in the field.

5.2 Timing

Monitoring of installed artificial shelters will be undertaken throughout the construction and operation phases of the project in accordance with the RTA guidelines (RTA, 2011). Species-specific artificial shelter monitoring requirements are outlined in **Table 5.1**.

Table 5.1 Artificial shelter monitoring requirements

Species	Seasonal requirement	Monitoring period	Frequency
Squirrel glider	April – September	One to two years post-installation.	Once to check that the artificial shelter is still functional.
Superb parrot	September – December	During construction, then for three years post-construction.	Every six months during construction, then annually for the first two years of operations and again in the fourth year.

6.0 References

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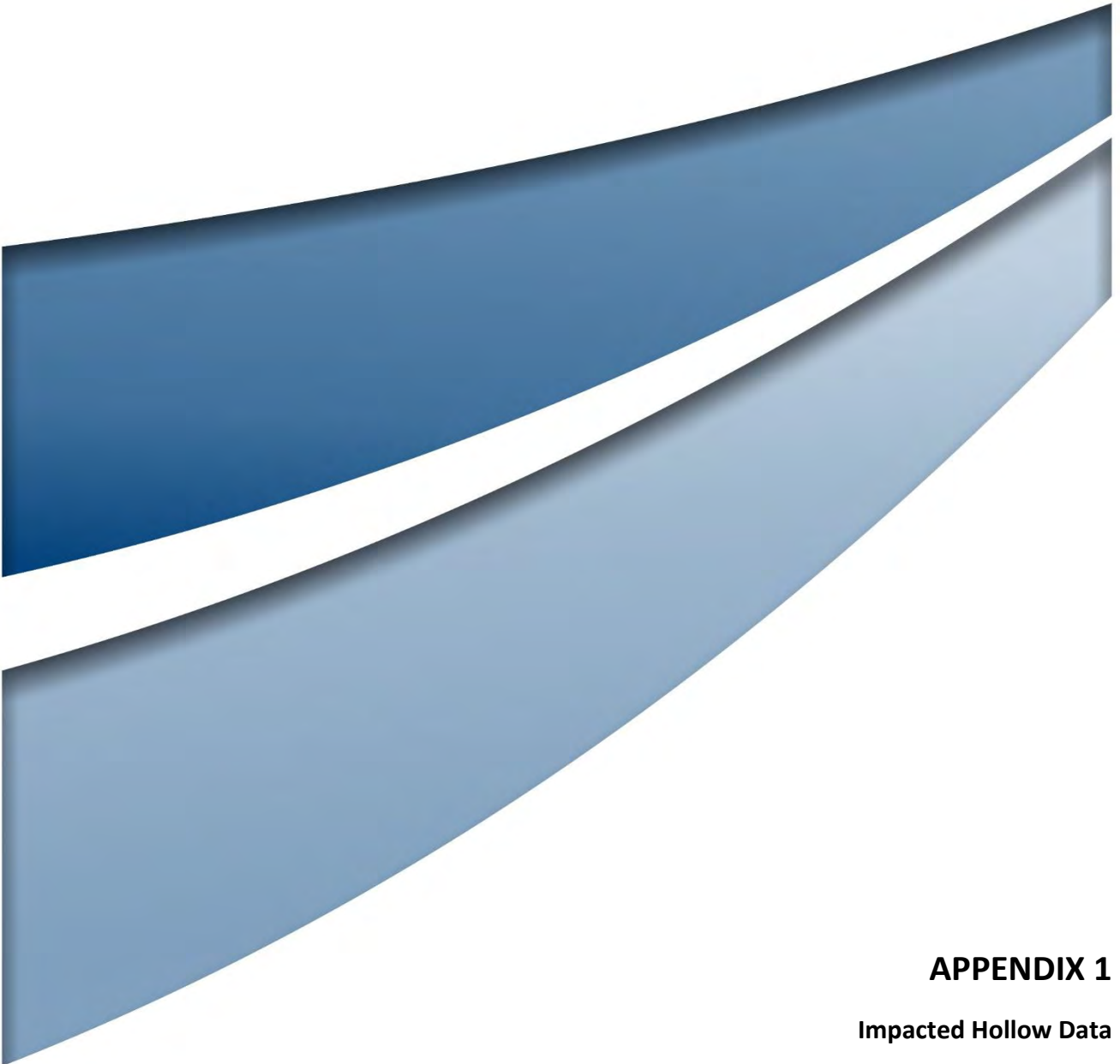
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APPENDIX 1
Impacted Hollow Data

Table A.1 Hollow bearing trees to be impacted by the Project

HBT ID	Location	Tree Species	DBH (cm)	Hollow Dimensions					Co-ordinates (GDA94 MGA55)	
				Tiny (<2.5mm)	Small (26mm – 50mm)	Medium (51mm – 100mm)	Large (100mm – 300mm)	Extra Large (>300mm)	Eastings	Northings
HBT5	Travers Street Intersection	<i>Eucalyptus melliodora</i>	75	6	3	3	1	0	531934.05	6115739.36
HBTT7	Travers Street Intersection	<i>Eucalyptus camaldulensis</i>	100	1	5	4	0	0	531986.17	6115748.05
HBTON08	Old Narrandera Road Intersection	<i>Eucalyptus camaldulensis</i>	220	6	0	1	0	0	531931.68	6117494.23
HBTT28	Old Narrandera Road Intersection	<i>Eucalyptus camaldulensis</i>	85	1	4	0	0	0	531988.02	6117572.07
HBTT36	Old Narrandera Road Intersection	<i>Eucalyptus camaldulensis</i>	100	0	2	1	0	0	531980.64	6117541.81
HBTXXX	Old Narrandera Road Intersection	<i>Eucalyptus camaldulensis</i>	100	4	0	0	0	0	531840.26	6117346.92
HBT19	Ancillary Site ON10	<i>Eucalyptus camaldulensis</i>	65	0	1	0	0	0	532128.18	6117523.52
HBTON17	Ancillary Site ON10	<i>Eucalyptus camaldulensis</i>	65	0	3	4	0	0	532076.54	6117561.59
HBTON21	Ancillary Site ON10	<i>Eucalyptus camaldulensis</i>	165	2	1	0	0	0	532401.70	6117465.51
HBTON22	Ancillary Site ON10	<i>Eucalyptus camaldulensis</i>	60	0	0	1	0	0	532283.16	6117504.91
HBTON20	Ancillary Site ON10	<i>Stag</i>	70	1	1	0	2	0	532216.35	6117482.75



APPENDIX 5 - ENVIRONMENTAL ASSESSMENT FOR ANCILLARY SITES

Briefing Note

To: Colin Elliott
E | colin.elliott@spiire.com.au
From: Jarmin Thornberry
Date: 14 December 2022
Subject: **Biodiversity Assessment Briefing Note – Olympic Highway
Intersection Upgrade Additional Ancillary Sites ON12/ON13**

Purpose

This briefing note for Transport for NSW (TfNSW) details the outcomes of the biodiversity assessment conducted to support the inclusion of two additional ancillary sites (ON12 and ON13) at the corner of Boorooma Street and Gardiner Street in the Review of Environmental Factors (REF) Submissions Report for the Olympic Highway Intersection Upgrade project (the Project).

Outcomes/Key messages

All vegetation assessed within the proposed ancillary sites (ON12 and ON13, hereby known as the study area) was identified as Plant Community Type (PCT) 0: Not native vegetation under the NSW State Vegetation Type Mapping (SVTM) classification system and during field assessments. The PCT within the study area does not conform to any threatened ecological communities (TECs) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Up to 2.65 hectares of PCT 0 is expected to be impacted by the proposed works. Potential impacts to habitat for threatened flora and fauna species are also expected to be negligible. Assessments of significance were not conducted on any threatened flora or fauna species as the proposed works are unlikely to have a significant impact on biodiversity values.

1.0 Introduction

This biodiversity assessment briefing note has been prepared by Umwelt (Australia) Pty. Ltd. (Umwelt) to inform works associated with the inclusion two additional ancillary sites (ON12 and ON13) at the corner of Boorooma Street and Gardiner Street, Wagga Wagga in the REF Submissions Report for the Project.

1.1 The proposed works

The Project is located within Wagga Wagga, in the City of Wagga Wagga Local Government Area (LGA) NSW, about 380 kilometres southwest of Sydney. The study area is located about 500 metres east of the Olympic Highway, and is under private freehold tenure between two property owners (**Figure 1.1**).

The proposed works will involve the following construction activities:

- construction of temporary hardstand for plant storage
- construction of temporary tracks/roads for ingress/egress
- earthworks associated with establishment of temporary site buildings and placement of pad footings.

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GDA 1994 MGA Zone 55

Legend

- Watercourses
- Property Boundaries
- Ancillary Sites
- Project Area

FIGURE 1.1
Project Location

2.0 Assessment methodology

The study area assessed for the purposes of this biodiversity assessment was based on Property Lease Sketch 2236 (**Appendix B**) and Property Lease Sketch 2235 (**Appendix C**) supplied by TfNSW. The overall area of the study area is 2.65 hectares.

Where necessary, a 10-metre buffer was applied to the defined study area, in order to capture all potential direct and indirect impacts of the proposed works.

2.1 Desktop assessment

A review of relevant public databases and literature was undertaken to identify threatened and migratory species, endangered populations, threatened ecological communities (TECs) and their habitats that have previously been recorded within the locality (a 10-kilometre radius around the study area). Threatened species, migratory species, endangered populations and TECs (listed under the BC Act, NSW *Fisheries Management Act 1994* (FM Act) EPBC Act) that have the potential to occur within the locality were also considered based on the type of habitat present and the Interim Biogeographic Regionalisation for Australia (IBRA) subregion within which the study area occurs.

Databases and literature reviewed as part of this ecological assessment include:

- a search of the Department of Planning and Environment (DPE) BioNet Atlas based on a 10-kilometre radius around the study area
- a search of the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (PMST) based on a 10-kilometre radius around the study area
- BioNet Threatened Biodiversity Data Collection (TBDC)
- BioNet Vegetation Classification
- the Biodiversity Values Map Threshold Tool (BVMTT).

2.2 Vegetation mapping

Three sets of broadscale vegetation mapping were considered to inform the assessment of the vegetation communities present within the study area:

1. NSW State Vegetation Type Map (SVTM) VIS_ID 4469
2. Native Vegetation Map of the City of Wagga Wagga, 2004. VIS_ID 1559
3. NSW Council Roadside Reserves Conservation Values.

2.3 Site visit

The site visit was conducted from 20 October to 21 October 2022 by two Umwelt ecologists. Observations of any threatened and/or migratory species, endangered populations, TECs and any other ecological features that had the potential to be impacted were recorded. All investigations were limited to the extent of the study area.

A combination of the Biodiversity Assessment Method (BAM) Vegetation Integrity (VI) plots (DPE 2020) and rapid data assessments were carried out to record the flora species occurring within the study area.

Two BAM VI plots (comprising a 20 x 50 metre plot assessing vegetation function and a 20 x 20 metre floristic composition plot) were carried out across the study area. One BAM VI plot was carried within each of the proposed ancillary sites. The BAM VI plots recorded landscape, vegetation structure and detailed floristic composition.

Additionally, 11 rapid data assessments were carried out across the study area. Of these, five rapid data assessments were undertaken within the proposed ON13 ancillary site, and six rapid data assessments were undertaken within the proposed ON12 ancillary site. The rapid data assessments recorded the dominant flora species present and vegetation structure. The purpose of undertaking rapid data assessments throughout the proposed ancillary sites was to ensure adequate survey coverage, and to capture potential structural and floristic changes throughout the site area, including potential transitions between exotic and native grasslands.

The presence of fauna habitat within the study area was also assessed. Specific attention was paid to the potential occurrence of hollow bearing trees, rocky outcrops, soaks/streams and structures which may support bat roosts. No targeted threatened species surveys were carried out as part of the site visit.

3.0 Results

3.1 Desktop assessment

Seventy threatened species, one threatened fauna population and seven migratory species were identified from the BioNet Atlas and PMST searches as known or predicted to occur within the locality. Four TECs were also identified with the database searches as having the potential to occur within the locality.

3.2 Vegetation communities

During the desktop assessment two vegetation communities were identified by the regional mapping (Native Vegetation Map of the City of Wagga Wagga, 2004. VIS_ID 1559) as potentially occurring within the study area:

- Yellow Box Woodland (VIS ID1559)
- PCT 0: Not native vegetation (VIS ID_4469).

The site visit confirmed one vegetation community, that being PCT 0: Not native vegetation (PCT0), as occurring within the study area as detailed in **Table 3.1** below. PCT0 is used to describe a community dominated by exotic vegetation that is not able to be assigned to any other PCT and does not meet the Final Determination for any TECs listed under either the BC Act or EPBC Act.

Table 3.1 Plant Community Types within the study area

Plant Community Type	Status BC Act	Status EPBC Act	Area within the study area (ha)
PCT 0: Not native vegetation	-	-	2.65

The vegetation within the study area is entirely confined to the lower stratum, excluding two planted *Casuarina cunninghamiana* in the south-west corner of the proposed ON12 ancillary site. The planted *Casuarina cunninghamiana* are about six to seven metres tall and have a diameter at breast height (DBH) of between 20-30 centimetres. No hollows were observed within either *Casuarina cunninghamiana*.

The lower stratum of the study area contains a mix of exotic agricultural annual and perennial grasses and forbs typical to disturbed pastoral environments in the Riverina area. All flora species recorded within the VI plots within ON12 and ON13 ancillary sites are listed in **Table 3.2**.

Table 3.2 Flora species recorded in VI plots within ON12 and ON13 ancillary sites

Strata	Species Name	Common Name	Species occurrence (VI plots)	
			ON12	ON13
Lower	<i>Arctotheca calendula</i>	Cape weed	Occasional	Occasional
Lower	<i>Avena sp.</i>	Oats	Not recorded	Occasional
Lower	<i>Bromus sp.</i>	Brome	Not recorded	Frequent
Lower	<i>Capsella bursa-pastoris</i>	Shepherd's purse	Occasional	Frequent
Lower	<i>Cirsium vulgare</i>	Spear thistle	Not recorded	Occasional
Lower	<i>Echium plantagineum</i>	Patterson's curse	Not recorded	Occasional
Lower	<i>Hordeum leoprinum</i>	Barley grass	Occasional	Dominant
Lower	<i>Lactuca serriola</i>	Prickly lettuce	Not recorded	Occasional
Lower	<i>Lepidium draba</i>	Hoary cress	Not recorded	Frequent
Lower	<i>Lolium sp.</i>	Rye grass	Not recorded	Dominant
Lower	<i>Malva parvifolia</i>	Small-flowered mallow	Occasional	Not recorded
Lower	<i>Medicago polymorpha</i>	Burr medic	Occasional	Not recorded
Lower	<i>Medicago sativa</i>	Lucerne	Dominant	Occasional
Lower	<i>Modiola caroliniana</i>	Red-flowered mallow	Not recorded	Occasional
Lower	<i>Oxalis sp.</i>	Oxalis	Occasional	Not recorded
Lower	<i>Phalaris sp.</i>	Canary-grass	Not recorded	Occasional
Lower	<i>Rumex crispus</i>	Curly dock	Not recorded	Occasional
Lower	<i>Sisymbrium officinale</i>	Hedge mustard	Occasional	Not recorded
Lower	<i>Sonchus oleraceus</i>	Common sowthistle	Not recorded	Occasional
Lower	<i>Stachys arvensis</i>	Staggerweed	Occasional	Occasional
Lower	<i>Trifolium repens</i>	White clover	Frequent	Frequent
Lower	<i>Veronica persica</i>	Speedwell	Frequent	Not recorded
Lower	<i>Vulpia sp.</i>	Rat's tail fescue	Dominant	Dominant

Figure 3.1 and **Photo 3.1** and **Photo 3.2** shows the type and extent of vegetation within the study area.

Photo 3.1 PCT 0: Not native vegetation within the ON12 ancillary site



Photo 3.2 PCT 0: Not native vegetation within the ON13 ancillary site





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GDA 1994 MGA Zone 55

- Legend**
- Property Boundaries
 - Ancillary Sites
 - Plant Community Type**
 - PCT0 - Not Native Vegetation

FIGURE 3.1
Vegetation Extent within the Study Area

3.3 Threatened Ecological Communities

No TECs were recorded within the study area during the site visit. Three TECs were identified on databases as known or likely to occur within 10 kilometres of the study area. All three TECs were considered to have low likelihood of occurring as either the edaphic and/or floristic composition of the study area did not meet the requirements detailed within each respective Final Determination.

3.4 Threatened species

3.4.1 Threatened flora

The desktop assessment identified the study area as providing potential habitat for nine threatened flora species. Of these, one species, Claypan daisy (*Brachyscome muelleroides*), was identified as having a moderate or higher likelihood of occurring within the study area based on known habitat preference and distribution. Following the site visit, all threatened flora were identified as having a low likelihood of occurring within the study area.

No threatened flora species were incidentally recorded within the study area.

3.4.2 Threatened fauna

The desktop assessment identified the study area as providing potential habitat for 61 threatened fauna species. No threatened fauna species were incidentally recorded during the site visit. No targeted surveys were undertaken; however, a habitat assessment was conducted to determine the potential for threatened species to utilise the study area. Eight threatened fauna species were identified as having a moderate likelihood of occurring within the study area based on known habitat preference, presence of suitable habitat surrounding the study area and known species distribution, as identified in **Table 3.3**.

Species listed in **Table 3.3** as having moderate likelihood or occurrence may forage or travel through PCT 0 on occasion but the study area is unlikely to provide important foraging or breeding habitat. These species are unlikely to permanently inhabit or otherwise extensively utilize the study area based on observations of habitat value and overall connectivity of the site.

Table 3.3 Threatened fauna with a moderate or higher likelihood of occurring within the study area

Common Name	Scientific Name	BC Act	EPBC Act	Source	Likelihood of occurrence
Aves					
Spotted Harrier	<i>Circus assimilis</i>	V	NL	BioNet	Moderate
White-fronted Chat	<i>Epthianura albifrons</i>	V	NL	BioNet	Moderate
Black Falcon	<i>Falco subniger</i>	V	NL	BioNet	Moderate
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V	NL	BioNet	Moderate
Little Eagle	<i>Hieraaetus morphnoides</i>	V	NL	BioNet	Moderate
White-throated Needletail	<i>Hirundapus caudacutus</i>	NL	V, M	BioNet	Moderate
Mammals					
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	BioNet,PMST	Moderate
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	NL	BioNet	Moderate
Note: NL = Not Listed, V = Vulnerable, E = Endangered, CE = Critically Endangered, Ex = Extinct, M = Migratory					

3.4.3 Migratory species

The study area may provide habitat for the migratory bird species. Of seven species assessed as potentially occurring within the study area, two species, the fork-tailed swift (*Apus pacificus*) and white-throated needletail (*Hirundapus caudacutus*), listed under the EPBC Act as migratory, are listed as having a moderate likelihood of occurring within the study area. These species may forage and move through the vegetation within the study area – as well as the airspace above it as – during migratory movements.

4.0 Impact assessment

4.1 Direct impacts

4.1.1 Direct impacts to native vegetation

The proposed works would require substantial modification of the groundcover vegetation within the study area, including stripping of and incidental impact to topsoil and exotic grasses and forbs, in order to facilitate the construction of temporary hardstands, site builds and associated pad footings, and access tracks.

Two planted native canopy trees (*Casuarina cunninghamia*) remain on the site and may also need to be removed to undertake the proposed works within the study area. About 2.65 hectares of primarily exotic vegetation would be directly impacted by the proposed works as detailed in **Table 4.1**.

Table 4.1 Direct impacts to Plant Community Types

Ancillary site ID	Plant Community Type	Status BC Act	Status EPBC Act	Extent to be impacted (ha)
ON12	PCT 0: Not native vegetation	NL	NL	1.07
ON13				1.58
Total				2.65

4.1.2 Direct impacts to threatened flora

No threatened flora species were incidentally recorded within the study area during the site visit. As detailed within **Section 3.4.1**, one threatened flora species was assessed as having a moderate likelihood of occurrence prior to the site visit. No threatened flora species were assessed as having a high likelihood of occurring within the study area.

Due to the highly disturbed nature of the landscape, and dominance of exotic flora, it is unlikely that the study area would support the threatened flora species detailed within **Section 3.4.1**. As such, no Tests of Significance under either BC Act or EPBC Act have been carried out for this assessment.

4.1.3 Direct impacts to threatened fauna

No threatened fauna species were incidentally recorded within the study area during the site visit. As outlined within Section 3.4.2, eight threatened fauna species were assessed as having a moderate or higher likelihood of occurrence within the study area prior to the site visit. Up to 2.65 hectares of potential transitory/foraging habitat for these species would be impacted as part of the proposed works, however, due to the exotic and highly disturbed nature of the landscape and known habitat requirements of threatened fauna species addressed within Section 3.4.2, it is unlikely that the study area would constitute valuable habitat for these species. The removal of *Casuarina cunninghamiana* (should that be required) within ancillary sites ON12 may result in a marginal reduction of potential sheltering and foraging habitat for terrestrial fauna species, and potentially a small amount of foraging habitat for bird species.

No habitat features important to threatened species identified within **Table 3.3** were identified within the study area during the site visit.

The scale of the proposed work is such that impacts to threatened fauna species are unlikely to be significant. As such, no Tests of Significance under either BC Act or EPBC Act have been carried out for this assessment.

4.2 Indirect impacts

The proposed works have the potential to indirectly impact the biodiversity occurring with the study area. These indirect impacts and a description of how they may impact the biodiversity present in the study area are outlined in **Table 4.2**.

Table 4.2 Indirect impacts to biodiversity

Impact	Description	Affected biodiversity
Spread of weeds and exotic species	Weeds and exotic flora species occur throughout the study area. The movement of machinery and people have the potential to spread weeds throughout the study area and outside it.	<ul style="list-style-type: none"> All vegetation communities within the study area. Potentially vegetation occurring outside of the study area.
Spread of pathogens and disease	Soil-borne pathogens with the potential to infect plants e.g., <i>Phytophthora cinnamomic</i> , may be mobilised by the proposed works.	<ul style="list-style-type: none"> All vegetation communities within the study area. Potentially vegetation occurring outside of the study area.
Changes to the acoustic environment	The proposed construction activities would temporarily alter the noise environment within the study area.	The flying patterns and foraging/hunting behaviour of microbats may be altered if construction activities are to occur at night.
Changes to the light environment	Artificial lighting within the site has the potential to temporarily alter the light environment within the study area.	The flying patterns and foraging/hunting behaviour of the Grey-headed Flying-Fox, nocturnal birds, and microbats may be altered if artificial lighting is to be used during the night
Changes to habitat connectivity	Construction activity and the presence of loud machinery has the potential to disrupt connectivity between adjoining habitat areas	The flying patterns, movement and foraging/hunting behaviour of some species of birds and bats may be altered due to presence of construction activity. Movement and foraging activity of terrestrial fauna may be disrupted following alteration of the lower stratum within the study area.

5.0 Mitigation measures

Mitigation measures and safeguards to avoid and minimise the impacts of the proposed works on the biodiversity values identified in the study area are detailed in **Table 5.1**.

Table 5.1 Mitigation measures

Impact	Mitigation	Timing
Removal of vegetation	Minimising vegetation clearing to only what is necessary to the design of the ancillary sites. Specifically, efforts should be made to retain the two <i>Casuarina cumminghamiana</i> within the south-west corner of the ON12 ancillary site.	Detailed design
	Prior to the commencement of work, a physical vegetation clearing boundary at the approved clearing limit is to be clearly demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar.	Before construction Before construction
Accidental spills and contamination from remediation activities	Carry out refuelling of plant and equipment, chemical storage and decanting away from the vegetated areas within impervious bunds.	During construction
Light Spill	Night works would be avoided where possible. If required, any floodlights are directed away from vegetation where practicable.	During construction

Impact	Mitigation	Timing
Spread of weeds and exotic species	Hygiene controls for all plant and people working in the study area.	During construction
	All weed material removed would be disposed of in a suitable waste facility and not mulched on site. This would avoid the reintroduction and further spread of weeds in the area. Particular care should be taken during construction activities at the police precinct.	During construction
	Machinery would be washed following best practice hygiene protocols prior to being brought to site.	Prior to construction
Spread of pathogens and disease	Hygiene controls for all plant and people working in the study area.	During construction
	Machinery would be washed following best practice hygiene protocols prior to being brought to site.	Prior to construction

6.0 Offset requirements

TfNSW is committed to achieving its goal of no net loss of biodiversity as a consequence of its infrastructure development activities in line with its biodiversity policy (TfNSW 2022). The new policy came into effect 1 August 2021 and sets out the steps TfNSW is committed to take in order to meet its objective of achieving no net loss of biodiversity. Section 4 of the policy sets out exclusions or exemptions for instances when the policy will not apply. The proposed works form part of a project being assessed via an REF which was exhibited from 21 September to 22 October 2021, prior to the commencement of this policy, thus can be exempted from offset and tree replacement provisions under the policy.

The former TfNSW offset policy, Guideline for Biodiversity Offsets V2.0 (RMS 2016), provides offset thresholds which are appropriate and proportional for the scale of EP&A Act Division 5.1 assessments, and their expected impacts on biodiversity. Table 1 within Section 4.2 of the biodiversity offsetting guidelines outlines the offsetting thresholds for MWREFs. Expected impacts a result of the proposed works do not exceed any of the offset thresholds detailed in Table 1 of (RMS 2016), as such no offsets are required.

7.0 Conclusion

This briefing note assesses impacts to biodiversity caused by the proposed establishment of ancillary sites at the intersection of Boorooma Street and Gardiner Street to support the Olympic Highway Intersection Upgrade project at Wagga Wagga, NSW. A site visit was conducted to determine the extent of these impacts and rule-out the presence of any threatened biodiversity.

One PCT, PCT0: Not Native Vegetation was mapped within the study area. Direct impacts to this PCT are expected to be minimal, with up to 2.65 hectares of PCT 0 directly impacted by the proposed works. The impacts involve the removal exotic groundcover vegetation within proposed ancillary sites ON12 and ON13 of the study area. Two *Casuarina cunninghamiana* within the south-west corner of ON12 may be removed as part of the work, pending detailed design. No threatened ecological communities were mapped within the study area.

The site visit did not identify the presence of any threatened flora or fauna species within the study area. Up to 2.65 hectares of potential transitory or foraging habitat for threatened fauna species may be impacted by the proposed works. Assessments of significance were not conducted on any threatened flora or fauna species, and the proposed works are unlikely to have a significant impact on biodiversity values.

Direct and indirect impacts on biodiversity within and surrounding the study area can be minimised if the mitigation measures identified in Section 5.0 are implemented. Any residual impacts are not expected to significantly impact upon the biodiversity occurring within the study area.

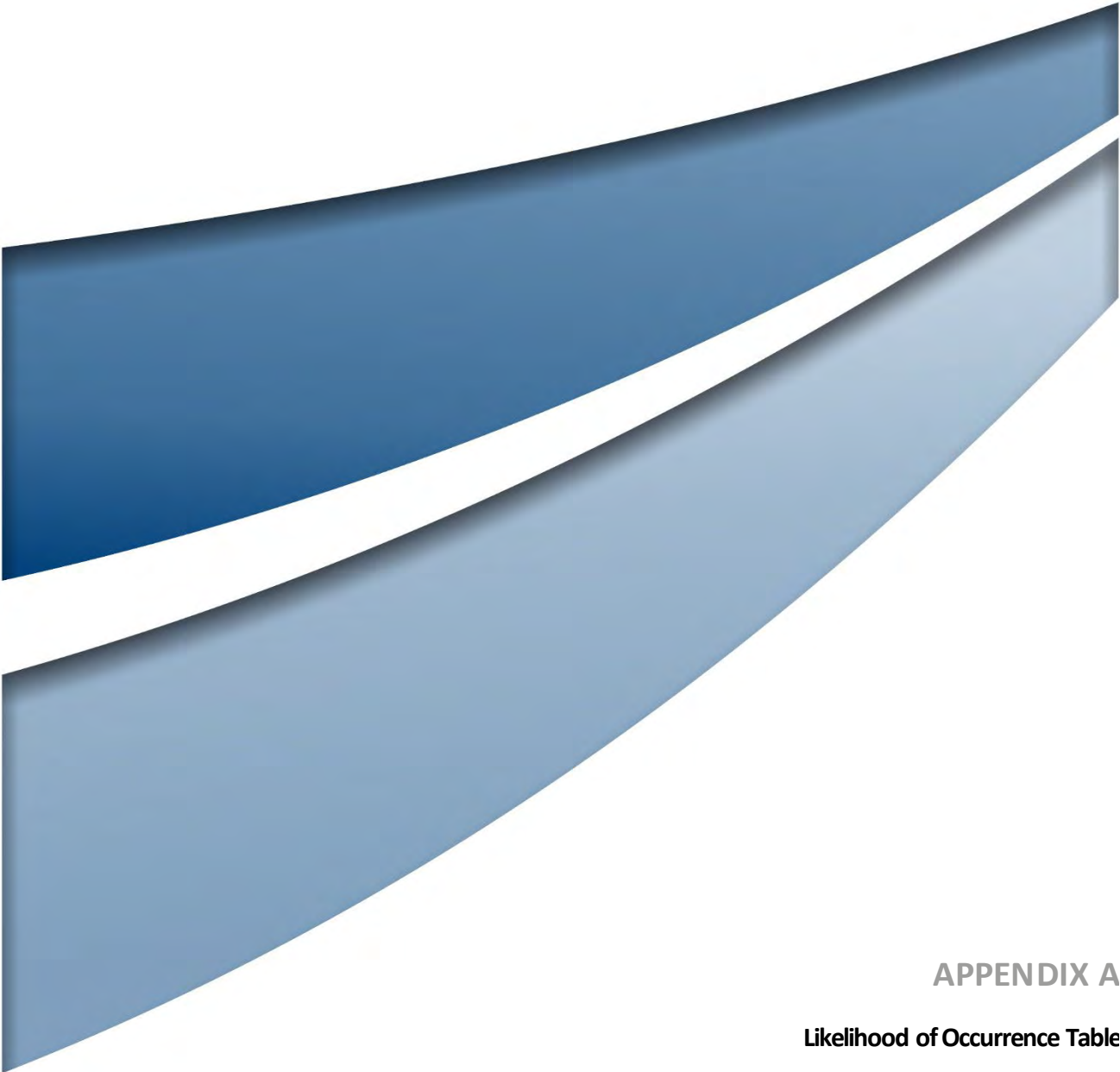
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APPENDIX A

Likelihood of Occurrence Table

Table A1 Likelihood of Occurrence Table

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey.
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 kilometres) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area or has not been recorded recently in the locality (10 kilometres). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded. Do not include this species in the final letter.
Nil	Suitable habitat is absent from the study area.

Table A2 Habitat assessment table

*Marine and pelagic species

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Threatened flora						
<i>Austrostipa wakoolica</i>	<i>Austrostipa wakoolica</i>	E	E	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW. Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise.	PMST	Low – Study area outside of known distribution for this species; required habitat not present
Claypan Daisy	<i>Brachyscome muelleroides</i>	V	V	Within NSW, the Claypan Daisy occurs in the Wagga Wagga, Narrandera, Tocumwal and Walbundrie areas. Grows in damp areas on the margins of claypans in moist grassland with <i>Pycnosorus globosus</i> , <i>Agrostis avenacea</i> and <i>Austrodanthonia duttoniana</i> .	1	Low – Study area lacks the required damp/waterlogged habitat and soil profile required by this species. Associated floristics not present within study area
Sand-hill Spider-orchid	<i>Caladenia arenaria</i>	E	E	<i>Caladenia arenaria</i> is found mostly on the south west plains and western south west slopes. Occurs in woodland with sandy soil, especially that dominated by White Cypress Pine.	PMST	Low – Study area lacks required vegetation structure and floristic composition

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Spiny Pepper-cress	<i>Lepidium aschersonii</i>	V	V	Not widespread, occurring in the marginal central-western slopes and north-western plains regions of NSW (and potentially the south western plains). Found on ridges of gilgai clays dominated by Brigalow (<i>Acacia harpophylla</i>), Belah (<i>Casuarina cristata</i>), Buloke (<i>Allocasuarina luehmanii</i>) and Grey Box (<i>Eucalyptus microcarpa</i>). In the south has been recorded growing in Bull Mallee (<i>Eucalyptus behriana</i>).	PMST	Low – Study area lacks required vegetation structure and floristic composition
Winged Pepper-cress	<i>Lepidium monoplocoides</i>	E	E	Widespread in the semi-arid western plains regions of NSW. Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm.	PMST	Low – Study area does not align with the required climate and vegetation structure required by this species
Tarengo Leek Orchid	<i>Prasophyllum petilum</i>	E	E	Natural populations are known from a total of five sites in NSW. These are near Boorowa, Queanbeyan area, Ilford, and Delegate and a newly recognised population c.10 kilometres west of Muswellbrook. Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Species also grows in grassy woodland in association with River Tussock <i>Poa labillardieri</i> , Black Gum <i>Eucalyptus aggregata</i> and tea-trees <i>Leptospermum spp.</i> near Queanbeyan and within the grassy groundlayer dominated by Kangaroo Grass under Box-Gum Woodland at Ilford (and Hall, ACT).	PMST	Low – Study area is outside of the known range for species & lacks required floristic composition

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Slender Darling-pea	<i>Swainsona murrayana</i>	V	V	Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams.	PMST	Low – Study area is outside of the known range for species
Small Purple-pea	<i>Swainsona recta</i>	E	E	Small Purple-pea was recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum <i>Eucalyptus blakelyi</i> , Yellow Box <i>E. melliodora</i> , Candlebark Gum, <i>E. rubida</i> , and Long-leaf Box <i>E. goniocalyx</i> .	2	Low – Species likely extinct in the Wagga Wagga area
Woolly Ragwort	<i>Senecio garlandii</i>	V	NL	Found between Temora, Bethungra and Albury and possibly Burrinjuck near Yass. Woolly Ragwort occurs on sheltered slopes of rocky outcrops.	2	Low – No rocky outcrops occur within the study area
Amphibians						
Growling Grass Frog	<i>Litoria raniformis</i>	E	V	Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat.	PMST	Low – Species not known to currently occur in the Wagga Wagga area; no suitable habitat species or floristic composition present within or surrounding study area

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Aves						
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	1	Low – Species occurs in the Wagga Wagga area very infrequently; no suitable vegetation structure and species composition present within or surrounding study area
Dusky Woodswallow	<i>Artamus cyanopterus cyanopterus</i>	V	NL	Dusky woodswallows are widespread in eastern, southern and south western Australia. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of <i>Eucalypt</i> saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	57	Low – Species is widespread, and suitable vegetation structure is present in the vicinity of the study area; species is known to inhabit farmland toward the edges of forest & woodland. No suitable habitat available nearby
Australasian Bittern	<i>Botaurus poiciloptilus</i>	E	E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha spp.</i>) and spikerushes (<i>Eleocharis spp.</i>).	PMST	Low – Study area lacks required freshwater inundation, vegetation structure and floristic composition

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Bush Stone-curlew	<i>Burhinus grallarius</i>	E	NL	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	5	Low – Distribution of species is very sparse; study area lacks required vegetation structure
Curlew Sandpiper	<i>Calidris ferruginea</i>	E	CE,M	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts.	3	Low – Species generally only pauses inland during migrations and requires freshwater wetlands
Gang gang Cockatoo	<i>Callocephalon fimbriatum</i>	V	NL	In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.	3	Low – No suitable habitat exists within or surrounding study area. Species is very uncommon in the Wagga Wagga area

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Glossy Black Cockatoo	<i>Calyptorhynchus lathami</i>	V	NL	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	4	Low – Study area and surrounding areas lack required vegetation structure and feed trees for this species.
Speckled Warbler	<i>Chthonicola sagittata</i>	V	NL	The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria. The Speckled Warbler lives in a wide range of <i>Eucalyptus</i> dominated communities that have a grassy understorey, often on rocky ridges or in gullies.	2	Low – Study area and surrounding areas lack required vegetation structure for this species.
Spotted Harrier	<i>Circus assimilis</i>	V	NL	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges. Occurs in grassy open woodland including <i>Acacia</i> and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	6	Moderate – Species exists sparsely throughout NSW, and agricultural/grassland structure of study area may constitute suitable foraging habitat.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Brown Treecreeper	<i>Climacteris picumnus victoriae</i>	V	NL	The western boundary of the range of Brown treecreeper <i>victoriae</i> runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range. Fallen timber is an important habitat component for foraging.	35	Low – High number of records of species in the area surrounding the subject area; study area not likely to constitute habitat for species
Varied sittella	<i>Daphoenositta chrysoptera</i>	V	NL	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and <i>Acacia</i> woodland.	3	Low – Study area lacks required vegetation structure for this species
White-fronted Chat	<i>Epthianura albifrons</i>	V	NL	The White-fronted Chat is found across the southern half of Australia. Usually found foraging on bare or grassy ground in wetland areas, singly or in pairs.	8	Moderate – Study area not likely to constitute habitat for species but may move throughout landscape between suitable patches of vegetation.
Grey Falcon	<i>Falco hypoleucos</i>	E	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	PMST	Low – Species is very sparsely distributed throughout NSW and is seldom observed in the Wagga Wagga area.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Black Falcon	<i>Falco subniger</i>	V	NL	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees.	13	Moderate – Species is sparsely but widely distributed throughout NSW and occasionally observed in the Wagga Wagga area; species known to forage in agricultural areas and grasslands.
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	NL	NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Forages primarily in the canopy of open <i>Eucalyptus</i> forest and woodland, yet also finds food in <i>Angophora</i> , <i>Melaleuca</i> and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	49	Low – High number of records of species in the area surrounding the subject area; study area not likely to constitute habitat or suitable movement corridor for species.
Painted Honeyeater	<i>Grantiella picta</i>		V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. Inhabits Boree/ Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) and Box-Gum Woodlands and Box-Ironbark Forests.	PMST	Low – Study area lacks required vegetation structure and floristic composition for this species
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V	NL	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea.	1	Moderate – Due to the proximity of the Murrumbidgee River to the study area, and the wide distribution of this species, the White-bellied Sea-Eagle may occasionally occur in the airspace above and surrounding the site

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Little Eagle	<i>Hieraaetus morphnoides</i>	V	NL	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. Occupies open eucalypt forest, woodland or open woodland. <i>Casuarina</i> or <i>Acacia</i> woodlands and riparian woodlands of interior NSW are also used.	28	Moderate – Species is sparsely but widely distributed throughout NSW and occasionally observed in the Wagga Wagga area; species known to forage in agricultural areas and grasslands.
White-throated Needle-tail	<i>Hirundapus caudacutus</i>	NL	V	Migratory and usually seen in eastern Australia from October to April.	3	Moderate – Species is widely distributed and may be observed in at high elevations above the airspace; species seldom lands.
Swift Parrot	<i>Lathamus discolor</i>	E	CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	19	Low – High number of records of species in the area surrounding the subject area; study area not likely to constitute habitat or suitable movement corridor for species.
Malleefowl	<i>Leipoa ocellata</i>	E	V	The stronghold for this species in NSW is the mallee in the south west centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas.	PMST	Low - Study area and surrounding areas lack required vegetation structure and floristic composition for this species; geographically restricted.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Major Mitchell's Cockatoo	<i>Lophochroa leadbeateri</i>	V	NL	Found across the arid and semi-arid inland. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water.	2	Low – Species primarily inhabits arid areas, with few recent observations in the Wagga Wagga area.
Hooded Robin	<i>Melanodryas cucullata cucullata</i>	V	NL	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	12	Low – High number of records of species in the area surrounding the subject area; study area not likely to constitute habitat or suitable movement corridor for species.
Black-chinned Honeyeater	<i>Meliphreptus gularis gularis</i>	V	NL	In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts.	3	Low – High number of records of species in the area surrounding the subject area; study area not likely to constitute habitat or suitable movement corridor for species.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Turquoise Parrot	<i>Neophema pulchella</i>	V	NL	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	4	Low – Study area would not constitute habitat for species but may be observed within and moving through open landscape between suitable patches of vegetation, particularly creek and river corridors. Study area not likely to constitute habitat or suitable movement corridor for species.
Barking Owl	<i>Ninox connivens</i>	V	NL	The Barking Owl is found throughout continental Australia except for the central arid regions. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW).	5	Low – Study area would not constitute habitat for species but may be observed within and moving through open landscape between suitable patches of vegetation, particularly creek and river corridors. Study area not likely to constitute habitat or suitable movement corridor for species.
Far Eastern Curlew	<i>Numenius madagascariensis</i>	NL	CE	Within Australia, the Eastern Curlew has a primarily coastal distribution. Eastern Curlews are rarely recorded inland. It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts.	PMST	Low – No suitable habitat exists for this species within or surrounding the study area.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Blue Billed Duck	<i>Oxyura australis</i>	V	NL	The Blue-billed Duck is endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover.	4	Low – Study area lacks required aquatic areas and vegetative structure for this species; it is unlikely that the study area would be utilized by this species.
Gilbert's Whistler	<i>Pachycephala inornata</i>	V	NL	The Gilbert's Whistler is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia, from the western slopes of NSW to the Western Australian wheatbelt. The Gilbert's Whistler occurs in a range of habitats within NSW, though the shared feature appears to be a dense shrub layer.	5	Low – No suitable habitat exists for this species within the study area; it is unlikely that the study area would be utilized by this species.
Scarlet Robin	<i>Petroica boodang</i>	V	NL	The Scarlet Robin is found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	9	Low – Study area would not constitute habitat for species but may be observed within and moving through open landscape between suitable patches of vegetation. Study area not likely to constitute habitat or suitable movement corridor for species.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Flame Robin	<i>Petroica phoenicea</i>	V	NL	The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east & South Australia and also in Tasmania. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys.	16	Low – Study area would not constitute habitat for species but may be observed within and moving through open landscape between suitable patches of vegetation. Study area not likely to constitute habitat or suitable movement corridor for species.
Superb Parrot	<i>Polytelis swainsonii</i>	V	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. They inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland.	170	Low – Study area would not constitute habitat for species but may be observed within and moving through open landscape between suitable patches of vegetation. Study area not likely to constitute habitat or suitable movement corridor for species.
Australian Painted Snipe	<i>Rostratula australis</i>	E	E	In NSW many records of Australian Painted Snipe are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	PMST	Low – Species requires high-quality wetlands, marshes, dams.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Grey-crowned Babbler	<i>Pomatostomus temporalis temporalis</i>	V	NL	The eastern subspecies (<i>temporalis</i>) occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions.	5	Low – Study area would not constitute habitat for species but may be observed within and moving through open landscape between suitable patches of vegetation. Study area not likely to constitute habitat or suitable movement corridor for species.
Diamond Firetail	<i>Stagonopleura guttata</i>	V	NL	The Diamond Firetail is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum <i>Eucalyptus pauciflora</i> Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities.	18	Low – Study area would not constitute habitat for species but may be observed within and moving through open landscape between suitable patches of vegetation. Study area not likely to constitute habitat or suitable movement corridor for species.
Freckled Duck	<i>Stictonetta naevosa</i>	V	NL	The Freckled Duck is found primarily in south-eastern and south-western Australia. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, <i>Lignum</i> or Tea-tree.	1	Low – No suitable habitat exists for this species within the study area; it is unlikely that the study area would be utilized by this species.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Invertebrates						
Key's Matchstick Grasshopper	<i>Keyacris scurra</i>	E	E	Current distribution of Key's Matchstick grasshopper is poorly defined, however this species was originally distributed from Victoria to Orange (NSW) across the wheat/sheep belt. This species is typically recorded in native grasslands and grassy woodland but it has also been recorded in other vegetation associations usually containing a native grass understory (especially kangaroo grass <i>Themeda triandra</i>) and known food plants (particularly <i>Asteraceae</i>).	PMST	Low – No suitable habitat exists for this species within the study area; it is unlikely that the study area would be utilized by this species due to a high proportion of exotic groundcover and high levels of historic vegetation disturbance.
Mammals						
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	E	The range of the Spotted-tailed Quoll has declined considerably since European settlement. It is now relatively uncommon throughout its present mainland range through eastern NSW, eastern Victoria, south-east and north-eastern Queensland. It is still relatively common in Tasmania. This species has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	PMST	Low – No suitable habitat exists for this species within the study area; unsuitable vegetation structure and lack of fallen timber and rocky outcrops.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Bilby	<i>Macrotis lagotis</i>	V	E	A hundred years ago, Bilbies were common in many habitats throughout Australia, from the dry interior to temperate coastal regions. Changes to the Bilby's habitat have seen their numbers greatly reduced and today the species is nationally listed as vulnerable, and is presumed extinct in NSW. They now occur in fragmented populations in mulga shrublands and spinifex grasslands in the Tanami Desert of the Northern Territory; in the Gibson and Great Sandy Deserts and the Pilbara and Kimberley regions of Western Australia; and the Mitchell Grasslands of southwest Queensland.	1	Nil – Population believed to be extinct
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	V	NL	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. This species hunts in forested areas, catching moths and other flying insects above the tree tops.	1	Low – No suitable roosting or foraging habitat exists for this species within the study area.
Southern Myotis	<i>Myotis macrocatpus</i>	V	NL	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 kilometres inland, except along major rivers. Species generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. This species forages over streams and pools catching insects and small fish by raking their feet across the water surface.	2	Low – No suitable roosting or foraging habitat exists for this species within the study area; Species most likely to be observed within close proximity to the Murrumbidgee River.

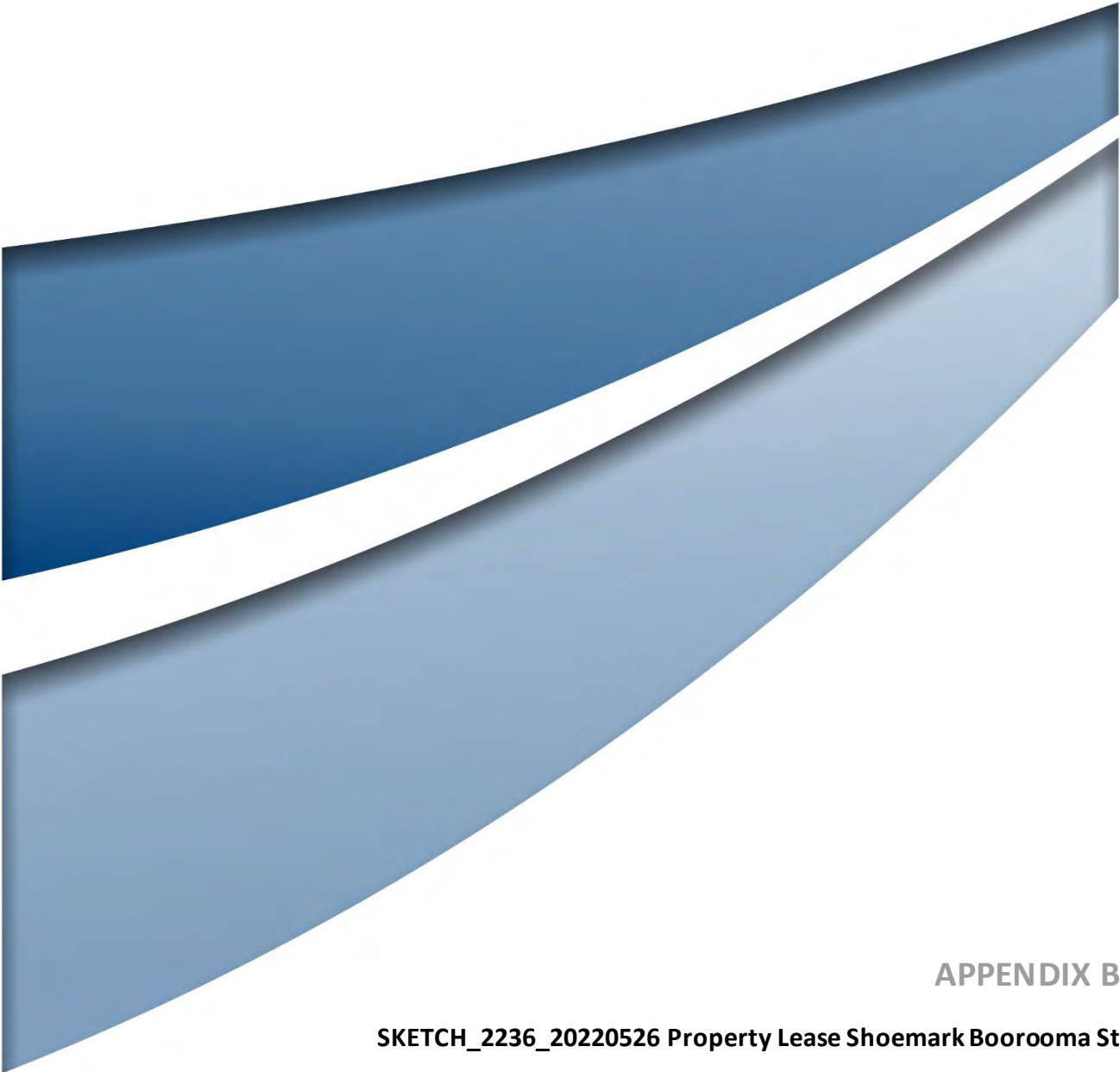
Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	V	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bullocke <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	PMST	Low – No suitable roosting or foraging habitat exists for this species within the study area; no recent records of species in locality
Squirrel Glider in the Wagga Wagga LGA	<i>Petaurus norfolcensis</i>	E	NL	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Require abundant tree hollows for refuge and nest sites.	136	Low – Species is known to occur in nearby forested areas, but no suitable breeding or foraging habitat exists for this species within the study area as species is dependent on tree hollows for refuge and tree/shrub cover for foraging.
Koala	<i>Phascolarctos cinereus</i>	V	V	In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Spend most of their time in trees, but will descend and traverse open ground to move between trees.	2	Low – Study area lacks the required vegetation composition/structure for this species; although species is known to cross open ground between patches of habitat, more suitable corridors across the local landscape exist.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	Grey-headed Flying-foxes are generally found within 200 kilometres of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	34	Moderate – No suitable roosting or foraging habitat exists within the study area; as a known flying fox camp exists along the Murrumbidgee River corridor in Wagga Wagga, this species may occupy the airspace over the study area while moving throughout the landscape.
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	NL	The Yellow-bellied Sheath-tail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range – most of Victoria, south-western NSW and adjacent South Australia – it is a rare visitor in late summer and autumn. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	1	Moderate – Suitable foraging habitat may exist for this species; one recent record of this species exists within the local area
Inland Forest Bat	<i>Vespadelus baverstocki</i>	V	NL	In NSW, this species has been most regularly captured in the far south west, north from the Murray River to Menindee, and at least as far east as the Balranald-Ivanhoe Road. This species roosts in tree hollows and abandoned buildings and is known to roost in very small hollows in stunted trees only a few metres high. Most records are from drier woodland habitats with riparian areas inhabited by the Little Forest Bat. However, other habitats may be used for foraging and/or drinking.	1	Low – Study area lacks the required vegetation composition/structure for this species; species is more likely to inhabit woodland areas further west than Wagga Wagga.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Reptiles						
Pink-tailed Worm-lizard	<i>Aprasia parapulchella</i>	V	V	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (<i>Themeda triandra</i>). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks.	PMST	Low – Study area lacks the required vegetation composition/structure for this species; study area lacks required distribution of surface rocks/outcrop for this species.
Fish						
Murray Cod	<i>Maccullochella peelii</i>	NL	V	Murray Cod are distributed throughout the Murray-Darling system and prefer the main channel of rivers, flowing anabranches and creeks.	PMST	Nil – Aquatic habitat not present.
Threatened Ecological Communities						
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia		NL	E	Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia mostly occurs from central NSW, through northern/central Victoria into eastern South Australia. The ecological community occurs in two forms, a grassy woodland form and as a derived native grassland. This grassy woodland form has a tree canopy that is dominated or co-dominated by Grey Box (<i>Eucalyptus microcarpa</i>).	PMST	Low – Epahics and floristic composition do not conform to the Final Determination for this TEC.

Common Name	Scientific Name	BC Act	EPBC Act	Habitat requirements	Number of records (BioNet)/ source of records	Likelihood of occurrence
Weeping Myall Woodlands		NL	E	Weeping Myall (<i>Acacia pendula</i>) Woodlands occur in a range of forms from open woodlands to woodlands, in which weeping myall (<i>Acacia pendula</i>) trees are the sole or dominant overstorey species. Although weeping myall trees are often the only tree species in these woodlands, other trees can occur in the overstorey of the ecological community. It occurs on the inland alluvial plains west of the Great Dividing Range in NSW and QLD.	PMST	Low – Epahics and floristic composition do not conform to the Final Determination for this TEC.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		NL	CE	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland can occur as either a woodland or derived native grassland. It is characterised by a lower stratum dominated by native tussock forming grasses and herbs/forbs and a sparse shrub layer. White Box (<i>Eucalyptus albens</i>), Yellow Box (<i>Eucalyptus melliodora</i>) or Blakely's Red Gum (<i>Eucalyptus blakelyi</i>) dominate the upper stratum if present. This community occurs throughout the western slopes and tablelands of the Great Dividing Range.	PMST	Low – Epahics and floristic composition do not conform to the Final Determination for this TEC in either a woodland or derived native grassland condition.
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions		CE	NL		N/A	

Note: NL = Not Listed, V = Vulnerable, E = Endangered, CE = Critically Endangered, Ex = Extinct, M = Migratory



APPENDIX B

SKETCH_2236_20220526 Property Lease Shoemark Boorooma St



Transport
for NSW

**PROPERTY LEASE
SKETCH 2236**

DRAWN: 26/05/2022

SUBJECT:

SKETCH SHOWING
LAND TO BE LEASED
FOR COMPOUND SITE
AT NORTH WAGGA WAGGA




FROM
**WAYNE IAN SHOEMARK
LYNETTE GAI SHOEMARK**
OVER LOT 1 DP 346146
and LOT 367 DP 751422

LOCALITY: NORTH WAGGA WAGGA

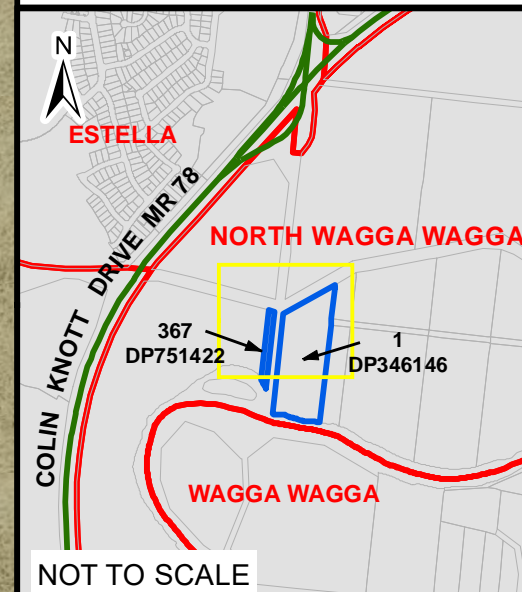
LGA: WAGGA WAGGA

LSE FILE NO: SF2022/101222

Legend

-  TEMPORARY GATE
-  PROPERTY BOUNDARY
-  LAND TO BE LEASED

Lengths are in metres
Dimensions are approximate only



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Accuracy Disclaimer
Areas, Boundaries, Dimensions and positions
of improvements in relation to the boundaries
are subject to final survey.

1
DP707812

7
DP855252

GARDINER STREET

1
DP128450

BOOROOMA STREET

Abt 123

ABT
1 ha

2
DP128450

ABT
1920m²

(Abt
24.5)

Abt 93.5

Abt 64

(Abt
20)

Abt 100

1
DP740088

367
DP751422

1
DP346146

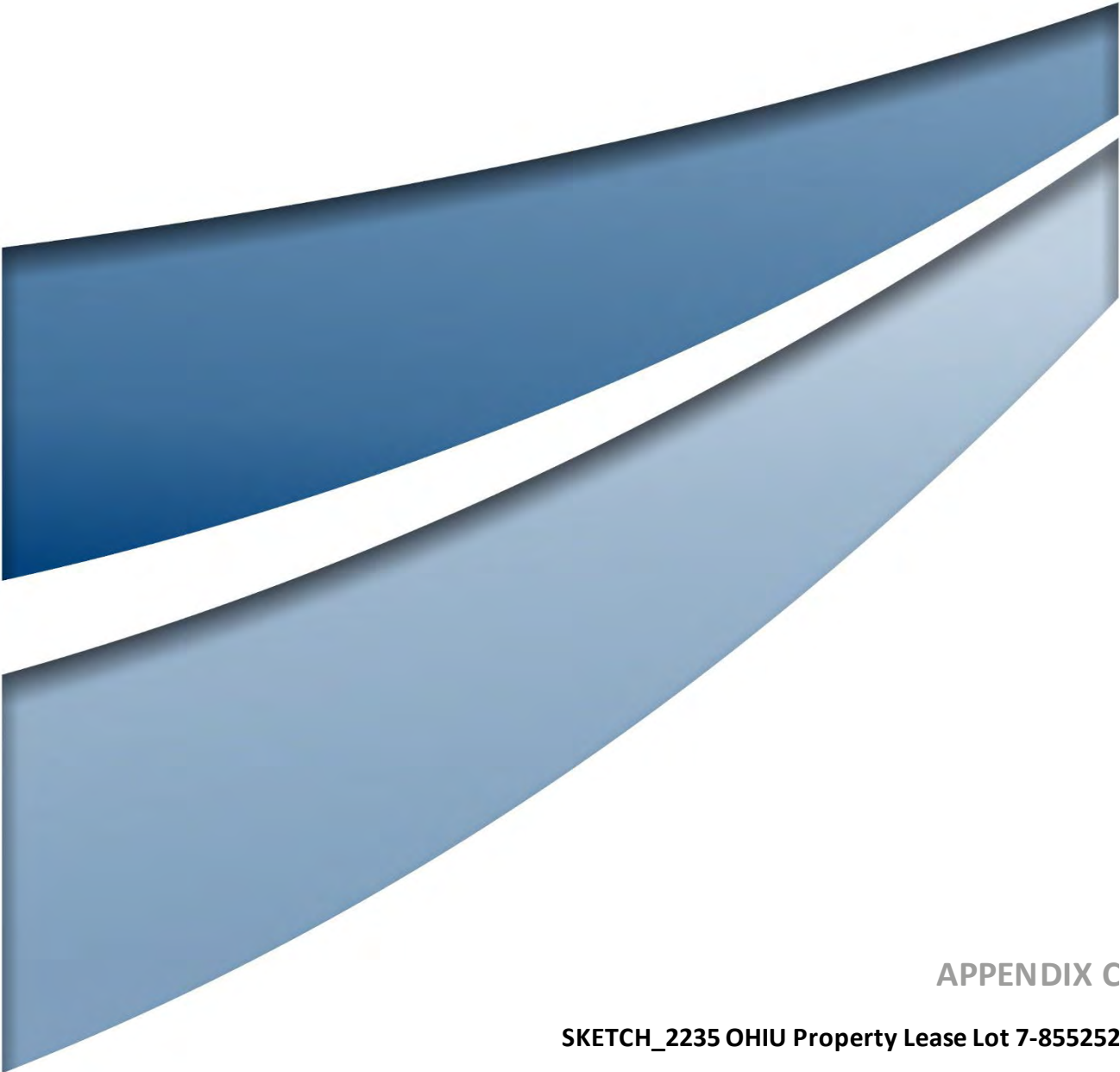
1
DP128450

**LEASE BOUNDARIES AND AREA
RECOMMENDED AND APPROVED BY:**

Sam Millie
Project Manager

SIGNED: _____

DATE: 26-May-2022



APPENDIX C

SKETCH_2235 OHIU Property Lease Lot 7-855252



Transport
for NSW

**PROPERTY LEASE
SKETCH 2235**

DRAWN: 18/05/2022

SUBJECT:

SKETCH SHOWING
LAND TO BE LEASED
FOR COMPOUND SITE
AT NORTH WAGGA WAGGA




FROM
**JEFFREY ANDREW HAZELMAN
TRACEY LEE HAZELMAN**
OVER LOT 7 DP 855252

LOCALITY: NORTH WAGGA WAGGA

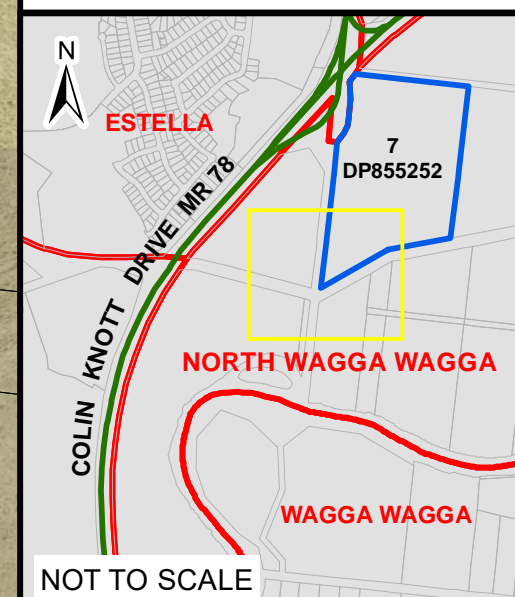
LGA: WAGGA WAGGA

LSE FILE NO: SF2022/101221

Legend

-  TEMPORARY GATE
-  PROPERTY BOUNDARY
-  LAND TO BE LEASED

Lengths are in metres
Dimensions are approximate only



NOT TO SCALE

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Accuracy Disclaimer
Areas, Boundaries, Dimensions and positions
of improvements in relation to the boundaries
are subject to final survey.

1
DP707812

7
DP855252

BOOROOMA STREET

ABT
1.5ha

Abt 155

Abt 239.5

(Abt
20)

GARDINER STREET

1
DP128450

249
DP751422

1
DP740088

367
DP751422

1
DP346146

2
DP128450

1
DP128450

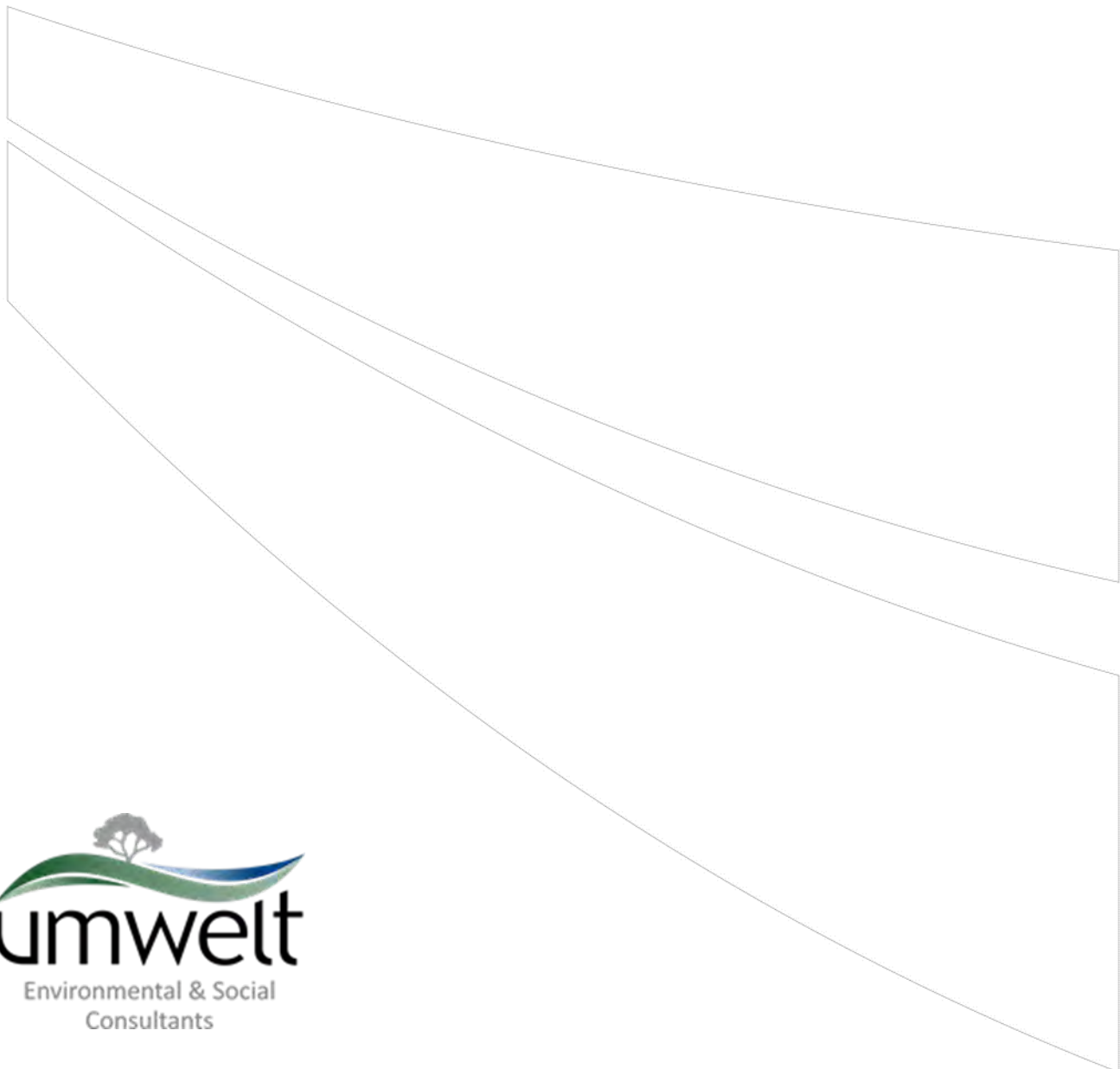
252
DP751422

**LEASE BOUNDARIES AND AREA
RECOMMENDED AND APPROVED BY:**

Sam Millie
Project Manager

SIGNED: _____

DATE: 20-May-2022



APPENDIX 6 - FLORA AND FAUNA MANAGEMENT PLAN

**FLORA AND FAUNA MANAGEMENT
PLAN**

Olympic Highway Intersection Upgrade, Wagga
Wagga

FINAL

December 2022



FLORA AND FAUNA MANAGEMENT PLAN

Olympic Highway Intersection Upgrade, Wagga
Wagga

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Transport for NSW

Project Director: Malinda Facey
Project Manager: Lucinda Burchfield
Report No. 21132_R11
Date: December 2022



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QMS Certification Services

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final V1	Naomi Buchhorn & Lucinda Burchfield	14/12/2022	Malinda Facey	14/12/2022

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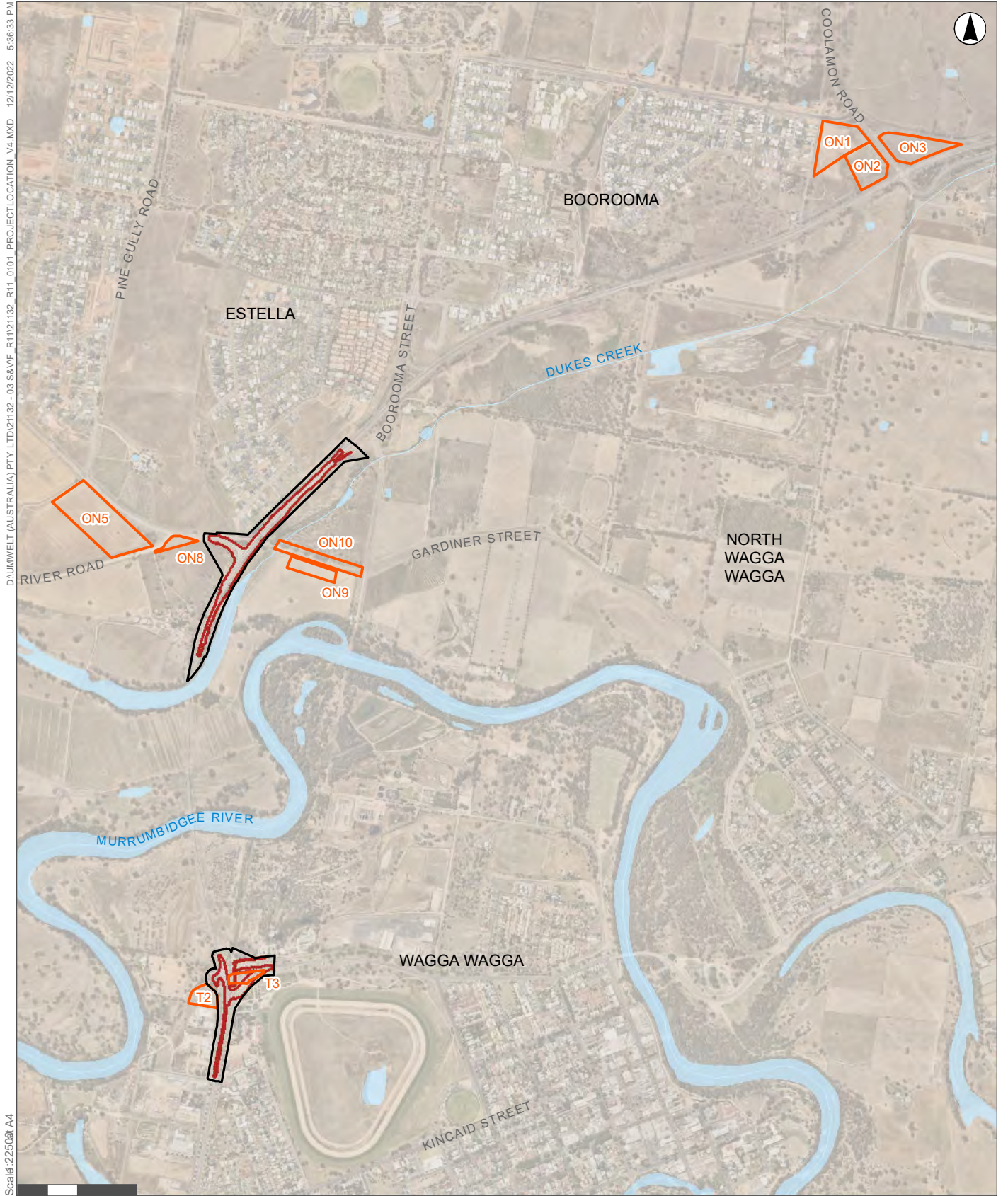
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1.0 Introduction

This Fauna and Flora Management Plan (FFMP) has been prepared for Transport for New South Wales (TfNSW) by Umwelt (Australia) Pty Limited (Umwelt) and forms part of the Construction Environmental Management Plan (CEMP) (in preparation) for early works associated with the Olympic Highway Intersection Upgrade Project at Wagga Wagga.

The Project is located within northern Wagga Wagga and includes the intersections of the Olympic Highway with Old Narrandera Road and Travers Street, and several adjoining and satellite ancillary areas. The Project Vegetation Disturbance Footprint comprises the maximum extent of construction which covers about 22.57 hectares and contains about 2.61 hectares of native vegetation. The Project vegetation disturbance footprint represents a substantial contraction of the original Project Area assessed in the BAR (Umwelt, 2021). The Project vegetation disturbance footprint, and Project Area are shown in **(Figure 1.1)**.



Legend

- Watercourses
- Ancillary Sites
- Vegetation Disturbance Footprint
- Project Area

FIGURE 1.1

Project Vegetation Disturbance Footprint

2.0 Purpose and Objectives

2.1 Purpose

The purpose of this FFMP is to describe how early works construction impacts on fauna and local ecosystems will be minimalised and managed, and to ensure that early works clearing complies with development approval requirements relating to the minimisation of ecological impacts. The use of appropriate protocols for handling fauna and managing weeds encountered during the course of the project are mitigation measures detailed *Olympic Highway Intersections Upgrade Biodiversity Assessment Report* (Transport for NSW, 2021). This Flora and Fauna Management Plan has been developed for the Development Footprint and ancillary sites ON1, ON2, ON3, ON5, ON8, ON9, ON10, T3 and T2.

2.2 Objectives

The key objective of the FFMP is to ensure that early works construction impacts on flora, fauna and local environments are minimised and managed. To achieve this the FFMP will:

- Describe the existing fauna habitat within the disturbance Area, including hollow-bearing trees (HBTs)
- ensure that controls and procedures are implemented for soft-soil treatment works to avoid, minimise or manage potential adverse impacts on fauna within and adjacent to the Disturbance Area in accordance with Guide 1: Pre-clearing process of the Roads and Maritime Biodiversity Guideline (RTA, 2011)
- provide fauna interaction management strategies consistent with Guide 9: Fauna Handling of the Roads and Maritime Biodiversity Guideline (RTA, 2011)
- describe existing exotic flora species presence within the Disturbance Area, particularly priority weeds
- ensure that weed management strategies are implemented to avoid, minimise or manage spread of weeds during the early works in accordance with Guide 3: Weed management of the Roads and Maritime Biodiversity Guidelines (RTA 2011).

3.0 Site Conditions

3.1 Existing environment

The Biodiversity Assessment Report (BAR) (Umwelt, 2021) identified five vegetation communities including three terrestrial Plant Community Types (PCT) in the Project vegetation disturbance footprint:

- PCT 5: River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplain in the lower slopes sub-region of the NSW South Western Slopes Bioregion and Eastern Riverina Bioregion
- PCT 346: White box – Blakely’s Red Gum – White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga – Cootamundra region of the NSW South Western Slopes
- PCT 277: Blakely’s Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- Native planted trees with mixed native and exotic understorey, and
- Exotic pasture.

PCT 277 was found to align with the threatened ecological community ‘White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland’ listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) as critically endangered. The PCT did not meet the key diagnostic or condition threshold for threatened ecological communities under the *Environment Protection Biodiversity and Conservation Act 1999* (Cth) (EPBC Act).

The construction footprint in the vicinity of Old Narrandera Road and Olympic Highway is parallel with Gobagombalin Lagoon. While not directly impacted, sufficient mitigation measure will need to be in place to prevent impacting this aquatic habitat). Erosion and sedimentation controls will be outlined in the CEMP (in preparation).

Six threatened fauna species were identified in or adjacent to the disturbance area in the BAR (Umwelt, 2021) (refer to **Table 3-1**).

Targeted microbat surveys, consisting of culvert inspections and Anabat recordings, were conducted along Gobagombalin Lagoon, Dukes Creek and Olympic Highway. These surveys confirmed the presence of two threatened bat species, grey-headed flying fox (*Pteropus poliocephalus*) and yellow-bellied sheath-tailed bat (*Saccolaimus flaviventrus*). Three additional bat species were identified with a certainty rating of ‘potential’ **Table 3-1** (Umwelt, 2021). No potential roosting or breeding sites were identified in the disturbance area.

Detailed design of the soft soil treatment area and the selection of ancillary sites, have been designed to avoid areas containing threatened species records. All threatened species recorded in (Umwelt, 2021) occur within 160 metres of the Disturbance Footprint.

Table 3-1 Threatened species identified in or adjacent to the Disturbance Area

Scientific Name	Common Name	EPBC Status	BC Act Status	Confidence
<i>Petaurus norfolcensis</i> – <i>endangered population</i>	squirrel glider in the Wagga Wagga Local Government Area	-	Endangered Population	Confirmed
<i>Miniopterus orianae</i> <i>oceanensis</i>	large bent-winged bat	-	Vulnerable	6,757 possible calls
<i>Falsistrellus tasmaniensis</i>	eastern false pipistrelle	-	Vulnerable	5 probable calls 63 possible calls
<i>Myotis macropus</i>	southern myotis	-	Vulnerable	9 possible calls
<i>Pteropus poliocephalus</i>	grey-headed flying fox	Vulnerable	Vulnerable	Confirmed
<i>Saccolaimus flaviventrus</i>	yellow-bellied sheath- tailed bat	-	Vulnerable	Confirmed

3.2 Site Inspection

3.2.1.1 Soft soil treatment works- Old Narrandera Road

The soft soil treatment area within the vicinity of Old Narrandera Road supports exotic pasture, mixed planted native and exotic vegetation, low and moderate quality PCT 5 and low quality PCT 346. These habitats have the potential to support reptiles, amphibians, small mammals and mobile bird species. Four threatened species have been recorded in the riparian zone of the adjacent waterway, these are:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (Vulnerable under BC Act) confirmed,
- Squirrel Glider (*Petaurus norfolcensis*) (Vulnerable under BC Act) confirmed,
- Southern Myotis (*Myotis macropus*) (Vulnerable under BC Act) potential and
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) (Vulnerable under BC Act) potential.

Four hollow-bearing trees were recorded in this area of PCT 5. These trees contain extra small, small and medium hollows which can support birds and microbats.

No priority weeds or weeds of national significance (WoNS) were identified in this area.

3.2.1.2 Soft soil treatment works- Travers Street

The soft soil treatment area within the vicinity of Travers Street supports exotic pasture, infrastructure, mixed planted native and exotic vegetation and low quality PCT 5. These areas feature a simple structural composition compiled of mown grassland, planted exotic and native trees and remnant native trees. This habitat may support disturbance tolerant reptile and bird species. A number of confirmed and potential

threatened species have been recorded in PCT 5 and exotic pasture north of the Travers Street intersection, these are:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (Vulnerable under BC Act) confirmed,
- Grey-headed Flying Fox (*Pteropus poliocephalus*) (Vulnerable under the BC Act and EPBC Act) confirmed,
- Squirrel Glider (*Petaurus norfolcensis*) (Vulnerable under BC Act) confirmed,
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*) (Vulnerable under BC Act) confirmed,
- Southern Myotis (*Myotis macropus*) (Vulnerable under BC Act) potential and
- Large Bent-winged Bat (*Miniopterus orianae oceansis*) (Vulnerable under BC Act) potential.

Two hollow-bearing trees were recorded in this area in mixed planted native and exotic vegetation. These trees contain a mixture of extra small, small, medium and large sized hollows which constitute suitable habitat for birds, microbats and small mammals.

No priority weed species of WoNS were identified in this area.

3.2.1.3 Ancillary sites ON1, ON2 and ON3

These ancillary sites are located at the intersection of Coolamon Road and Olympic Highway. Ancillary sites ON1 and ON2 feature exotic pasture. ON3 is dominated by exotic pasture but also contains PCT 277 Derived Native Grassland. These areas contain habitat with the potential to support disturbance tolerant reptiles, amphibians, small mammals and mobile bird species.

No hollow-bearing trees, priority weeds or WoNS were identified in these ancillary sites.

3.2.1.4 Ancillary sites ON5, ON8, ON9 and ON10

Ancillary sites ON5, ON8, ON9 and ON10 are located at the intersection of Old Narrandera Road and Colin Knott Drive.

Ancillary site ON5 exclusively contains exotic pasture, ON8 exclusively contains PCT277 derived grassland, ON9 exclusively contains exotic pasture and ON10 contains a combination of infrastructure, exotic pasture and PCT5 regrowth. These ancillary sites are likely to contain habitat with the potential to support disturbance tolerant reptiles, amphibians, small mammals and mobile bird species.

Five hollow-bearing trees were identified in ancillary site ON10. These trees contained a mixture of extra small, small, medium and large sized hollows which constitute suitable habitat for birds, microbats and small mammals.

No priority weed species or WoNS were identified in these ancillary sites.

3.2.1.5 Ancillary sites T2 and T3

Ancillary sites T2 and T3 are located at the intersection of Travers Street and Moorong Street. Ancillary site T3 is comprised exclusively of mixed planted native and exotic vegetation. Ancillary site T2 is comprised of a mix of infrastructure, exotic pasture and low quality PCT5.

No priority weeds or WoNS were identified in these areas.

3.2.2 Threatened flora

No threatened flora were identified during fieldwork associated with the BAR (Umwelt, 2021).

3.2.3 Threatened fauna

Six threatened species were identified in the Project Vegetation Disturbance Footprint assessed in the BAR (Umwelt 2021). Through the refinement process, areas in which threatened species were recorded have been excluded. Even though the Project Vegetation Disturbance Footprint has been refined to exclude areas in which threatened species were recorded, habitat which could support these species still exists in the Project Vegetation Disturbance Footprint

A summary of habitat within the Project Vegetation Disturbance Footprint that contains habitat for recorded threatened species recorded is provided below in **Table 3-2**.

Table 3-2 Areas in the Project Vegetation Disturbance Footprint that contain habitat for recorded threatened species

Species	Status		Habitat present in Project Vegetation Disturbance Footprint (Y/N)
	BC Status	EPBC Status	
Eastern False Pipistrelle	Vulnerable	-	ON10, T3, Soft Soil Treatment Area
Grey-headed Flying Fox	Vulnerable	Vulnerable	T3, Soft Soil Treatment Area
Large Bent-winged Bat	Vulnerable	-	ON10, Soft Soil Treatment Area
Southern Myotis	Vulnerable	-	ON10, T3, T3Soft Soil Treatment Area
Squirrel Glider	Endangered population	-	ON10, T3, Soft Soil Treatment Area
Yellow-bellied Sheath-tail Bat	Vulnerable	-	T3, Soft Soil Treatment Area

3.2.4 Habitat features

3.2.4.1 Hollow-bearing trees

A total of 11 hollow-bearing trees (HBTs) were identified in the Project Vegetation Disturbance Footprint. HBTs were recorded using handheld GPS devices during the preparation of the BDAR (Umwelt, 2021). All HBTs to be removed are required to be marked with spray paint and flagging tape to clearly indicate impacted trees. The Artificial Shelter Strategy (Umwelt 2022) provides a summary of HBTs and hollows to be removed by the soft soil treatment and ancillary sites. The actual number of hollows would be

confirmed at the completion of clearance works and documented in the results of the Pre-clearance and Tree felling Report.

A breakdown of HBT locations is presented in **Figure 3.1**. **Table 3-4** presents the number of HBTs within each species polygon and the number of those which meet the requirements for each species.

Table 3-3 Location of Hollow-bearing Trees

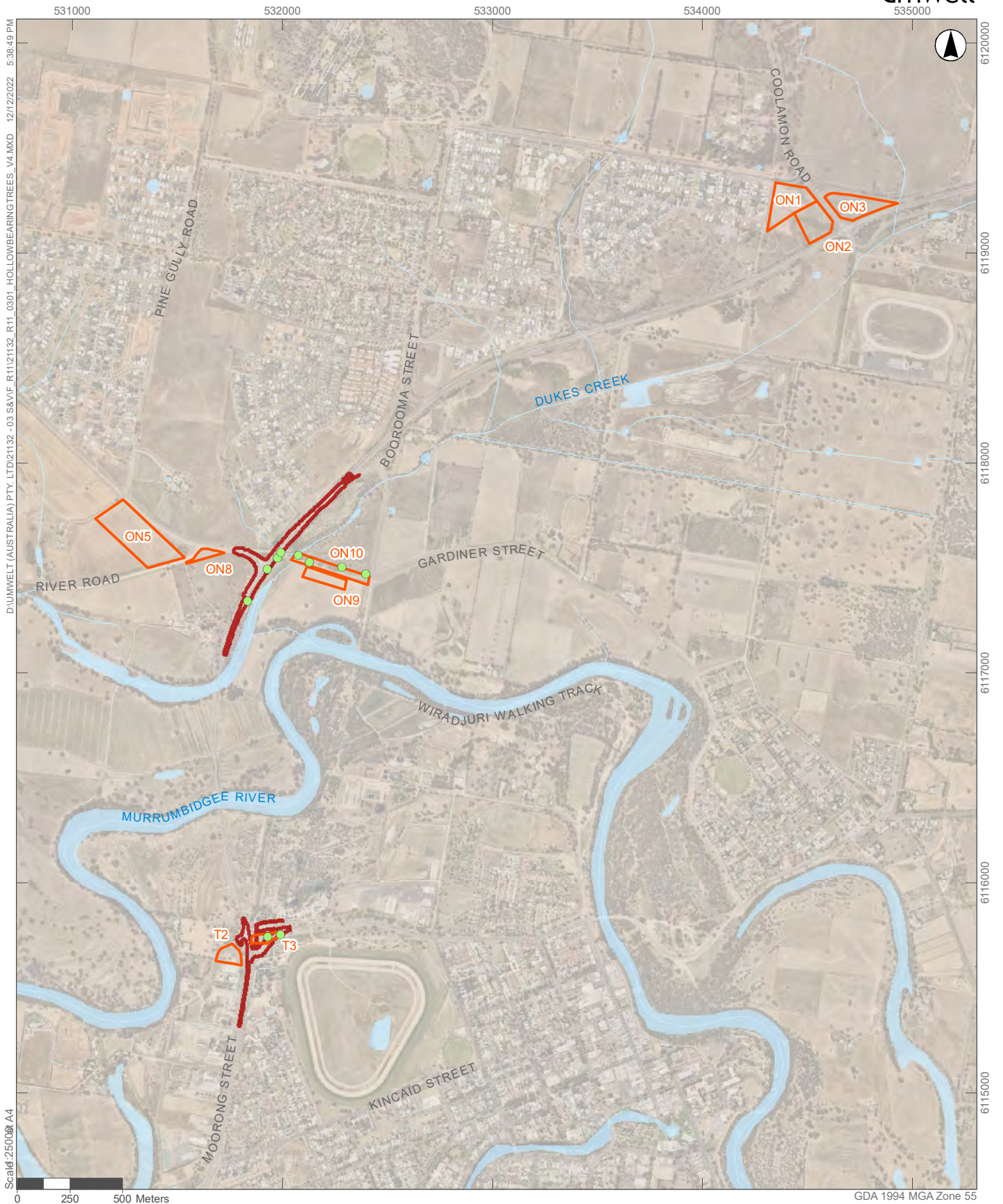
Site	Number of hollow-bearing trees
Soft Soil Treatment Area- Old Narrandera Road	4
ON10	5
Soft Soil Treatment Area- Travers Street	2
Total	11 (one hollow-bearing tree is intercepted by the footprint of T3 and Soft Soil Treatment Area- Travers Street)

Table 3-4 Number of hollows and species suitability

Species polygon	Total number of hollows
Southern myotis *	18
Superb parrot	10
Squirrel glider	14

** TfNSW have advised that artificial hollow replacement for microbats is no longer undertaken by TfNSW due to limited evidence of utilisation for breeding by threatened microbat species*

Other habitat features present on site include scattered coarse woody debris (CWD), large rocks and culverts. Ten (10) culverts were identified in the Disturbance Area. All were manually searched for evidence of roosting microbats, however, none were recorded. Access to eight of the ten culverts was limited.. These culverts were assessed for suitable cracks by an ecologist from the opening of the culvert.



- Legend**
- Hollow Bearing Trees
 - Ancillary Sites
 - Project Area

FIGURE 3.1

Location of Hollow-bearing Trees

3.2.5 Weeds

Field surveys associated with the BAR (Umwelt, 2021) identified two weed species, being blackberry and African boxthorn, that listed as both WoNS and weed species under the NSW *Biosecurity Act 2015* as well as three notable exotic species (refer to **Table 3-5**). Through the refinement of the Development Footprint, areas supporting recorded weeds have been eliminated from the Vegetation Disturbance Footprint.

All weed species were recorded incidentally while on site or as part of a vegetation plot during the preparation of the BAR (Umwelt, 2021). No targeted weed mapping survey was conducted for the FFMP. As such other notable weed species may be present onsite and the extent of recorded weed species is not known. It is recommended that a weed mapping survey be conducted in the Disturbance Area.

Table 3-5 Notable Weeds identified onsite

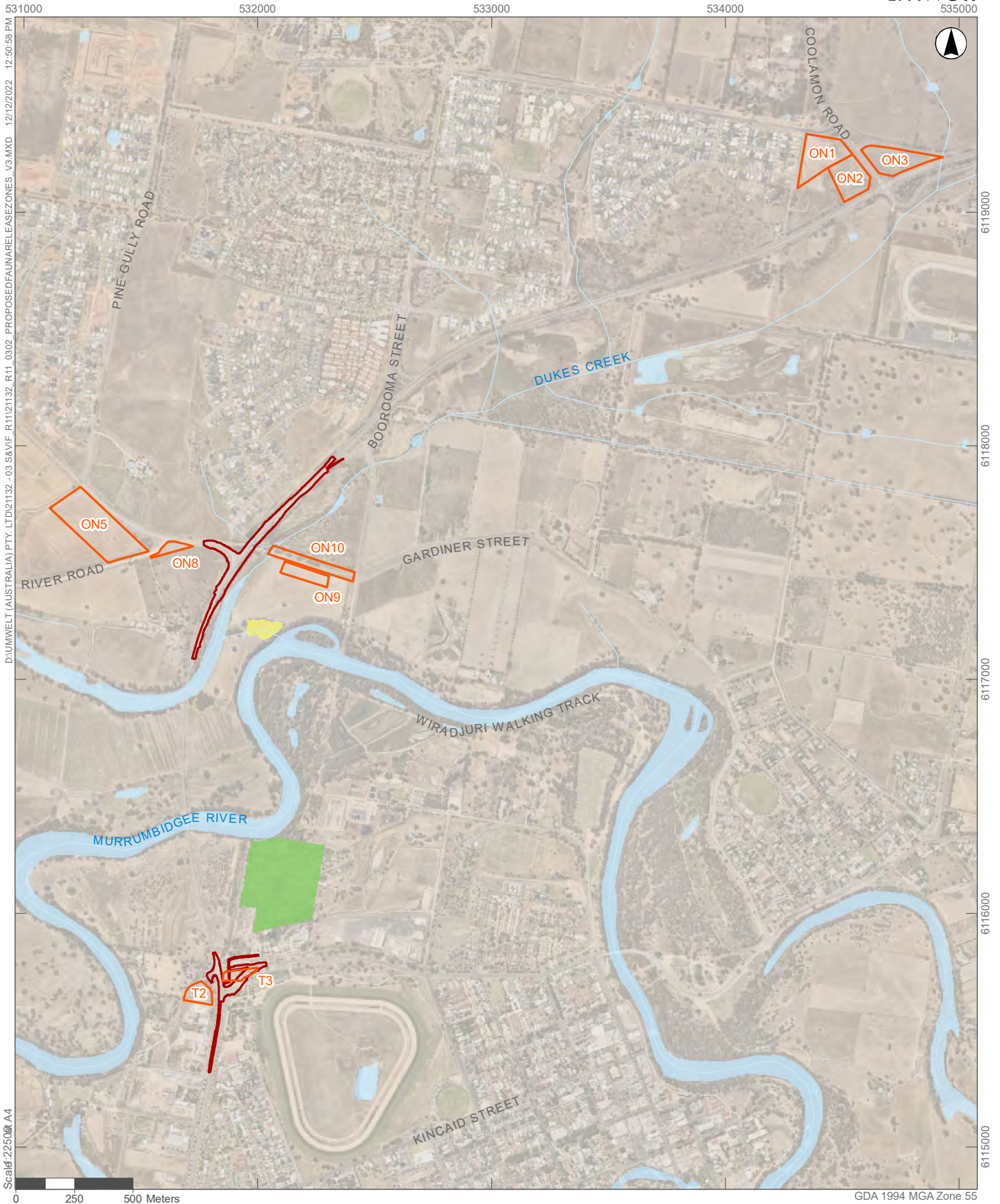
Species Name	Common Name	National Status	Riverina LLS Status	NSW <i>Biosecurity Act 2015</i> Status
<i>Rubus fruticosus</i> <i>agg. Sp</i>	Blackberry	WoNS	Species of Concern	General Biosecurity Duty Prohibition on Dealings
<i>Lycium ferocissimum</i>	African Boxthorn	WoNS	Species of Concern	General Biosecurity Duty Prohibition on Dealings
<i>Echium plantagineum</i>	Paterson's curse	-	-	General Biosecurity Duty
<i>Hypericum perforatum</i>	St. John's-wort	-	Species of Concern	General Biosecurity Duty
<i>Eragrostis curvula</i>	African lovegrass	-	Species of Concern	General biosecurity Duty

3.2.6 Fauna release zones

Two potential fauna release zones have been identified during desktop assessment:

- FRZ1 is designated release zone for fauna captured south of the Murrumbidgee River and
- FRZ2 is designated release zone for fauna captured south of the Murrumbidgee River.

The proposed fauna release zones are presented in **Figure 3.2**. Both fauna release zones provide connectivity within the broader landscape and river corridor.



- Legend**
- Ancillary Sites
 - Project Area
 - Proposed Fauna Release Zone 1
 - Proposed Fauna Release Zone 2

FIGURE 3.2
Proposed Fauna Release Zones

4.0 Fauna Management Plan

4.1 Induction and training

All employees, contractors and utility staff working on site will undergo site induction training relating to flora and fauna management issues. Toolbox talks must also be held prior to vegetation clearing and tree felling to identify specific fauna management measures. The Works Supervisor is responsible for providing documentation and procedures to enable site personnel are aware of, and follow, the following plans and processes:

- Existence and requirements of this plan
- Relevant legislation
- Specific responsibilities for the protection of flora and fauna
- Specific species likely to be affected by the construction works and how these species can be recognised
- Fauna interaction procedures:
 - no feeding of wildlife at or near site
 - recording of fauna onsite
 - stop work in immediate vicinity, notify the works supervisor and / or environmental manager and allow any wildlife to leave site independently
 - fauna rescue requirements in the event that any wildlife is not willing or able to leave the site independently comprising:
 - stop work
 - notify the works supervisor, environmental manager and onsite ecologist
 - fauna can only be handled by a project ecologist an on-site ecologist
 - fauna handling protocols **Section 4.3** must be followed
- Unexpected Threatened Species Finds Protocol (not yet produced).

4.2 Contacts

Table 4-1 provides contact details for local fauna rescue contacts. The project manager and/or environment manager should ensure that animal rescue agency/wildlife care groups and vet have been contacted before works start to check they are willing and available to be involved in fauna rescue and assist with injured animals. Confirmed contact details must be updated in the FFMP and displayed in the site office.

Table 4-1 Fauna Rescue Contact Details

Agency / business	Contact number
Project Ecologist, tbc	tbc
Moorong Veterinary Clinic – After hours	02 6921 3462
WIRES Wagga Wagga	1300 094 737

4.3 Fauna handling protocol

The following fauna handling protocol is based on Guide 9: Fauna handling in *Biodiversity Guidelines protecting and managing biodiversity on RTA projects* (RTA 2011). The objective of the protocol is to minimise impacts on fauna as a result of being handled by humans and prevent injury to people handling fauna.

During works, fauna would be allowed to leave the area with as little intervention as possible. A local animal rescue agency/wildlife care group and vet will be contacted, whose details are provided in **Section 4.2** and which will be displayed in the site office before work begins in case assistance is needed for injured fauna. If intervention is necessary, fauna will only be handled by a licensed and trained fauna ecologist or wildlife carers with experience in handling fauna, and the following protocols will be followed:

- gloves will be worn when handling mammals (including bats) to protect against scratches and bites.
- appropriately sized cloth or hessian bags will be used to house mammals before release.
- bats must only be handled by a qualified ecologist or wildlife handler experienced in bat handling and vaccinated against the Australian Bat Lyssavirus (ABL). Gloves must be worn when handling bats. Microbats should be held in calico bags. Larger bats would be wrapped in a large towel and handled with wearing elbow length leather welding gloves.
- the Hygiene Protocol for the control of disease in frogs (Wellington & Haering, 2008) must be followed for all frog handling to prevent pathogen spread amongst individuals and between catchments:
 - single use, non-nitrile, non-latex, non-powdered (i.e. vinyl) disposable gloves to be worn when handling individuals; if gloves are not available, then avoid touching the frog with bare hands by using implements to transfer to a container
 - healthy frogs are to be placed in separate single-use plastic bags which should be partially inflated and include a small amount of leaf litter or clean (i.e. washed in a 0.1% concentration of a benzalkonium chloride based disinfectant solution such as F10SC at 1:250 dilution and not re-used) damp cloth bag containing a small amount of leaf litter
 - sick or injured individuals would be euthanized immediately, unless there is a high probability of recovery, in which case treatment would be as for healthy frogs

- handling equipment, hands and boots to be cleaned of all soil and sprayed with a 0.1% concentration of a benzalkonium chloride based disinfectant solution (i.e. F10SC at 1:250 dilution) and rinsed when moving between waterbodies
- frogs and tadpoles not to be moved between catchments
- dead frogs would be handled only using single-use gloves and buried in situ to avoid movement of pathogens
- handling of snakes would only occur by qualified ecologists with experience in snake handling. No-contact handling technique (i.e. use a snake hook and bag in opposed to manually handling the snake) is recommended.
- if the fauna species is identified as a threatened species, and is a species not identified in the approval, then:
 - all work likely to affect the threatened species must cease; and
 - Unexpected Threatened Species Finds Protocol, (not yet produced) must be implemented.
- if an animal is injured, it will be kept in a quiet, warm and dark place until it can be transferred to a wildlife carer or vet.
- uninjured fauna will be released into suitable pre-determined habitat areas **Figure 3.2** as similar as possible to their capture location and it provides it a likely chance of survival.
- nocturnal fauna will be released at or after dusk, and trees with rough bark or hollows will be selected for bats and gliders. Arboreal fauna will be released slowly onto the trunk of a tree.
- pest species are not to be released and should be euthanized.
- if any fauna is to be euthanized, it will be undertaken using a suitable technique (i.e. cervical dislocation) by trained and competent personnel or will be taken to a veterinarian for euthanasia. The ecologist will consider methods that are humane, painless and rapid.
- details of captured and relocated fauna will be recorded on the fauna handling record sheet (Fauna Rescue Event Record, Not yet produced) including:
 - species
 - location and time captured
 - location and time released
 - behaviour and condition upon release
 - contact details of wildlife carer or vet if the animal was transferred into their care
- any fauna injury or death will be recorded and reported to Transport for New South Wales.

4.4 Pre-clearance surveys

Pre-clearance surveys will be required for the clearing of vegetation in the proposed early works area and ancillary sites no more than two weeks prior to clearing. Subcontractors will be informed about the marked individual trees to be retained and exclusion zones.

Pre-clearance surveys will be undertaken by suitably qualified and experienced ecologist and in accordance with the RTA Biodiversity Guidelines, Guide 1: Pre-clearance process (RTA, 2011) as follows:

- mark all potential fauna habitat, areas where fauna is present, or areas where evidence of recent occupation is detected, within the early works area and the site compound using spray paint, including hollows, cracks or fissures and spouts, active nests, dreys or other signs of recent fauna usage.
- mark areas approved for clearing and establish exclusion zones/fencing to reduce risk of accidental clearing.
- the identification of habitat features that are suitable for salvage and re-use (if present).
- the identification of nearby habitat suitable for the relocation of captured fauna.

Fauna searches in areas identified as containing habitat features should occur no more than two hours prior to the vegetation clearance commencing. Fauna will be captured and relocated into pre-determined release habitat using the below fauna handling protocols. Transport for New South Wales will be informed of changes to the clearing sequence if deemed necessary based on the outcomes of this process.

If a threatened flora or fauna species is found that was not previously identified and assessed in the BAR (Umwelt 2021), the Unexpected Threatened Species Finds Procedure (Unexpected Threatened Species Finds Protocol, (not yet produced) will be followed.

Preclearance surveys must be documented as per the Pre-clearance Survey Recording sheet (Pre-clearance Checklist, (not yet produced).

4.5 Ecological supervision of clearing

The clearance of vegetation and tree-felling procedure has been designed to minimise the impact of native vegetation clearance on native fauna species and their habitat and is based on Guide 4: Clearing of vegetation and removal of bushrock in *Biodiversity Guidelines protecting and managing biodiversity on RTA projects* (RTA 2011).

An ecologist must be present during the clearance works within areas identified as containing habitat features (e.g. HBT, nests and burrows) and is to advise on the clearing program to allow fauna to safely vacate the area. If the fauna were unable to flee safely, it would be captured and relocated to the designated fauna release sites or taken to the vet clinic if injured.

Vegetation clearance and tree felling will be undertaken as soon as possible, but not more than two weeks, after the pre-clearance survey and following a 'two-stage' clearing procedure:

- Stage one:
 - clearing non-habitat trees and the understorey vegetation
 - all marked habitat trees and fauna habitat features would be checked, but not removed
 - a qualified ecologist would inspect all vegetation and woody debris following clearing and immediately prior to chipping or mulching to ensure no fauna has been displaced or injured.
- Stage two:
 - clearance of habitat trees
 - conducted a minimum of 24 hours after stage one has been completed allowing resident fauna to vacate voluntarily overnight due to the disturbance
 - pre-clearance assessment would be conducted two hours before Stage two commences, and an inspection immediately prior to clearing
 - felling of the habitat trees would be supervised by a qualified ecologist according to the following procedure:
 - prior to felling, hollow-bearing tree will be shaken vigorously with heavy machinery for 30 seconds and then left for two minutes to allow any fauna present to escape
 - the machinery operator will then push the tree over as slowly as possible, so as to minimise the intensity of impact when hitting the ground
 - once the tree has been felled, the ecologist will inspect the tree, and any hollows present for signs of any trapped or injured fauna
 - tree hollow details would be recorded on the Tree Felling Recording Sheet (not yet produced).
- all fauna would be handled according to the Fauna Handling Protocol (**Section 4.3**)
- any injured fauna will be carefully captured by the qualified and experienced ecologist or fauna handler, and taken to a wildlife carer or veterinary clinic or euthanized if necessary
- Any non-injured fauna will be allowed to leave the site or captured and held in a quiet and safe location until the evening when the fauna will be released at the fauna release sites.

All fauna rescue events in Stage one or Stage two would be documented (Fauna Rescue Event Record, (not yet produced)). Following clearance, the measures to protect fauna would be documented in the Post-clearance Checklist (Post-clearance Checklist, (not yet produced)).

4.6 Nest box management plan

The provision of supplementary fauna habitat in the form of artificial shelter sites can help mitigate the impact of HBT removal. Appropriate nest box management is one of mitigation measures detailed in the BAR (Umwelt 2021) for this project, and a separate artificial shelter site management strategy has been developed (Umwelt, 2022).

5.0 Weed Management Plan

5.1 Purpose


This procedure details weed management and control procedures to be implemented during the early works vegetation clearance and soft soil treatment works to minimise threats to remnant vegetation, native flora and fauna habitats and waterways from weeds. This procedure does not include weed management and control procedures following the early works. The control of weeds described below is required to be in accordance with RMS Biodiversity Guidelines: Guide 6 Weed management (RTA, 2011).




Through the refinement of the Disturbance Footprint, areas containing previously identified weeds (Umwelt, 2021) have been removed from the Disturbance Footprint. A targeted weed survey is recommended to determine the presence and abundance of weeds in the refined Disturbance Footprint.


5.2 Induction and training

All site personnel and subcontractors will be inducted about the presence of weed species, including the identification and disposal of priority weeds as per this management plan. This training will occur on site during the Project Induction and as required in Toolbox Talks. **Table 5-1** shows the weed identification details to be presented to staff during the project induction.

Table 5-1 Weed Species present in previously assessed areas.

Common name	Scientific name	Duty under Biosecurity Act 2015	Weed of National Significance	Photo (Source: DPI 2018a; 2018b; 2014)
African Boxthorn	Lycium ferocissimum	General Biosecurity Duty Prohibition on Dealings	Yes	

Common name	Scientific name	Duty under Biosecurity Act 2015	Weed of National Significance	Photo (Source: DPI 2018a; 2018b; 2014)
Blackberry	<i>Rubus anglocandicans</i>	Prohibition of dealings – must not be imported into the State or sold	Yes	
Paterson's curse	<i>Echium plantagineum</i>	General Biosecurity Duty	No	
St. John's-wort	<i>Hypericum perforatum</i>	General Biosecurity Duty	No	

Common name	Scientific name	Duty under Biosecurity Act 2015	Weed of National Significance	Photo (Source: DPI 2018a; 2018b; 2014)
African lovegrass	Eragrostis curvula	General biosecurity Duty	No	

Personnel will be advised of the weeds in their work area at Toolbox Talks. The controls that are required to be implemented to minimise weed spread (i.e. weed hygiene protocols) will be implemented prior to clearing and grubbing or ground disturbance.

5.3 Weed removal

Suitable weed control methods for all priority weeds recorded as occurring within the early works area and the site compound are listed below. Clearing of weed infested areas must be undertaken by staff trained in the identification of weed species, or supervised by Wagga Wagga City Council Weeds Officer. Appropriate weed management practices are available on the NSW WeedWise Website.

5.4 Vehicle, plant and equipment movement

To prevent the spread of weeds throughout the early works site or to the surrounding areas, the movement of weed-contaminated plant and equipment is to be monitored. It is required that all plant and machinery entering the site is inspected for soil and vegetative material, including priority weeds. Plant or machinery contaminated by soil or vegetative matter is required to be cleaned and re-inspected before entering site.

All plant and equipment must be cleaned and inspected for of soil and vegetative matter before leaving the work site.

All screening checks for plant and machinery entering or leaving the site must be recorded on a Mobile Plant Inspection checklist to be included in the CEMP and / or provided by the Works Supervisor.

5.5 Weed disposal

Where priority weed areas are disturbed by construction activities, all vegetative material potentially containing weeds, and any stripped topsoil potentially containing weed propagules, will be removed and disposed of at an approved offsite licensed facility with consultation with Wagga Wagga City Council.

All weeds physically removed (particularly those bearing seeds) are to be disposed of appropriately at a licensed landfill which is able to receive green waste. Loads of weed-contaminated material must be securely covered during transportation to prevent weed plant material falling or blowing off vehicles. Weed contaminated material must not be mulched for re-use.

Topsoil and mulched vegetation that may include weed material would not be reused for revegetation.

5.6 Follow-up inspection

A three month and six month follow-up inspection of identified weed infestation areas following works would be undertaken by the Wagga Wagga City Council weeds officer to ensure that no priority weeds are present around the edges of the work site. If priority weeds are detected, follow up weed control consistent with advice on the NSW Department of Primary Industries WeedWise website must be undertaken, documented and monitored for success.

6.0 Vegetation and Bushrock Re-use

6.1 Weed-free vegetation <300mm in diameter

Weed free vegetation up to 300 mm in diameter would be mulched on site and spread across the early works area for erosion and sediment control purposes. No vegetation < 300 mm in diameter would be re-used off site.

6.2 Woody debris >300mm in diameter

Native woody debris larger than 300 mm in diameter would be stored on site prior to mulching. Weed free native mulch would be spread across the early works area for erosion and sediment control purposes or re-used off site according to Wagga Wagga City Council procedures.

6.3 Weed contaminated vegetation

Vegetation potentially contaminated with weed material would be collected and disposed of as specified in **Section 5.5**. Weed containing material would be removed directly into a truck or container and would not be stockpiled on site.

6.4 Bushrock management

No bushrock suitable for re-use as been identified on-site. No rocky material is planned to be re-used for habitat restoration off-site.

7.0 Reporting

The following checklists and recording sheets would be applied during the early works:

- Fauna Rescue Event Record (not yet produced)
- Pre-clearance Checklist (not yet produced)
- Post-clearance Checklist (not yet produced)
- Tree Felling Record (not yet produced)
- Construction Plant Weed Screening Record (not yet produced).

A Pre-clearance and Tree Felling Report will be prepared following the soft-soil treatment works. This would contain a description of targeted fauna species and habitat, methods and results from pre-clearance survey, translocation procedures, outcomes for fauna from tree felling and further recommendations for fauna management.

8.0 Implementation Strategy

Table 8-1 summarises the actions required in accordance with the FFMP to minimise and mitigate the impacts of the soft soil treatment works and establishment of the site compound on local fauna and flora. The contractor undertaking the works on behalf of Transport for NSW will be responsible for monitoring in accordance with the determination and statement of commitments in the Review of Environmental Factors and the RTA Biodiversity Guidelines (RTA, 2011).

Table 8-1 Fauna Handling and Weed Management Strategy

Management Issue	Action Required	Responsibility	Timing
Management of fauna species and habitat	Demarcation of clearing extent	Works Supervisor Transport Roads and traffic Authority	Prior to vegetation clearing works
	Pre-clearance surveys	Qualified ecologist Works Supervisor	Prior to vegetation clearing works
	Tree-felling procedure	Qualified ecologist Works Supervisor	During vegetation clearing works
	Artificial habitat installation	Qualified ecologist Transport Roads and traffic Authority	Prior to vegetation clearing works Post vegetation clearing works
	Artificial habitat monitoring	Qualified ecologist Transport Roads and traffic Authority	Post vegetation clearing works
Management of weeds	Demarcation of clearing extent	Works Supervisor Transport Roads and traffic Authority	Prior to vegetation clearing works
	Removal and treatment of weeds	Works Supervisor Weeds Officer	Prior to vegetation clearing works
	Ongoing weed monitoring	Weeds Officer	Post vegetation clearing works

