



NEST BOX STRATEGY

FOR

Mulgoa Road Upgrade

Stage 1 – Jeanette Street to Blaikie Road, Jamisontown

Doc No: MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS Contract No: 21.0000139287.0621

Transport for NSW (TfNSW)











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REVISION	REV DATE	REVISION DETAILS
A		Initial development for TfNSW review
В	30/01/2023	Incorporated TfNSW comments
С	06/02/2023	Incorporated update to nest box numbers
D	28/02/2023	Incorporated consultation undertaken
E	28/03/2023	Finalised strategy
F	10/05/2023	Updated by NGH to reflect pre-clear survey data
G	17/05/2023	Response to TfNSW comments
00	06/06/2023	Approved

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 2 of 45





TABLE OF CONTENTS

Page

ACR	ONYM	S AND DEFINITIONS				5
1	INTR	ODUCTION				6
	1.1	CONTEXT				6
	1.2	BACKGROUND				
	1.3	ENVIRONMENTAL MANAGEMENT SYSTEMS OVERVIEW				
	1.4	LIMITATIONS				7
2	PUR	OSE AND OBJECTIVE	ES			
	2.1	PURPOSE				
	2.2	OBJECTIVES				
	2.3	TARGETS				
3	ENVI	RONMENTAL REQUIR	EMENTS			10
	3.1	RELEVANT LEGISLATION	AND GUIDELINES	S		10
	3.2	MITIGATION MEASURES .				
4	EXIS	TING ENVIRONMENT				
	4.1	NATIVE VEGETATION				
	4.2	HOLLOW-BEARING TREE	INVENTORY			
	4.3	TARGET FAUNA SPECIES				
	4.4	HABITAT PARAMETERS				
5	RESI	ARCH AND CONSULT	ATION			
	5.1	Reuse of Hollows				
	5.2	NEST BOXES				
	5.3 Consultation Summary					
6	ARTIFICIAL HABITAT SPECIFICATIONS					
	6.1	REQUIRED NUMBER OF A	ARTIFICIAL HABIT	АТ		
	6.2	.2 LOCATION OF ARTIFICIAL HABITAT				
	6.3	ARTIFICIAL HABITAT DES	IGN			
		6.3.1Installation pr6.3.2Fauna handling	ocedures ng procedures.			
7	ENVI	RONMENTAL MITIGAT	ION AND MAN	IAGEMENT N	MEASURES	
	7.1	FLORA AND FAUNA MANA	AGEMENT			
8	COM	PLIANCE MANAGEME	NT			
	8.1	1 ROLES AND RESPONSIBILITIES				
	8.2	8.2 Training				
	8.3 MONITORING AND INSPECTIONS					
	8.4	8.4 AUDITING				
	8.5 Reporting					
9	REVI	EW AND IMPROVEME	NT			
		MRUA-TSWA-N	WW-PM-PLN-200	010(00)_NBS		21.0000139287.0621
		Seymour Whyte Construction	ons	Rev: 00	Date: 06/06/2023	Page 3 of 45





	9.1	CONTINUOUS IMPROVEMENT	36
	9.2	NBS UPDATE AND AMENDMENT	36
10	REFE	RENCES	37
APPE	NDIX	A – HOLLOW BEARING TREE DATA (EPS, 2019)	38
APPE		B – EMAIL SENT TO STAKEHOLDERS	41
APPE	NDIX	C – UPDATED HOLLOW INVENTORY (NARLA ENVIRONMENTAL, 2023)	42

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS		21.0000139287.0621	
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 4 of 45





ACRONYMS AND DEFINITIONS

Acronyms	Meanings
BAR	Biodiversity Assessment Report
BC Act	Biodiversity Conservation Act
CEMP	Construction Environmental Management Plan
ESR	Environmental Site Representative
EMS	Environmental Management System
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
EPS	Environmental Property Services
ESR	Environmental Site Representative
EWMS	Environmental Work Method Statement
FFMP	Flora and Fauna Management Plan
GPS	Global Positioning System
HBT	Hollow bearing tree
ISEPP	State Environmental Planning Policy (Infrastructure)
NBS	Nest Box Strategy
NEM	National Environmental Manager
PCT	Plant Community Type
РМ	Project Manager
PE	Project Engineer
PSEM	Project Safety and Environment Manager (Database)
The Project	Mulgoa Road Upgrade: Stage 1 – Jeanette Street to Blaikie Road, Jamisontown
REF	Review of Environmental Factors
RMS	Roads and Maritime Services (now TfNSW)
SS	Site Supervisor
SSu	Site Superintendent
SWC	Seymour Whyte Construction Pty Ltd
TEC	Threatened Ecological Communities
TfNSW	Transport for New South Wales
TSC Act	Threatened Species Conservation Act 1995 (NSW)

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 5 of 45





1 INTRODUCTION

1.1 <u>Context</u>

This Nest Box Strategy (NBS) forms part of the Construction Environment Management Plan SWC-CEMP-N (CEMP) for Stage 1 of the Mulgoa Road upgrade, between Jeanette Street and Blaikie Road (the Project).

This NBS has been prepared to address the requirements of the Project REF, Submissions Report, the Addendum REF, TfNSW QA Specification G40, and all applicable legislation.

The Project Submissions Report requires:

A Nest Box Strategy will be developed in association with Council, the local community and potentially other organisations such as Cumberland Land Conservancy. The Nest Box Strategy will investigate opportunities to relocate and reuse significant hollow-bearing tree features and hollows. The loss of all hollows observed to be being used will be compensated at a ratio of one nest box for every used hollow lost.

1.2 Background

Transport for NSW (TfNSW) propose to complete Stage 1 of the Mulgoa Road upgrade, between Jeanette Street and Blaikie Road (the Project). The Project forms part of the overall upgrade of the Mulgoa Road / Castlereagh Road corridor. The entire corridor upgrade is approximately 6.5 kilometres (km) in length, with Stage 1 comprising 1.3km (including transitions to the existing road alignment) of this length.

Arup completed a Detailed Design and Review of Environmental Factors (REF) for Mulgoa Road Stage 1 (hereafter referred to as the Project) in August 2018. In response to submissions made during the exhibition of the REF, the design was refined, and a Submissions Report was prepared in October 2019. Additional safeguards were included in the submissions report. These were prepared in accordance with Division 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to help determine if the Project should progress as defined by its concept design.

As a result of the refined design, some adjustments to the safeguards and management measures were made in an Addendum REF, in order to avoid and mitigate against any predicted adverse social, economic and environmental impacts. This process allowed Transport to discharge its duties and responsibilities under Division 5.1 of the NSW EP&A Act.

The works are being carried out under Division 17 (Road and Traffic) of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) and are permitted without the need for development consent.

The REF and Addendum REF (including the revised Biodiversity Assessment Report (BAR)) assessed the environmental impacts of construction and operation of the Project. As part of this, potential flora and fauna impacts were assessed, and management measures recommended.

1.3 Environmental Management Systems Overview

The overall Environmental Management System for the Project is described in Section 1.4 of the Construction Environmental Management Plan (CEMP).

This NBS is part of the Project environmental management system structure. Management measures identified in this Plan will be incorporated into activity specific Environmental Work Method Statements (EWMS).

EWMSs will be developed and signed off by the Environmental Site Representative (ESR) and nominated personnel prior to construction. EWMSs detail practical environmental management measures to be implemented at worksites to minimise potential impacts of construction activities on the environment and community. They are designed to provide more site-specific detail than that which may be included in the Sub-plans and are an important means of communicating environmental requirements to those personnel constructing the works. Construction personnel will be required to undertake works in accordance with these identified mitigation and management measures.

Used together, the CEMP, Sub-plans and EWMS form management guides for project personnel, contractors and consultants that clearly identify required environmental management actions.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS		21.0000139287.0621	
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 6 of 45





The review and document control process for this plan are described in Section 2.11, 2.12 and 2.13 of the CEMP.

1.4 Limitations

This Plan was prepared through a combination of desktop research, the current design footprint and using the results of hollow-bearing tree surveys conducted by Environmental Property Services (EPS, 2019) and Narla Environmental (2023). Any changes to alignment or extent of clearing required may involve a consequential change in the number of hollow-bearing trees to be removed. This may affect the final number and type of habitat features to be provided as compensatory habitat. It is recommended that if the number of used hollows removed increases by more than 10%, additional compensatory habitat should be provided.

The Environmental Site Representative (ESR) is to be notified of any changes to the construction clearance zone as soon as possible. Changes to the clearance zone may require additional survey and assessment.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 7 of 45





2 PURPOSE AND OBJECTIVES

2.1 <u>Purpose</u>

The purpose of this NBS is to describe how construction impacts on hollow-dependent species will be managed and minimised through the provision of artificial habitat in the form of carved hollows and reused hollows salvaged during construction of the project. This NBS will also describe how hollowbearing trees within the project site will be managed during the project. Finally, this NBS will detail the ongoing monitoring requirements for artificial habitat established for the project.

This is to meet the requirements from the Submissions Report and AREF to develop a Nest Box Strategy.

A Nest Box Strategy will be developed in association with Council, the local community and potentially other organisations such as Cumberland Land Conservancy. The Nest Box Strategy will investigate opportunities such as;

- To relocate and reuse significant hollow-bearing tree features and hollows;
- Providing species specific nest boxes targeting fauna species recorded;
- Installing nest boxes in the same habitat type;
- Nest boxes to be installed pre-clearing
- Monitoring and replacement of nest boxes where required

The loss of all hollows observed to be being used will be compensated at a ratio of one nest box for every used hollow lost.

2.2 Objectives

The key objectives of the NBS are to:

- Identify target species that are likely to be adversely affected by the project
- Present the known locations of hollow-bearing trees (based on existing surveys) including characterisation of hollow resources
- Identify locations for artificial habitat installation within Fernhill Estate, suitable for the target species
- Identify number, size, and GPS location of artificial habitat for target species to be installed to compensate for hollow-bearing tree removal and habitat loss within the project site
- Detail methods for re-use of existing hollows
- Present procedures for artificial habitat creation and existing hollow reuse, including timing
- Describe roles and responsibilities for implementation of the plan, including nest box installation
 procedures
- Prescribe monitoring and maintenance requirements to be implemented following the installation of artificial habitat
- Provide data on the effectiveness of carved hollows for microbats and other non-threatened arboreal species.

2.3 <u>Targets</u>

The following project specific objectives and targets have been developed.

Table 2-1 Project objectives and targets

Objective	Target	Monitoring
Minimise clearing of native vegetation	No loss of significant vegetation unless permitted by relevant approvals. No net loss of significant habitat resources including hollow logs and tree nesting hollows unless permitted by relevant approvals.	Weekly Environmental and Sustainability Inspection Checklist SWC-SOP-015.20

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Seymour Whyte Constructions Rev: 00 Date: 06/06/2023		Page 8 of 45





Target	Monitoring
100% compliance with legislation and permit conditions and the project EPL.	Weekly Environmental Inspections SWC-CEMP-010.10
	Environmental Site Representative's Report SWC- IC-040.42
No impacts on protected flora and fauna without the necessary approvals.	Monthly Environmental and Sustainability Performance Report SWC-SOP-021.20
No fauna mortality as a direct consequence of construction activity.	Weekly Environmental and Sustainability Inspection
No pollution or siltation of aquatic ecosystems, endangered ecological	Checklist SWC-SOP-015.20
communities or threatened species habitat.	Permit to Clear SWC-ESP- 040.20
	Target 100% compliance with legislation and permit conditions and the project EPL. No impacts on protected flora and fauna without the necessary approvals. No fauna mortality as a direct consequence of construction activity. No pollution or siltation of aquatic ecosystems, endangered ecological communities or threatened species habitat. Minimise barriers to fauna movement

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Seymour Whyte Constructions Rev: 00 Date: 06/06/2023		Page 9 of 45





3 ENVIRONMENTAL REQUIREMENTS

3.1 Relevant Legislation and Guidelines

SWC obligations include satisfying the requirements and complying with the provisions of the applicable legislation, guidelines and policies, as well as international and TfNSW standards.

Table 3-1 Relevant legislation, standards, policies and guidelines

	Environmental Planning and Assessment Act 1979 (NSW)	
	Environment Protection and Biodiversity Conservation Act 1999 (Cth)	
	Threatened Species Conservation Act 1995 (NSW)	
Locialation	National Parks and Wildlife Act 1974 (NSW)	
Legislation	Native Vegetation Act 2003 (NSW)	
	Biosecurity Act 2015 (NSW)	
	Pesticides Act 1999 (NSW)	
	Animal Research Act 1985 (NSW)	
Standards	AS/NZS ISO 14001: Environmental Management	
	TfNSW QA Specification G40	
	R176 – Native Seed Collection	
	R178 – Vegetation	
	R179 – Landscaping	
Policies/Guidelines	RMS Biodiversity Guideline: Protecting and Managing Biodiversity on RMS Projects (Guide 8: Nest Boxes) (RTA, 2011)	
	Guideline for the Relocation of Large Tree Hollows (CCC, 2016)	
	Nest Box Manual: Sustainable Management of Significant Urban and Peri-urban Bushland Areas (TSC, n.d)	
	Policy for the Translocation of Threatened Fauna in NSW: Policy and Procedure Statement No. 9 Threatened Species Unit, Hurstville NSW (NPWS, 2001)	

Please refer to Appendix A1 of the CEMP for a register of legal and other requirements.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Seymour Whyte Constructions Rev: 00 Date: 06/06/2023		Page 10 of 45





3.2 <u>Mitigation Measures</u>

The mitigation measures, approvals and permit requirements relevant to this NBS are listed in Table 3-2 below. A cross reference is also included to indicate where the measure is addressed in this Plan or other project management documents.

Table 3-2 Mitigation measures relevant to this NBS (extract from Project Submissions Report, AREF – Biodiversity Assessment and TfNSW QA Specification G40)

Reference number	Requirement	Document Reference
G40 Cl2.4	 A Nest Box Strategy must be developed in association with Council, the local community and potentially other organisations such as Cumberland Land Conservancy. The Nest Box Strategy must investigate opportunities such as: To relocate and reuse significant hollow-bearing tree features and hollows Providing species specific nest boxes targeting fauna species recorded Installing nest boxes in the same habitat type Nest boxes to be installed pre-clearing Monitoring and replacement of nest boxes where required. 	This Plan
	The loss of all hollows observed to be being used must be compensated at a ratio of one nest box for every used hollow lost.	Table 7-1

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Seymour Whyte Constructions Rev: 00 Date: 06/06/2023		





4 EXISTING ENVIRONMENT

The following section summarises:

- The number and location of existing hollows within the Project area
- Threatened species likely to occur within the Project area
- Other species likely to be impacted by the works

Key reference documents are listed in Section 1.2 of this plan.

4.1 <u>Native vegetation</u>

The Project area contains the following plant community type (PCT): PCT 835 Forest Red Gum – Roughbarked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion, located between Wolseley Street and Blaikie Road.

EPS (2019) conducted a site assessment for the revised Biodiversity Assessment Report (BAR) and found approximately 50 mature trees were recorded within this PCT, the majority being *Eucalyptus tereticornis* (Forest Red Gum). Of this, 46 trees were recorded as hollow-bearing.

In 2022, DPE issued a revision to the classification of native plant assemblages of eastern NSW (DPE, 2022). Under the new classification system, PCT 835 was incorporated into PCT 4025 Cumberland Red Gum Riverflat Forest.

4.2 Hollow-bearing Tree Inventory

EPS (2019) conducted a site assessment for the revised Biodiversity Assessment Report (BAR), reporting a total of 46 hollow-bearing trees (HBTs) and 240 hollows, within the Project area. Of these, up to 42 trees (including 225 hollows) are proposed for removal.

Refer to Appendix A for hollow-bearing tree data.

It is noted that an updated hollow inventory was developed by Narla Environmental during pre-clearance surveys in March 2023 (Appendix C). This inventory identified a significantly greater number of potential hollows than the 2019 survey however no confirmation of hollow occupation was ascertained during pre-clearance surveys. During Stage 1 of clearing activities, eight hollows were observed as used by on-site ecology staff. During Stage 2 of clearing activities, six hollows were observed as being used by on-site ecology staff.

The design has been revised and finalised between Wolseley Street and Blaikie Road to confirm the number of hollow bearing trees required to be removed as part of the Project. Narla Environmental's pre-clear surveys identified 50 hollow bearing trees, the finalised design requires the removal of 34 identified hollow bearing trees. 16 Hollow bearing trees will be retained.

4.3 <u>Target fauna species</u>

One threatened species, the Grey-headed Flying-fox (*Pteropus poliocephalus*), was recorded within the Project area (EPS, 2019). This species was recorded twice flying over the Project area and a dead specimen was also observed within the Project area.

Two other species, the Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) and the Eastern Broadnosed Bat (*Scotorepens orion*) were reported as probable composite recordings (EPS, 2019). Composite recordings contain frequency signatures which could not be delineated between two or more species. A precautionary approach has been adopted and presence of these species has been assumed within the Project area.

Based on habitat characteristics within the Project area (refer to Section 4.5), eight threatened species were assessed to have a moderate likelihood of occurring locally (refer to Table 4-1).

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 12 of 45





Table 4-1 Threatened fauna likely to occur within the Project area (EPS, 2019)

Species name	EPBC Act	BC Act	Occurrence likelihood
Cave-dependent microbats			
Large-eared Pied Bat	Vulnerable	Vulnerable	Moderate:
Chalinolobus dwyeri			 Foraging potential
Eastern Bentwing-bat (now referred	Not listed	Vulnerable	Roosting / breeding
to as the Large Bent-winged Bat)			habitat associated with
Miniopterus schreibersii			the M4 Motorway and
oceanensis			Surveyors Creek road
Southern Myotis	Not listed	Vulnerable	bridges
Myotis macropus			
Hollow-dependent microbats	1	1	1
Eastern False Pipistrelle	Not listed	Vulnerable	Species recorded (composite
Falsistrellus tasmaniensis			recording):
			 Foraging / nesting and
			roosting potential within
			vegetation and hollow-
			bearing trees
Eastern Freetail-bat	Not listed	Vulnerable	Moderate:
Mormopterus norroikensis			Foraging / nesting and
	Not listed	vuinerable	roosting potential within
Scoteanax rueppeilli			vegetation and hollow-
Mawashingutanana			bearing trees
Megachiropterans			
Grey-headed Flying-fox	Vulnerable	Vulnerable	Species recorded:
Pteropus poliocephalus			Foraging potential
			within existing
			vegetation
	1		

In addition to this, the following non-threatened hollow-dependent species were recorded or are likely to occur within the Project area:

• Birds:

- Little Corella (Cacatua sanguinea)
- Long-billed Corella (*Cacatua tenuirostris*)
- Galah (*Eolophus roseicapilla*)
- Rainbow Lorikeet (*Trichoglossus haematodus*)
- o Scaly-breasted Lorikeet (Trichoglossus haematodus)
- Red-rumped Parrot (*Psephotus haematonotus*)
- Sulphur Crested Cockatoo (*Cacatua galerita*)
- Laughing Kookaburra (*Dacelo novaguineae*)
- Pacific Black Duck (*Anas superciliosa*)
- Australian Wood Duck (*Chenonetta jubata*)
- o Dollarbird (Eurystomus orientalis)
- Welcome Swallow (*Hirundo neoxena*)
- Bats:
 - Southern Free-tailed Bat (*Mormopterus planiceps*)
 - o Gould's Wattled Bat (Chalinolobus gouldii)
- Mammals:
 - o Common Brushtail Possum (Trichosurus vulpecula)

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 13 of 45





4.4 Habitat Parameters

The following parameters have been considered in preparation of this plan:

- Hollow size (entrance and cavity diameter and depth) to inform artificial habitat construction sizes and materials
- Tree species some fauna species prefer particular tree species, or rough over smooth bark
- Hollow aspect, height and orientation to inform the direction and height of box installation
- Habitat type to inform hollow densities for the existing habitat types in order to guide artificial habitat densities.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Seymour Whyte Constructions Rev: 00 Date: 06/06/2023		Page 14 of 45





5 RESEARCH AND CONSULTATION

5.1 Options for Artificial Habitat

5.1.1 Reuse of Hollows

Recent research indicates that the reuse of tree hollows has many advantages (Griffiths, Robert, & Jones, 2021), including:

- A closer resemblance to natural hollows (including microclimates)
- Greater longevity than nest boxes
- The ability to maintain the natural hollow density and type within an area, and can be installed at the same aspect and angle due to the individual features of natural hollows that cannot be replicated with a nest box
- Greater attractiveness for a larger array of hollow-dependent species.

Some limitations associated with the reuse of hollows include:

- It can be labour intensive, without an established and efficient workflow
- Drying out and cracking the hollow microclimate is less reflective of the natural environment when a live hollow is reused
- Public safety nest box construction and attachment are well established, whereas the use of natural hollows is more variable
- A repurposed limb is much heavier than a nest box, which can be a limiting factor for effective installation, cost and safety considerations.

5.1.2 <u>Nest Boxes</u>

Nest boxes from Hollow Log Homes were selected as an option as they are 100% recycled plastic and Queensland Cypress. These materials were chosen because they are termite and rot proof and have a lifespan of more than 30 years. The longevity of the boxes is important because they compensate for the long term reduced availability of hollows due to declining health of remnant vegetation and current clearing practices in the region.

The type of nest box was also selected because they can be installed using the Habisure system. This allows for at least one metre growth in the diameter of the host tree before adjustment is required. Bolting or screwing nest boxes to trees is not recommended due to increased damage to trees and a comparatively short lifespan. RTA Biodiversity Guidelines state that an ecologist should be engaged on site during the installation of nest boxes to provide advice on attaching nest boxes to trees, height, density, spacing, location, aspect and timing.

Limitations of nest box installations include difficulties in engaging property owners who are willing to have nest boxes installed on their properties, due to ongoing maintenance requirements. In addition to this, nest box installations have a shorter lifespan when compared to more permanent solutions, e.g. carved hollows. In addition to this, research into next boxes deployed to mitigate the loss of bat roosting habitat indicates that traditional nest box designs can lead to an increased risk of overheating, due to inappropriate microclimate conditions (Crawford & O'Keefe, 2020).

5.1.3 <u>Carved Hollows – HollowHog</u>

The Hollow Hog is a unique wood carving tool that has been specifically designed to create habitat for hollow dependent wildlife. Through extensive trialling in NSW, this Australian designed and manufactured tool has proven its ability to safely and quickly carve hollows in the toughest hardwoods. The Hollow How efficiently and safely creates large internal cavities through small entry holes in both living and dead wood. No other damage to the tree's cambium (living tissue) occurs through the carving process meaning that there is little disruption to a tree's growth. The tool creates a 50mm entry hole and then progressively carves a larger and larger hollow of any dimensions up to 600mm wide and long by 600mm deep. The hollow shape can be easily adapted to the size and shape of the tree limb or trunk that it is being carved in.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Seymour Whyte Constructions Rev: 00 Date: 06/06/2023		Page 15 of 45





Crawford and O'Keefe (2020) acknowledged that carving hollows into standing live and dead trees could create viable roosting habitat for cavity and crevice roosting bat species, with microclimates that are more robust to temperature extremes, akin to natural hollows.

Limitations to this technique include that there are no long-term studies or monitoring complete for this form of carved hollow due to it being a newly developed tool.

5.2 Consultation Summary

In February 2023 Transport for NSW (Transport) and its Alliance partners Seymour Whyte Construction and Turnbull Engineering commenced consultation about the Nest Box Strategy as committed in the REF.

Consultation activities

- The Nest Box Strategy was uploaded to the Project website
- https://nswroads.work/jeanettestblaikierd
- An email was sent to the project database of 550 recipients on 7 February 2023 (Appendix B) asking recipients to comment on and provide feedback on the strategy by Monday, 27 February 2023
- The email also invited recipients to register for an online session on the strategy to be held on Thursday, 16 February 2023
- Penrith City Council was sent a copy of the strategy and invited to a session at a time of their choosing
- Community group Mulgoa Landcare was offered a special briefing which was declined, with a written email response provided instead
- An online session was held with Council on Wednesday 15 February 2023. In attendance were members of the Public Spaces team from Penrith City Council
- The online session was held for interested community members on Thursday,16 February 2023 from 11am to 12 noon with 2 attendees
- A reminder email was sent on Monday, 20 February 2023 asking for comment and feedback by Monday, 27 February 2023.

Feedback received

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- Feedback received from Council and response to the feedback is provided in Table 5-1 below.
- 16 emails were received from members of the community and community group representatives.

Summary of this feedback and responses to the comments and issues raised are provided in Table 5-2 below.

Table 5-1 Penrith City Council Feedback and response to feedback

Item No	Discussion and response	
1	Traffic flow during tree felling Any tree felling that will have an impact on the road or pedestrian footpaths will be done at night to reduce impact on traffic and disruption to businesses on Mulgoa Road.	
2	2 How was identification done of occupied hollows The Nest Box Strategy includes the number of hollows used when the Biodiversity Assessment Report was completed. A qualified ecologist assessed the hollows by climbing the trees and conducting a visual inspection. During the clearing process on the Project a climbing arborist and an ecologist will be on site to determine the used hollows.	
	MRUA-TSWA-NWW-PM-PLN-200010(00) NBS	21.0000139287.0621

Rev: 00

Date: 06/06/2023

Page 16 of 45





Item No	Discussion and response
3	Should another assessment be done since the BAR was done in 2019? The hollows will be inspected again prior to clearing as part of the pre-clearance surveys. This will be done by climbing arborists and ecologists to determine which hollows are used. The Project is required to adapt the number of artificial habitat following the clearing process and confirmation of the number of used hollows.
4	Have you allowed for potential capture of fauna Yes, the project ecologist will be on site for the clearing of any habitat and hollow bearing trees on the project and is qualified to relocate fauna. The project ecologist will identify a suitable location for any relocation of fauna and will undertake any relocation in line with the Fauna Handling and Relocation procedure.
5	What is the process to be followed for felling the trees The project follows the RTA Biodiversity Guidelines for all clearing works on site. This includes a staged clearing process. Non-habitat trees are cleared prior to habitat trees. A 24 hour wait period is then followed before clearing habitat trees. Trees with hollows will be inspected by a climbing arborist while an ecologist is present to confirm hollows are not used. The Project team will investigate blocking hollows after this inspection. After the waiting period is complete for the hollow bearing trees, these trees will be soft felled ie. branches with hollows will be slowly lowered to the ground using ropes or a crane where required.
6	Culverts under roads should be checked for microbats and appropriate action taken. The biodiversity assessment report (BAR) that refers to the potential microbat activity in the culvert at School House Creek crossing is related to the next stage of the Mulgoa Road Upgrade project, which is not part of the current scope of works (Stage 1). We have also checked the culvert near the M4, which is in Stage 1, however there was no evidence of microbat habitat.
7	During soft felling is there provision to lower the whole tree to the ground? The large hollow bearing trees will first have branches from the crown removed and lowered to the ground before the trunk is soft felled. The clearing contractors will use ropes and a crane where required to slowly lower branches. There is no provision to lower the whole tree to the ground in one go due to the size of the trees and space and safety constraints due to the proximity to the road.
8	For the nest boxes installation with bent wire is there a wedge box to hold the nest box in place The boxes will be installed in accordance with the installation procedure developed by the supplier. The installation procedure details the best way to secure the nest boxes to the trees using the habisure system. The nest boxes are being sourced from Hollow Log Homes which provide high-quality, long- lasting nest boxes.
9	Mulgoa Nature Reserve is close to Urban Development and many people walk their dogs so nest boxes installed here may not be the best for fauna. Noted
10	Alternative locations suggested – Surveyors Creek/School House Creek Transport is in the process of assessing other locations and will work with Council to identify additional suitable locations.
11	Additional locations for nest boxes should be sourced within Council and Government lands. Add a broader spread of areas. Transport is currently also looking at Fernhill Estate and land owned by Sydney Water in Glenmore Park as suitable locations, as well as other properties.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions Rev: 00 Date: 06/06/2023		Page 17 of 45	





Item No	Discussion and response			
12	Has Transport or the Alliance done an assessment of what species use Mulgoa Nature Reserve (MNR). The target species can upset the balance in the reserve. An assessment has not been done on the other fauna species currently occupying Mulgoa Nature Reserve; however, the ecologist has surveyed MNR and deemed it suitable for artificial habitat to be installed. In addition, the Project ecologist has deemed the MNR a suitable habitat area for the fauna species identified in the Project area. The Project Ecologist is the same ecologist who has surveyed Mulgoa Nature Reserve for The Northern Road Project and is aware of the local area and species that occupy these locations			
13	Recommend that the used to traffic and ur Noted.	species on ban noise. N	Mulgoa Road are ur lest box locations s	ban tolerant species hould be similar.
14	Reuse hollows from to Transport has an agree hollows and branches	t rees on othe ement with Lo at a site in clo	e r sites ocal Land Services (L ose proximity to Mulg	LS) for to repurpose oa Road.
15	Move trees intact and Transport has an agree with hollows to the Ord transported as LLS red they are undertaking.	I install them ement with LI hard Hills res quires smaller	A at restoration proj S to repurpose bran storation project site. cuts of branches and	ect at Orchard Hills ches and tree trunks Large trees will not be d trunks for the projects
16	Can nest boxes be installed on private property – in the trees left behind after the road reserve has been cleared. Private landowners do not generally like to provide access to their land as it might disrupt the use and/or enjoyment of the land, as well committing for ongoing access to their property from the ecologist to assess the success of the nest box program. Transport prefer to place artificial habitat on public land for this reason			
17	Will Transport do a tree assessment As part of the design finalisation, a tree assessment has been undertaken in the area between Wolseley St and Blaikie Rd on the western side of the road and the exact number of trees to be retained is yet to be finalised.			
18	Will there be a Tree In on site. Will there be As part of the environn develop a Tree Protect consultation with an AC Construction Environm An arborist or ecologis are undertaken adjace	mpact Inspect a management mental management tion Plan for t QF Level 5 An ment Manager t will be present t to the trees	ction Report done for ent plan of how to p ement for the Project rees that are to be re borist. This Plan is in nent Plan. ent during the clearing s.	or the trees remaining rotect these trees the Alliance will tained on the Project in icluded in the g works and when works
19	 Will there be fencing around the trees left to protect trees – suggestion for concrete barriers. An AQF Level 5 Arborist will be engaged to determine the measures needed to be implemented to protect trees on site. This may include fencing around retained trees to protect them during construction. 			
20	Suggestion to not discount the time taken to remove trees and inspections beforehand. The Project Alliance is following clearing processes as detailed in the Environmental Management Plans in line with developing a detailed clearing program and construction methodology.			
21	Seed collection and how many plants are going to be planted. Prior to completion of tree clearing, seed collection will be undertaken by Greening Australia. The landscaping design is being finalised and the design			e planted. e undertaken by lised and the design
MRU	JA-TSWA-NWW-PM-PLN-200	010(00)_NBS		21.0000139287.0621
Seymour Whyte	Constructions	Rev: 00	Date: 06/06/2023	Page 18 of 45





Item No	Discussion and response
	drawings will show the number of trees to be planted within the Stage 1 work limit. The Stage 1 project corridor is a constrained area and hence there is not enough space to plant more trees.
22	Comment that it is safer to attach nest boxes to trees as the safety risks that come with attaching removed branches with hollows to live trees can be a hazard. Particularly for public safety. Noted.
23	Suggestion that nest boxes should be sterilised – as the resin can deter fauna. Noted.
24	Suggestion to contact 'All Mould Plastics" in Orange Noted.
25	 Discussion around reinstatement of 111 Mulgoa Road which is owned by Council Impact on trees Cars driving over roots This item is not part of the nest box strategy and will be dealt with as part of site set up for the compound.
26	Suggestion that everything with hollows needs to be reused and not replace with nest boxes only The Alliance has an agreement with Local Land Services and other interest groups to reuse all branches and trunks with hollows and also other timber to a local restoration project.
27	Even non habitat trees need to be retained. Trees with hollows with no habitat As part of the design finalisation, a tree assessment has been undertaken in the area between Wolseley St and Blaikie Rd on the western side of the road and the number of trees to be retained is yet to be finalised.
28	Even timber which doesn't have hollows can be used to create hollows. Noted.
29	Can hollows be covered during the day to prevent access during the night to try and reduce the number of fauna injured. The Project Alliance is looking into ways to cover hollows once they have been inspected by a climbing arborist as part of the pre-clearance process for hollow bearing trees to prevent fauna re-entering the hollows before the trees are cleared.
30	Will the introduction of additional habitat boxes in MNR create an issue where there are too many hollows for the target species to protect. The Mulgoa Nature Reserve has been identified as a suitable area by the ecologists that developed the Nest Box Strategy and also by the Project Ecologist.
31	Is TfNSW happy to discuss the installation of the habitat hollows with other independent ecologists that have experience specifying locations and heights of nest boxes. Transport will work with Council and other interested parties to identify more locations for future stages of the Mulgoa Road upgrade project.
32	How long will the nest boxes be monitored for after the completion of the project? The Project Alliance will monitor the artificial habitat every 6 months while the Project is under construction, with construction expected to be complete in 2026, weather dependent.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Seymour Whyte Constructions Rev: 00 Date: 06/06/2023		





Feedback received from community members and response to feedback is detailed in Table 5-2.

Fifteen written responses were received from community members and are summarised below with responses where required.

Table 5-2 Community Feedback and response to feedback

Summary of feedback received and project's response

Do not remove any hollow bearing trees. Nest boxes are very poor alternative to hollows in existing trees.

During the development of the project TfNSW considered all options and had to strike a balance between removal of trees and acquisition of homes. The REF has determined that that balance has been achieved and has identified compensatory measures to be taken for the removal of the trees. The Nest Box Strategy is one of those measures.

The nest boxes are essential Noted

Happy with advice about the upcoming work on Mulgoa Road and glad the birds have been considered in the planning.

Noted

Number of nest boxes seem to be less than the hollows removed. The replacement should be one for one.

The nest box strategy outlines the need to install one nest box for every used hollow that is removed on the Project. While it is proposed to install 163 artificial habitat, the project will also reuse existing hollows where possible by placing them at other locations, which will result in a net increase on the number of original hollows. Local Land Services has committed to reuse the removed trees (of certain length and diameter) on a habitat creating site in Western Sydney.

Strategy seems too narrow in its focus and does not address the overall habitat loss. The solution is to purchase alternative land.

In accordance with Transport for NSW's Biodiversity Offset Guidelines, offsets are required for further stages of the Mulgoa Road upgrade but not for Stage 1.

There is acknowledgement that the use of a plastic composite will extend the life of nest boxes, suggestion that the maintenance program is too short and TfNSW should take over the long-term maintenance of these nest boxes.

The habisure nest box system uses recycled plastic in many of their nest boxes, and 100% of the nest boxes ordered for the project are made of recycled plastic. The next boxes will be maintained every 6 months while the Project is in construction (ie until at least 2026).

Has assessment been done of Mulgoa Nature Reserve to satisfy that this is an appropriate site for the species which are being dislocated.

The Project ecologist has assessed Mulgoa Nature Reserve as a suitable location for the introduction of artificial habitat and replacement hollows.

Recommend that nest boxes be put in the Penrith area and not further away.

The Project is looking at suitable areas within close proximity to the Project. Mulgoa Nature Reserve is located 670 metres south of the Project. Other locations close to the project site are also being considered.

Suggested that team contact Birds Australia to gain more knowledge especially with their success with the Orange bellied parrot.

Noted.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 20 of 45





Summary of feedback received and project's response

Nest boxes not supported as appropriate offsets. Needs to have offsets purchased

In accordance with Transport for NSW's Biodiversity Offset Guidelines, offsets are required for further stages of the Mulgoa Road upgrade but not for Stage 1.

Hope nest boxes are in similar shape and size

The size of artificial habitat proposed is in Table 6.3 of the draft Strategy and are built to be the preferred size and shape for the selected target species and replacement hollows.

You are on the right track to manage the project

Noted.

Is clearing to be undertaken outside of breeding and nesting seasons? If not would like to see the nest boxes installed prior to work commencing and that existing hollows are blocked so they can't be used.

Clearing has been scheduled to be undertaken outside the breeding and nesting season, as per the REF which states that clearing of the forest red gum trees to be undertaken outside the period of May to September if practical. The Nest Box Strategy also looks at ways in which the artificial habitat can be installed prior to the clearing works.

Nest boxes will not replicate the 'smell' from the existing hollows. Noted

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 21 of 45





6 ARTIFICIAL HABITAT SPECIFICATIONS

6.1 Required Number of Artificial Habitat

As per TfNSW specification G40 Cl2.4, the loss of all hollows observed to be being used must be compensated at a ratio of one nest box for every used hollow lost (1:1).

EPS (2019) provided a summary of hollows observed within the Project area within the revised BAR. Along with this, species observed utilising the hollows was also recorded. *The survey that took place in August 2019 identified 46 hollow bearing trees containing 240 hollows. Species of commonly occurring native birds, including Little Corella, Long-billed Corella, Scaly-breasted Lorikeet, Rainbow Lorikeet, Red-rumped Parrot, Sulphur-crested Cockatoo and Galah were observed entering/exiting or nesting in these trees during the September 2017 and November 2018 surveys. Forty-five pairs of the above bird species were recorded in thirty hollow-bearing trees in this habitat. The total number of 163 used hollows was determined as shown in the table below using the data collected from the EPS 2019 survey in Appendix D of the revised BAR.*

Based on this, the number and size class of hollows needing replacement for the Project has been provided in Table 6-1.

Hollow size	Number within Project area	Used hollows
Very small hollow (< 5cm)	11	7
Small hollow (5 – 10cm)	107	67
Medium hollow (10 – 20cm)	101	74
Large hollow (20 - 30cm)	17	13
Very Large hollow (30cm >)	4	2
Total	240	163

Table 6-1 Size and number of used hollows proposed to be removed for the Project (EPS, 2019)

This NBS aims to use carved hollows using the Hollow Hog tool (refer Section 6.3.1) as required by the land owner of the approved installation site. The Hollow Hog tool is versatile and able to provide hollows that meet the very small size criteria to the required very large hollows. The Hollow Hog hollow carving tool was found to be preferable to nest box installation due to a number of factors, including a lack of land local to the Project in which nest boxes were able to be installed and better outcomes for biodiversity.

Following information gathered during pre-clearing surveys and Stage 1 clearing activities undertaken during March and April 2023, indicating a significantly greater number of potential hollows within the Project area than initially anticipated, alterations to this strategy and artificial habitat installation approach were made in consultation with TfNSW and NGH. As no confirmation of hollow occupation could be determined during pre-clear surveys, the initial number of used hollows will still be utilised to determine habitat replacement.

Original used hollow numbers (Table 6-1) will still be replaced 1:1 with carved hollows.

Due to both an inability to confirm occupation rates during pre-clearance surveys and the discovery of only eight instances of hollow occupation during Stage 1 clearing and six in Stage 2 of the clearing, the use of the original BAR occupation numbers has been deemed appropriate by NGH and TfNSW.

If 180+ (>10% increase) hollows are found to be used during further clearing activities, all additional used hollows will be replaced at a rate of 1:1 by nest boxes or carved hollows. It is also noted that 16 of the 50 hollow-bearing trees identified during pre-clearance surveys in March 2023 are to be retained by the Project.

The Project will additionally relocate hollow logs from all cleared hollow bearing trees from the site to a nearby Local Land Services (LLS) restoration project at Orchard Hills Defence Site, approximately 5km southeast of the Project site.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 22 of 45





6.2 **Opportunities identified for beneficial re-use of hollows**

During the clearing process, all hollow-bearing sections of the trees will be transported for beneficial re-use at the Orchard Hills Defence site, as part of a Local Land Services project.

6.3 Locations identified for artificial habitat installation

The Project involves the widening of Mulgoa Road, between Jeanette Street and Blaikie Road. As noted in the Project REF (Arup, 2018):

- Approximately 4.03ha, or 85%, of vegetation recorded within the Project area is proposed for removal
- Mulgoa Road currently experiences traffic volumes of up to 52,000 vehicles per day
- The Project area intersects the M4 Motorway.

Noting the high proportion of vegetation that would be removed for the Project, the Project team assessed suitable locations nearby the Project for potential to install artificial habitat or natural hollows. The Project team also looked to find suitable sites to install artificial habitats that are the similar to the habitat type being removed on the Project. Two sites have been identified as preferred sites to install nest boxes and natural hollows. These sites are a site owned by Sydney Water and Fernhill Estate, see Figure 6-1.

The habitat being cleared on the Project is predominantly PCT 4025 *Cumberland Red Gum Riverflat Forest*. The majority of hollow bearing trees being cleared on the Project are Forest Red Gum species (*Eucalytpus teriticornis*). The Project Ecologist was engaged to assess each site to identify suitable trees for artificial habitat installation. While the species of the tree was not assessed and recorded individually, a desktop study was completed to identify the vegetation mapping of these two sites. The vegetation in these areas belongs to the Cumberland Red Gum Riverflat Forest Community and the trees in this community generally consist of:

- Eucalyptus teriticornis 69%
- Angophora floribunda 38%
- Eucalyptus Amplifolia 32%
- Eucalyptus eugenoides 19%
- Eucalyptus moluccana 14%

As well as several more eucalyptus species in lower abundance.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 23 of 45







Figure 6-1: Location of Sydney Water site and Fernhill Estate from the Project

The first site is owned by Sydney Water and is located on the north-eastern corner of the Glenmore Parkway and Mulgoa Road intersection. This area is approximately 3 ha and is located 250m from the Project site, see

Figure **6-2**. Its proximity to School House Creek is considered advantageous for artificial habitat installation. The Project ecologist assessed this site on the 2nd of March 2023 and has identified 27 suitable trees at this site to have artificial habitat installed in, see Figure 6-3. Unfortunately, due to future development plans at this site it was not suitable for the installation of artificial habitat.

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 24 of 45







Figure 6-2 Sydney Water Site Location



Figure 6-3 Suitable trees for artificial hollow installation at Sydney Water Site (Narla, 2023)

An additional site has been identified at Fernhill Estate which is owned by the NSW Government, purchased in 2018 under the guidance of Western Sydney Parklands. Fernhill Estate has heritage and conservation areas on the property. Fernhill Estate which is located approximately 7.7km from the Project. Its proximity to the Nepean River and its tributaries was also considered to be advantageous for artificial hollow installation. Fernhill Estate have agreed to install natural hollows on the site using the Hollow Hog tool. Several areas of the estate have been highlighted by the landowner as available for natural hollow installation, see Figure 6-4.

94 MGA Zone 56

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 25 of 45





6.3.1 Fernhill Site inspection

Fernhill Estate gave the Project access to all areas highlighted in pink in Figure 6-4 below. An inspection by the Project ecologist was completed on the 2nd of March 2023 and 97 suitable trees for artificial hollow installation were identified, see Figure 6-5. Access was limited during this site visit due to security so was just used as an initial assessment to confirm that there were multiple suitable sized trees at this site.

This area is approximately 88 ha. The Hollow Hog contractors are qualified ecologists or AQF Level 3 arborists and used their expertise during the installation of the hollows to identify suitably large and structurally sound trees for hollow installation.



Figure 6-4 Sites on Fernhill Estate identified by landowner as suitable for potential artificial habitat installation.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 26 of 45







Suitable trees for artificial hollow installation

 Suitable Habitat Tree



Figure 6-5 Suitable trees for artificial hollow installation at Fernhill Estate (Narla, 2023)

6.3.2 Justification

NGH were engaged to assess the suitability of the Fernhill site for the proposed hollow installation.

As noted in Section 4.1 of this Strategy, the Project area contains vegetation consistent with PCT 4025 (Cumberland Red Gum Riverflat Forest). As shown in Figure 6-6 below, vegetation occurring within Fernhill Estate is consistent with PCT 4025.

The BAR (EPS, 2019) identified one threatened species, the Grey-headed Flying-fox (Pteropus poliocephalus), within the Project area. The Grey-headed Flying-fox has been recorded within Fernhill Estate; however, it is a roosting species that forms large camps. As such, artificial habitat creation is not required for this species.

Two other species, the Eastern False Pipistrelle (Falsistrellus tasmaniensis) and the Eastern Broadnosed Bat (Scotorepens orion) were reported as probable composite recordings. In addition to this, a number of other bat species are considered as likely to occur within the Project area (refer to Table 4-1).

As shown in Figure 6-6 below, a number of bat species have been identified within 2km of Fernhill Estate. It is considered likely that a variety of bat species would utilise Fernhill Estate, given that:

- Vegetation within Fernhill Estate is consistent with that identified within the Project area
- Microbats generally hunt flying insects above or just below the tree canopy. Vegetation within and surrounding the Fernhill Estate is considered mature and dense enough to support this feeding behaviour
- A number of waterbodies occur within and adjacent to the Fernhill Estate. The Southern Myotis, also known as the fishing bat, are known to feed on small fish and invertebrates. The Greater Broad-nosed Bat also hunts for insects over the water's surface.

A number of non-threatened bird species were also identified utilising hollows within the Project area during the BAR. Given that the Fernhill Estate is located approximately 5km southwest of the Project area, it is reasonable to expect that these species will relocate to nearby areas of undisturbed vegetation. Noting the available water sources, that the vegetation is consistent with that identified within the Project area, the site is located away from major thoroughfares and urban infrastructure and that the

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 27 of 45





bird species identified in Section 4.3 are not preferential in their habitat requirements, Fernhill Estate is considered an ideal location for artificial habitat creation. It is considered that the addition of artificial hollows at Fernhill Estate would ease competition for resources and provide a suitable alternative to habitat identified within the Project area.



Figure 6-6 Threatened species and vegetation types occurring at the Fernhill site

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 28 of 45





6.3.3 Installation approach

Narla Environmental, the Project's ecologist inspected the site again with the Hollow Hog contractors on the 24th of April 2023. They were able to identify suitable trees across the entire site so that hollows can be installed across the whole site at an appropriate density. This is so an area doesn't become filled with artificial habitat leading to non-target species potentially becoming dominant and out-competing other natives in that patch of habitat.

The Hollow Hog tool allows for multiple hollows to be installed in a single tree if deemed suitable by the Project ecologist or arborist. If additional trees are needed for installing appropriate number of Hollow Hog hollows additional trees will be assessed by suitability by the Project arborist or ecologist. The agreement with Fernhill Estate has been to install hollows in 97 trees across the site.

6.4 Artificial Habitat Design

Artificial habitat will be specifically designed and selected to suit the target species identified in Section 4.3 of this Plan.

The specifications of suitable artificial habitat for each target species are provided in Table 6-2 below, along with the recommended number of each artificial habitat type. This will be used to inform the size of artificial hollows using the Hollow Hog tool. All artificial habitat will be created using the Hollow Hog tool.

Other commonly occurring non-threatened fauna perform important ecosystem functions such as pollination, seed dispersal, and invertebrate control and provide foraging resources for threatened species. While no species were identified within the Project area that utilise large / very large hollows, there is significant ecosystem value in the retention of habitat features suitable for a range of common species. The Project would aim to maintain availability of habitat for these species to support ecosystem functionality.

Artificial habitat type and size*	Number of artificial habitat/hollows required	Size	Hollow Entry Size	Approximate cavity dimensions
Microbats* (Wedge style)	7 – very small 20 – small	Very small / Small	<5 cm	30 cm deep by 15 cm by 15 cm
Mammals	17 – small 26 – medium	Small / medium	5 – 10 cm	40 cm deep by 20 cm by 20 cm
Small birds	30 – small	Small	10 – 20 cm	40 – 60 cm deep by 20 cm by 20 cm
Medium-sized birds	48 - medium	Medium	20 – 30 cm	60cm deep by 25 cm by 25cm
Large / very large hollow bearing species	13 – large 2 – very large	Large / very large	>30 cm	60 – 80 cm deep by 30 cm by 30 cm
TOTAL	163			

Table 6-2 Artificial habitat types, placement and quantities

6.4.1 Installation procedures

Hollow Hog installation

The Project will engage a Hollow Hog specialist contractor to install natural bored hollows using the Hollow Hog tool. The Project ecologist will provide advice of suitable trees to install hollows into and the number of hollows to be installed per tree. The height, location and aspect of the bored hollow will be determined taking into consideration the nature of the tree the hollow is being installed into. This assessment at Fernhill Estate between the Hollow Hog contractor and Project ecologist was undertaken on the 24th of April 2023.

Figure 6-7 provides a visual representation of the procedure for making hollows using the bored method.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 29 of 45





As part of the carving of each hollow the contractors will determine whether or not a timber entrance modifier / false branch stub will be required to ensure the correct entry diameter, weather protection and to minimise the risk that living tissue will close over the hollow. Where a species is known to keep an entry open to the correct dimension through chewing (e.g. little lorikeet or glider) the contractor will make the decision to carve entries without installing a modifier in some instances. This will be assessed on site and will depend on an estimation of how rapidly a tree is likely to seal a particular hollow.

Hollows will be carved in both living and potentially also dead trees that do not pose a risk of falling on adjoining roadways or other nearby infrastructure or pathways.

Each hollow installed will be recorded, including hollow dimensions, aspect, heigh above ground and entrance attributes and a photograph. Each tree will be recorded using a GPS device and the information gathered on each tree and hollow will be supplied in an Excel spreadsheet within 4 weeks of completion of the works.



MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 30 of 45







Figure 6-7 Hollow replacement using the Hollow Hog tool

6.4.2 Fauna handling procedures

Any necessary fauna handling during installation or monitoring works must be in accordance with the Fauna Rescue and Release Procedure (refer to Appendix J of the FFMP). If any unexpected threatened species, habitat or populations of flora or fauna are found on site, then the Unexpected Threatened Species Finds Procedure (Appendix B of the FFMP) must be followed.

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 31 of 45





7 ENVIRONMENTAL MITIGATION AND MANAGEMENT MEASURES

The management actions, responsibilities, performance criteria and timeframes relevant to this Plan are described in the tables below.

7.1 Flora and Fauna Management

Table 7-1 Nest Box management measures to be implemented throughout the Project

Item	Management Action	Responsibility	Timeframe	Reference
Genera	I de la constante de			
NB1	Training (inductions / toolboxes) will be provided to all personnel (including subcontractors) on the requirements of this Strategy.	ESR, PM	Prior to removal of any vegetation	Good practice G40
NB2	Toolbox talks will be undertaken prior to works in or adjacent to environmentally sensitive areas.	ESR, PM, PE	Prior to and during construction	G36
NB3	 A Nest Box Strategy will be developed in association with council, the local community and potentially other organisations such as Cumberland Land Conservancy. The Nest Box Strategy will investigate opportunities such as; To relocate and reuse significant hollow-bearing tree features and hollows; Providing species specific nest boxes targets fauna species recorded; Installing nest boxes in the same habitat type; Nest boxes to be installed pre-clearing Monitoring and replacement of nest boxes where required 	ESR, PM	Prior to construction	G40 Submissions Report AREF
Installa	tion			
NB4	The loss of all hollows observed to be being used must be compensated at a ratio of one nest box for every used hollow lost.	ESR, PM	Prior to construction	G40
NB5	A project ecologist will be appointed to supervise installation of all next boxes.	ESR, PM	Prior to and during construction	G40
NB6	If the number of used hollows removed exceeds the estimated number by more than 10%, additional artificial habitat (or reused hollows) will be provided. Additional hollows would be provided at a ratio of 1:1.	ESR, PM	Construction	Best practice
NB7	Nest box or artificial hollow installation would be conducted in a manner consistent with this Plan.	ESR, PM	Prior to and during construction	Best practice

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 32 of 45





Item	Management Action	Responsibility	Timeframe	Reference
NB8	Artificial hollows / reused hollows will be visually inspected for damage every 12 months until the end of construction of the Project (estimated 2026 completion date).	ESR, PM	Construction	Best practice
NB9	Damaged artificial hollows will be repaired or replaced.	ESR, PM	Construction	Best practice
NB10	In the event that a threatened species or threatened ecological community is unexpectedly identified during construction the 'Unexpected Threatened Species Procedure' (Appendix B of the FFMP) will be implemented.	All personnel	Prior to construction and construction	G36
Monito	ring			
NB11	This Nest Box Strategy (NBS) will be implemented and monitored to determine the effectiveness of the mitigation measures implemented as part of the Project.	PM, ESR	Construction	Good practice
NB12	12 monthly monitoring will be conducted until the Project is completed, in accordance with this NBS.	PM, ESR	Construction	Good practice
NB13	A brief inspection report will be prepared post-completion of all artificial habitat, and after each monitoring / inspection event and provided to the land owner where artificial habitat are installed.	PM, ESR	Construction	Good practice

MRUA-TSWA-NWW-PM-PLN-200010(00)_NBS			21.0000139287.0621
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 33 of 45





8 COMPLIANCE MANAGEMENT

8.1 Roles and Responsibilities

Environmental responsibilities are detailed within the CEMP. Responsibilities specific to this NBS are outlined below in Table 8-1.

 Table 8-1 Roles and responsibilities specific to this Nest Box Strategy.

Role	Responsibilities
Project Manager (PM)	The PM is accountable for legal and contractual compliance. The PM will receive reports of significant incidents. The PM is responsible for ensuring that appropriate authorities and the senior management team are informed of any incidents that do occur and for the authorisation of mitigation action undertaken. The PM will review the findings of incident investigation reports and authorise improvements to prevent recurrence. The PM is responsible for the overall implementation and maintenance of this Management Plan.
Site Supervisors (SS)	SSs are responsible for ensuring that clearing works are undertaken in accordance with the Clearing and Grubbing plan and that mitigation measures required as a consequence of the works are implemented and maintained. Provision of safe access and cooperation with investigations as necessary during the works. Implementation of "unexpected threatened species finds" strategy should unexpected threatened species be encountered.
Environmental Site Representative (ESR)	The ESR or delegate is responsible for management of system documents and for auditing site activities against this procedure as required by the PM. Responsible for updating this Plan and for ensuring compliance with monitoring requirements as detailed in this Strategy. Any amendments to this Plan shall be submitted to the PM for review and approval.
Ecologist	An ecologist has been engaged to provide specialist advice including pre-clearing inspections, inspections during clearing, unexpected threatened species and weed identification and removal and confirm compliance with the clearing boundaries. The project ecologist will conduct all monitoring requirements of the artificial habitat
Arborist	AQF Level 3 arborists will work with the clearers and will climb the trees to confirm used hollows. An AQF Level 5 arborist has been engaged to provide specialist advice for installing bored hollows.
All Staff	Comply with mitigation measures outlined within this document and report any sightings of injured, threatened or dead species to the ESR or SS immediately.

8.2 <u>Training</u>

The general project induction will include a component on nest box installation requirements. The Project induction will include, but not be limited to, the following:

- The reuse of hollows from habitat trees occurring within the Project area
- No-go areas and the requirement to remain outside of these locations; and
- Procedures to follow if an unexpected species is identified on-site (Appendix B of the FFMP).

Toolbox and prestart meetings will be used, as required, to highlight any specific issues that arise onsite and posters will be used to further educate employees and sub-contractors, particularly immediately prior to clearing works.

8.3 Monitoring and Inspections

Inspections of sensitive areas and activities with the potential to impact fauna will occur for the duration of the Project as outlined in the CEMP.

The objectives of ongoing monitoring include:

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 34 of 45





- Ensuring hollows are available for use
- Providing a record of species use
- Providing data on the effectiveness of carved hollows for microbats and other non-threatened arboreal species

Construction is expected to be complete in 2026, weather permitting. Maintenance works and monitoring inspections will be undertaken in accordance with *Guide 8: Nest Boxes of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (RTA, 2011).* This would include:

- During the construction phase of the project (Mulgoa Road Upgrade Stage 1), the artificial hollows will be checked by an ecologist / project arborist every twelve months following installation. To minimise disturbance to any fauna that may be occupying the boxes, this should be performed with a camera on the end of an extendable pole.
- Where the use of a camera and extendable pole are not feasible (e.g. for very small hollows) monitoring will be performed via visual observations from the ground.
- Monitoring activities will coincide with nesting seasons for the target species
- In order to accurately determine micro-bat occupancy, monitoring will occur around dusk
- Maintenance works and pest management will be undertaken as necessary
- Monitoring data will include (at a minimum): name of the observer, date, prevailing weather conditions, assessment of artificial hollow condition, evidence of rot or termites, evidence of fauna activity and whether there is any pest activity like feral bees, common mynas, common starlings or ants.

8.4 <u>Auditing</u>

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this Plan and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 2.9.5 of the CEMP.

8.5 Reporting

Reporting requirements and responsibilities are documented in the CEMP.

Reports will be provided in conjunction with the following:

- Within six (6) weeks of completing the installation of artificial habitat
- Each monitoring / inspection event
- After a fauna incident

The objectives of the reporting process is to:

- Provide a record of fauna uptake and use
- Determine the efficacy of providing carved hollows for the target species, namely bats

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 35 of 45





9 REVIEW AND IMPROVEMENT

9.1 <u>Continuous Improvement</u>

Continuous improvement of this plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any nonconformances and deficiencies
- · Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement; and
- Make comparisons with objectives and targets.

9.2 <u>NBS Update and Amendment</u>

This plan will be reviewed annually or as required by the construction alliance partner until the end of construction as a minimum but may be updated more regularly depending on process changes and refinements.

Any revisions to the NBS will be in accordance with the process outlined in Section 2.13.1 of the CEMP.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 2.11.2 of the CEMP.

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 36 of 45





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MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 37 of 45





APPENDIX A – HOLLOW BEARING TREE DATA (EPS, 2019)

HBT No.	DBH (cm)	Species*	Number & Size of Hollows			ws	Total hollows	Nesting Species	Tree to be removed?	
			Very Small < 5cm	Small 5 – 10cm	Medium 10 – 20cm	Large 20 – 30cm	Extra Large 30cm+	per Tree		
MR1	60	Eucalyptus tereticornis	0	1	0	0	0	1	N/A	Yes
MR2	65	Eucalyptus tereticornis	0	1	1	1	0	3	Little Corella Long- billed Corella	Yes
MR3	70	Eucalyptus tereticornis	0	0	3	0	0	3	Galah Rainbow Lorikeet	Yes
MR4	60	Eucalyptus tereticornis	0	2	1	0	0	3	N/A	Yes
MR5	70	Eucalyptus tereticornis	0	1	1	0	0	2	N/A	Yes
MR6	115	Eucalyptus tereticornis	0	0	3	0	0	3	Scaly- breasted Lorikeet	Yes
MR7	90	Eucalyptus tereticornis	0	1	3	0	0	4	Rainbow Lorikeet Long- billed Corella	Yes
MR8	110	Eucalyptus tereticornis	0	5	2	0	0	7	Rainbow Lorikeet Little Corella	Yes
MR9	95	Eucalyptus tereticornis	0	0	1	1	0	2	Red- rumped Parrot	Yes
MR10	85	Eucalyptus tereticornis	0	1	1	0	0	2	N/A	No
MR11	70	Eucalyptus tereticornis	0	1	1	0	0	2	N/A	Yes
MR12	90	Eucalyptus tereticornis	0	0	1	0	0	1	Rainbow Lorikeet	Yes
MR13	95	Eucalyptus tereticornis	1	3	0	0	0	4	Little Corella	Yes
MR14	75	Eucalyptus tereticornis	0	3	1	1	0	5	N/A	Yes
MR15	145	Eucalyptus tereticornis	2	5	2	0	0	9	Sulphur- crested Cockatoo	Yes
MR16	100	Eucalyptus tereticornis	0	3	0	0	0	3	Rainbow Lorikeet	Yes
MR17	85	Eucalyptus tereticornis	0	5	1	0	0	6	N/A	Yes

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 38 of 45





MR18	120	Eucalyptus tereticornis	0	5	3	0	0	8	Scaly- breasted Lorikeet	Yes
MR19	100	Eucalyptus tereticornis	0	3	5	0	0	8	Little Corella Long- billed Corella	Yes
MR20	150	Eucalyptus tereticornis	0	4	4	1	0	9	Rainbow Lorikeet Scaly- breasted Lorikeet	Yes
MR21	130	Eucalyptus tereticornis	1	1	3	2	0	7	Rainbow Lorikeet Little Corella Beehive	Yes
MR22	95	Eucalyptus tereticornis	0	1	1	0	0	2	Little Corella	Yes
MR23	120	Eucalyptus tereticornis	0	0	6	0	0	6	N/A	Yes
MR24	100	Eucalyptus tereticornis	0	6	8	0	0	14	Rainbow Lorikeet	Yes
MR25	60	Eucalyptus tereticornis	0	0	2	0	0	2	N/A	Yes
MR26	80	Eucalyptus tereticornis	0	4	6	0	0	10	Little Corella Rainbow Lorikeet	Yes
MR27	100	Eucalyptus tereticornis	1	1	3	0	0	5	Little Corella Rainbow Lorikeet	Yes
MR28	60	Eucalyptus tereticornis	1	1	0	0	0	2	Rainbow Lorikeet	Yes
MR29	140	Eucalyptus tereticornis	2	3	0	0	1	6	N/A	Yes
MR30	120	Eucalyptus tereticornis	0	3	3	1	1	8	Little Corella Rainbow Lorikeet	Yes
MR31	70	Eucalyptus tereticornis	0	0	1	0	0	1	N/A	Yes
MR32	85	Eucalyptus tereticornis	0	1	1	0	0	2	Rainbow Lorikeet	Yes
MR33	65	Eucalyptus tereticornis	0	3	5	0	0	8	Little Corella	Yes
MR34	75	Eucalyptus tereticornis	0	6	1	1	0	8	N/A	Yes
MR35	110	Eucalyptus tereticornis	0	3	5	0	0	8	Little Corella Long-	Yes

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 39 of 45





									billed Corella	
MR36	100	Eucalyptus tereticornis	0	4	4	2	0	10	Rainbow Lorikeet	Yes
MR37	65 + 90	Eucalyptus tereticornis	0	4	6	0	0	10	N/A	Yes
MR38	70	Eucalyptus tereticornis	0	3	0	0	0	3	N/A	Yes
MR39	95	Eucalyptus tereticornis	1	3	2	0	1	7	Little Corella Rainbow Lorikeet Scaly- breasted Lorikeet	Yes
MR40	80 + 60 + 50	Eucalyptus tereticornis	0	5	1	1	0	7	Rainbow Lorikeet	Yes
MR41	120	Eucalyptus tereticornis	2	2	1	1	0	6	N/A	Yes
MR42	95	Eucalyptus tereticornis	0	1	4	4	0	9	Rainbow Lorikeet Little Corella	Yes
MR43	70	Eucalyptus tereticornis	0	2	1	0	0	3	Rainbow Lorikeet	No
MR44	100	Eucalyptus tereticornis	0	4	1	0	0	5	Rainbow Lorikeet	No
MR45	100	Eucalyptus tereticornis	0	2	1	1	1	5	Rainbow Lorikeet Little Corella	No
MR46	66	Eucalyptus amplifolia			1					Yes
Totals			11	107	101	17	4	240		42

*Exact differentiation between *Eucalyptus amplifolia* and *E. tereticornis* without diagnostic plant material for every single tree (which was not available due to the constant mowing and disturbance of the ground layer) was difficult. Therefore, some of the hollow-bearing trees recorded as *E. tereticornis* may actually be *E. amplifolia*.

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 40 of 45





APPENDIX B – EMAIL SENT TO STAKEHOLDERS

Email sent to stakeholders (550) We need your feedback on the Nest Box Strategy

Dear Stakeholder As you might be aware, Transport for NSW has entered into an Alliance contract with Seymour Whyte/Turnbull Engineering to deliver the upgrade of Mulgoa Road to 3 lanes in each direction between Jeanette Street and Blaikie Road.

You would have received a Community update on the project and what is happening. You can view the Community update here. Some early work has started on the project and this includes utility investigations, site compound set up and related activities.

To construct this project we will need to remove some vegetation adjacent to the existing road.

We only remove vegetation where it is absolutely necessary and prior to removal of some of the trees

- we will be providing nest boxes in an area close to the project to cater for loss of habitat
- -we will be commissioning Greening Australia to collect seeds from existing vegetation and store them for use by local community and groups
- *-a* comprehensive landscaping plan is being developed so that Mulgoa Road will be a suitable gateway to Penrith with an enhanced look and feel.

Why we are writing to you? A Nest Box Strategy has been prepared and we would like your feedback on this strategy before we install the nest boxes. A link to the strategy is attached.

How you can find out more? We will hold an online session (via Microsoft Teams) on **Thursday 16 February between 11 am and 12 noon** so you can ask questions and get further information.

To register for this session please email us at the email address below.

Comments on the Nest Box strategy should be sent to us as per the contact details below prior to **Monday 27 February 2023**.

E: construction.mulgoaroadupgrade@transport.nsw.gov.au

P: 1800 733 084/Option 1

M: PO Box 973 Parramatta CBD NSW 2124

If you have further questions please contact us as per the details above. Regards Project Team Mulgoa Road Upgrade Alliance – Jeanette Street to Blaikie Road M 1800 733 084/Press 1 E <u>construction.mulgoaroadupgrade@transport.nsw.gov.au</u> <u>https://nswroads.work/jeanetteblaikierd</u>

MRUA-TSWA-NWW-PM-PLN-200	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 41 of 45





APPENDIX C – UPDATED HOLLOW INVENTORY (NARLA ENVIRONMENTAL, 2023)

Total Hollow Bearing Trees: 50 (54 habitat trees but 4 trees only have nests present) Total hollows: 716

Total hollows in trees being cleared: 508

Total hollows in retained trees: 208

Tag # From TreelQ Report	Preclear Number	Habitat Features	Retained	Initial Hollows (count)	Total Hollows	Scientific Name
-	HT1	Hollow		1 x Medium	1	Eucalyptus spp.
-	HT2	Nest		-		Corymbia maculata
-	HT3	Nest		-		Corymbia maculata
-	HT4	Hollow		1 x Medium	1	Eucalyptus mollucana
-	HT5	Nest		-		Melaleuca spp.
-	HT6	Nest		-		Eucalyptus tereticornis
T1040	HT7	Hollow		10 x Medium, 2 x Large, 1 x Large	13	Eucalyptus tereticornis
T1035	HT8	Hollow		5 x Small, 4 x Medium		Eucalyptus tereticornis
T1030	HT9	Hollow		8 x Small, 4 x Medium, 3 x Large, 2 x Extra Large		Eucalyptus tereticornis
T980	HT10	Hollow		7 x Small, 12 x Medium, 8 x Large, 3 x Extra Large	30	Eucalyptus tereticornis
Т930	HT11	Hollow		15 x Small, 12 x Medium, 7 x Large, 1 Extra Large	35	Eucalyptus tereticornis
T835	HT12	Hollow		2 x Small, 4 x Large		Eucalyptus tereticornis
T840	HT13	Hollow	8 x Medium, 4 x Large, 1 x Extra Large		13	Eucalyptus tereticornis
T845	HT14	Hollow		9 x Small, 6 x Medium, 2 x Large	17	Eucalyptus tereticornis

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 42 of 45





T815	HT15	Hollow	3 x Small, 6 x Medium, 3 x Large	12	Eucalyptus tereticornis
T785	HT16	Hollow	8 x Small, 11 x Medium	19	Eucalyptus tereticornis
T755	HT17	Hollow	4 x Small, 3 x Medium, 2 x Large	9	Eucalyptus tereticornis
T750	HT18	Hollow	5 x Small, 3 x Medium, 2 x Large	10	Eucalyptus tereticornis
T760	HT19	Hollow	6 x Small, 4 x Medium, 10 x Large, 1 x Extra Large	21	Eucalyptus tereticornis
T675	HT20	Hollow	8 x Small, 3 x Medium, 4 x Large	15	Eucalyptus tereticornis
T655	HT21	Hollow	5 x Small, 1 x Medium, 3 x Large	9	Eucalyptus tereticornis
T650	HT22	Hollow	4 x Small	4	Eucalyptus tereticornis
T645	HT23	Hollow	7 x Small, 3 x Medium, 2 x Large	12	Eucalyptus tereticornis
T635	HT24	Hollow	13 x Small, 9 x Medium, 2 x Large	24	Eucalyptus tereticornis
T630	HT25	Hollow	4 x Small	4	Eucalyptus tereticornis
T625	HT26	Hollow	10 x Small, 5 x Medium, 1 x Large	16	Eucalyptus tereticornis
T615	HT27	Hollow	5 x Small, 1 x Medium	6	Eucalyptus tereticornis
T620	HT28	Hollow	3 x Small, 2 x Medium	5	Eucalyptus tereticornis
T600	HT29	Hollow	18 x Small, 9 x Medium	27	Eucalyptus tereticornis
T595	HT30	Hollow	7 x Small, 2 x Medium	9	Eucalyptus tereticornis
T605	HT31	Hollow	6 x Small, 7 x Medium, 4 x large, 1 x Extra Large	18	Eucalyptus tereticornis
T590	HT32	Hollow	10 x Small, 4 x Medium	14	Eucalyptus tereticornis
T565	HT33	Hollow	12 x Small, 3 x Medium, 1 x Large	16	Eucalyptus tereticornis

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 43 of 45





T570	HT34	Hollow		13 x Small, 4 x Medium	17	Eucalyptus tereticornis
T560	HT35	Hollow	11 x Small, 6 x Medium, 4 x Large		21	Eucalyptus tereticornis
T550	HT36	Hollow		12 x Small, 5 x Medium, 1 x Large, 2 x Extra Large	20	Eucalyptus tereticornis
T540	HT37	Hollow		8 x Small, 3 x Medium	11	Eucalyptus tereticornis
T535	HT38	Hollow		13 x Small, 10 x Medium	23	Eucalyptus tereticornis
T900	HT39	Hollow	Retained	5 x Small, 4 x Medium, 6 x Large, 2 x Extra Large	18	Eucalyptus tereticornis
T1090	HT40	Hollow	Retained	7 x Small, 5 x Medium, 1 x Extra Large	13	Eucalyptus tereticornis
T765	HT41	Hollow	Retained	7 x Small, 3 x Large	10	Eucalyptus tereticornis
T1085	HT42	Hollow	Retained	6 x Small, 5 x Medium, 2 x Large, 2 x Extra Large	15	Eucalyptus tereticornis
T1075	HT43	Hollow	Retained	1 x Small, 1 x Large	2	Eucalyptus tereticornis
T1080	HT44	Hollow	Retained	10 x Small, 1 x Large	11	Eucalyptus tereticornis
T1095	HT45	Hollow	Retained	9 x Small, 3 x Medium, 1 x Large	13	Eucalyptus tereticornis
T1070	HT46	Hollow	Retained	7 x Small, 5 x Medium, 2 x Large	14	Eucalyptus tereticornis
T610	HT47	Hollow	Retained	5 x Small, 2 x Medium, 1 x Large	8	Eucalyptus tereticornis
T575	HT48	Hollow	Retained	8 x Small, 3 x Medium, 1 x Large	12	Eucalyptus tereticornis
T555	HT49	Hollow	Retained	5 x Small	5	Eucalyptus tereticornis
T545	HT50	Hollow	Retained	9 x Small, 10 x Medium, 3 x Large, 1 x Extra Large	13	Eucalyptus tereticornis

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 44 of 45





T525	HT51	Hollow	Retained	10 x Small, 3 x Large	13	Eucalyptus tereticornis
T520	HT52	Hollow	Retained	9 x Small, 3 x Medium	12	Eucalyptus tereticornis
T515	HT53	Hollow	Retained	12 x Small, 2 x Medium	14	Eucalyptus tereticornis
T500	HT54	Hollow	Retained	53 x Small, 4 x Large, 2 x Extra Large	59	Eucalyptus tereticornis

MRUA-TSWA-NWW-PM-PLN-2000	21.0000139287.0621		
Seymour Whyte Constructions	Rev: 00	Date: 06/06/2023	Page 45 of 45