Vegetation Management Plan

Regrowth - Kurri Kurri – Precinct 1B

Loxford Project Management Pty Ltd

8 August 2022

The Power of Commitment

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Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A	James Baldry	Arien Quin		Michelle Kiejda		04/08/2022
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1. Introduction

GHD Pty Ltd (GHD) has been engaged by Loxford Project Management Pty Ltd (Loxford Project Management) to prepare this Vegetation Management Plan (VMP) to accompany development applications (DA) for a residential subdivision at Cessnock Road, Gillieston Heights ('the proposal') (refer to Figure 1).

The proposal site is located within part of the buffer zone surrounding the former Hydro Aluminium Smelter site and has been recently rezoned by Maitland City Council from RU2 (Rural Landscape) land zoning to R1 zoning (General Residential; refer to Figure 2). Approximately 2.87 hectares (ha) of vegetated land to the northwest of the site will remain as RU2 and is the subject of this management plan (the subject site). Several biodiversity assessments have been prepared across the former Hydro site, of which the subject site forms a part. Results of these assessments have been reviewed and included in this VMP where relevant.

1.1 Purpose of this report

This VMP provides a framework for the management of vegetation adjacent to the proposal site including ecological restoration and ongoing weed management. Its purpose is to:

– Outline the management requirements of retained vegetation (Section 3)
– Specify the objectives of vegetation management at the site (Section 1.5)
– Detail required management activities (e.g. weed control) (Section 3)
– Detail the timing and responsibilities to complete management activities (Section 1.6 and 1.7)
– Specify monitoring and reporting schedules and requirements and triggers for any corrective actions (Section 5)

The VMP is a supporting document to the Development Application (DA) for a residential subdivision. The VMP will provide management actions appropriate for the subject site given it will remain zoned RU2 – Rural Landscape within the Maitland Local Government Area. This will involve weed management and revegetation practices (where appropriate) to a standard compliant with Inner Protection Zone (IPZ) requirements in an urban setting.

This VMP has been issued as a draft and will be updated with any conditions of consent issued by the approval authority.

The management actions of this VMP will result in beneficial outcomes for native wildlife by protecting native habitat, enhancing its ecological values and restoring habitat connectivity.

1.2 Scope and limitations

This report has been prepared by GHD for Loxford Project Management Pty Ltd and may only be used and relied on by Loxford Project Management Pty Ltd for the purpose agreed between GHD and Loxford Project Management Pty Ltd as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Loxford Project Management Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section 1.1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD is not responsible for any updates to this report that may be required following issue to Maitland City Council.

1.3 Terms and definitions

For the purposes of this VMP, the following definitions are implemented:

– The ‘subject site’ refers to the 2.87 ha of land that is the subject of this VMP.
– The ‘proposal’ refers to the proposed rezoning of 58.78 ha of land associated with the former Hydro Aluminium site from RU2 to R1 within the Maitland LGA (adjacent to the subject site).
– The ‘study area’ refers to the subject site and adjacent land that form part of the proposed Regrowth Precinct 1 development.

1.4 Links to legislation, other plans and documents

Recommendations contained within this VMP are consistent with both State and Commonwealth legislation as well as local planning instruments and relevant guidance documents, including:

– *Biodiversity Conservation Act 2016.*
– *Biosecurity Act 2015.*
– *Fisheries Management Act 1994.*
– *Water Management Act 2000.*
– *Pesticides Act 1999.*
– *Environment Protection and Biodiversity Conservation Act 1999.*
– Maitland City Council Local Environment Plan 2011.
– Hunter Regional Strategic Weed Management Plan 2017 – 2022.

Other relevant reports reviewed during the completion of this plan include:

– EcoLogical (ELA) (2016), Hydro Aluminium Kurri Kurri –Biodiversity Assessment Report, unpublished report prepared for Hydro Aluminium.
– Cenwest Environmental Services (2004), Hydro Aluminium Kurri Kurri – Terrestrial Vertebrate Fauna Assessment, unpublished report prepared for Hydro Aluminium.
– GHD (2021) Hydro Aluminium Kurri Kurri Pty Ltd Biodiversity Certification Assessment Report.
– GHD (2022) Hydro Aluminium Kurri Kurri Pty Ltd Vegetation Management Precinct 1a.

1.5 Objectives

Vegetation management within the subject site will be focused on ecological restoration and vegetation management to comply with IPZ requirements, where required. Vegetation management and clearing will be required. The overall objectives of the VMP are to:

– Limit impacts to environmentally sensitive areas, including TECs.
– Protect and restore native vegetation to enhance its ecological value and retain habitat connectivity.
– Achieve specified restoration targets (as specified in Section 4.1).
– Control weeds in an environmentally appropriate manner.
– Achieve and maintain compliance with IPZ requirements (as specified in Section 4.6).

Management actions to meet these objectives broadly include:

– Installation of exclusion fencing
– Assisted natural regeneration
– Revegetation
– Weed control
– Targeted removal and/or management of native vegetation to comply with IPZ requirements.

Management actions and their application in each management zone are summarised in Section 4.7.

The Project Manager, in consultation with the Project Ecologist, Bush Regeneration Contractor and Weed Control Contractor, can adapt these criteria as required in response to the success of restoration works to ensure that the restoration objectives are achieved.

1.6 Timing

Implementation of this VMP will commence following its approval. The VMP will apply for ten (10) years or until the performance criteria outlined in this VMP are met.

1.7 Roles and responsibilities

Table 1.1 provides details of key personnel with responsibilities associated with the proposed works and the management and mitigation of environmental impacts. All personnel involved in implementing the VMP will be suitably qualified with relevant specialist skills.

Table 1.1 Roles and responsibilities for implementation of this VMP

Roles and responsibilities for implementation of this VMP Role	Responsibility
Project Manager	The Project Manager is responsible for co-ordinating and overseeing works associated with the VMP. They will also keep all site monitoring and reporting documentation in the event that evidence is required for submission to Maitland City Council.
Project ecologist	Responsible for monitoring vegetation recovery and IPZ compliance within the subject site.
Bush regeneration contractor	Responsible for implementation of ecological restoration activities and IPZ management practices. Minimum of Conservation and Land Management (Natural Area Restoration and Management) Certificate II, plus a minimum of 500 hours of practical bushland regeneration experience under an experienced supervisor.
Weed control contractor	Responsible for implementation of weed control activities. Must hold a current chemicals application training certification to AQF Level 3 and comply with Occupational Health and Safety Standards.

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Loxford Project Group Pty Ltd
Regrowth Kurri Kurri – Maitland LGA
Vegetation Management Plan (Precinct 1B)

Project No. **12527690**
Revision No. **A**
Date **03/08/2022**

Site location

Figure 1

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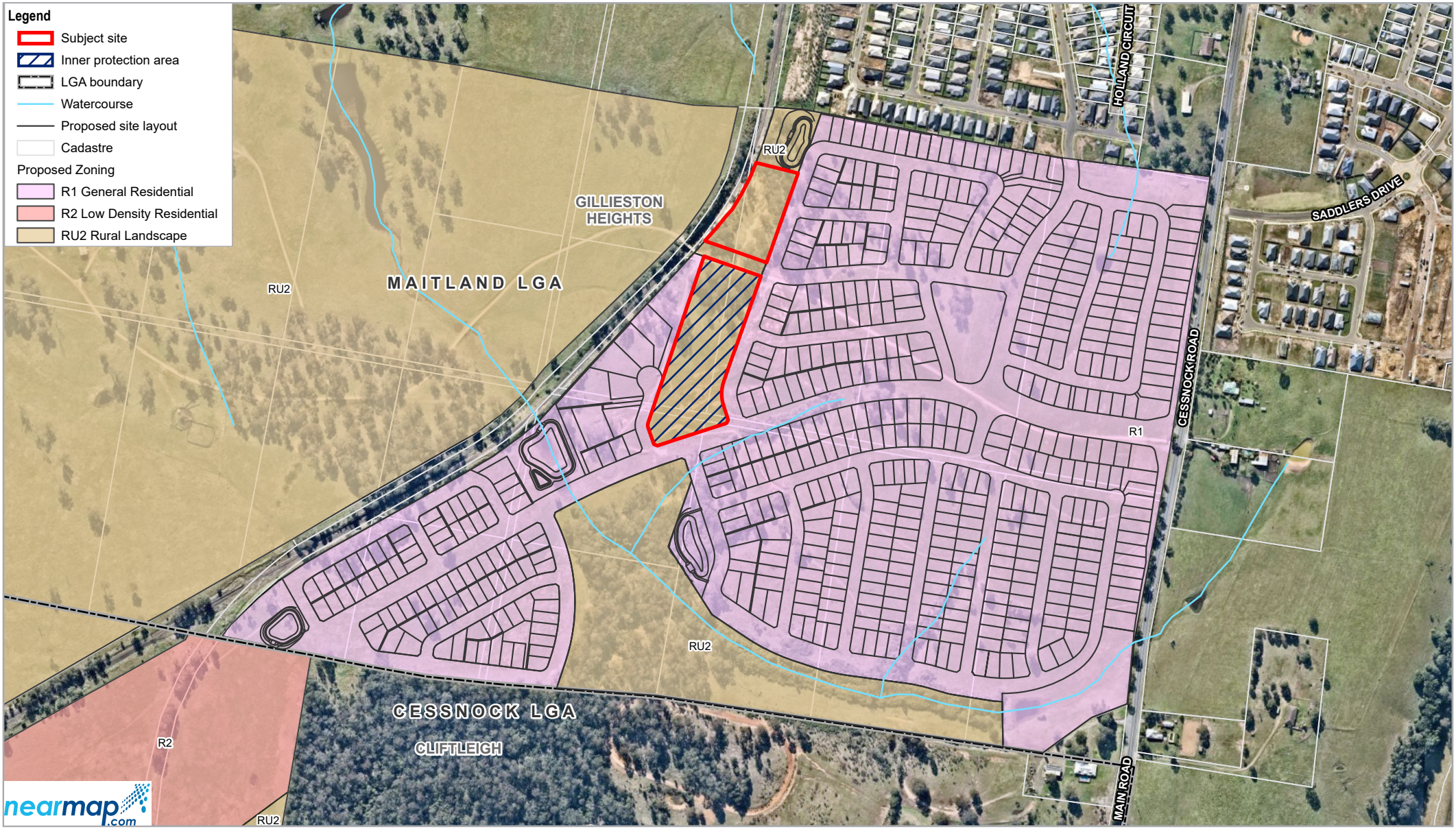
Data source: Nearmap: Imagery dated June 2020, extracted 20200825; Geoscience Australia: 250k Topographic Data Series 3, 2006; Hydro Aluminium: Subject Site, 2021; LPI: DTDB / DCDB, 2017public_NSW_Imagery: © Department of Customer Service 2020. Created by: fmackay



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Meters

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Date **08/08/2022**

Proposed site layout

Figure 2

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Data source: Nearmap: Imagery dated June 2020, extracted 20200825; Hydro Aluminium Pty Ltd: Subject Site, Proposed layout, 2021; LPI: DTDB / DCDB, 2017. Created by: fmackay

2. Existing environment

2.1 Location

The subject site is located off Cessnock Road in the suburb of Gillieston Heights, approximately 30 km northwest of Newcastle Central Business District within the Maitland City Council LGA (Figure 1). It occurs within the Hunter Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the Sydney Basin IBRA bioregion. The subject site is part of the Wallis Creek catchment, with Wallis Creek flowing into the Hunter River approximately 10 km to the north of the subject site between East and West Maitland.

2.2 Existing land use

The subject site is zoned RU2 under the Maitland City Council Local Environment Plan 2011 (Maitland LEP). It is comprised of lightly undulating hills associated with adjacent tributaries that occur within the broader study area. These waterways adjoin and feed into Wentworth Swamp to the west. The subject site contains remnant native vegetation of varying condition and grassland dominated by exotic species. It forms part of agricultural land that has been extensively cleared and grazed by livestock.

The study area has predominantly been rezoned as 'R1 – General Residential'. It contains scattered remnant trees, areas of young regrowth as well as small patches of remnant native vegetation. The study area contains several mapped waterways and three (3) small farm dams located either end of a drainage line.

2.3 Existing vegetation

The subject site contains the following plant community type (PCT), as per the NSW Vegetation Identification System (VIS; DPE 2022b):

– *PCT 1600: Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter*

Recently the DPE has completed a state-wide review and updates to PCT mapping across NSW. Under this new state-wide PCT classification PCT 1600 has been split into three new PCTs. The PCT that most closely aligns with vegetation within the site is *PCT 3433: Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*. As these new PCTs have not been officially adopted yet and to maintain consistency with the Biodiversity Development Assessment Report (BDAR) that has been prepared for the study area this VMP has mapped the vegetation in accordance with the former PCT classification as PCT 1600.

Additionally, exotic grassland vegetation, not representative of a PCT, occurs within the subject site.

A description of this vegetation is provided in Table 3.1 and is shown on Figure 3.

2.4 Threatened ecological communities

PCT 1600 is associated with the Endangered Ecological Community (EEC) *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* listed under the *Biodiversity Conservation Act 2016* (BC Act).

An assessment determined that remnant vegetation within the subject site (Management Zones 1 and 2) is commensurate with the EEC, *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* listed under the *Biodiversity Conservation Act 2016* (Table 2.1).

Table 2.1 Threatened Ecological Community Determination - Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions EEC listed under the BC Act

Determination Criteria	Presence	Justification
Location: *Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion* is restricted to a range of approximately 65 km by 35 km centred on the Cessnock – Beresfield area in the Central and Lower Hunter Valley. Within this range, the community was once widespread. A fragmented core of the community still occurs between Cessnock and Beresfield. Remnants occur within the Local Government Areas of Cessnock, Maitland, Singleton, Lake Macquarie, Newcastle, and Port Stephens but may also occur elsewhere within the bioregion.	**Yes**	The subject site occurs within Maitland Local Government Area of the Lower Hunter Valley
Soils: The community is strongly associated with, though not restricted to, the yellow podsolic and solodic soils of the Lower Hunter soil landscapes of Aberdare, Branxton and Neath.	**Yes**	The subject site does not occur within the soil landscapes of Aberdare, Branxton, and Neath, but rather the Bolwarra Heights soil landscape (DPE, 2022d). This soil landscape is associated with well-drained yellow podzolic soils.
Canopy floristics: Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions EEC is dominated by *Corymbia maculata* and *Eucalyptus fibrosa* while *E. punctata* and *E. crebra* occur occasionally.	**Yes**	Remnant vegetation within the subject site is dominated by *Corymbia maculata* (Spotted Gum), and *Eucalyptus fibrosa* (Broad-leaved Ironbark). A low abundance of *E. crebra* (Narrow-leaved Ironbark) is present.
Shrub floristics: The understorey is marked by the tall shrub, *Acacia parvipinnula, and by the prickly shrubs, Daviesia ulicifolia, Bursaria spinosa, Melaleuca nodosa* and *Lissanthe strigosa*. Other shrubs include *Persoonia linearis, Maytenus silvestris* and *Breynia oblongifolia.*	**Yes**	Despite grazing pressures, the community retains several associated shrubs species including *Acacia parvipinnula* (Silver-stemmed Wattle)*, and by the prickly shrubs, Daviesia ulicifolia* (Gorse-bitter Pea), *Bursaria spinosa* (Native Blackthorn)*, Melaleuca nodosa* and *Maytenus silvestris.*
Groundcover Floristics: The ground layer is diverse; frequent species include *Cheilanthes sieberi, Cymbopogon refractus, Dianella revoluta, Entolasia stricta, Glycine clandestina, Lepidosperma laterale, Lomandra multiflora, Microlaena stipoides, Pomax umbellata, Lobelia purpurascens, Themeda australis* and *Phyllanthus hirtellus*	**Yes**	Despite grazing pressures, the subject site retains several associated groundcover species such as *Cheilanthes sieberi, Cymbopogon refractus* (Barbed-wire Grass)*, Dianella revoluta* (Blueberry Lily)*, Entolasia stricta* (Wiry Panic)*, Glycine clandestina, Lepidosperma laterale, Microlaena stipoides* (Weeping Grass)*, Lobelia purpurascens* and *Themeda australis* (Kangaroo Grass).
Community Structure: In an undisturbed condition the structure of the community is typically open forest. If thinning has occurred, it may take the form of woodland or a dense thicket of saplings, depending on post-disturbance regeneration.	**Yes**	Despite having experienced a significant degree of disturbance, the subject site still conforms to an open woodland structure.
Determination:	The subject site **is commensurate** with the definition of the EEC*, Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* as listed under the New South Wales *Biodiversity Conservation Act 2016*.	

2.5 Threatened flora

No threatened flora species were identified during assessments within the subject site, however it does represent suitable habitat for several threatened flora species recorded in the locality including:

– *Grevillia parviflora* subsp*. parviflora* (Small Flowered Grevillia)
– *Callistemon linearifolious* (Netted Bottlebrush)
– *Acacia bynoeana* (Bynoe's Wattle)

None of these species or any other threatened flora species were observed within the subject site during surveys completed for this VMP.

2.6 Exotic flora

The *Biosecurity Act 2015* provides for the declaration of priority weeds in local government areas. All plants are regulated by a general biosecurity duty to prevent, eliminate, or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated, or minimised, so far as is reasonably practicable.

A total of 24 exotic species were recorded within the subject site (Table 2.2). This high diversity of exotic species occurs abundantly throughout the site, particularly in areas of exotic grassland.

Table 2.2 Exotic species within the subject site and distribution per zone

Scientific name	Common name	Zone		
		1	2	3
Bidens pilosa	Farmer's Friend			✓
Cenchrus clandestinus	Kikuyu	✓	✓	✓
Cirsium vulgare	Spear thistle	✓	✓	✓
Conyza bonariensis	Fleabane	✓		
Cyperus eragrostis	Umbrella Sedge	✓		
Ehrharta erecta	Panic Veldt Grass	✓	✓	✓
Facelis retusa	Annual Trampweed			✓
Gomphocarpus fruticosus	Narrow-leaved Cotton Bush	✓	✓	
Lantana camara	Lantana	✓	✓	✓
Lysimachia arvensis	Scarlet Pimpernel	✓		
Olea europaea	African Olive		✓	
Paspalum urvillei	Vasey Grass		✓	✓
Phytolacca octandra	Ink Weed		✓	
Plantago lanceolata	Lamb's Tongue	✓	✓	✓
Rumex conglomeratus	Clustered Dock	✓		
Senecio madagascariensis	Fireweed	✓	✓	✓
Seteria parviflora	-	✓	✓	
Sida rhombifolia	Paddy's Lucerne	✓	✓	✓
Solanum mauritianum	Tobacco bush	✓	✓	✓
Solanum nigrum	Black-berry Nightshade			✓
Stellaria media	Chickweed			✓

Scientific name	Common name	Zone		
		1	2	3
Taraxacum officinalis	Dandelion	✓	✓	✓
Trifolium repens	White Clover	✓	✓	✓
Verbena bonariensis	Purpletop	✓	✓	✓

Three (3) of the exotic species present within the subject site are listed as priority weeds under the *Biosecurity Act 2015*. Two (2) of these weeds are also considered to be Weeds of National Significance and Priority weeds for the Hunter Region (Table 2.3). Weed control activities will focus on eliminating Priority Weeds and WoNS from the site. Other environmental weeds listed above will also be controlled where practical.

Table 2.3 Priority weeds and Weeds of National Significance (WoNS)

Scientific name	Common name	Priority Weed for the Hunter Region	WoNS
Lantana camara	Lantana	✓	✓
Olea europaea	African Olive	✓	-
Senecio madagascariensis	Fireweed	✓	✓

2.7 Fauna habitats

A range of fauna habitat features are present throughout the subject site that provide a variety of potential foraging, breeding, roosting and nesting resources for native fauna. Key habitat features include:

– Hollow-bearing trees and stags (roosting / breeding habitat for arboreal mammals, microbats, birds)
– Leaf litter / woody debris (shelter and foraging habitat for insects, birds, reptiles, frogs, small mammals)
– Mature flowering Eucalypt trees (foraging habitat for nectar-feeding birds and flying-foxes)

The site retains little connectivity to other remnant vegetation in the locality. A small extent of similarly structured vegetation occurs directly to the east of the site. This vegetation has been rezoned as R1 – General Residential and is subject to a BDAR under the same DA. Vegetation within the subject site is predominantly surrounded agricultural grassland and may support mobile fauna such as the Vulnerably listed Grey-crowned Babbler (*Pomatostomus temporalis temporalis*; BC Act) that was identified during the site assessment.

The objectives of this VMP are consistent with maintaining and improving the fauna habitat values of the site.

3. Management zones

Ecological restoration and management will be focused on three (3) management zones that correspond with the current condition and management requirements of existing vegetation within the subject site. These zones and their management objectives are described in Table 3.1 and shown in Figure 3.

The tasks associated with each vegetation management objective are described in Section 4.

Table 3.1 Management zones and objectives

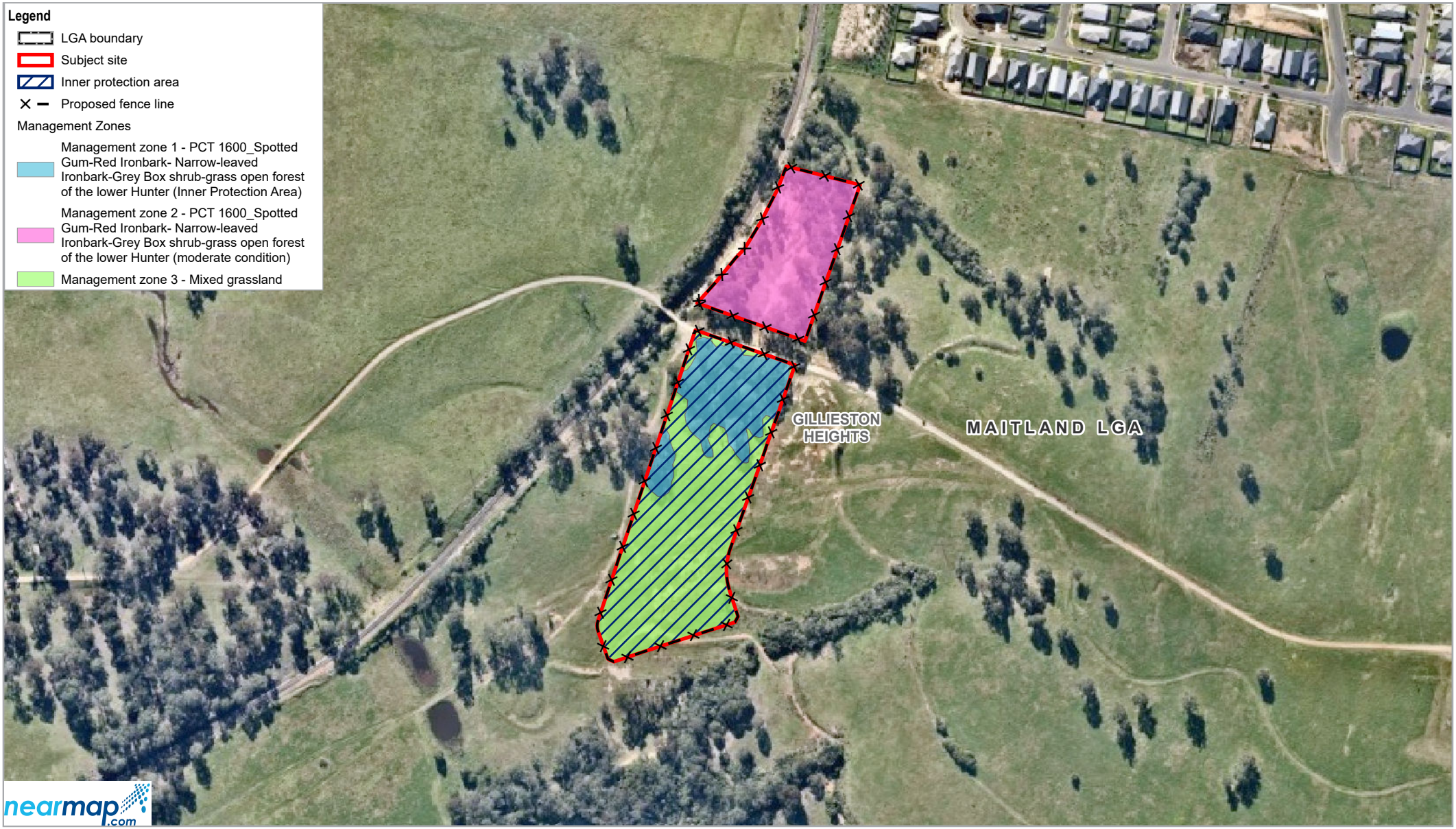
Zone	Name/PCT association	Area	Description	Vegetation management objectives
1	PCT 1600 (now 3443): low-moderate (IPZ)	0.59 ha	 **Plate 3.1*:* Zone 1 - *PCT 1600 Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest* (low-moderate condition; IPZ management)** **Condition** Low-moderate **Description** – Remnant native vegetation with a relatively intact overstorey and grazed shrub/ground layer – Supports a moderate diversity of native species – A high abundance of exotic species occur in the ground layer – Leaf litter, fallen logs and woody debris is abundant.	Protect and enhance the ecological community through: – Exclusion fencing – Natural regeneration – Supplementary planting – Weed control Comply with IPZ requirements through: – Removal, trimming and/or management of native vegetation, where required.

Zone	Name/PCT association	Area	Description	Vegetation management objectives
			Structure An open forest to 20 m with a typically shrubby midstorey and moderately dense ground layer dominated by grasses and forbs. **Characteristic Species** The canopy within this zone is dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus fibrosa* (Red Ironbark) with a lower abundance of *Angophora bakeri* (Narrow-leaved Apple), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus umbra* (Broad-leaved White Mahogany) and *Eucalyptus capitellata* (Brown Stringybark). The shrub stratum contains a moderate diversity of species and is characterised by *Melaleuca nodosa*, *Ozothamnus diosmifolius* (White Dogwood) and *Bursaria spinosa* (Native Blackthorn). Other common species include *Acacia parvipinnula* (Silver-stemmed Wattle) and *Denhamia silvestris* (Narrow-leaved Orangebark). The groundlayer is characterised by native grass species, including *Entolasia stricta* (Wiry Panic), *Cynodon dactylon* (Common Couch) and *Microlaena stipoides* (Weeping Grass). Additional native ground cover species include *Dianella revoluta* (Blueberry Lily), *Goodenia hederacea* (Forest Goodenia), *Solanum prinophyllum* (Forest Nightshade)*, Hardenbergia violacea* (False Sarsaparilla), *and Cheilanthes sieberi* (Rock Fern) **Weed cover** A diverse assemblage of exotic species was recorded in Zone 1 with a moderate level of cover. Species include (but are not limited to) *Sida rhombifolia* (Paddy's Lucerne), *Senecio madagascariensis* (Fireweed), *Ehrharta erecta* (Panic Veldtgrass), *Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush), *Trifolium repens (*White Clover), *Taraxacum officinale* (Dandelion) and *Cenchrus clandestinus* (Kikuyu Grass).	

Zone	Name/PCT association	Area	Description	Vegetation management objectives
2	PCT 1600 (now 3433) and exotic-dominated grassland: low-moderate	0.85 ha	 **Plate 3.2*: Zone 2 - PCT 1600 Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest* (low-moderate condition).** **Condition** Low-moderate **Description** - Zone 2 has a similar structure to Zone 1, albeit with a modified canopy. Select areas retain little to no canopy trees and are representative of exotic-dominated grassland - This zone appears to have been grazed to a higher degree than Zone 1 but still supports a moderate diversity of native species - A high abundance of exotic species. Leaf litter, hollow bearing trees and woody debris are present **Structure** An open forest to 20 m with scattered canopy trees, a typically shrubby midstorey and sparse ground layer. Select areas retain little to no canopy vegetation and a high abundance of exotic grasses and forbs.	Protect and enhance the ecological community through: – Exclusion fencing – Natural regeneration – Supplementary planting – Weed control

Zone	Name/PCT association	Area	Description	Vegetation management objectives
			Characteristic Species The canopy within this zone is dominated by *Corymbia maculata* (Spotted Gum), *Eucalyptus umbra* (Broad-leaved White Mahogany) and *Eucalyptus fibrosa* (Red Ironbark) and a low abundance of *Eucalyptus crebra* (Narrow-leaved Ironbark). The shrub stratum is sparse from cattle grazing, excluding an area of fence off vegetation within the eastern extent of the zone. Common species include *Melaleuca nodosa*, *Daviesia ulicifolia* (Gorse Bitter Pea), *Pultenaea spinosa* (Spiny-bush Pea), *Bursaria spinosa* (Native Blackthorn), *Acacia parvipinnula* (Silver-stemmed Wattle) and *Denhamia silvestris* (Narrow-leaved Orangebark). The ground layer is characterised by a diverse assemblage of native grass species including *Entolasia stricta* (Wiry Panic), *Cynodon dactylon* (Common Couch), *Microlaena stipoides* (Weeping Grass), *Themeda triandra* (Kangaroo Grass) and *Eragrostis brownii* (Brown's Lovegrass). Other common species include *Lomandra filiformis* (Wattle Matt-rush), *Lomandra longifolia* (Spiny-headed Mat-rush), *Pratia purpurascens* (Whiteroot) *Hardenbergia violacea* (False Sarsaparilla) and *Lepidosperma laterale*. **Weed cover** A high abundance of exotic species is present. Weeds of concern include *Lantana camara* (Lantana), *Olea europaea* (African Olive), *Cenchrus clandestinus* (Kikuyu) and *Sida rhombifolia* (Paddy's Lucerne).	

Zone	Name/PCT association	Area	Description	Vegetation management objectives
3	N/A – Predominantly exotic grassland (IPZ)	1.42 ha	 **Plate 3.3: Zone 3 – Predominantly exotic grassland** **Condition** Poor **Description** Disturbed, cleared mixed grassland occurring at the edges of native vegetation communities. **Structure** Vegetation consists of exotic groundcover species with no canopy or shrub layer other than occasional scattered remnant trees. **Characteristic Species** Native ground cover has a very low diversity and is dominated by exotic species including *Conyza bonariensis* (Fleabane), *Cenchrus clandestinus* (Kikuyu), *Trifolium repens* (White Clover), *Paspalum urvillei* (Vasey Grass) and *Setaria parviflora*. Some patches also contain a higher abundance of the native grasses *Cynodon dactylon* (Common Couch) and, *Microleana stipoides* (Weeping Grass). Other natives to be observed within the plots, but at very low percentage covers include *Cheilanthes sieberi* (Rock Fern), *Eragrostis brownii* (Brown's Lovegrass) and *Themeda triandra* (Kangaroo Grass). **Weed cover** The ground storey is dominated by exotic grasses and herbaceous species including, *Ehrhara erecta* (Panic Veldt Grass), *Hypochaeris radicata* (Catsear), *Senecio madagascariensis* (Fireweed), *Trifolium repens* (White Clover), *Facelis retusa* (Annual Trampweed) and *Paspalum urvillei* (Vasey Gras).	Reinstate the ecological community through: – Exclusion fencing – Natural regeneration – Supplementary planting – Weed control Comply with IPZ requirements through: – Removal and/or management of native vegetation, where required.



DRAFT

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Management zones

Figure 3

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Print date: 03 Aug 2022 - 08:01

Data source: Nearmap: Imagery dated June 2020, extracted 20200825; Hydro Aluminium Pty Ltd: Subject Site,2021; LPI: DTDB / DCDB, 2017. Created by: fmackay

4. Management actions

4.1 Restoration targets

Restoration targets have been guided by identified ecosystem attributes including composition (species), structure (complexity and configuration) and function (processes and dynamics) associated with the benchmark (pre-disturbance) state of each vegetation type (PCT). These descriptions have been adapted from previous biodiversity data collected from the site (GHD 2022) and represent the target ecosystem attributes to be achieved as a result of ecological restoration. The targets have also considered the IPZ requirements in Management Zones 1 and 2, as listed below (NSW RFS 2019):

Trees

- Tree canopy cover should be less than 15% at maturity
- Trees at maturity should not touch or overhang the building
- Lower limbs should be removed up to a height of 2 m above the ground
- Tree canopies should be separated by 2 to 5 m
- Preference should be given to smooth barked and evergreen trees

Shrubs

- Create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided
- Shrubs should not be located under trees
- Shrubs should not form more than 10% ground cover
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation

Grass

- Grass should be kept mown (as a guide grass should be kept to no more than 100 mm in height)
- Leaves and vegetation debris should be removed

Table 4.1 Target condition of each Management Zone following management actions under this VMP

Target condition	Zone 1	Zone 2	Zone 3
PCT	PCT 1600 – IPZ management	PCT 1600	Exotic-dominated grassland – restored to PCT 1600, with IPZ management
Description	Open forests with a canopy dominated by *Corymbia maculata*. The mid-storey consists of an open shrub layer. The ground layer is predominately grassy with various graminoids, forbs and small ferns.	Open forests with a canopy dominated by *Corymbia maculata*. The mid-storey consists of an open shrub layer. The ground layer is predominately grassy with various graminoids, forbs and small ferns.	Exotic-dominated grassland. Common species include *Conyza bonariensis* (Fleabane), *Cenchrus clandestinus* (Kikuyu), *Trifolium repens* (White Clover), *Paspalum urvillei* (Vasey Grass) and *Setaria parviflora*.
Upper stratum species (at least 2)	*Corymbia maculata; Eucalyptus fibrosa; Eucalyptus umbra; Eucalyptus capitellata;* *Eucalyptus crebra* Cover 10-15 %	*Corymbia maculata; Eucalyptus fibrosa; Eucalyptus umbra; Eucalyptus capitellata;* *Eucalyptus crebra* Cover 25-40 %	*Corymbia maculata; Eucalyptus fibrosa; Eucalyptus umbra; Eucalyptus capitellata;* *Eucalyptus crebra* Cover 10-15 %
Mid stratum species (at least 5)	*Daviesia ulicifolia; Bursaria spinosa; Persoonia linearis; Pultenaea villosa; Phyllanthus hirtellus; Leucopogon juniperinus; Acacia falcata; Acacia ulicifolia; Acacia parvipinnula; Breynia oblongifolia; Melaleuca nodosa, Lissanthe strigosa, Maytenus silvestris, Ozothamnus diosmifolius,* Cover 5-10%	*Daviesia ulicifolia; Bursaria spinosa; Persoonia linearis; Pultenaea villosa; Phyllanthus hirtellus; Leucopogon juniperinus; Acacia falcata; Acacia ulicifolia; Acacia parvipinnula; Breynia oblongifolia; Melaleuca nodosa, Lissanthe strigosa, Maytenus silvestris, Ozothamnus diosmifolius,* Cover 10-30%	*Daviesia ulicifolia; Bursaria spinosa; Persoonia linearis; Pultenaea villosa; Phyllanthus hirtellus; Leucopogon juniperinus; Acacia falcata; Acacia ulicifolia; Acacia parvipinnula; Breynia oblongifolia; Melaleuca nodosa, Lissanthe strigosa, Maytenus silvestris, Ozothamnus diosmifolius,* Cover 5-10%
Lower stratum species (at least 8)	*Entolasia stricta; Themeda triandra; Lobelia purpurascens; Microlaena stipoides; Aristida vagans; Panicum simile; Imperata cylindrica; Lomandra multiflora; Lomandra filiformis; Glycine clandestina; Lepidosperma laterale; Cheilanthes sieberi subsp. sieberi; Cymbopogon refractus; Dianella revoluta and Dianella caerulea; Lomandra confertifolia; Vernonia cinerea; Brunoniella australis; Goodenia hederacea subsp. hederacea, Hardenbergia violacea.*	*Entolasia stricta; Themeda triandra; Lobelia purpurascens; Microlaena stipoides; Aristida vagans; Panicum simile; Imperata cylindrica; Lomandra multiflora; Lomandra filiformis; Glycine clandestina; Lepidosperma laterale; Cheilanthes sieberi subsp. sieberi; Cymbopogon refractus; Dianella revoluta and Dianella caerulea; Lomandra confertifolia; Vernonia cinerea; Brunoniella australis; Goodenia hederacea subsp. hederacea, Hardenbergia violacea.*	*Entolasia stricta; Themeda triandra; Lobelia purpurascens; Microlaena stipoides; Aristida vagans; Panicum simile; Imperata cylindrica; Lomandra multiflora; Lomandra filiformis; Glycine clandestina; Lepidosperma laterale; Cheilanthes sieberi subsp. sieberi; Cymbopogon refractus; Dianella revoluta and Dianella caerulea; Lomandra confertifolia; Vernonia cinerea; Brunoniella australis; Goodenia hederacea subsp. hederacea, Hardenbergia violacea.*
Weed cover	Maximum 20%	Maximum 20%	Maximum 20%
Conservation significance	Consistent with EEC	Consistent with EEC	Consistent with EEC

4.2 General site procedures

Exotic flora species are already present within the site in high abundance, particularly in areas of exotic grassland. However, increased visitation and disturbance of soil has the potential to introduce and spread of exotic plants. It is essential that weed and pathogen mitigation methods are followed to prevent their establishment on the site or spread to other areas. It is equally important that environmentally sensitive areas are not disturbed as a result of management actions. Procedures described in Table 4.2 will be implemented to ensure negative outcomes at the site do not occur as a result of management actions outlined within this VMP.

Table 4.2 General site procedures

Controls	Procedures	Timing	Responsibility
Inductions	All contractors will complete a site environmental induction including details regarding: – Priority weeds and WoNS occurring and with potential to occur at the site – Requirements for all personnel to report sightings of priority weeds or WoNS to the Site Manager – Weed and pathogen hygiene controls described in this plan to be acknowledged and adhered to	Prior to personnel commencing site tasks	All personnel
Weed hygiene controls	The following procedures will be implemented to minimise the risk of spread / invasion of weeds to / from the site: – Any machinery used on site will follow biosecurity measures, including a thorough inspection prior to entry to the site to look for any weed matter that may pose a biosecurity risk. Inspections will be recorded in a register and kept on file – Any machinery carrying potential weed matter will undergo appropriate wash-down procedures in a controlled location – Wash down areas on site must not be located within 20 m of native vegetation or water bodies. Dirty water is to be disposed of appropriately – Restrict vehicles to designated tracks, trails and parking areas – Light vehicles driving around site will follow biosecurity measures, including a thorough inspection prior to entry and exit of the site for any weed matter that may pose a biosecurity risk – Any removed propagative weed material will be bagged, removed from site and disposed of at a registered green waste facility	Ongoing during all site tasks	All personnel
Pathogen hygiene controls	All works on site should follow appropriate hygiene controls to reduce the risk of introduction or spread of the following pathogens: – Chytrid Fungus (*Bactrachochytrium dendrobatidis*) – an infectious disease that affects amphibians – *Phytophthora cinnamomi* – a soil borne pathogen that causes plant disease and death – Myrtle Rust (*Uredo rangelii*) – an exotic fungus causing plant disease and death Procedures include: – Avoiding work during excessively wet or muddy conditions – All personnel to be inducted on pathogen management measures – Restrict vehicles to designated tracks, trails and parking areas – Wash down boots prior to leaving site at an appropriate location. Disinfect with cleaning products containing 70% methylated spirits in 30 % water	Ongoing during all site tasks	All personnel

4.3 Weed control

Weed monitoring and control is required to reduce weed cover and identify and respond to re-emergence of weed species or new weed infestations that have the potential to compromise the restoration works and to identify appropriate responses.

Appropriate weed removal techniques for exotic species should be implemented by a qualified bush regeneration contractor. Weed control must be carried out in a manner that minimises negative environmental impacts such as over-clearing that may result in erosion and sedimentation and destruction of fauna habitat. Weed management should align with appropriate State and Commonwealth legislation and guidelines including (but not limited to):

– *Pesticides Act 1999*
– *Biosecurity Act 2015*
– *Water Management Act 2000*
– Garden Escapees and Other Weeds of Bushland and Reserves, 3rd Edition (Great Lakes Council 2015)
– NSW Weeds Control Handbook- a guide to weed control in non-crop aquatic and bushland situations (DPI 2018)

Weed biomass should be either composted on-site or disposed of at an approved weed management centre in compliance with the *Biosecurity Act 2015*.

Chemical treatments methods will follow those described in the New South Wales Weed Control Handbook (DPI 2018) and be conducted in accordance with the *Pesticides Act 1999*. The following protocols for chemical weed control should be followed:

– The weed control contractor is to select the most appropriate herbicide based on the information within this plan and current best practices for weed control.
– Pesticide users must hold a current chemicals application training certification to AQF Level 3 and comply with Occupational Health and Safety Standards
– A Material Safety Data Sheet (MSDS) for herbicides is to be used, read and carried by personnel involved with weed control activities
– Foliar spraying is only to be undertaken during periods of low wind (less than 10 km/hr) to reduce overspray
– All pesticide users should take reasonable care to protect their own health and the health of others when using a pesticide
– All pesticide users should make every reasonable attempt to protect sensitive areas on site or harm to native species

Additional chemical weed control, or other weed control techniques may be required in subsequent weed management events beyond those described in Table 4.3.

The need for this will be informed by the results of the monitoring and reporting program as detailed in Section 5.

Weed control guidelines for priority weeds are detailed in Appendix B.

An example weed control proforma is provided in Appendix C.

4.4 Topsoil Preparation

Management Zone 3 (mixed grassland) and grassland areas of Zone 2 have been subject to a moderate level of compaction from long term cattle grazing. To improve conditions for seed germination scarifying/ripping (to 300 mm deep) of topsoil will be necessary to reduce soil compaction and provide a suitable seedbed for germination of native plants. This should be undertaken when the soil is relatively dry (summer or autumn).

Disturbed areas are to have topsoil replaced where required and mulch spread over the roughened/scarified soil. Mulching will assist with absorbing precipitation and retaining moisture levels following rainfall, increasing the surface area and preventing scouring and erosion from surface flows.

4.5 Revegetation guidelines

4.5.1 Direct seeding

Direct seeding is the delivery of native seeds into the soil using a mechanical seeder. *Acacias* and other legumes fix nitrogen in the soil while growing and can therefore greatly improve soil condition. Many of these plants also flower heavily and are therefore very attractive to birds and insects. The addition of these pollinators into the revegetation work adds diversity and brings opportunities for natural regeneration.

Direct seeding can be a cost-efficient method of re-establishing native vegetation that has been disturbed or removed. This method will be used to re-establish a native groundcover within Management Zones 2 and 3.

4.5.2 Hand broadcasting of native seed

To supplement the establishment of native trees, shrubs and lower story, native grass seeds will be hand broadcast throughout the maintenance period of the restoration program. This will add further diversity to the site, particularly ground covers, and assist in achieving targets for planting densities.

4.5.3 Tube stock

Planting of tube-stock for trees and shrub species and Hiko or Viro cells will be utilised. Advanced stock will not be used for rehabilitation purposes. Plants grown from seed of local provenance are to be used for revegetation. Plants may be sourced from local seed collection and propagation or will be purchased from a local bush regeneration nursery. The sourcing of plants from commercial nurseries is not recommended unless the provenance of these plants is known and local to the study area.

Appendix A provides a list of species suitable for planting within each management zone and the recommended planting densities, where required. The table lists a more than adequate number of species, to allow for the non-availability of some species. Horticultural varieties and cultivars are not acceptable under any circumstance.

Stock for revegetation should be sourced as early as possible to ensure availability.

The species listed are:

– Associated with the appropriate vegetation type.
– Expected to be available as local provenance through seed collection and propagation or tube-stock from a local bush regeneration nursery.
– Likely to have good survival rates in the subject area under the proposed site preparation and maintenance regime.

4.5.4 Installation

Planting should occur at a time that will maximise plant survival rates as determined by the Bush Regeneration Contractor, the commencement date of VMP, prevailing weather conditions and timing of weed control activities at the site.

Planting should be done via a low impact method such as hand digging or hand auger. The holes dug for each tubestock should be at least 1.5 x the width and 2 x the depth of the root ball. Fertiliser and water crystals should be added to each hole dug as per the label specifications. Water crystals will be treated prior to planting to ensure they are at their full extent so as not to push any seedling out of the ground once planted.

4.5.5 Watering

Seedlings should be initially watered in with at least 1 litre (L) of water and follow up watering every second day for two weeks (or at the discretion of the bush regeneration contractor based on prevailing weather conditions or if plants are deemed to have sufficient water supply from water crystals). If significant rainfall occurs post planting irrigation is only required every 5 days. Irrigation will be required if rainfall does not occur within a 5-day period, irrigation should continue for at least 6 weeks or until the bush regeneration contractor determines the plants have established successfully and irrigation can be phased out.

4.5.6 Tree guards

To improve seedling survival plan for plantings prior to small rainfall events. Tree guards are recommended for canopy species to provide protection from browsing.

4.6 Vegetation management for IPZ compliance

4.6.1 Zone 1: PCT 1600, low-moderate condition.

Stage 1: Initial management of vegetation

Management Zone 1 is representative of low-moderate condition woodland and retains an open canopy structure (Plate *3.1*). It is broadly commensurate with *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* EEC under the BC Act. The overall canopy cover in this zone is estimated to be 30% and require thinning to comply with IPZ requirements. This zone cannot exceed 15% canopy cover and subsequently it is recommended that:

- Approximately 10% of established trees be removed. Trees to be removed should be identified and clearly demarcated by a suitably qualified ecologist
- An ecologist should attend the subject size during tree felling to relocate any displaced fauna to adjacent vegetation
- Felled trees from Zone 1, representative of potential fauna habitat, be placed in Zone 2
- Fallen trees and branches greater than 10 cm in diameter be placed in Zone 2
- Tree canopies within 2 m of each other be trimmed to ensure at least 2-5 m between individuals
- Lower limbs of all trees should be removed up to a height of 2 m above the ground

The shrub layer with Zone 1 is sparse and less than 10% cover. Despite this, the removal of shrubs may be required where:

- Shrubs occur directly beside the base of a tree
- Clumps of shrubs occur within close vicinity to one another

The ground stratum is to be managed through the removal of vegetation debris, and the trimming of grasses to a maximum of 10 cm in height.

The management of this community as an IPZ will impact native vegetation representative of an EEC. These impacts have been considered within the associated Precinct 1 Biodiversity Development Assessment Report (GHD, 2022).

Stage 2: Selective planting

Selective planting of native species associated with PCT 1600 and by extent, *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* EEC, is recommended within Zone 1. Planting should target the midstorey and understorey, follow the specifications outlined in Appendix B and utilise the methods outlined in Section 4. Tree species should not be planted within this zone.

Stage 3: Ongoing maintenance

It is recommended that routine maintenance (every 3-6 months) be completed within Zone 1 as to ensure the continued compliance with IPZ requirements.

Maintenance should include:

– The trimming of tree canopies within 2 m, ensuring a 2-5 m gap between individuals
– The removal of built-up vegetation debris
– The trimming of grass to 10 cm or below in height

Further management recommendations may be provided throughout the 10-year duration of the VMP, informed by monitoring surveys.

4.6.2 Zone 3: Exotic-dominated grassland

Zone 3 contains little to no mature canopy trees and is broadly compliant with the vegetation requirements of an IPZ. It is recommended that a selective planting programme be completed within this zone that aims to regenerate PCT 1600, and by extent, *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* EEC (BC Act).

Stage 1: Topsoil preparation

Management Zone 3 has been subject to a moderate level of compaction from long term cattle grazing. To improve conditions for seed germination scarifying/ripping (to 300 mm deep) of topsoil will be necessary to reduce soil compaction and provide a suitable seedbed for germination of native plants. This should be undertaken when the soil is relatively dry. The zone may require the replacement of topsoil where compaction and erosion have occurred. Mulch should be spread over the roughened/scarified soil to assist with absorbing precipitation and retaining moisture levels.

Stage 2: Selective planting

Selective planting of native species associated with PCT 1600 and by extent, *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* EEC, is recommended within Zone 3. Planting should target all strata, follow the specifications outlined in Appendix B and utilise the methods outlined in Section 4.

Stage 3: Ongoing maintenance

It is recommended that routine maintenance (every 3-6 months) be completed within Zone 3 as to ensure the continued compliance with IPZ requirements.

Maintenance should include:

– The trimming of tree canopies (once established) within 2m, ensuring a 2-5m gap between individuals
– The removal of built-up vegetation debris
– The trimming of grass to 10cm or below in height

4.7 Summary of management actions

The management actions that will be undertaken to meet the objectives of the VMP are provided in Table 4.3.

Table 4.3 Summary of management actions

Activity	Applicable zone	Task	Performance criteria	Timing	Responsibility
1. Source required personnel	All zones	Source Bush Regeneration Contractor and Weed control Contractor.	Suitably qualified personnel (see Section 1.7) engaged.	Within three months of the commencement of this VMP.	Project manager
2. Source local provenance tubestock and seed	Zones, 1, 2 and 3	Contact local suppliers to ensure availability of local tubestock and seed.	Order placed for seed and tubestock to meet required planting densities (refer to Appendix A).	Within three months of engaging Bush Regeneration Contractor.	Bush Regeneration Contractor
3. Exclusion fencing	All zones	All existing fencing should be removed and replaced with new exclusion fencing as shown in Figure 3.	Fencing installed that follows best practice for stock proof fencing including wildlife friendly fencing guidelines.	Within three months of the commencement of this VMP.	Site manager
4. Establish photo monitoring points	Two (2) photo monitoring points will be established in Zones 2 and 3. One (1) will established in Management Zone 1.	– Photo monitoring points will be established within the site with a capped star picket or surveyors peg – The location will be recorded with a GPS so the point can be located easily, especially in the event the marker is knocked down or removed	– Four (4) photos are to be taken from each photo point. Photos are to be taken to the north, south, east and west – Photos will be labelled with the: • Photo point code • Direction of view • Date and time	Within three months of the commencement of this VMP.	Project ecologist
5. Control of Fireweed	All zones.	– Chemical spot spraying of Fireweed seedlings – Hand weeding of individual plants	– Less than 10% of original weeds remaining	Chemical control occurs once in the first year Follow up hand weeding annually in Spring (Sept – Nov), if required	Weed control contractor
6. Control of Lantana	All zones.	– Suppress growth and eradicate infestations – Chemical or manual control as determined by the weed control contractor	– All Lantana individuals eradicated	Year 1	Weed control contractor
7. Control of African Olive	All zones	– Suppress growth and eradicate infestations	– All African Olive Individuals eradicated.	Years 1 – 3.	Weed control contractor

Activity	Applicable zone	Task	Performance criteria	Timing	Responsibility
		– Chemical control via various methods		Chemical control occurs twice in the first year (6 months apart). Follow up chemical control is to be conducted once annually until full eradicated.	
8. General weed control	All zones	Spot spraying of annual and perennial weeds once every three months	– Up to 20% cover of exotic species	Years 1 – 5	Weed control contractor
9. Annual maintenance weed control	All zones	– Chemical or physical weed removal as required – Frequency to be determined by the weed control contractor based on the outcomes of previous weed control	– No mature woody weeds remaining – Priority weeds less than 5% cover – Exotic groundcover less than 5%	Years 2-6	Weed control contractor
10. Revegetation	All zones	Replanting to restore native vegetation communities. Refer to Section 4.5 for revegetation guidelines and Appendix A for recommended densities.	85% survival rate of tubestock. A 50% coverage of native groundcover with at least 8 groundcover species, 5 shrub species and 2 canopy species that are consistent with restoration targets in Section 4.1.	Within 18 months of commencement of this VMP.	Bush regeneration contractor
			80% coverage of native groundcover with at least 8 groundcover species and 3 shrub species and 2 canopy species that are consistent with restoration targets in Section 4.1.	Year 3	Bush regeneration contractor
			90% coverage of native groundcover. Restoration targets in Section 4.1 achieved.	Years 4-5	Bush regeneration contractor
11. Supplementary planting if: • Original tube stock has less than 85% survival rate • performance criteria have not been met	All zones	Replacement or infill planting of tubestock.	85% survival rate of tubestock. Revegetation performance criteria are met.	Annual checks and plantings where required to meet performance criteria.	Bush regeneration contractor

5. Monitoring and review

Monitoring actions to meet the objectives of the VMP are provided in Table 5.1.

An adaptive management approach should be employed during the implementation of this VMP to ensure that the objectives of the VMP are achieved. This will include a process of monitoring, reviewing and then implementing corrective actions in response to the statues of weed growth, the health and survival of plantings, natural regeneration rates of native vegetation and prevailing weather conditions as outlined in Table 5.1.

The Project Manager, in consultation with the Project Ecologist, Bush Regeneration Contractor and Weed Control Contractor, can adapt the actions described in this VMP where required, as long as any changes comply with the purpose and objectives of this VMP, and any licensing or approval conditions issued. Such changes may include (but not limited to):

– Application rates for fertiliser
– Watering schedule
– Species composition or planting densities if required by availability or survival rates of a particular species or stock
– Schedule of weed control activities if they are meeting or not meeting performance indicators

Table 5.1 Monitoring actions

Activity	Applicable zone	Task	Performance criteria	Timing	Responsibility
Photo monitoring surveys	All zones	– Four (4) photos are to be taken from each photo point. Photos are to be taken to the north, south, east and west – Photos will be labelled with the: • Photo point code. • Direction of view. • Date and time.	– Photos must accompany monitoring reports in an appropriate file format (e.g.jpeg) to enable comparison between monitoring events	Annually in Spring	Project ecologist
Annual monitoring reports	All zones	Complete an annual report to evaluate the success of the VMP. Monitoring reports will be submitted to the Project Manager.	Reporting will address the following: – Describe weed control measures undertaken and their success against VMP objectives and performance criteria – Describe any revegetation activities and their success against VMP objectives and performance criteria – Any recommendations to update or amend the VMP to include alternative or additional activities to meet the objectives and performance criteria of the VMP	Annually in Spring	Bush regeneration contractor, weed control contractor, project ecologist
Corrective actions	All zones	To correct any issues identified. Corrective actions may include: – Additional weed control events (increased frequency) – Additional weed control strategies (different treatments / techniques) – Additional supplementary planting events or techniques (e.g increased irrigation)	Performance criteria are achieved as per the management actions detailed above.	Once two or more monitoring events reveal either: – An increase in the coverage of exotic species (especially priority weeds) or the introduction of new weeds – Native vegetation performance criteria have not been met Restoration targets have not been achieved by Year 5.	Site manager Project ecologist Bush regeneration contractor Weed control contractor

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Appendices

Appendix A

Revegetation species list and densities

Planting densities

Table A.6.1 Planting densities

	Trees	Shrubs	Ground covers/ grasses	Total
Zone 1 (IPZ)				
Density	Not required	1 per 15 m^2	1 per 1 m^2	
Required numbers	-	395	5,900	6,295
Zone 2				
Density	1 per 10 m^2 (where trees are absent)	1 per 4 m^2	1 per 1 m^2	
Required numbers	250	2,125	8,500	10,875
Zone 3 (IPZ)				
Density	1 per 40 m^2	1 per 10 m^2	1 per 1 m^2	
Required numbers	355	1,420	14,200	15,975

Species list

Table A.6.2 Recommended planting list for Management Zones 1, 2 and 3 to align with PCT 1600

Scientific name	Common name
Trees	
Corymbia maculata	Spotted Gum
Eucalyptus crebra	Narrow-leaved Ironbark
Eucalyptus fibrosa	Red Ironbark
Eucalyptus umbra	Broad-leaved White Mahogany
Shrubs	
Persoonia linearis	Narrow-leaved Geebung
Bursaria spinosa	Sweet Bursaria
Daviesia ulicifolia	Gorse Bitter Pea
Denhamia silvestris	Narrow-leaved Orangebark
Pultenaea villosa	Hairy Bush-pea
Acacia parvipinnula	Silver-stemmed Wattle
Breynia oblongifolia	Coffee Bush
Melaleuca nodosa	Prickly-leaved Paperbark
Leucopogon juniperinus	Prickly Beard-heath
Acacia falcata	Hickory Wattle
Ground covers	
Themeda triandra	Kangaroo Grass
Microlaena stipoides	Weeping Grass
Imperata cylindrica	Blady Grass
Panicum simile	Two-colour Panic
Aristida vagans	Threeawn Speargrass

Scientific name	Common name
Cheilanthes sieberi	Mulga fern
Lepidosperma laterale	Variable Sword-sedge
Lomandra confertifolia	Matrush
Lomandra multiflora	Many-flowered Mat-rush
Entolasia stricta	Wiry Panic
Cymbopogon refractus	Barbwire Grass
Pteridium esculentum	Bracken Fern
Lobelia purpurascens	Whiteroot

Appendix B

Weed control guidelines

African Olive (*Olea europaea*)

A relatively low abundance of African Olive was detected within the subject site. Successfully controlling this species involves following up on initial efforts (DPI, 2022). Efforts should be taken to avoid the dropping of seeds in soil during control methods.

Controlling African Olive within the subject site should involve:

Spraying – This involves the spraying of herbicides on the plant's leaves. This is only recommended for seedlings and small plants. A mixture of 1 part glyphosate (360 g/L) to 50 parts water should be used.

Cut Stump – This method is effective for plants up to 10 cm in diameter (if present). It involves cutting the plant 10cm from its base and applying a mixture of 1 part glyphosate (350 g/L) per 1.5 parts of water within 15 seconds.

All African Olive plant material should be removed from the subject site and disposed of appropriately.

Fireweed (*Senecio madagascariensis*)

Long-term fireweed control needs to consider that:

– Most new seedlings appear in autumn
– Many new seedlings appear after rain when temperatures are 15–27 °C
– Seedlings grow fast and can flower 6–10 weeks after emerging
– Flowering and seeding occur mostly in spring
– Most plants die off by late spring
– Some plants live for up to three years - the tops die back in spring and regrow the following autumn
– Fireweed seed buried deeper than two centimetres (cm) is unlikely to germinate
– Long-term follow up is essential because about 15% of seeds remain dormant for over 10 years

In environmentally sensitive areas it is recommended to hand-pull individual plants and spot spray herbicide where necessary and within the most appropriate time of the year, generally late autumn (DPI, 2022).

Table B.1 Herbicide options for control of Fireweed (DPI, 2022)

Herbicide	Rate	Method
Metsulfuron-methyl 600 g/kg (Various products)	10 g in 100 L of water	Spot spray application
Fluroxypyr 140 g/L + Aminopyralid 10 g/L (Hot Shot™)	500 mL in 100 L of water	Spot spray flowering plants up to 30 cm tall
Picloram 100 g/L + Triclopyr 300 g/L + Aminopyralid 8 g/L (Grazon Extra®)	350 mL in 100 L of water	Spot spray application

Lantana (*Lantana camara*)

To control lantana:

- Gradually control sections of large infestations, starting at the edges (do as much at a time as you can follow up)
- Dry or frosty periods are good times to work on mature lantana plants
- Treat regrowth or seedlings before they are 1 m high
- Control young plants before they are a year old to prevent new fruit and seeds
- In summer, look for a flush of seedlings after rain, and kill the seedlings 1 – 3 after the rain event (lantana seeds can germinate year-round but peak after summer rain)
- 1 – 3 months after clearing, burning or cultivation, look for regrowth or new seedlings and control them
- 3 – 6 months after the end of a dry spell, look for dry lantana that appeared dead reshooting from the base, and control the regrowth
- In spring, look for plants that reshoot after frost damage, and control the survivors
- Physical removal can occur year-round, after rain when soil is moist. Follow-up within 3-6 months

Chemical control

Spraying leaves

Small plants less than 2 m can be sprayed at any time of the year as long as they are actively growing. Stressed plants don't take up much herbicide. Treat regrowth from burning, cutting, slashing or frost when plants are 30 cm to 1 m high.

Spray mature lantana (>2 m high) between February and the first frost.

Early morning or late afternoon is the best time to spray during Autumn.

Gas or splatter-gun

Splatter-guns use small amounts of highly concentrated herbicide. A 5 L bottle of mixed herbicide should cover about 0.2 ha of lantana. The splatter gun:

- Works best on dense infestations at least 300 mm high
- Limits off-target plant damage
- Is good for hard-to-access and steep areas
- Can be used year-round if plants are actively growing, but works best during summer
- Is cheaper than traditional foliar spray methods

Spray before 10 am and after 3 pm when it is cool. Angle the gun at 45 degrees and spray an arc over the top of the plant and down the front face. Apply 2 squirt lines per half a metre of plant height. The amount to apply will depend on the herbicide concentration. Do not spray until herbicide runs off.

Do not use the splatter-gun:

- In wet weather
- When there is water or dew on the plants
- On spindly lantana regrowth

Spraying stems

Applying herbicide to the stems is called 'basal barking'. It is effective at any time of year. Mix herbicide with diesel. Apply around all stems from the ground up to 30 cm high by:

- Spraying at low-pressure
- Painting on with a brush

Cut stump method

Cut stems off at about 15 cm from the ground. Apply herbicide to the cut surface of the stump within 15 seconds. Treat every cut stem because lantana regrows vigorously from untreated stems.

Herbicide	Rate	Method
2,4-D 300 g/L + Picloram 75 g/L (Tordon® 75-D)	650 mL per 100 L of water	High volume spot spray. Thoroughly wet foliage and soil around the base of plant during March to May.
2,4-D amine 625 g/L (Various products)	320 m/L in a 100 L of water	Apply to actively growing bushes.
Dichlorprop 600 g/L (Lantana 600®)	1.0 L per 200 L of water	Spot spray application, completely wet all leaves and stems.
Fluroxypyr 140 g/L + Aminopyralid 10 g/L (Hot Shot™)	500 mL per 100 L of water	seedlings and regrowth 0.5–1.2 m height. Apply to actively growing plants.
Fluroxypyr 200 g/L (Comet® 200 herbicide)	500 mL or 1.0 L per 100 L of water	Apply to actively growing bushes from October to April. Use lower rate on seedlings or bushes to 1.2 m high, higher rate on bushes over 1.2 m.
Fluroxypyr 333 g/L (Starane™ Advanced)	300 - 600 mL in 100 L of water	Apply to actively growing bushes from October to April. Use lower rate on seedlings or bushes to 1.2 m high, higher rate on bushes over 1.2 m.
Glyphosate 360 g/L (Various products)	1.0 L per 100 L of water	Actively growing with full foliage. Avoid summer stress.
	1 part per 9 parts water	Gas gun / Splatter gun application. Apply 2 x 2 mL doses per 0.5 m of bush height.
Glyphosate 360 g/L with Metsulfuron-methyl 600 g/kg (Various products)	10 g metsulfuron-methyl plus 200 mL glyphosate per 100 L of water	Apply to bushes up to 2 m high. Thoroughly wet all foliage and stems. Add organosilicone penetrant.
Metsulfuron-methyl 300 g/kg + Aminopyralid 375 g/kg (Stinger™)	20 g in 100 L of water	Hand gun application.
Metsulfuron-methyl 600 g/kg (Various products)	10 g per 100 L of water	Apply to bushes up to 2 m tall. Spray to wet all foliage and stems. Re-treatment will be necessary.
Picloram 100 g/L + Triclopyr 300 g/L + Aminopyralid 8 g/L (Grazon Extra®)	350 - 500 mL in 100 L of water	Wet thoroughly, use higher rate on large bushes, 1–2 m tall. Low rates for bushes up to 1 m tall. Apply from summer to autumn.
Picloram 44.7 g/kg + Aminopyralid 4.47 g/L (Vigilant II ®)	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm.
Triclopyr 240 g/L + Picloram 120 g/L (Access™)	1.0 L per 60 L of diesel	Basal bark or cut stump application.
Triclopyr 300 g/L + Picloram 100 g/L (Various products)	350 - 500 mL per 100 L of water	Wet thoroughly, use higher rate on large bushes, 1–2 m tall. Low rates for bushes up to 1 m tall. Apply from summer to autumn.
Triclopyr 600 g/L (Garlon® 600)	1.0 L per 60 L of diesel	Basal bark application for basal diameter less than 5 cm or cut stump application above 5 cm.

Appendix C

Example weed control proforma template

Weed control proforma			
Project details			
Date			
Name			
Contact details			
Location			
Company/organisation			
Site	1	2	3
Weather	Wind speed and direction:		
	Temperature:	Rainfall (prev 24hrs):	
Woody weeds			
Weed cover %			
Dominant species			
Proportion ground cover extent			
Weed cover %			
Dominant species			
Native cover %			
Common species			
Treatment			
Weed management techniques used (e.g. Spray unit, manual removal, cut and paint)			
Equipment details (eg nozzle type, angle, pressure)			
Product details (transcript product name, rate or dose from the label)			
Volume of herbicide used	Concentrate: mL Mixed volume: L	Concentrate: mL Mixed volume: L	Concentrate: mL Mixed volume: L

Weed control proforma			
Maintenance and additional works required			
Photos taken at monitoring locations (circle answer)	Yes / No	Yes / No	Yes / No
Planned work before next monitoring report			
Any recommendations for corrective actions to improve weed management outcomes at the site.			

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