BLACKWOOD ECOLOGICAL SERVICES

Vegetation Management Plan
Afterlee Ecovillage

Afterlee, NSW 2474
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NOTE

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1 INTRODUCTION

1.1 Background

Blackwood Ecological Services has been engaged by Planning Regenerative Communities to prepare a Vegetation Management Plan (VMP) for the proposed Afterlee Ecovillage site at 2085-2087 Afterlee Road, Afterlee.

The site is located to the immediate southeast of the village of Afterlee. Approximately two thirds of the site occurs south of Afterlee Road including expansive areas of bushland south of the Dam Access Road. In the north-east the site extends north of Afterlee Road with the northern boundary formed by Cob O'Corn Creek which flows in a south-easterly direction.

The site consists of areas of open grazing land with scattered native paddock trees as well as large tracts of wet sclerophyll forest. These forested areas are located predominantly in the western and southern parts of the site. There are some small pockets of Subtropical rainforest which occur in the more sheltered areas of the site in association with drainage lines.

The master plan for the Afterlee Ecovillage includes the establishment of 65 homesites with access from both Afterlee Road and the Dam Access Road. A community hall, village square and revival of the local Afterlee village school and café are proposed as part of this project.

FIGURE 1 shows the location of the site. FIGURE 2 shows the entire Ecovillage site as well as the location of proposed restoration zones.

1.2 The Study Area

1.2.1 Introduction

The site is located centrally within Kyogle Shire. To the north and east the site adjoins open grazing land with scattered paddock trees. Surrounding areas to the north, south and west include large expanses of bushland connecting through to Toonumbar State Forest and the World Heritage areas of Richmond Range and Toonumbar National Parks.

1.2.2 Weather

Climate in the Northern Rivers is warm subtropical with heavy summer rainfall (January to March) and a dry winter and spring. Rainfall is high – a result of mountainous topography close to the coast. The average rainfall tends to decrease from east to west. In the warmer summer-autumn months, tropical cyclones often move down the Queensland coast from the Coral Sea and affect the Northern Rivers, bringing flood rains and strong winds (Forestry Commission of NSW 1996).

1.2.3 Flora and Fauna

The north-eastern corner of NSW is generally an area of extremely high biodiversity, the biogeographic province known as the McPherson-Macleay overlap zone (Landmark *et al* 1999). In the Study area the range of environmental factors such as topography, altitude, aspect, geology and climate have produced a diversity of available habitats, which support a high diversity of plants at both the species and community level. Many tropical plant species reach their southern limits within the McPherson-Macleay overlap zone, with many species of temperate origin reaching their northern limits. More than half the 6,363 vascular plant species identified in NSW occur in north-eastern NSW (Landmark *et al* 1999).

The North Coast of NSW (coastal areas east of the Dividing Range between the Hunter River in the south to the Queensland border in the north) has the highest number of Rare or Threatened plant species in the state (Briggs and Leigh 1996).

Afterlee is situated in a region where elements of three of Australia's five historic land biotas mingle (Schodde 1991). Only in the north-east wet tropics of Queensland is the biotic mixture more complex where four of the five biotas abut. The Tumbunan fauna consists of subtropical rainforest species that were formerly widely distributed across the continent during wetter periods. The Torresian fauna is comprised of species from the tropical, grassy savanna woodlands of northern Australia. The Bassian component of the local fauna comes from the eucalypt-dominated sclerophyll forests of Southern Australia (Landmark *et al* 1999).

As a result of these palaeogeographical factors and neogeographical factors (coastal location, wide elevational and topographic variation, mixture of fertile and infertile soils, high rainfall and mild climatic regime resulting in a mosaic of vegetation communities), the vertebrate fauna of the region is one of the richest and most diverse in Australia. The diversity of available habitats over a wide range of altitudes from near sea level to over one thousand metres (1000m) ASL creates a wide variety of occupiable niches.

1.3 Ecological restoration on the Subject site

The site includes a variety of landscape types including intact forests, open grazing land, dams and disturbed watercourses. Native vegetation has largely been removed from the more fertile soils in lower lying parts of the site and the site has experienced decades of disturbance from other sources including weed invasion, soil compaction and other agricultural practices.

One of the aims of the Ecovillage is to contribute toward rehabilitation of the land over time and to help restore ecosystem functions to this historically degraded landscape. Ecological restoration works are to occur in tandem with regenerative agriculture practices to contribute toward other objectives of the Ecovillage such as sustainable food production and improved amenity values.

The purpose of this VMP is to identify areas of the site best suited to environmental restoration works, develop appropriate strategies for the implementation and ongoing maintenance of these works and provide a resource for the community to guide the restoration process. The VMP includes detail on weed control, planting, site maintenance and other issues to ensure a best practice approach to restoration works.

2 LITERATURE REVIEW

2.1 Introduction

This section provides a summary of relevant studies into significant areas of remnant native vegetation in the surrounding area.

2.2 South Toonumbar State Forest

South Toonumbar State Forest is located approximately 1.5km west of the Subject site. Forest types within this State Forest include large areas of Wet sclerophyll with small pockets of Subtropical rainforest in sheltered areas.

The wet sclerophyll forests are very tall with a sparse mid story and grassy ground layer is the dominant vegetation type within this state forest. The canopy includes a mix of species although collectively it very frequently includes mahoganies, Grey ironbark and Small-fruited grey-gum. In addition, Spotted gum, Tallowood and Pink bloodwood are all occasional but can be locally prominent. Forest oak is almost always present in the midstory. Grasses include Kangaroo grass and Blady grass with native vines and scramblers also common.

2.3 Eden Creek State Forest

Eden Creek State Forest is located approximately 3km east of the Subject site. This State forest is made up of areas of Wet sclerophyll, Dry sclerophyll and Dry rainforest communities. Areas of Wet sclerophyll forest are similar in composition to South Toonumbar National Park. Dry sclerophyll forests are tall with a sparse mid-stratum and grassy ground cover. The canopy is diverse and can include Grey ironbark, Narrow-leaved ironbark, Pink bloodwood, Forest red gum and White mahogany. The mid-dense ground layer is typically comprised of soft-leaved forbs, grasses, twiners and hardy ferns.

2.4 Toonumbar National Park

The World Heritage listed Toonumbar National Park covers an area of 14991ha and is located approximately 4km northwest of the site. The underlying geology is underlying sandstones, siltstones and shales which are sedimentary material deposited by ancient rivers during the Mesozoic era (135 – 235 million years ago). More recent volcanic activity from the Focal Peak Shield Volcano has overlain areas of the park with basalt flows. The basalts weather to form krasnozems and chocolate soils which are fertile and support rainforest communities (Richmond Range Plan of Management 2005). The park supports areas of Subtropical and Dry rainforest as well as Wet sclerophyll forest. These communities provide a habitat for a range of fauna and flora.

Threatened fauna species found in the Reserve include the Koala (*Phascolarctos cinereus*), Black-striped wallaby (*Macropus dorsalis*), Common planigale (*Planigale maculata*), Pouched frog (*Assa darlingtoni*) and Little bent-wing bat (*Miniopterus australis*). Threatened birds recorded include Albert's lyrebird (*Menura alberti*), Marbled frogmouth (*Podargus ocellatus*), Sooty owl (*Tyto tenebricosa*), Powerful owl (*Ninox strenua*), Barred cuckoo-shrike (*Coracina lineata*), Wompoo fruit-dove (*Ptilinopus magnificus*), Superb fruit dove (*Ptilinopus superbus*) and Rose-crowned fruit dove (*Ptilinopus regina*) (NPWS, Parks and Reserves of the Northern Richmond Range: Plan of Management).

2.5 Richmond Range National Park

Richmond Range National Park is a World Heritage listed reserve located 5km west of the site. It covers 15420ha supporting areas of Wet and Dry sclerophyll forest as well as Subtropical and Dry Rainforest communities.

These rainforests support a diversity of threatened animal species, particularly fruit eating pigeons, owls and a diversity of mammals such as wallabies, pademelons, native rodents, gliders, koalas and the spotted-tailed quoll. The wet sclerophyll forests of the northern Richmond Range also support a range of threatened fauna and are also significant because the dominant canopy tree is the Richmond Range spotted gum, a form of *Corymbia variegata* (Hunter, 1999) which is has highly restricted range.

The Richmond Range forms the upper catchments of both the Richmond and Clarence Rivers, the main river systems of the far north coast of NSW. The Richmond Range separates these two catchment areas with the eastern side of the Range draining into the Richmond River and the western side into the Clarence River (NPWS, Parks and Reserves of the Northern Richmond Range: Plan of Management).

3 FLORA

3.1 Introduction

This section describes vegetation communities present on the site and the biodiversity values of site vegetation. Relevant databases and reports were reviewed to identify records of locally occurring Threatened and Rare plant species, populations, and communities. Site surveys were completed on site in September 2023 by Blackwood Ecology.

3.2 Literature Review

3.2.1 NPWS Database search

A search of the NPWS Database revealed 8 Threatened flora species within 5km of the Subject site. These species are shown in **TABLE 1**.

TABLE 1
NPWS DATABASE RECORDS OF THREATENED FLORA SPECIES WITHIN 5 KM OF THE SUBJECT SITE

Botanical name	Common name	NSW Status	No. of records
Senna acclinis	Rainforest Cassia	E1	2
Sophora fraseri	Brush Sophora	V	9
Owenia cepiodora	Onion Cedar	V	3
Tinospora smilacina	Tinospora Vine	E1	1
Backhousia subargentea	Giant Ironwood	E1	1
Rhodamnia rubescens	Scrub Turpentine	E4A	6
Rhodomyrtus psidioides	Native Guava	E4A	2
Arthraxon hispidus	Hairy Jointgrass	V	7

KEY
E1 Endangered
E4A Critically endangered
V Vulnerable

3.2.2 Commonwealth EPBC Act (1999) Database search

A search of the Commonwealth EPBC Act (1999) Database revealed records of 26 Threatened flora species within 5km of the Subject site. These species are shown in **TABLE 2**.

TABLE 2
COMMONWEALTH EPBC ACT (1999) DATABASE RECORDS OF THREATENED FLORA SPECIES WITHIN 5 KM OF THE SUBJECT SITE

Botanical name	Common name	Comm Status
Rhodomyrtus psidioides	Native Guava	CE
Lenwebbia sp. Main Range		CE
Rhodamnia rubescens	Scrub Turpentine	CE
Corchorus cunninghamii	Native Jute	E
Cynanchum elegans	White-flowered Wax Plant	E
Lepidium peregrinum	Wandering Pepper-cress	E
Coleus nitidus	Nightcap Plectranthus	E
Vincetoxicum woollsii		E
Westringia rupicola		V
Paspalidium grandispiculatum	a grass	V

Botanical name	Common name	Comm Status
Sophora fraseri		V
Thesium australe	Austral Toadflax	V
Owenia cepiodora	Onionwood	V
Eucalyptus glaucina	Slaty Red Gum	V
Floydia praealta	Ball Nut	V
Dichanthium setosum	Bluegrass	V
Sarcochilus weinthalii	Blotched Sarcochilus	V
Macadamia integrifolia	Macadamia Nut	V
Bulbophyllum globuliforme	Miniature Moss-orchid	V
Cryptostylis hunteriana	Leafless Tongue-orchid	V
Persicaria elatior	Knotweed	V
Macadamia tetraphylla	Rough-shelled Bush Nut	V
Clematis fawcettii	Stream Clematis	V
Bosistoa transversa	Three-leaved Bosistoa	V
Arthraxon hispidus	Hairy-joint Grass	V
Leichhardtia longiloba	Clear Milkvine	V

KEY
CE Critically Endangered
E Endangered
V Vulnerable

3.3 Site description

The Subject site features large cleared open areas which were historically cleared for grazing. These areas would have previously supported large tracts of wet sclerophyll forests with pockets of subtropical rainforest in protected gullies and creek lines.

FIGURE 3 shows historical imagery of the site in 1975 and 1991. Areas of native forest vegetation cover on the site have remained relatively consistent over the last 50 years with additional patches having begun to re-establish in more recent years and the canopy cover of larger patches in the south becoming more consistent. Large tracts of wet sclerophyll bushland within the property show a history of disturbance with few mature hollow-bearing trees and moderate weed presence.

The property is divided by the Dam Access Road which follows an east-west ridgeline through the site. Areas of the property north of this ridgeline have a generally northerly aspect and drain towards Cob O'Corn Creek. Cob O'Corn Creek flows in a south-easterly direction and partly forms the northern boundary of the property.

Riparian vegetation along Cob O'Corn Creek and its minor tributaries includes well-established Forest red gum, River oak and Moreton bay fig. Grazing and cattle access to the creek along with exotic species have degraded this riparian corridor. The exotic species Mulberry, Giant devil's fig, Cat's claw creeper, Jacaranda and Broad-leaved privet are common in this area.

Giant devil's fig, Cats claw creeper and Mulberry are common weeds along Cob O'Corn Creek

Open grassland areas dominate the northern parts of the site with occasional paddock trees including Forest red gum, Swamp turpentine, Silky oak and non-native trees including Camphor laurel and Coral tree. Blady grass and Setaria are the dominant grasses through the more open areas of the property.

Open grassland with Blady grass and areas of Wet sclerophyll forest

A large dam is located in the north-western corner of the site with the spillway running to the north-east through the site towards Cob O'Corn Creek. Vegetation around the dam consists of a stand of Flooded gum with occasional Pink bloodwood and a rainforest understory with some weeds including Camphor laurel and Lantana. Cape water lily grows along the periphery of the dam. Vegetation along the spillway path includes thickets of Soft bracken and other ferns, knot weeds, sedges and Setaria with occasional regenerating Forest red gum and Swamp turpentine.

The dam spillway watercourse includes patches of Soft bracken, club rush and knot weed with occasional paddock trees of Forest red gum and Swamp turpentine

South of the Dam Access Road the site is mostly vegetated with large tracts of wet sclerophyll forests with Tallowood, Brush box, Grey ironbark, Small-fruited grey gum and Forest oak common. Small pockets of Subtropical rainforest occur in the more sheltered areas of the site. Weed presence is moderate through these areas with Lantana common in the understory. Other less abundant weed species include Camphor laurel, Giant devil's fig and Broad-leaved privet.

Environmental weeds are relatively common and widespread and are most abundant on forest edges, disturbed patches and along waterways. Cat's claw creeper has become established along Cob O'Corn Creek. Mulberry is a small weed tree common throughout the riparian zone.

Other substantial environmental weed issues on the site include:

- Presence of invasive vines within riparian areas including Cat's claw creeper
- Presence of woody weeds within and adjacent to bushland areas including Lantana, Camphor laurel, Large-leaved privet and Giant devil's fig
- Infestations of Lantana in the understory of wet sclerophyll forests

Wet sclerophyll forest with Lantana common in the understory

Overall the site is considered to be of low-moderate biodiversity value with more intact areas of habitat toward the southern portion of the property. The site masterplan has identified open areas of the site with little biodiversity value for the location of dwelling sites and community infrastructure (see **APPENDIX A**).

4 FAUNA

4.1 Introduction

Although detailed fauna surveys have not been completed as part of this study, an analysis of fauna habitats on the site as well as local fauna records allows for an assessment of fauna habitat values to be made.

4.2 Literature Review

4.2.1 NPWS Database search

A search of the NPWS Database revealed 34 Threatened fauna species within 5km of the Subject site. These species are shown in **TABLE 3**.

TABLE 3
NPWS DATABASE RECORDS OF THREATENED FAUNA SPECIES WITHIN 5 KM OF THE SUBJECT SITE

Scientific name	Common name	NSW Status	No. of records
Litoria brevipalmata	Green-thighed Frog	V	1
Ptilinopus magnificus	Wompoo Fruit-Dove	V	11
Ptilinopus regina	Rose-crowned Fruit-Dove	V	7
Ptilinopus superbus	Superb Fruit-Dove	V	1
Podargus ocellatus	Marbled Frogmouth	V	3
Circus assimilis	Spotted Harrier	V	1
Falco subniger	Black Falcon	V	1
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	31
Glossopsitta pusilla	Little Lorikeet	V	1
Ninox strenua	Powerful Owl	V	6
Tyto tenebricosa	Sooty Owl	V	5
Atrichornis rufescens	Rufous Scrub-bird	V	1
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	2
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	2
Daphoenositta chrysoptera	Varied Sittella	V	2
Coracina lineata	Barred Cuckoo-shrike	V	2
Carterornis leucotis	White-eared Monarch	V	5
Dasyurus maculatus	Spotted-tailed Quoll	V	1
Phascogale tapoatafa	Brush-tailed Phascogale	V	2
Phascolarctos cinereus	Koala	E1	34
Petaurus australis	Yellow-bellied Glider	V	11
Petaurus norfolcensis	Squirrel Glider	V	1
Petauroides volans	Southern Greater Glider	E1	12
Aepyprymnus rufescens	Rufous Bettong	V	3
Potorous tridactylus	Long-nosed Potoroo	V	3
Macropus dorsalis	Black-striped Wallaby	E1	2
Notamacropus parma	Parma Wallaby	V	1
Petrogale penicillata	Brush-tailed Rock-wallaby	E1	1

Scientific name	Common name	NSW Status	No. of records
Thylogale stigmatica	Red-legged Pademelon	V	2
Pteropus poliocephalus	Grey-headed Flying-fox	V	1
Myotis macropus	Southern Myotis	V	2
Phoniscus papuensis	Golden-tipped Bat	V	1
Scoteanax rueppellii	Greater Broad-nosed Bat	V	1
Miniopterus australis	Little Bent-winged Bat	V	2

KEY
E1 Endangered
E4A Critically endangered
V Vulnerable

4.2.2 Commonwealth EPBC Act (1999) Database search

A search of the Commonwealth EPBC Act (1999) Database revealed 41 Threatened fauna species that have been recorded in the NPWS database within 5km of the Subject site. These species are shown in **TABLE 4.**

TABLE 4
COMMONWEALTH EPBC ACT (1999) DATABASE RECORDS OF THREATENED FAUNA SPECIES WITHIN 5 KM OF THE SUBJECT SITE

Scientific name	Common name	Comm Status
Anthochaera phrygia	Regent Honeyeater	CE
Lathamus discolor	Swift Parrot	CE
Calidris ferruginea	Curlew Sandpiper	CE
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	CE
Dasyornis brachypterus	Eastern Bristlebird	E
Atrichornis rufescens	Rufous Scrub-bird	E
Botaurus poiciloptilus	Australasian Bittern	E
Melanodryas cucullata cucullata	South-eastern Hooded Robin	E
Erythrotriorchis radiatus	Red Goshawk	E
Rostratula australis	Australian Painted Snipe	E
Falco hypoleucos	Grey Falcon	V
Hirundapus caudacutus	White-throated Needletail	V
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V
Grantiella picta	Painted Honeyeater	V
Stagonopleura guttata	Diamond Firetail	V
Turnix melanogaster	Black-breasted Button-quail	V
Climacteris picumnus victoriae	Brown Treecreeper	V
Euastacus gumar	Bloodclaw Crayfish	E
Maccullochella ikei	Clarence River Cod	E
Mixophyes fleayi	Fleay's Frog	E
Philoria richmondensis	Richmond Range Sphagnum Frog	E
Philoria kundagungan	Mountain Frog	E
Mixophyes balbus	Stuttering Frog	V
Assa darlingtoni	Pouched Frog	V
Mixophyes iteratus	Giant Barred Frog	V
Phyllodes imperialis smithersi	Pink Underwing Moth	E

Scientific name	Common name	Comm Status
Petauroides volans	Greater Glider	E
Pseudomys oralis	Hastings River Mouse	E
Dasyurus maculatus maculatus	Spot-tailed Quoll	E
Phascolarctos cinereus	Koala	E
Pteropus poliocephalus	Grey-headed Flying-fox	V
Pseudomys novaehollandiae	New Holland Mouse	V
Petaurus australis australis	Yellow-bellied Glider	V
Notamacropus parma	Parma Wallaby	V
Chalinolobus dwyeri	Large-eared Pied Bat	V
Petrogale penicillata	Brush-tailed Rock-wallaby	V
Potorous tridactylus tridactylus	Long-nosed Potoroo	V
Delma torquata	Adorned Delma	V
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	V
Harrisoniascincus zia	Rainforest Cool-skink	V
Furina dunmalli	Dunmall's Snake	V

KEY
E1 Endangered
CE Critically endangered
V Vulnerable

4.3 Site survey

4.3.1 Methods

Site habitats were assessed to determine their value for native fauna species. The assessment focused on identifying habitat features associated with threatened species as well as other native fauna groups. Particular attention was paid to habitat features such as:

- The presence of mature trees with hollows, fissures and/or other suitable roosting/nesting places.
- The presence of Koala food trees.
- The presence of Glossy black cockatoo food trees.
- The condition, flow and water quality of drainage lines and bodies of water.
- Areas of vine scrubs, heathland or other dense vegetation.
- Presence of hollow logs/debris and areas of dense leaf litter.
- Presence of fruiting flora species.
- Presence of blossoming flora species, particularly winter-flowering species.
- Vegetation connectivity and proximity to neighbouring areas of intact vegetation.
- Presence of caves and man-made structures suitable as microchiropteran bat roost sites.

4.3.2 Results

Amphibians

A number of amphibian species are considered likely occurrences on the site. Habitats along Cob O'Corn Creek and its minor tributaries including the dam spillway provide good quality habitat for many frogs. Species considered likely occurrences include the Dwarf green tree frog (*Litoria fallax*), Bleating tree frog (*Litoria dentata*), Striped marsh frog (*Limnodynastes peronii*) and Tusked frog (*Adelotus brevis*), all of which occur in similar environments in the locality.

Closed forest habitats along drainage lines represent suitable habitat for tree frogs including the Dainty tree frog (*Litoria gracilenta*), Peron's tree frog (*Litoria peronii*) and Green tree frog (*Litoria caerulea*). The large dam provides an artificial body of water that provides a refuge for amphibians in drier periods.

Reptiles

Distribution and abundance of reptiles is generally a function of habitat structure and availability of shelter and prey. The site provides a variety of microhabitats for reptiles, including closed and open forest types, grasslands, creek lines and disturbed areas. The site represents good habitat for reptiles due to the presence of: the combination of shelter and basking sites; the juxtaposition of varying mesic forest types; rocky areas for shelter; wet sclerophyll areas with good canopy and leaf litter development; availability of water in drainage lines; presence of artificial shelter sites (farm sheds, old cattle yards and farm equipment etc) and reliable sources of prey.

Species considered likely to occur include: Green tree snake; Brown tree snake; Carpet python; Red-bellied black snake; Brown snake; Yellow-faced whip snake; Eastern water dragon; Blue-tongued lizard and a number of smaller skinks.

Birds

The diversity of ecosystems on the site provide habitat for a wide range of bird groups. Many insectivorous birds from higher latitudes spend winter in the locality and are likely to visit the site seasonally or periodically. These include species such as the Fantail cuckoo, Rainbow bee-eater, Noisy pitta, Tree martin, Black-faced cuckoo-shrike, Cicada bird, Golden and Rufous whistler, Rose robin, White-throated gerygone, Silvereye, Olive-backed oriole and Spangled drongo.

Birds such as honeyeaters and lorikeets move locally in response to changes in the availability of nectar and or pollen. The site contains a large quantity of nectar bearing plants in the genera Eucalyptus, Banksia, Melaleuca and Callistemon. These plants provide a continuity of food for nectarivorous birds. Some flowering species, such as Forest red gum, flower during winter providing an important food source for lorikeets and other birds during a time of general food scarcity.

Rainforest areas, wet sclerophyll forests and scattered fig trees along Cob O'Corn Creek provide habitat for a relatively high diversity of resident and nomadic birds over the year. The site provides a moderate diversity and abundance of fruiting species. With close proximity to subtropical rainforest areas within Toonumbar and Richmond Range National Park the site is likely to be utilised by locally nomadic and migratory rainforest species such as the Wompoo, Rose-crowned and Superb fruit-doves, Common koel and Black-faced cuckoo-shrike.

Relatively high abundance of Forest oak and Black she-oak throughout the forested areas of the site may provide forage for the vulnerable Glossy black cockatoo as well as other species of cockatoo and parrot.

Expanses of wet sclerophyll forests with maturing eucalypts provide hollows necessary for hollow-nesting birds as well as important forage habitat for hollow-dependent avifauna breeding in forests in the locality.

Mammals

Despite historical disturbance to the site and widespread vegetation clearance in the surrounding area, the site is likely to play host to a number of mammal species. The Mountain brushtail

possum, Common brushtail and Ringtail possum are all likely to be found on the site. The site may also provide habitat for less common species including gliders.

Koalas are known to occur in the locality as well as in nearby state forests and national parks. The site provides a range of preferred feed trees including Tallowwood, Forest red gum and Small-fruited grey gum.

The Swamp wallaby, Echidna and Platypus are all likely to occur on the site. Smaller terrestrial mammals likely to occur on or near the site include the Northern brown bandicoot and the Bush rat as well as the introduced Black rat, House mouse and European fox.

The site provides good quality forage habitat for megachiropteran and microchiropteran bats. Microchiropteran bats may also roost on the site. The Grey-headed and Black flying-fox are likely to forage on the site during peak flowering and fruiting of site vegetation.

5 BIODIVERSITY AND CORRIDOR VALUE

5.1 Biodiversity value

Areas of mapped biodiversity value (under the Biodiversity Conservation Act 2016) occur along Cob O'Corn Creek which forms the northern boundary of the property. This riparian vegetation includes established River oak, Forest red gum and Moreton bay fig in the canopy. Rainforest species occur in the mid story with Red kamala, Rough-leaved elm, Cheese tree and Creek sandpaper fig common. The vegetation is limited in width and has a high occurrence of weeds present. Cattle access to the creek line has also further degraded the condition of the riparian vegetation in some parts. However, there is still some moderate biodiversity value in this vegetation which provides refuge for native plant species, habitat for native fauna, allows for fauna movement through the landscape and performs other ecosystem services.

Areas of wet sclerophyll forests on the site are also considered to currently be of moderate biodiversity value. These forested areas are connected to nearby state forests and national parks and enable species to utilise a large habitat range. These forests provide habitat for several threatened species known to the locality including fruit-doves, forest owls, flying foxes, Koala, Glossy black cockatoo, Parma wallaby, Greater glider, microchiropteran bats and rainforest invertebrates.

Despite the existing biodiversity values of the site having been compromised over the years by clearing, grazing, weed invasion and other factors, the site has good potential for restoration works to improve the existing biodiversity values of the site.

5.2 Wildlife corridors

A wildlife corridor is a link of wildlife habitat, generally native vegetation, that joins two or more areas of similar wildlife habitat (DIPNR 2004). Corridors enable migration, colonisation and interbreeding of plants and animals (DIPNR 2004). In fragmented or highly disturbed landscapes, wildlife corridors may allow fauna populations to move between small patches of habitat to access forage resources, shelter sites and so on, allowing for a viable population to continue to exist where individual patches are not sufficient to provide adequate resources in the long term.

The functionality of wildlife corridors will differ between fauna groups, but, for most fauna, a wildlife corridor need not be a continual strip of habitat, as a sequence of stepping stones across the landscape may be adequate to allow for fauna movement. For birds, bats and other more mobile species, individual paddock trees, roadside vegetation or a chain of ponds may form part of a wildlife corridor. These small areas of habitat also represent a refuge from aggression and competition from open-country species such as Noisy miners and Magpies.

The Subject site is situated between Richmond Range in the west which is part of the Great Dividing Range and areas of the Tweed caldera to the east. This area was historically cleared for grazing and farming with few intact areas of bushland conserved. Linkage between these two important areas of biodiversity is provided by disjunct patches of privately owned bushland, riparian corridors, and state forests. The subject site forms part of this corridor with large areas of relatively diverse wet sclerophyll bushland and pockets of subtropical rainforest.

Within the subject site, extensive areas of wet sclerophyll forest serve as discontinuous corridors that primarily connect to Cob O'Corn Creek to the north, running along both the eastern and western boundary lines. The headwaters of Cob O'Corn Creek originate in Toonumbar National

Park and then flow southeast, passing the Subject site, ultimately linking with Eden Creek State Forest and other surrounding forested areas. Although the vegetation along Cob O'Corn Creek is highly modified and degraded it encompasses pockets of well-established native trees and patches of bushland that offer a generally continuous corridor for dispersing and locally migrating fauna.

6 RESTORATION AND ENHANCEMENT STRATEGY

6.1 Introduction

The restoration strategy initially involves identification of areas of the site with high priority for restoration with goals that can be achieved over time by the Ecovillage community.

The following priority zones have been chosen:

- Cob O'Corn Creek Riparian Zone
- Western Dam Corridor Zone
- Eastern Corridor Zone

Restoration zones are shown in **FIGURE 4**.

These restoration areas within the site are considered of high priority for restoration and enhancement due to several factors including:

- Existing biodiversity values including important waterway and habitat corridors.
- Proximity to adjacent areas of higher quality fauna habitat.
- Levels of natural resilience evident with regeneration of a diversity of native plant species in regrowth areas near to restoration zones
- Close proximity to high quality habitat areas including national parks and state forests with potential to expand wildlife corridors and threatened species habitat
- Presence of preferred Koala feed trees
- Presence of feed trees for Glossy black cockatoo
- The zones are located away from the potential disturbances of the residential allotments.
- The zones can be easily accessed by vehicles and volunteers for restoration activities
- Proximity to water reserves that will provide an additional water source for regeneration activities and for watering of plantings if applicable.

Restoration zones are located within the northern part of the site near to the village centre. This will substantially improve aesthetic values for residents and help build awareness and involvement within the community as residents interact with restoration areas on a regular basis. This interaction will assist with casual monitoring of restoration zones including checking of fencing and gates and early identification of potential threats such as wallaby browsing, dumping of garden waste, weed invasion and so on.

6.2 Enhancement of fauna habitats

One of the key objectives of the VMP is to improve fauna habitat values on the site and to contribute toward improving fauna habitat values on a landscape scale. In particular, the VMP will improve habitat values for native fauna including:

- Fruit-doves, including the Threatened Rose-crowned, Superb and Wompoo fruit-doves as well as more common species such as the Brown cuckoo-dove, Topknot pigeon and White-headed pigeon.
- Other rainforest and closed forest birds, including bowerbirds, flycatchers, monarchs and Green catbirds.
- Koalas
- Glossy black cockatoo
- Flying-foxes, including the Threatened Grey-headed and Black flying-foxes.
- Common blossom bat and various microchiropteran bats.

- Native closed-forest frogs such as the Green tree frog, Barred frogs, Tusked frog and smaller tree-frogs.
- Closed forest skinks and snakes requiring a denser groundcover and leaf litter layer.
- Forest invertebrates including butterflies and moths.
- Fish and other aquatic fauna.

6.3 Natural resilience and recruitment

The site is situated in a landscape supporting fragments of remnant and regrowth wet sclerophyll and sub-tropical rainforest vegetation of varying size and connectivity. The location of the site, together with the presence of a relatively high diversity of species found during the site inspection suggest that the emergence of a diversity of native species from the seedbank is likely once environmental conditions are more favourable.

The site is likely to be currently used by seed-dispersing fauna such as rainforest birds and flying-foxes, and as habitat values improve, these species will bring in a diversity of rainforest seeds to the site.

This VMP has been designed to take advantage of natural recruitment to increase species diversity in the longer term.

6.4 Species for revegetation plantings

Revegetation by way of plantings is the main strategy proposed for this regeneration project. Plantings should contain a diverse mix of endemic species that will provide habitat for a range of wildlife. Specific plant species lists are provided for each of the three restoration zones.

The rationale for selecting plant species has been based on several considerations:

- To establish a relatively diverse planting representative of a wet sclerophyll forests and riparian vegetation along Cob O'Corn Creek
- To use a high proportion of pioneer and early secondary species that will achieve relatively rapid growth
- To incorporate Koala and Glossy black cockatoo food trees into the plantings

6.5 Local provenance

Many native plants occur across a broad geographic range. However, within that range, different populations of a particular species may change slightly to become specifically adapted to local conditions and individual habitats. Different populations containing local genetic variations are called provenances. It is important to preserve these different provenances, as each provenance is unique (Waite 2003).

Waite (2003) discusses several reasons to use plants of local provenance in revegetation programs, including:

- Better survival mechanisms.
- Valuable genetic variations.
- Distinctive bush character.
- Ecological Balance with local fauna, including pollinators and seed dispersers.
- Improved pest and disease resistance.

Local provenance is a concept that is not necessarily easily applied as a clear rule in determining the suitable sourcing of seedlings/seeds for a particular revegetation program. The range and local distribution of different species can vary significantly, and the genetic interaction between

populations of a particular species is affected by a range of factors, including connectivity and movements of pollinator and seed dispersal species. For most plant species, these factors are not well quantified.

This plan requires that seedlings to be planted are sourced from local provenance. For the purposes of this plan, local provenance is considered to be satisfied by the use of seedlings sourced from within the far north coast region with a preference for species sourced from the northern part of the Richmond River catchment.

6.6 Plantings and protection of seedlings

Areas requiring planting should be either brush cut to expose the soil or planting holes spot-sprayed. Seedlings should be planted in accordance with the planting guidelines included as **APPENDIX C**. Tree seedlings should not be planted within 3-5m of an existing native tree or shrub depending on the potential future size of that species.

Plantings will need to be protected from stock access and from browsing by wallabies. Stock grazing is not to be permitted within planting areas. There are two options for protection of planted seedlings:

- The planting area could be perimeter fenced with wallaby-proof/stock-proof fencing. Fencing should incorporate a gate to provide vehicle access.
- Where stock do not have access to the planting area, and plantings are subject to substantial browsing by wallabies, planted tubestock could be individually guarded using a wooden stake and black plastic mesh (or other suitable guards) to protect against browsing. Some species have been shown to be undesirable to wallabies and these species can be left unguarded where appropriate.

Plantings should be adequately watered during planting and for at least a fortnight afterward unless there is sufficient rainfall.

Key performance indicators of plantings consist of:

- The revegetation area is free of disturbance from fauna, vandalism, storage of materials, inappropriate use etc.
- There is minimal presence of environmental weeds and those present are being actively controlled
- Plantings are healthy and showing signs of growth.
- Plants are individually guarded or showing minimal effects of browsing from wallabies.
- There is less than 10% loss of seedlings.
- After 5 years there is sufficient canopy cover to inhibit growth of grasses and other weeds.

6.7 Record Keeping

Daily work record sheets should be kept detailing site works. An example of a suitable record sheet is included as **APPENDIX D.**

7 COB O'CORN CREEK RIPARIAN ZONE

7.1 Restoration strategy

The restoration strategy for the Cob O'Corn Creek Riparian Zone consists of:

- Protection of existing riparian vegetation by fencing out cattle and providing alternative water sources to eliminate the need for cattle to drink from the creek.
- Targeting infestations of high priority weeds including Cat's claw creeper and Giant devil's fig
- Undertaking plantings to increase native diversity, connect areas of vegetation and expand riparian vegetation.
- Progressive control of waterway weeds including Jacaranda, Large-leaved privet, Mulberry, Camphor laurel and Lantana.
- Managing edges of forested areas to encourage a sharp boundary between forest and maintained grassland. Forest edges generally support a mix of exotic species including Small-leaved privet, Lantana and herbaceous weeds. Appropriate chemical control and mechanical removal will allow slashing/mowing up to the forested edge minimising opportunities for weed invasion.

It is important to ensure resources are available to provide adequate ongoing weed control following the commencement of regeneration activities. Plantings require maintenance for a minimum of 3 years but should ideally be maintained for 5 years or more to ensure their success. Livestock access into planting areas is not recommended and should not be permitted until at least 5 years if the trees are well established.

7.2 Weed issues

A major weed issues along the riparian corridor is the climbing vine Cat's claw creeper *(Dolichandra unguis-cati)* which is a weed of national significance and is widely distributed in Kyogle Shire. Cat's claw creeper is listed as a Key Threatening Process in NSW because of its potential to impact on endangered and vulnerable plants as well as Lowland Subtropical Rainforest, which is an Endangered Ecological Community (NSW WeedWise, 2023). Cat's claw creeper is a fast-growing vine that quickly forms dense mats that smother and outcompete native ground covers and seedlings. It can overtop native trees and cause them to fall during flooding which in turn changes water flow and creates canopy gaps. This weed should be prioritised for control within the Subject site and in particularly along the Cob O'Corn Creek riparian corridor. Successful weed control requires regular follow-up after initial control efforts. Work areas should be regularly followed up to ensure there is no missed plants and all regrowth is controlled (NSW WeedWise, 2023).

The other main weed species common along Cob O'Corn Creek are Devil's fig, Jacaranda, Mulberry, Camphor laurel, Lantana and Large-leaved privet. Weed control techniques for these species is provided in **APPENDIX B.**

7.3 Planting area

Revegetation planting should occur along the riparian corridor of Cob O'Corn Creek to an average width of 10m from the top of the bank. Plantings should occur at a sufficient density to establish a canopy quickly and reduce the required weed control. A suitable spacing is 1.8m centres for the riparian zone. The planting area is calculated at 1.5ha requiring approximately 4200 plants (allowing for existing vegetation within the riparian corridor).

7.4 Planting species list

TABLE 5
PLANTING LIST - COB O'CORN CREEK ZONE

Common name	Botanical name	Notes
Blackwood wattle	*Acacia melanoxylon*	1 2 4
Lilly pilly	*Acmena smithii*	2 3 5
Rough-leaved elm	*Aphananthe philippinensis*	1 2 3 5
Hoop pine	*Araucaria cunninghamii*	2 3
Willow bottlebrush	*Callistemon salignus*	1 2 5
Weeping bottlebrush	*Callistemon viminalis*	1 2 3 5
River oak	*Casuarina cunninghamiana*	1 2 3 7
Brown kurrajong	*Commersonia bartramia*	1 4
Pepperberry	*Cryptocarya obovata*	2 5
Hard quandong	*Elaeocarpus obovatus*	1 2 3 4 5
Forest red gum	*Eucalyptus tereticornis*	1 2 3 4 6
Creek sand-paper fig	*Ficus coronata*	1 2 3 5
Small-leaved fig	*Ficus obliqua*	2 3 5
Cheese tree	*Glochidion ferdinandi*	1 2 3 5
Silky oak	*Grevillea robusta*	1 2 3 4
Brush box	*Lophostemon confertus*	1 2 4 6
Swamp turpentine	*Lophostemon suaveolons*	1 2 4 6
Forest matrush	*Lomandra hystrix*	3 4
Spiny-headed matrush	*Lomandra longifolia*	3 4
Red kamala	*Mallotus philippensis*	1 3 5
White cedar	*Melia azerderach*	1 5
Whalebone tree	*Streblus brunonianus*	1 2 3 5
Brush cherry	*Syzygium australe*	1 2 3 5
Water gum	*Tristaniopsis laurina*	1 2 3

Key
1. Fast growing species
2. Wet/waterlogged areas
3. Creekbank/riparian areas
4. Bird attracting flowers
5. Bird attracting fruit
6. Koala feed tree
7. Glossy black cockatoo feed tree

7.5 Table of tasks

TABLE 6
TABLE OF TASKS - COB O'CORN CREEK ZONE

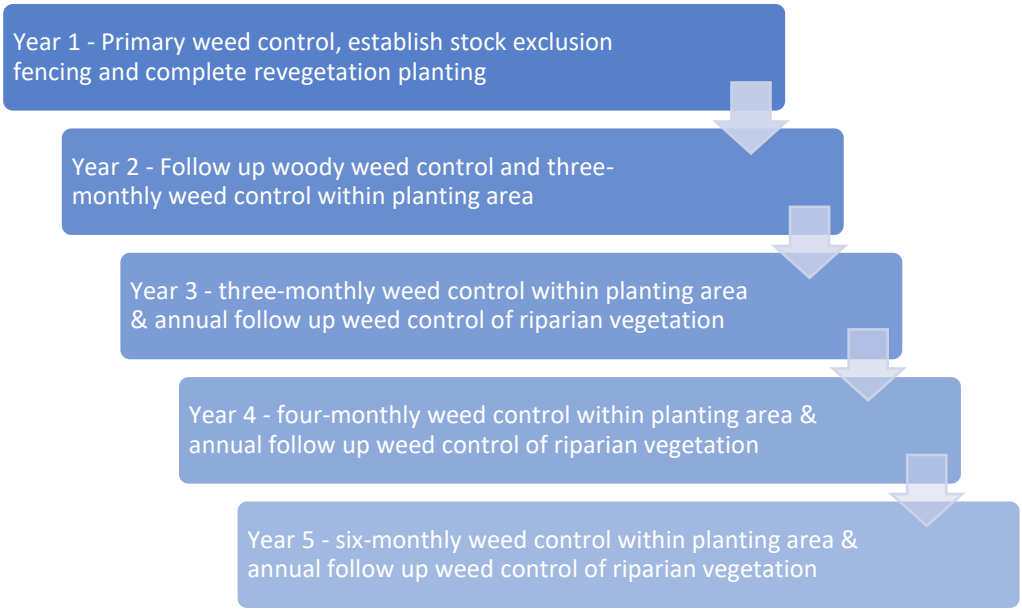
Regeneration action	Estimated number of person days	Timing
Stock fencing to exclude access to Cob O'Corn Creek and planting area	4	Summer
Primary weed control targeting priority weeds	8	Summer
Follow up weed control	4	Autumn
Plant 4200 native trees and groundcovers*	42	Autumn
Year 1 planting weed control (4 times)**	32	3 monthly
Year 2 planting weed control (4 times)	32	3 monthly
Year 3 planting weed control (4 times)	32	3 monthly
Year 4 planting weed control (3 times)	24	4 monthly

Year 5 planting weed control (2 times)	16	6 monthly

* The estimated time for planting has been calculated on each person planting (including fertilising, mulching and watering)100 trees per day.
** Planting maintenance has been calculated on each person maintaining around 1000 trees per day

7.6 Timeline

This section shows a conceptual timeline for actions in the Cob O'Corn Creek Riparian Zone.



8 WESTERN DAM CORRIDOR ZONE

8.1 Restoration strategy

The restoration strategy for the Western Dam Zone consists of:

- Protection of existing riparian vegetation and wet soaks by fencing out cattle and providing alternative water sources
- Undertaking plantings to increase native diversity, connect areas of vegetation and expand riparian vegetation.
- Targeting infestations of high priority weeds including Cockspur coral tree and Crofton weed
- Progressive control of weeds including Setaria, Mist flower and Blue billygoat weed
- Managing edges of forested areas to encourage a sharp boundary between forest and maintained grassland. Forest edges generally support a mix of exotic species including Small-leaved privet, Lantana and herbaceous weeds. Appropriate chemical control and mechanical removal will allow slashing/mowing up to the forested edge minimising opportunities for weed invasion.

It is important to ensure resources are available to provide adequate ongoing weed control following the commencement of regeneration activities. Plantings require maintenance for a minimum of 3 years but should ideally be maintained for 5 years or more to ensure the success of the planting.

8.2 Weed issues

A well-established Cockspur coral tree *(Erythrina crista-galli)* occurs immediately to the south of this revegetation zone. Cockspur coral tree is a deciduous shrub or tree with attractive red flowers that can dominate waterways and floodplains where they outcompete native vegetation. They can spread via seed and also vegetatively through cut or broken branches (NSW WeedWise, 2023). It is important to make sure this weed is not accidentally spread when attempting weed control. All plant material should be properly treated using herbicide or removed and disposed of appropriately.

Crofton weed *(Ageratina adenophora)* is a common weed of cleared land and can become prolific if left unmanaged. Individual plants can produce large volumes of wind-blown seed that become established in new locations. Crofton weed is poisonous to horses which preferentially graze plants even when ample feed is available. This weed is common within the Western Dam Corridor Zone and should be targeted as part of the restoration strategy. Weed control techniques for these species is provided in **APPENDIX B.**

8.3 Planting area

Revegetation planting should occur within the dam spillway and connect to vegetation on the northern side of Afterlee Road. This planting area will act as an important corridor linking areas of wet sclerophyll bushland in the south and west of the property with isolated paddock trees and through to the riparian vegetation along Cob O'Corn Creek.

This area receives regular water from the dam spillway and provides a favourable location to establish a wet sclerophyll forest. Plantings should occur at a sufficient density to establish a canopy quickly and reduce the amount of required weed control. A suitable average spacing of 2.5m centres is recommended for planting within the Western Dam Corridor Zone, with smaller

groundcover plantings at closer spacings and wider spacings for larger trees further up the banks. The planting area is calculated at approximately 5ha requiring 9000 plants.

FIGURE 5 shows a general planting profile for this planting zone indicating plant spacings closer to the channel and further up the banks of the drainage line.

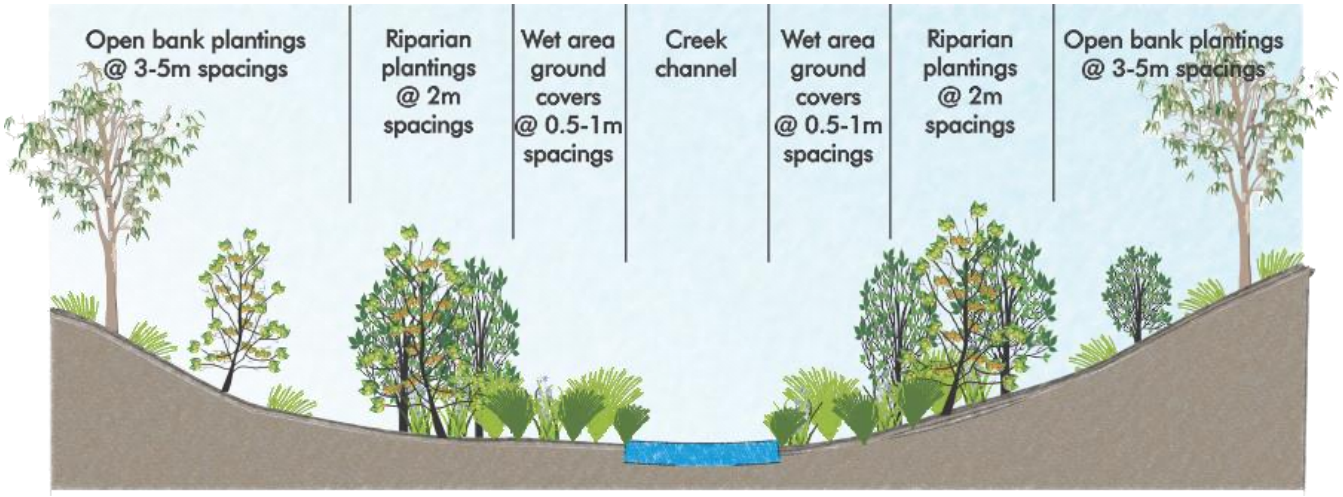


FIGURE 5 INDICATIVE PLANTING PROFILE FOR THE WESTERN DAM CORRIDOR ZONE

8.4 Planting species list

TABLE 7 shows a list of native plant species suitable for planting at the site. This list is preliminary and can be expanded over time.

TABLE 7
PLANTING LIST – WESTERN DAM CORRIDOR ZONE

Common name	Botanical name	Notes
Fringed wattle	*Acacia fimbriata*	1 4
Blackwood wattle	*Acacia melanoxylon*	1 2 4
Lilly pilly	*Acmena smithii*	2 3 5
Black she-oak	*Allocasuarina littoralis*	1 2 7
Forest oak	*Allocasuarina torulosa*	1 7
Rough-leaved elm	*Aphananthe philippinensis*	1 2 3 5
Hoop pine	*Araucaria cunninghamii*	2 3
Coast banksia	*Banksia integrifolia*	1 4
Willow bottlebrush	*Callistemon salignus*	1 2 5
Weeping bottlebrush	*Callistemon viminalis*	1 2 3 5
River oak	*Casuarina cunninghamiana*	1 2 3
Brown kurrajong	*Commersonia bartramia*	1 4
Pink bloodwood	*Corymbia intermedia*	1 3 4
Pepperberry	*Cryptocarya obovata*	2 5
Small-leaved tuckeroo	*Cupaniopsis parvifolia*	1 5
Hard quandong	*Elaeocarpus obovatus*	1 2 3 4 5
White mahogany	*Eucalyptus acmenoides*	1 4 6
Flooded gum	*Eucalyptus grandis*	1 2 4 6
Tallowood	*Eucalyptus microcorys*	1 4 6
Forest red gum	*Eucalyptus tereticornis*	1 2 3 4 6
Creek sand-paper fig	*Ficus coronata*	1 2 3 5

Common name	Botanical name	Notes
Small-leaved fig	*Ficus obliqua*	2 3 5
Cheese tree	*Glochidion ferdinandi*	1 2 3 5
Umbrella cheese tree	*Glochidion sumatranum*	1 2 5
Silky oak	*Grevillea robusta*	1 2 3 4
Forest matrush	*Lomandra hystrix*	3
Spiny-headed matrush	*Lomandra longifolia*	3
Brush box	*Lophostemon confertus*	1 2 4 6
Swamp turpentine	*Lophostemon suaveolons*	1 2 4 6
Jellybush	*Leptospermum polygalifolium*	1 2 4
Mat rush	*Lomandra hystrix*	3 4
Red kamala	*Mallotus philippensis*	1 3 5
Black tea-tree	*Melaleuca bracteata*	1 2 4
White cedar	*Melia azerderach*	1 5
Whalebone tree	*Streblus brunonianus*	1 2 3 5
Turpentine	*Syncarpia glomulifera*	1 2 4
Brush cherry	*Syzygium australe*	1 2 3 5
Water gum	*Tristaniopsis laurina*	1 2 3

KEY
1. Fast growing species
2. Wet/waterlogged areas
3. Creekbank/riparian areas
4. Bird attracting flowers
5. Bird attracting fruit
6. Koala feed tree
7. Glossy black cockatoo feed tree

Additional wetter area groundcover and shrub species suitable for planting closer to the drainage line include:

- Cunjevoi (*Alocasia brisbaniensis*)
- Rough saw-sedge (*Gahnia aspera*)
- Tall sedge (*Carex appressa*)
- Settler's flax (*Gymnostachys anceps*)
- Walking stick palm (*Linospadix monostachyos*)
- Blue flax lily (*Dianella caerulea*)
- Palm lillies (Native Cordyline species)
- Gristle fern (*Blechnum cartilagineum*)
- Sword sedge (*Schoenoplectus mucronatus*)
- Native ginger (*Alpinia caerulea*)

8.5 Table of tasks

TABLE 8
TABLE OF TASKS – WESTERN DAM CORRIDOR ZONE

Regeneration action	Number of days	Timing
Stock fencing to exclude access to planting zone	8	Summer
Primary weed control targeting priority weeds	5	Summer
Follow up weed control	3	Autumn
Plant 9000 native trees*	90	Autumn
Year 1 planting weed control (4 times)**	40	3 monthly
Year 2 planting weed control (4 times)	40	3 monthly
Year 3 planting weed control (4 times)	40	3 monthly
Year 4 planting weed control (3 times)	32	4 monthly

Year 5 planting weed control (2 times)	28	6 monthly

* The estimated time for planting has been calculated on each person planting (including fertilising, mulching and watering)100 trees per day.
** Planting maintenance has been calculated on each person maintaining around 1000 trees per day

8.6 Timeline

This section shows a conceptual timeline for actions in the Western Dam Corridor Zone.

9 EASTERN CORRIDOR ZONE

9.1 Restoration strategy

The Eastern Corridor Zone is located at the main entrance to the Afterlee village on the intersection of Afterlee Road and Dam Access Road and the planting will serve as an entrance treatment and character statement for the Ecovillage. The restoration strategy for the Eastern Corridor Zone consists of:

- Protection of existing vegetation and revegetation plantings with stock exclusion fencing
- Undertaking plantings to increase native diversity, connect areas of vegetation and expand areas of vegetation.
- Targeting infestations of high priority weeds including Camphor laurel, Crofton weed and Lantana
- Progressive control of weeds including Large-leaved privet, Wild tobacco bush, Setaria and Mist flower
- Managing edges of forested areas to encourage a sharp boundary between forest and maintained grassland. Forest edges generally support a mix of exotic species including Small-leaved privet, Lantana and herbaceous weeds. Appropriate chemical control and mechanical removal will allow slashing/mowing up to the forested edge minimising opportunities for weed invasion.

It is important to ensure resources are available to provide adequate ongoing weed control following the commencement of regeneration activities. Plantings require maintenance for a minimum of 3 years but should ideally be maintained for 5 years or more to ensure the success of the planting.

9.2 Weed issues

Several establishing Camphor laurel *(Cinnamomon camphora)* occur within this restoration zone. Camphor laurel are fast growing evergreen trees that produce prolific amounts of seed which are ingested and spread by birds. Seed germinates readily and they can quickly colonise disturbed areas and outcompete native vegetation. Camphor laurels have a shallow root system which are often undercut along stream banks causing erosion and bank collapse.

Camphor laurel should be prioritised for control within the Subject site and in particularly in the Eastern corridor. Successful weed control requires regular follow-up after initial control efforts. Work areas should be regularly followed up to ensure there is no missed plants and all regrowth is controlled (NSW WeedWise, 2023).

Crofton weed *(Ageratina adenophora)* is a common weed of cleared land and can become prolific if left unmanaged. Individual plants can produce large volumes of wind-blown seed that become established in new locations. Crofton weed is poisonous to horses which preferentially graze plants even when ample feed is available. This weed is common within the Eastern Corridor Zone and should be targeted as part of the restoration strategy.

Weed control techniques for these species is provided in **APPENDIX B.**

9.3 Planting area

Revegetation planting should occur in the corner between the Dam Access Road and Afterlee Road in the east of the property. Planting within this area will act as an important corridor helping to link areas of wet sclerophyll forest in the south of the site through to the riparian

corridor along Cob O'Corn Creek. Several well-established Forest red gum occur in the north of this zone along Afterlee Road. The establishment of revegetation plantings will connect these significant habitat trees with the surrounding bushland areas helping to improve the movement of fauna through the site.

Planting within this zone will also provide a visual barrier and feature between Afterlee road, the Dam Access Road and future residencies within the Ecovillage.

This area receives regular water from an upstream dam and provides a favourable location to establish a wet sclerophyll forest. Plantings should occur at a sufficient density to establish a canopy quickly and reduce the amount of required weed control. A suitable spacing of 2m centres is recommended for planting within the Eastern corridor zone. The planting area is calculated at 2.2ha requiring 6050 plants.

9.4 Planting species list

TABLE 9 shows a list of native plant species suitable for planting at the site. This list is preliminary and can be expanded over time.

TABLE 9
PLANTING LIST – EASTERN CORRIDOR ZONE

Common name	Botanical name	Notes
Fringed wattle	*Acacia fimbriata*	1 4
Blackwood wattle	*Acacia melanoxylon*	1 2 4
Lilly pilly	*Acmena smithii*	2 3 5
Black she-oak	*Allocasuarina littoralis*	1 2 7
Forest oak	*Allocasuarina torulosa*	1 7
Rough-leaved elm	*Aphananthe philippinensis*	1 2 3 5
Hoop pine	*Araucaria cunninghamii*	2 3
Coast banksia	*Banksia integrifolia*	1 4
Willow bottlebrush	*Callistemon salignus*	1 2 5
Weeping bottlebrush	*Callistemon viminalis*	1 2 3 5
River oak	*Casuarina cunninghamiana*	1 2 3
Brown kurrajong	*Commersonia bartramia*	1 4
Pink bloodwood	*Corymbia intermedia*	1 3 4
Pepperberry	*Cryptocarya obovata*	2 5
Small-leaved tuckeroo	*Cupaniopsis parvifolia*	1 5
Hard quandong	*Elaeocarpus obovatus*	1 2 3 4 5
White mahogany	*Eucalyptus acmenoides*	1 4 6
Flooded gum	*Eucalyptus grandis*	1 2 4 6
Tallowood	*Eucalyptus microcorys*	1 4 6
Forest red gum	*Eucalyptus tereticornis*	1 2 3 4 6
Creek sand-paper fig	*Ficus coronata*	1 2 3 5
Small-leaved fig	*Ficus obliqua*	2 3 5
Cheese tree	*Glochidion ferdinandi*	1 2 3 5
Umbrella cheese tree	*Glochidion sumatranum*	1 2 5
Silky oak	*Grevillea robusta*	1 2 3 4
Brush box	*Lophostemon confertus*	1 2 4 6
Swamp turpentine	*Lophostemon suaveolons*	1 2 4 6
Jellybush	*Leptospermum polygalifolium*	1 2 4
Mat rush	*Lomandra hystrix*	3 4

Common name	Botanical name	Notes
Red kamala	*Mallotus philippensis*	1 3 5
Black tea-tree	*Melaleuca bracteata*	1 2 4
White cedar	*Melia azerderach*	1 5
Whalebone tree	*Streblus brunonianus*	1 2 3 5
Turpentine	*Syncarpia glomulifera*	1 2 4
Brush cherry	*Syzygium australe*	1 2 3 5
Water gum	*Tristaniopsis laurina*	1 2 3

KEY
1. Fast growing species
2. Wet/waterlogged areas
3. Creekbank/riparian areas
4. Bird attracting flowers
5. Bird attracting fruit
6. Koala feed tree
7. Glossy black cockatoo feed tree

9.5 Table of tasks

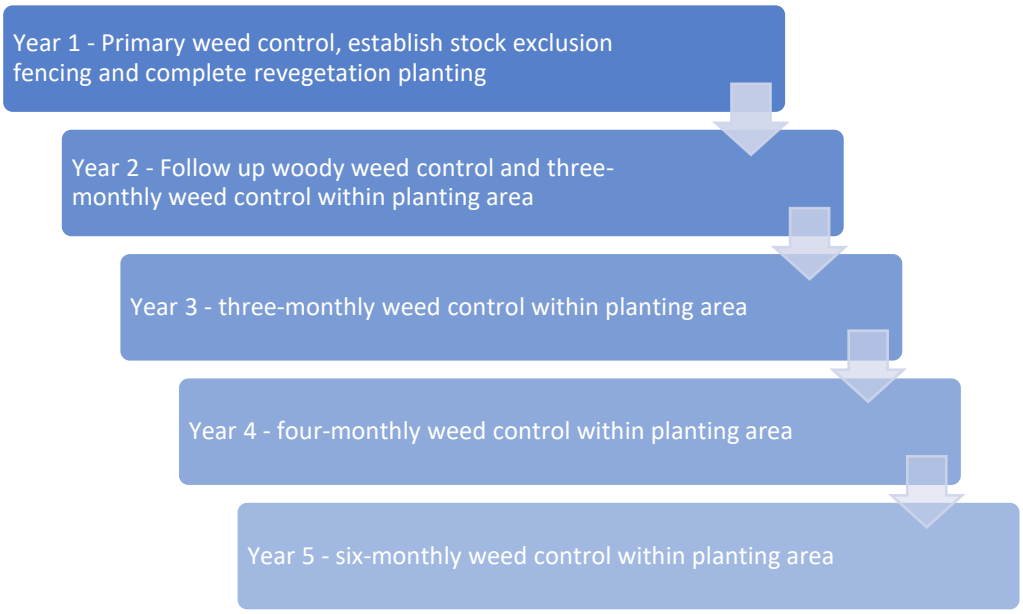
TABLE 10
TABLE OF TASKS – EASTERN CORRIDOR ZONE

Regeneration action	Number of days	Timing
Stock fencing to exclude access to planting zone	2	Summer
Primary weed control targeting priority weeds	3	Summer
Follow up weed control	1	Autumn
Plant 6050 native trees *	60	Autumn
Year 1 planting weed control (4 times)**	24	3 monthly
Year 2 planting weed control (4 times)	24	3 monthly
Year 3 planting weed control (4 times)	24	3 monthly
Year 4 planting weed control (3 times)	18	4 monthly
Year 5 planting weed control (2 times)	12	6 monthly

* The estimated time for planting has been calculated on each person planting (including fertilising, mulching and watering)100 trees per day.
** Planting maintenance has been calculated on each person maintaining around 1000 trees per day

9.6 Timeline

This section shows a conceptual timeline for actions in the Eastern Corridor Zone.


Year 1 - Primary weed control, establish stock exclusion fencing and complete revegetation planting
Year 2 - Follow up woody weed control and three-monthly weed control within planting area
Year 3 - three-monthly weed control within planting area
Year 4 - four-monthly weed control within planting area
Year 5 - six-monthly weed control within planting area

10 MONITORING & ONGOING MAINTENANCE

10.1 Monitoring

Monitoring is an essential tool for ensuring that the restoration activities described in this VMP are being achieved. Monitoring should commence prior to restoration work and continue for a period of about 5 years.

Baseline and annual monitoring will utilise fixed photopoints for each restoration zone. Each photopoint will be re-taken annually to give a clear demonstration on how the site is progressing over time.

At each annual monitoring event photos should be compared to the previous years to show the progress of the site and to help identify the success or otherwise of weed control and revegetation plantings in each restoration zone. Photopoint monitoring should be compared with the Key performance indicators.

Key performance indicators consist of:

- Within years 1 and 2, treated woody weeds are successfully dying off.
- The revegetation plantings are being maintained and trees are healthy and showing signs of growth
- There is less than 10% mortality in planting areas
- The Restoration Zones are free of disturbance from stock, vandalism, storage of materials, inappropriate use etc.
- There is minimal presence of environmental weeds and those present are being actively controlled.
- There is evidence of natural recruitment of native seedlings.
- After 5 years there is sufficient canopy cover to inhibit growth of grasses and other weeds

10.2 Ongoing maintenance

Maintenance requirements for restoration zones are discussed in previous chapters relating to each zone. The results of the monitoring program are to be assessed with regard to ongoing maintenance and any recommendations from annual monitoring to be addressed in future maintenance efforts.

11 SUMMARY AND CONCLUSIONS

Blackwood Ecological Services has been engaged by Planning Regenerative Communities to prepare a Vegetation Management Plan (VMP) for the proposed Afterlee Ecovillage site at 2085-2087 Afterlee Road, Afterlee. The master plan for the Afterlee Ecovillage includes the establishment of 65 homesites with access from both Afterlee Road and the Dam Access Road. A community hall, village square and revival of the local Afterlee village school and café are proposed as part of this project.

Site surveys were completed on site in September 2023 by Blackwood Ecology. The site features large cleared open areas which were historically cleared for grazing. These areas would have previously supported large tracts of wet sclerophyll forests with pockets of subtropical rainforest in protected gullies and creek lines. The property is divided by the Dam Access Road which follows an east-west ridgeline through the site. Areas of the property north of this ridgeline have a generally northerly aspect and drain towards Cob O'Corn Creek. Cob O'Corn Creek flows in a south-easterly direction and partly forms the northern boundary of the property. Open grassland areas dominate the northern parts of the site with occasional paddock trees including Forest red gum, Swamp turpentine, Silky oak and non-native trees including Camphor laurel and Coral tree. A large dam is located in the north-western corner of the site with the spillway running to the north-east through the site towards Cob O'Corn Creek.

South of the Dam Access Road the site is mostly vegetated with large tracts of wet sclerophyll forests with Tallowwood, Brush box, Grey ironbark, Small-fruited grey gum and Forest oak common. Small pockets of Subtropical rainforest occur in the more sheltered areas of the site.

Environmental weeds are relatively common and widespread and are most abundant on forest edges, disturbed patches and along waterways. Cat's claw creeper has become established along Cob O'Corn Creek. Mulberry is a small weed tree common throughout the riparian zone. Other substantial environmental weed issues on the site include exotic vines, woody weeds and infestations of Lantana in the understory of wet sclerophyll forests.

Overall the site is considered to be of low-moderate biodiversity value with more intact areas of habitat located toward the southern portion of the property. The site masterplan has identified open areas of the site with little biodiversity value for the location of dwelling sites and community infrastructure.

Areas of mapped biodiversity value (under the Biodiversity Conservation Act 2016) occur along Cob O'Corn Creek which forms the northern boundary of the property. This riparian vegetation includes established River oak, Forest red gum and Moreton bay fig in the canopy. Rainforest species occur in the mid story with Red kamala, Rough-leaved elm, Cheese tree and Creek sandpaper fig common.

Areas of wet sclerophyll forests on the site are also considered to currently be of moderate biodiversity value. These forested areas are connected to nearby state forests and national parks and enable species to utilise a large habitat range. These forests provide habitat for several threatened species known to the locality including fruit-doves, forest owls, flying foxes, Koala, Glossy black cockatoo, Greater glider, microchiropteran bats and rainforest invertebrates.

Proposed dwelling and community infrastructure sites are not situated on any areas of significant biodiversity or parts of the site that form part of a wildlife refuge, wildlife corridor or wildlife management area. Ongoing occupation and management of the Afterlee Ecovillage is not

likely to adversely affect any areas of wildlife refuge, wildlife corridor or wildlife management area.

Despite the existing biodiversity values of the site having been compromised over the years by clearing, grazing, weed invasion and other factors, the site has good potential for restoration works to improve the existing biodiversity values of the site. A restoration strategy has been developed for the site that initially involves identification of areas of the site with high priority for restoration with goals that can be achieved over time by the Ecovillage community.

The following priority zones have been chosen:

- Cob O'Corn Creek Riparian Zone
- Western Dam Corridor Zone
- Eastern Corridor Zone

Together these areas amount to approximately 8.65ha of restoration works.

These restoration areas within the site are considered of high priority for restoration and enhancement due to several factors including:

- Existing biodiversity values including important waterway and habitat corridors.
- Proximity to adjacent areas of higher quality fauna habitat.
- Levels of natural resilience evident with regeneration of a diversity of native plant species in regrowth areas near to restoration zones
- Close proximity to high quality habitat areas including national parks and state forests with potential to expand wildlife corridors and threatened species habitat
- Presence of preferred Koala feed trees
- Presence of feed trees for Glossy black cockatoo
- The zones are located away from the potential disturbances of the residential allotments.
- The zones can be easily accessed by vehicles and volunteers for restoration activities
- Proximity to water reserves that will provide an additional water source for regeneration activities and for watering of plantings if applicable.

This VMP highlights the importance of ensuring resources are available to provide adequate ongoing weed control following the commencement of regeneration activities. Plantings require maintenance for a minimum of 3 years but should ideally be maintained for 5 years or more to ensure their success. Livestock access into planting areas is not recommended and should not be permitted until at least 5 years in suitable areas if the trees are well established. Monitoring is an essential tool for ensuring that the restoration activities described in this VMP are being achieved. Monitoring should commence prior to restoration work and continue for a period of about 5 years.

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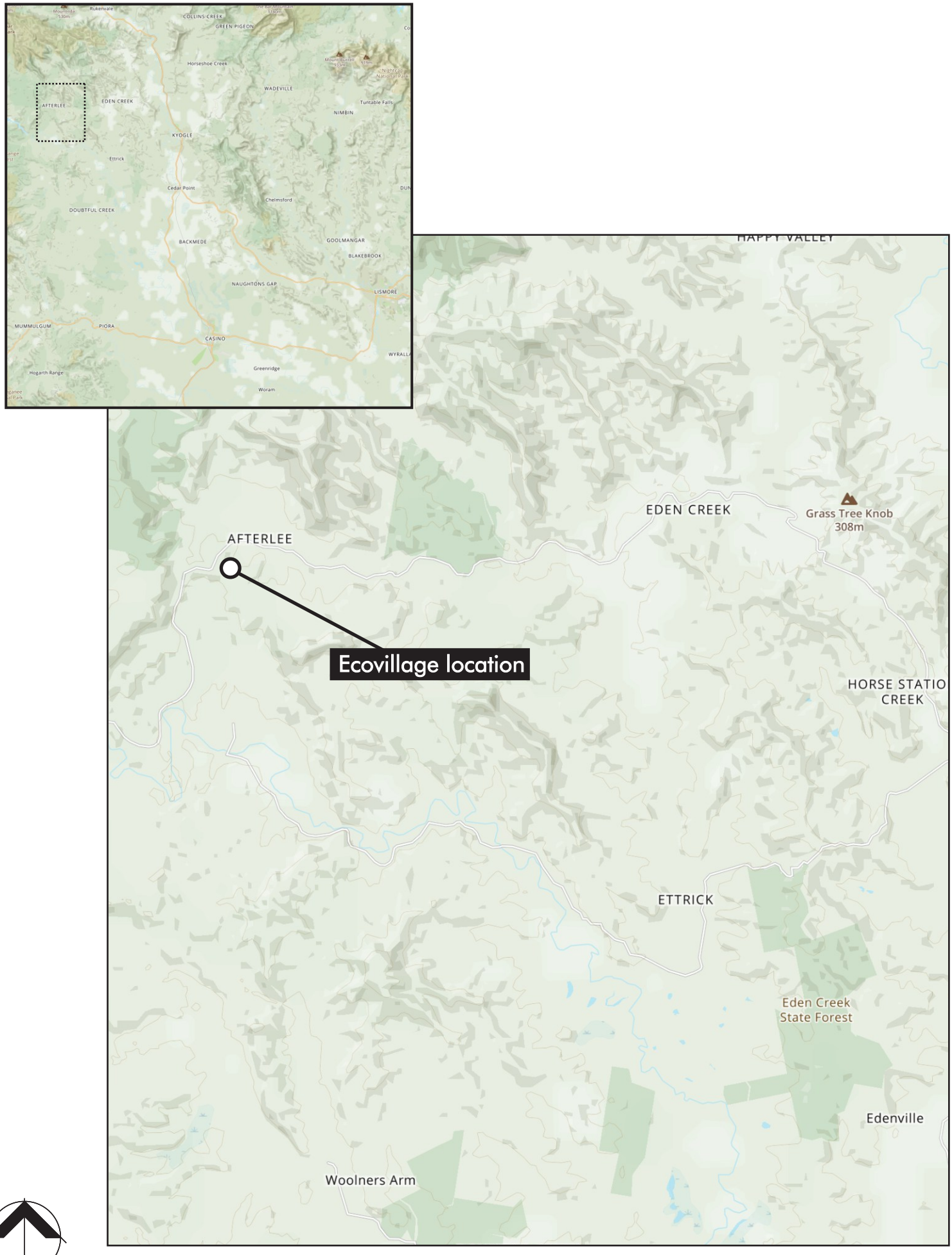
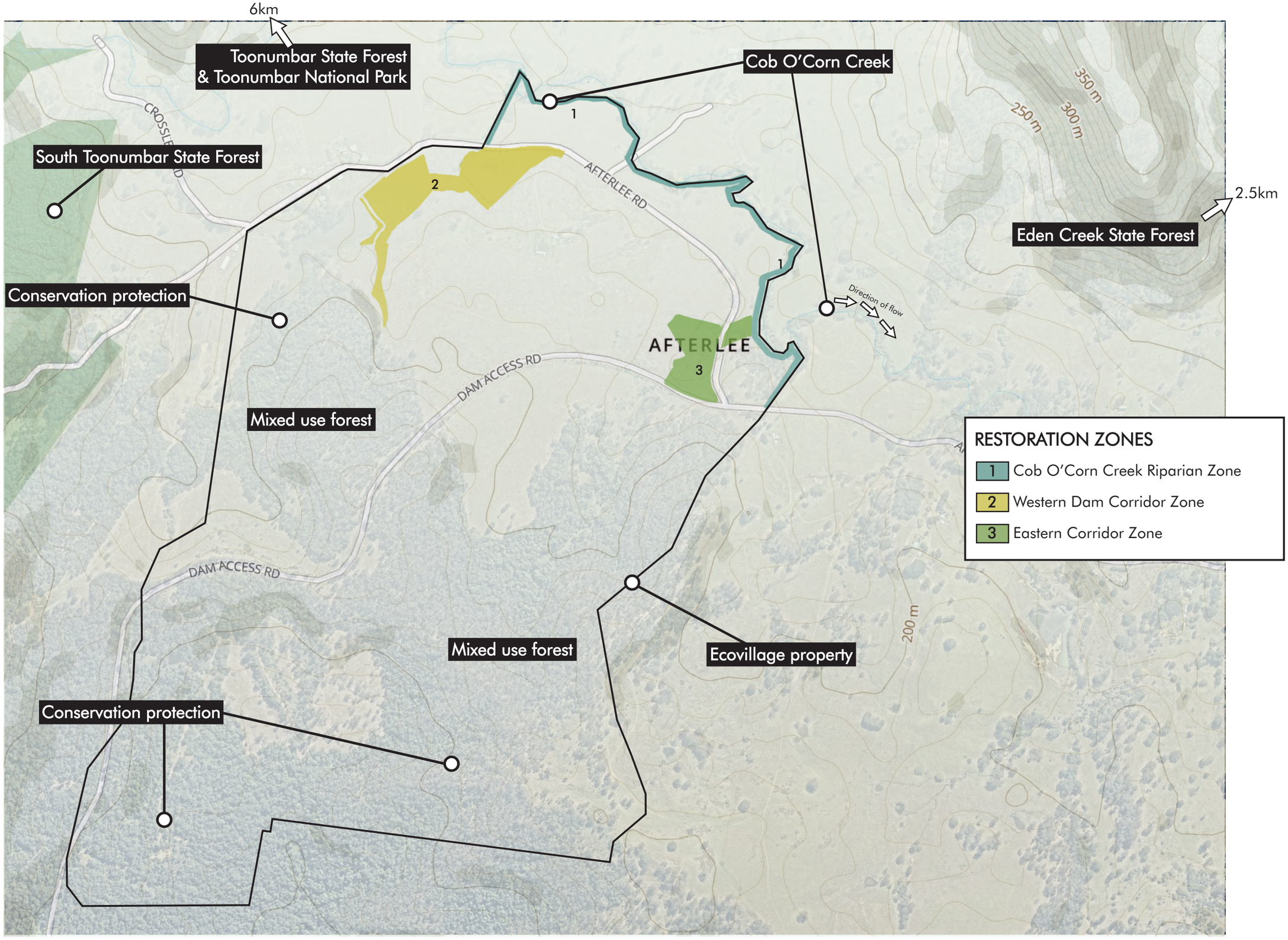
FIGURES



Afterlee Ecovillage Vegetation Management Plan

BLACKWOOD ECOLOGICAL SERVICES
WWW.BLACKWOODECOLOGY.COM.AU

Date: 25/10/23 Author: MF Job No: 2329 | Source OS maps | Figure 1 Locality



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Afterlee Ecovillage Vegetation Management Plan

Source: Nearmap/OS Maps

Date: 5/4/24 Author: MF Job No: 2329

Figure 2
Afterlee Ecovillage property

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Afterlee Ecovillage Vegetation Management Plan

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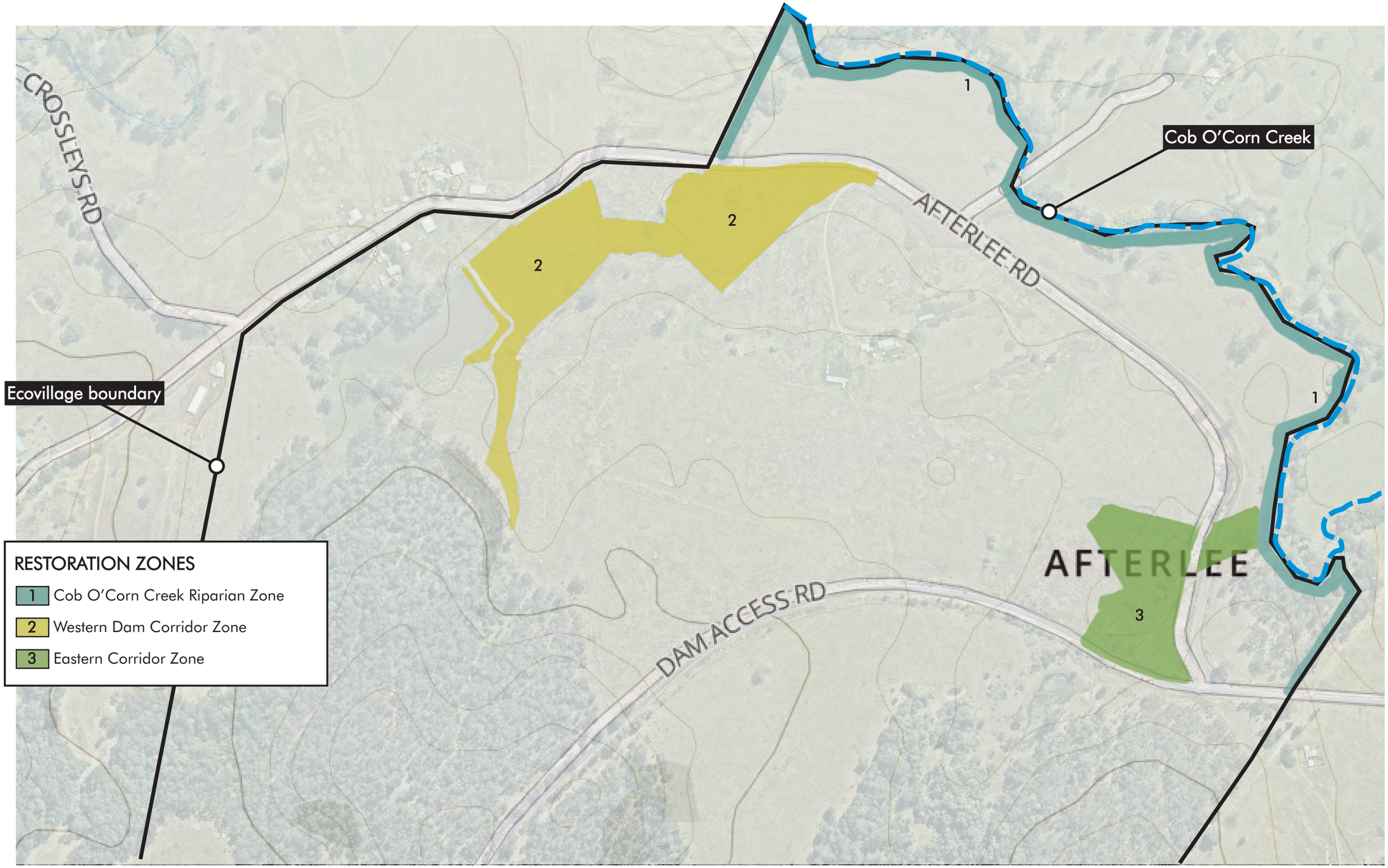
Source: NSW Spatial Viewer

Date: 25/10/23 Author: MF Job No: 2329

Figure 3
Historical aerial imagery



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Source: Nearmap/OS Maps

Afterlee Ecovillage Vegetation Management Plan

Date:25/4/24 Author: MF Job No: 2329

Figure 4
Location of restoration zones

APPENDIX A
VILLAGE MASTERPLAN

AFTERLEE ECOVILLAGE

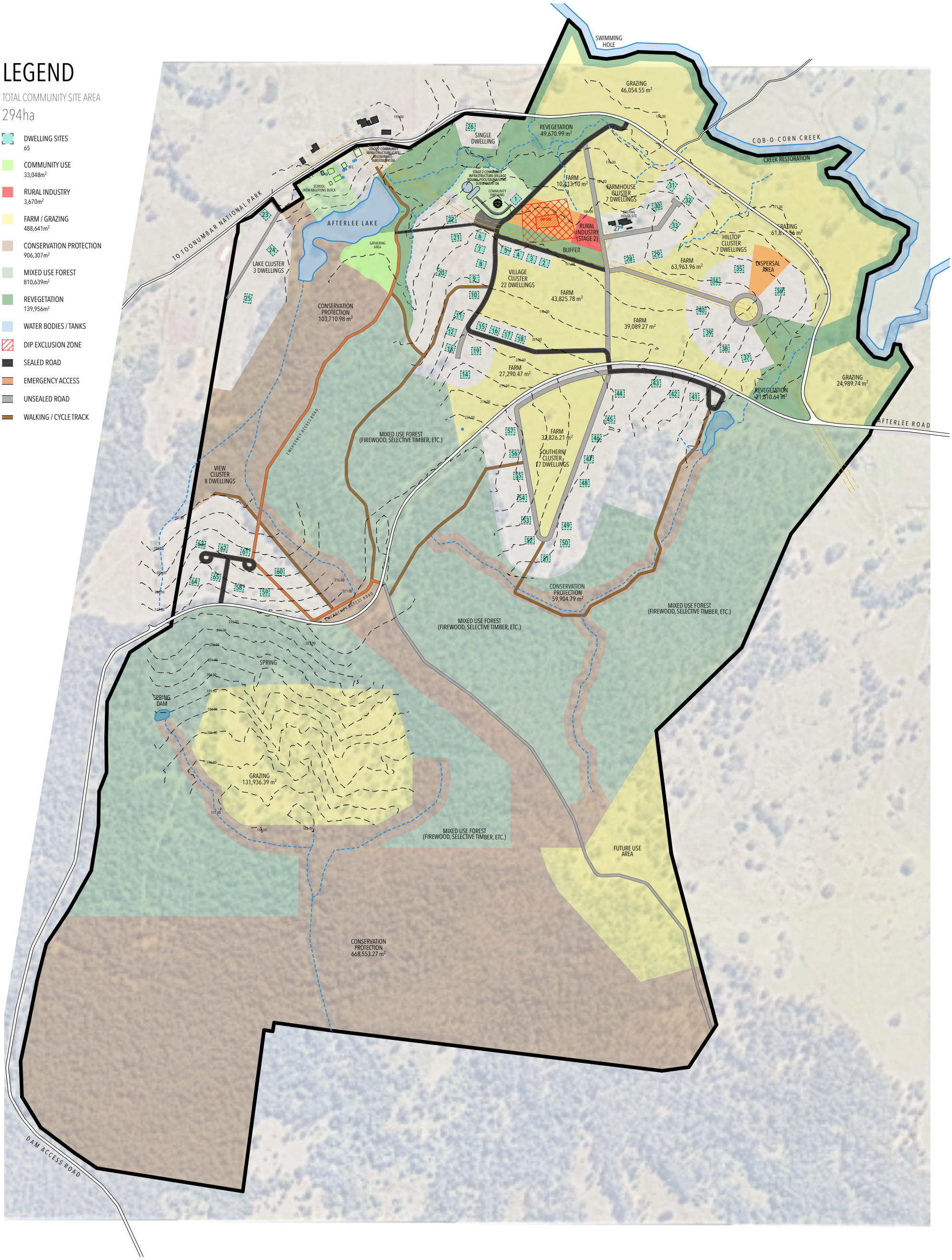
AFTERLEE, NSW 2474

LEGEND

TOTAL COMMUNITY SITE AREA

294ha

- DWELLING SITES 65
- COMMUNITY USE 33,048m²
- RURAL INDUSTRY 3,670m²
- FARM / GRAZING 488,641m²
- CONSERVATION PROTECTION 906,307m²
- MIXED USE FOREST 810,639m²
- REVEGETATION 139,956m²
- WATER BODIES / TANKS
- DIP EXCLUSION ZONE
- SEALED ROAD
- EMERGENCY ACCESS
- UNSEALED ROAD
- WALKING / CYCLE TRACK



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Planning Regenerative Communities Pty Ltd

MASTERPLAN

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APPENDIX B
WEED CONTROL TECHNIQUES

Details on weed control procedures are available in Big Scrub Rainforest Landcare Group (2000) Common Weeds of Northern NSW Rainforests.

Species	Control Methods
Camphor laurel *Cinnamomum camphora*	Seedlings: hand-pull or spray (1:50 + penetrant); Saplings: cut, scrape and paint (CSP) (1:1.5) Trees: Stem inject (1:2) or cut, scrape & paint(1:1.5).
Cat's claw creeper *Dolichandra unguis-cati*	CSP and or drill with (1:1.5) Cut and spray regrowth (1:100)
Chinese celtis *Celtis sinensis*	Seedlings: hand-pull Saplings: Spray (1:50 + 1.5g/10L) Trees: Stem-inject (1:1.5)
Coral tree *Erythrina* sp.	Frill/inject (1:1.5) or cut and paint stumps (1:1.5); stack any fallen branches above the ground to dry and prevent resprouting. Follow up frill/inject sprouted branches (1:1.5) Seedlings: Spray (1:50 + 1.5g)
Crofton weed *Ageratina adenophora*	Hand-pull and hang to dry Spray 1:50 or 1.5g/10L
Giant Devils Fig *Solanum chrysotrichum*	Hand-pull Spray (1:50). CSP, frill or inject (1:1.5)
Grasses	Hand-pull/mattock; slash spray (1:100)
Green cestrum	Spot spray seedlings. C, S & P (1:1.5).
Ground asparagus fern	Crown or spray metasulfuron (1.5g:10 L + surfactant) Most effective if done between flowering and berries forming. Non chemical: mechanically crown out
Groundsel	Cut, scrape and paint: (1:1.5); well before flowering: spray: (1:50).
Jacaranda	Hand-pull Spray (1:50). CSP, frill or inject (1:1.5)
Lantana Lantana camara	Hand pull Stems: Cut, scrape & paint(1:1.5); bush-hook/slash and spray regrowth with glyphosate (1:100); over-spray (1:100) thoroughly soaking both foliage and stems. Splatter with 1m grid pattern: (1:9)
Large-leaved privet *Ligustrum lucidum*	Hand-pull seedlings. Stem-inject, 1-2mL per cut. (undiluted glyphosate)
Mistflower/Crofton weed *Ageratina riparia*	Hand pull Spray (1:100) or 0.5g/10L
Mulberry	Hand pull Trees: frill/inject (1:1.5). Stack cut branches above the ground to dry; saplings: cut, scrape and paint (1:1.5); seedlings: spray (1:200 glyphosate)
Paddy's lucerne *Sida rhombifolia*	Hand-pull or spray (1:100 + 1.5g/10L) CSP (1.1.5 +1g/l)

Passionfruit vines *Passiflora* sp.	Hand pull and hang to dry Stems: Cut, scrape & paint(1:1.5) Spray (1:50 +1.5g/10L).
Senna (Cassia) *Senna* sp.	Seedlings: hand pull and bag seed Spray (1:50 + 1.5g/10L) or (1.5g/10L) Shrubs: cut, scrape & paint stump, or stem inject with (1:1.5)
Small-leaved privet *Ligustrum sinense*	Hand pull CSP, Frill or Stem Inject with (1:1.5 +1g/L or 1.5g/l) Spray (1:50 plus 1.5g/10L or 1.5g/10L)
Soft herbs/annuals	Hand pull Spray (1:100 Glyphosate + 1.5g/10L).
Tobacco bush *Solanum mauritianum*	Hand pull Seedlings: hand-pull Spray (1:50) CSP, Frill or inject (1:1.5)
Umbrella tree Dwarf umbrella tree *Schefflera* sp.	Hand pull Seedlings: Hand-pull and hang to dry CSP, Frill or Inject (1:1.5) Spray (1:50+1.5g/10L)

G = Glyphosate, MM = Metsulfuron methyl, Numbers in brackets are dilution ratios

Details of weed control methods

(Adapted from www.mullum.com.au/wilsonscreeklandcare/weeds/weeds_techniques.html)

Cut, Scrape and Paint

This is suitable for coppicing and suckering weeds such as Camphor and Privet, or any weeds which are too large for hand-pulling or have long taproots such as Ochna. This method provides for no soil disturbance and weed eradication is successful.

1. Cut the stem/s 1-2 cm above ground level using either secateurs, loppers, a pruning saw or a chainsaw, depending on the thickness and toughness of the stem.
2. Immediately apply glyphosate™ (generally 1:1 or 1:1.5 or 100%) to the cut surface of the stem or, with medium and large trees, to the outside edges of the cut surface. (Herbicides need to be applied immediately after the cut is made because the ability of the plant to transport fluids ceases as soon as the tissues are severed.)
3. Search through the leaf litter to locate any exposed stem or root surface. Scrape the exposed stem or root surface slightly with a knife until a light green coloured layer is exposed (Do not scrape too deeply.) Apply the herbicide to the scraped sections, either with a brush, injector or spray bottle.
4. Follow up as required.

Scrape and Paint

This is a variation of the cut, scrape and paint technique described above, the difference being the plant is not cut but left intact and scraped. This technique ensures the translocation of the herbicide throughout the entire plant.

1. Scrape several sections of the stem along one side only, in lengths of at least 30 cm. The stem needs to be scraped firmly, exposing the fibres and/or light green coloured layer. Be careful not to sever the stem completely.
2. Each scraped section is immediately painted, prior to scraping the next section, with the recommended diluted glyphosate for the particular weed.

Frill/Inject

Use a small axe to cut into the sapwood at a downward angle. Three rows of cuts are made in a brick pattern around all multi-branches, low to the ground. 1 to 3 cuts are made before immediately injecting the cuts with a glyphosate mix dependent on tree type. The cuts need to be filled slowly to avoid chemical spills. Frilling is easy to use in readily accessible spots. Drilling may be more suitable for hard to get at multi-stems.

De-Barking

Use the back of an axe to knock off the outer bark of a woody tree exposing the cambium layer. The width of the tree should roughly be translated to the height of the ringbarking with thicker trees requiring a bigger ring bark. To be successful each trunk of the plant needs to be fully ringbarked and regular follow up is essential to prevent it from re-establishing.

Brushcutting/Slashing

Repeat brush cutting of woody weeds at the ground layer can eventually exhaust the plant's reserves. This technique requires very regular follow up to ensure the plant does not re-establish and build up its carbohydrate stores. Slashing can also be effective to cover large areas.

APPENDIX C
PLANTING GUIDELINES

1. STOCK

Only use fully sun hardened plant stock, and not stock direct from a shade house. Tube stock is the best as it is a cost effective plant container size, light in weight and easy to handle. Choose plants that are not root bound, do not have yellowing or discoloured leaves and that have a strong stem. Seedlings should be about 30cm in height.

Seedlings should be ordered from a local nursery 6 months in advance and the need for local provenance emphasised.

The nursery should ensure no plants showing signs of Myrtle rust are delivered to the site.

2. SPACING

Random spacing is the usual planting pattern to obtain a natural effect, rather than lines or grids. Seedlings should not be planted within 3m of an existing tree or shrub seedling.

3. PREPARATION OF THE SITE

Remove the grasses and weeds completely at each specific planting location in a 1m diameter circle, either manually or chemically. Glyphosate (Roundup Bioactive) is generally used as a non-residual herbicide near waterways, taking care to follow all instructions and using protective gloves and clothing. Glyphosate is mixed with water at 1:100 concentration and spot sprayed prior to planting.

When the weeds/grass cover have died (after about 3 weeks) at each location planting can begin. Dig a hole in the centre of the circle 20 cm deeper than the plant container and twice as wide. Tools usually used for digging holes are shovels, forks or mattocks. The soil at the base and sides of the hole should be rough and loose to allow root penetration. Water the plants well before planting to ensure a moist root ball.

4. PLANTING

Place a generous amount of water into the hole before planting (2-4 litres if the soil is dry), as losses are reduced by planting into and providing a moist root zone. Tap the plant out of its container and loosen any pot bound or circular roots. Prune the roots if they are very bound up. Put the plant in the hole with the water and fertiliser and fill in with loose crumbly soil. Firm the plant in well with the feet or hands. This is very important for settling the plant roots in, and to provide a stress free start for each plant.

5. FERTILISING

For plantings apply approximately one handful of compound fertiliser. Place the fertiliser in the hole before planting, and mix well with the back filled soil, so that the roots are not in direct contact with concentrated fertiliser.

6. MULCH

Individual trees should be mulched. Straw mulch is recommended.

The usual method of mulching is to lay the mulch material in a 0.5m to 1.0m diameter area around the plant. Take care to mulch right up to the stem, but not too heavily. If a gap is left between the stem and the mulch weeds will grow from the gap in direct competition with the plant. Straw mulch should be used, at a rate of about 6 plants per bale.

7. TREE GUARDS/FENCING

If perimeter fencing is not employed, planted tubestock should be individually guarded using two wooden stakes and black plastic mesh (or other suitable guards) to protect against browsing by wallabies. Some species have been shown to be undesirable to wallabies and these species can be left unguarded where appropriate.

8. WATERING

Plants should be watered every few days for at least a fortnight following planting if there is not sufficient rain. Extra watering may be necessary if dry conditions prevail after planting.

Adapted from Greening Australia (NSW) Inc. North Coast Regional Office. (Undated) **Reforestation: Why and How.** http://www.nor.com.au/environment/greenwork/refinfo.htm.

APPENDIX D
RECORD KEEPING

BLACKWOOD ECOLOGICAL SERVICES

Record Sheet -Vegetation Restoration Works & Herbicide Usage

Site & project name/mgt. area

Date:

Regeneration Team, hours worked and Invoice Number.- (include landowner & others)

Weather conditions (wind speed – calm, light, strong, gusty; wind direction; weather - clear, overcast, rain; temperature – hot >30% v/warm 26º-30º, warm 21º-25º, cool <20º)

Work location and description of restoration actions: (vegetation types, relevance of work, site conditions, methods trialled, show work area on map)

Weeds treated & techniques: CSP-cut scrape paint, SP-scrape & paint, SS-spot spray, OS- over spray, CB-cut-back & SR - spray regrowth, SI stem inject (pressurised injector, drill, hatchet), HW - hand weed, CO -crown out, WW- wick-wipe, BS- bag seeds etc .
Growing conditions (Poor – Good):_____

Species	Technique	Species	Technique

Herbicide & volume: Sign operator's initials next to product. Total volume of mixed herbicide or No. of 10 L spray packs_____

Herbicide Product	Batch Number	Concentration	Application Method	Initials	Volume

No. of Trees Planted (attach species and numbers):

Area Planted (sq. m):

Follow-up timeframe & comments on previous work: (effectiveness of prior work, site conditions, weed species recruitment, additional work required)

Other observations: (tree health, fruiting/flowering, fauna, native species recruitment, new weed species or weed species not previously recorded in work zone)

Diagram of area worked and notes over sheet