



68-80 O'Connell Street, Kingswood – Vegetation Management Plan

Caddens Estate Development Pty Ltd

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Abbreviations

| Abbreviation | Description |
|--------------|---|
| AABR | Australian Association of Bush Regenerators |
| BC Act | NSW <i>Biodiversity Conservation Act 2016</i> |
| CEEC | Critically Endangered Ecological Community |
| CEMP | Construction Environmental Management Plan |
| CPW | Cumberland Plain Woodland |
| DCP | Development Control Plan |
| DPE | Department of Planning and Environment |
| DPI | Department of Primary Industries |
| ELA | Eco Logical Australia Pty Ltd |
| EPBC | Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> |
| HBT | Hollow Bearing Tree |
| LGA | Local Government Area |
| LLS | Local Land Services |
| MZ | Management Zone |
| NRAR | Natural Resources Access Regulator |
| PCC | Penrith City Council |
| PCT | Plant Community Type |
| RFI | Request for Information |
| VMP | Vegetation Management Plan |
| WM Act | NSW <i>Water Management Act 2000</i> |
| WoNS | Weeds of National Significance |

1. Introduction

This Vegetation Management Plan (VMP) has been prepared by Eco Logical Australia (ELA) on behalf of Caddens Estate Development Pty Ltd for the proposed residential development at 68-80 O'Connell Street, Kingswood (partial Lot 1 and 2 DP1268507) in Penrith Local Government Area (LGA).

1.1. Background and Context

The subject site is located within the suburb of Caddens, Sydney between Western Sydney University Kingswood to the west and Cedars Park estate to the east (**Figure 1**). Part of the area proposed for development falls within the same lot as the existing Caddens Corner Shopping Centre (Lot 1 DP1268507). Caddens Estate Development Pty Ltd proposed to submit a Development Application (DA) under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the staged construction of a mixed-use re-development. The works will involve the construction of 18 buildings, 469 residential apartments, four commercial premises, basement car parking & associated demolition, tree-removal, subdivision including boundary adjustment and public roads, earthworks, landscaping and stormwater drainage works.

Penrith City Council provided a 'Request for Information' on 7 November 2023 to provide feedback to Caddens Estate Development Pty Ltd's response to the initial RFI Council letter dated 2 August 2023. This RFI noted that a Vegetation Management Plan (VMP) must be included in the Development Application Submission outlining the following:

'To manage the indirect impacts of the development on the Cumberland Plain Woodland a Vegetation Management Plan will be required to accompany the DA, prepared by an ecological consultant or suitably qualified bush regenerator'.

1.2. Scope and objectives

The overarching objectives of the VMP is to improve ecological health and integrity, maintain and enhance habitat values within the VMP area. This document will address all issues related to the protection of existing vegetation from impacts associated with the undertaking of earthworks and any edge effects as well as undertaking bush regeneration and management actions to improve its extent, condition, and resilience.

This VMP will outline the areas to be revegetated as part of the works and recommend fully structured vegetated areas, where possible. The strategy is to maintain native species cover and integrity within the VMP area by assisting natural regeneration through active restoration actions such as treating weed species and reintroducing native species (as plant or seed).

This VMP covers an untimed establishment period as well as a five-year maintenance period or the achievement of the performance criteria, whichever is longer. This VMP may either be implemented all at once, or staged by areas (e.g. to correspond with construction stages) as long as each stage follows the full VMP programme.

The objectives of the VMP are summarised in **Table 1**.

Table 1 VMP Objectives

| Objectives | Approach |
|--|--|
| Reinstate native vegetation and maintain ecological health (species composition and structure) within the establishment period and five-year maintenance period. | <ul style="list-style-type: none"> • Protect existing native vegetation from development pressures • Rehabilitate and revegetate using appropriate native species. • Control weeds and prevent new outbreaks. • Assist in the natural regeneration of native species. • Addition of logs, rocks etc.. removed from the development footprint for habitat improvement. |
| Improve ecological health and integrity. | <ul style="list-style-type: none"> • Continue to assist natural regenerative processes. • Maintain weed control • Prevent outbreaks of priority weeds • Revegetate using appropriate native species. |

1.3. Preparation and implementation of this Plan

This VMP has been prepared and reviewed by Restoration Ecologist/s with over five years' experience in environmental management and a relevant Bachelor of Science degree. The role of the project restoration ecologist, where noted, should be undertaken by a similarly qualified and experienced restoration ecologist or bush regenerator.

Maintenance of this areas is to be carried out by an accredited Bush Regenerator (AABR) or should possess the required qualifications and experience for membership. In addition to this, they should have as a minimum, a Certificate III in Conservation & Land Management or equivalent. The contractor will need to carry out best practice bush regeneration techniques as described by Buchanan (2009).



Figure 1 Location Map

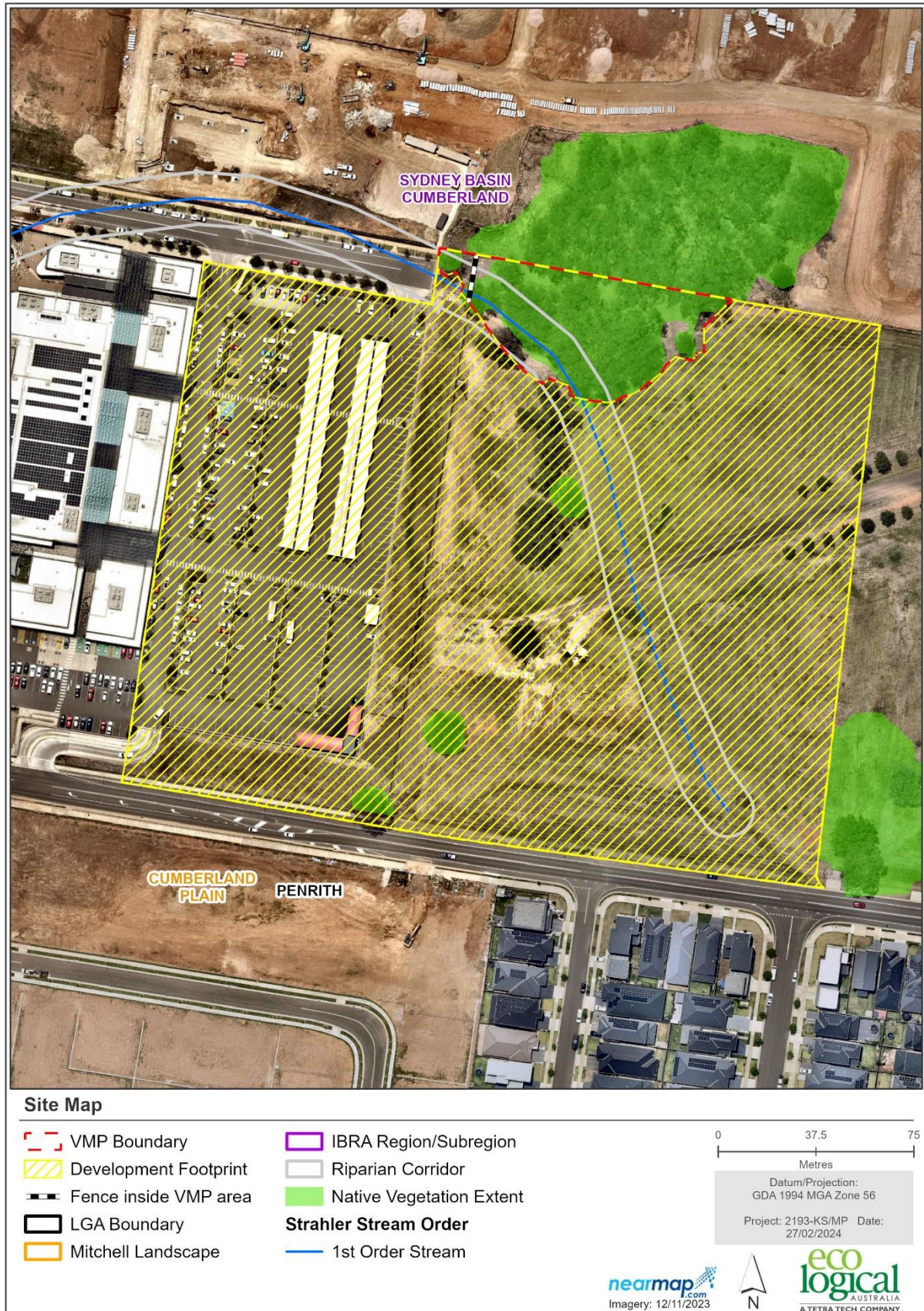


Figure 2 Site Map

2. Existing Environment

2.1. Location

The development site is located at 68-80 O'Connell Street, Kingswood and applies to a portion of Lot 1 and the entirety of Lot 2 DP1268507 (**Figure 1**). The land within the study area is primarily zoned R4 – High Density Residential with the portion of Lot 1 zoned E1 – Local Centre under the Penrith Local Environment Plan 2010 (LEP). The site is bordered by O'Connell Street to the South with residential housing behind. The new Caddens corner shopping complex within Lot 1, lies directly to the west of the development site and is bordered to the west by O'Connell Street. Cleared land zoned Medium Density Residential borders the Lots to the North. There is a cleared area designated for public recreation and a larger area with an access road zoned for special activities to the east.

2.2. Existing Land Use

The land within the development site is largely cleared of vegetation with some scattered mature trees remaining but predominantly open exotic grass. The site was the location of the former historic Kingswood drive-in cinema that closed in 1984. A portion of Lot 1 in the development site includes the carpark at the new Caddens Corner shopping complex (**Figure 2**). A native vegetation patch including mature canopy trees, primarily *Eucalyptus tereticornis*, within the northern boundary of the development site is connected to native vegetation located on the adjoining land to the north. The land to the north is currently under council review for a separate DA for residential development (ELA, 2021a), however the vegetation patch will be largely retained and managed for conservation through the implementation of a Vegetation Management Plan (VMP) prepared by ELA (2021b).

Despite the presence of canopy species, the mid-storey is entirely absent. Patches of native ground covers such as *Dichondra repens* and *Microlaena stipoides* were observed along with exotics and all grasses under the native vegetation have been either regularly mowed or grazed down by animals. The remaining vegetation includes planted native vegetation e.g. *Callistemon viminalis* (Weeping Bottlebrush), planted exotics *Nerium oleander* (Oleander) and *Olea europaea* subsp. *cuspidata* (African Olive) and exotic grasses *Cenchrus clandestinum* (Kikuyu).

2.3. Topography and Hydrology

The study area is highest in the north-eastern and south-western corners and grades toward the drainage line. There is minimal elevation change throughout the site. One 1st order Strahler stream (partly functioning as an open concrete drain and partly as a grassy swale) was observed during the field survey for the Biodiversity Development Assessment Report (ELA, 2024a). The drainage line follows the contours of the landscape, flowing south to north then west through the development site. The section of drainage line that is currently concrete lined runs east to west through the northern portion of the site including the VMP area and is exempt from controlled activity approvals under Clause 42 and 28 of Schedule 4 in the *Water Management (General) Regulation 2018*. The portion of the drainage line that runs south to north and consists of a grassy swale did not meet the definition of a 'river' as defined in the *Water Management Act 2000* because it has no defined bank or bed and does not experience hydrological flows.

2.4. Vegetation Communities

Vegetation mapping provided within the Biodiversity Assessment Report (ELA, 2024a) details the single Plant Community Type present, shown in **Figure 3**. PCT 3320 *Cumberland Plain Shale Woodlands* is listed as a critically endangered threatened ecological community (TEC) in both the *BC Act (Cumberland Plain Woodland in the Sydney Basin Bioregion)* and the *EPBC Act (Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest)*. The large patch of CPW within the north of the subject land met the criteria for listing under both the *BC Act* and the *EPBC Act* when assessed for the BDAR (ELA, 2024a). Despite satisfying the criteria for listing under the *BC Act*, the isolated *Eucalyptus tereticornis* located in the central and southern portion of the development did not meet the criteria for listing under the EPBC Act as these trees were located greater than 100m from the native vegetation patch in the north and the site was dominated by an exotic understory.

2.4.1. PCT 3320: Cumberland Shale Plains Woodland

This PCT is depicted by a tall open sclerophyll forest to woodland with a sparse midstratum of soft leaved shrubs and small trees with a grassy ground cover on the undulating shale plains of western Sydney. *Eucalyptus tereticornis* and *Eucalyptus moluccana* mixed with *Eucalyptus crebra*. *Acacia falcata*, *Acacia parramattensis*, *Acacia decurrens* and *Bursaria spinosa* are most frequently seen throughout the midstratum layer. The groundcover layer of this pct is primarily comprised of *Microlaena stipoides*, *Themeda triandra*, *dichondra repens*, *Desmodium varians*, *Aristida vagans* and *glycine tabacina*.

2.5. Weeds

The Biosecurity Act 2015 (BA Act) and regulations provide specific legal requirements for the state level priority weeds (**Table 2**). Under the BA Act all plants are regulated with 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 reasonably practicable.

Specific legal requirements apply to State determine priorities under the Greater Sydney Regional Strategic Weed Management Plan 2017-2022, while regional priorities include outcomes to demonstrate compliance with the general biosecurity duty and strategical responses in the region to achieve relevant management objectives (Greater Sydney LLS 2017). Weeds listed as 'other weeds of regional concern' under the plan warrant resources for local control or management programs and are a priority to keep out of the region. Inclusion in this list may assist Local Control Authorities and/or land managers to prioritise action in certain circumstances where it can be demonstrated the weed poses a threat to the environment, human health, agriculture etc. The corporate policy: *Biosecurity Priority Weeds Local Plan October 2017* prepared by Hawkesbury River County Council provides a framework for local weed management.

Weed species identified during the field survey for this VMP included ten weeds with State Biosecurity restrictions, two Weeds of National Significance (WoNS), one weed listed as regional level priority and there were six weeds listed as weeds of other regional concern.

The weeds present, the associated asset / value at risk and whether they are Weeds of National Significance (WoNS) or of regional concern in Greater Sydney or elsewhere are presented in **Table 2**. A full list of weeds recorded during the field survey are provided in Existing Vegetation (**Appendix D**).

Table 2 Priority Weeds identified within the study area

| Scientific Name | Common Name | WoNS | NSW priority weeds | Other weeds of regional concern | Category |
|---------------------------------------|--------------------|------|--------------------|---------------------------------|--------------------------------|
| <i>Anredera cordifolia</i> | Madeira Vine | Yes | Yes | Yes | Containment/Asset Protection |
| <i>Araujia sericifera</i> | Moth Vine | No | No | No | Environment |
| <i>Cirsium vulgare</i> | Spear Thistle | No | No | No | Environment |
| <i>Conyza sp.</i> | Fleabane | No | No | No | Environment |
| <i>Cyperus eragrostis</i> | Umbrella sedge | No | No | No | Environment |
| <i>Eragrostis curvula</i> | African Lovegrass | No | No | Yes | Asset Protection |
| <i>Ipomoea indica</i> | Blue Morning Glory | No | No | Yes | Environment |
| <i>Lycium ferocissimum</i> | African Boxthorn | Yes | Yes | Yes | Asset Protection / Containment |
| <i>Olea europaea subsp. cuspidata</i> | African Olive | No | Yes | Yes | Containment |
| <i>Solanum sisymbriifolium</i> | Sticky nightshade | No | No | Yes | Containment / Eradication |

2.6. Fauna

Fauna habitat within the subject land (containing the VMP Area) including hollow-bearing trees, rocky outcrops (if present) and deep leaf litter was surveyed as part of the Biodiversity Development Assessment Report, please refer to this report for details (ELA, 2024a). Three hollow bearing trees (HBT) and one hollow-bearing tree with a stick nest were located inside of the VMP area, these HBT's inside the VMP area should be retained.

Macropus giganteus (Eastern Grey Kangaroo) were observed foraging within the development site and adjoining land to the north. The development site and adjacent land provide supplementary foraging habitat (native grasses). This species is protected under the BC Act and consideration of the proposed development on the population is required. Consideration into the impacts on this species and mitigation has been addressed in the Fauna Management Plan (ELA, 2024b).

Revegetation works are not to begin until after the completion of earthworks within the development area as the VMP area is to provide a temporary additional refuge for the local Eastern Grey Kangaroo (EGK) population that may be displaced during earthworks.

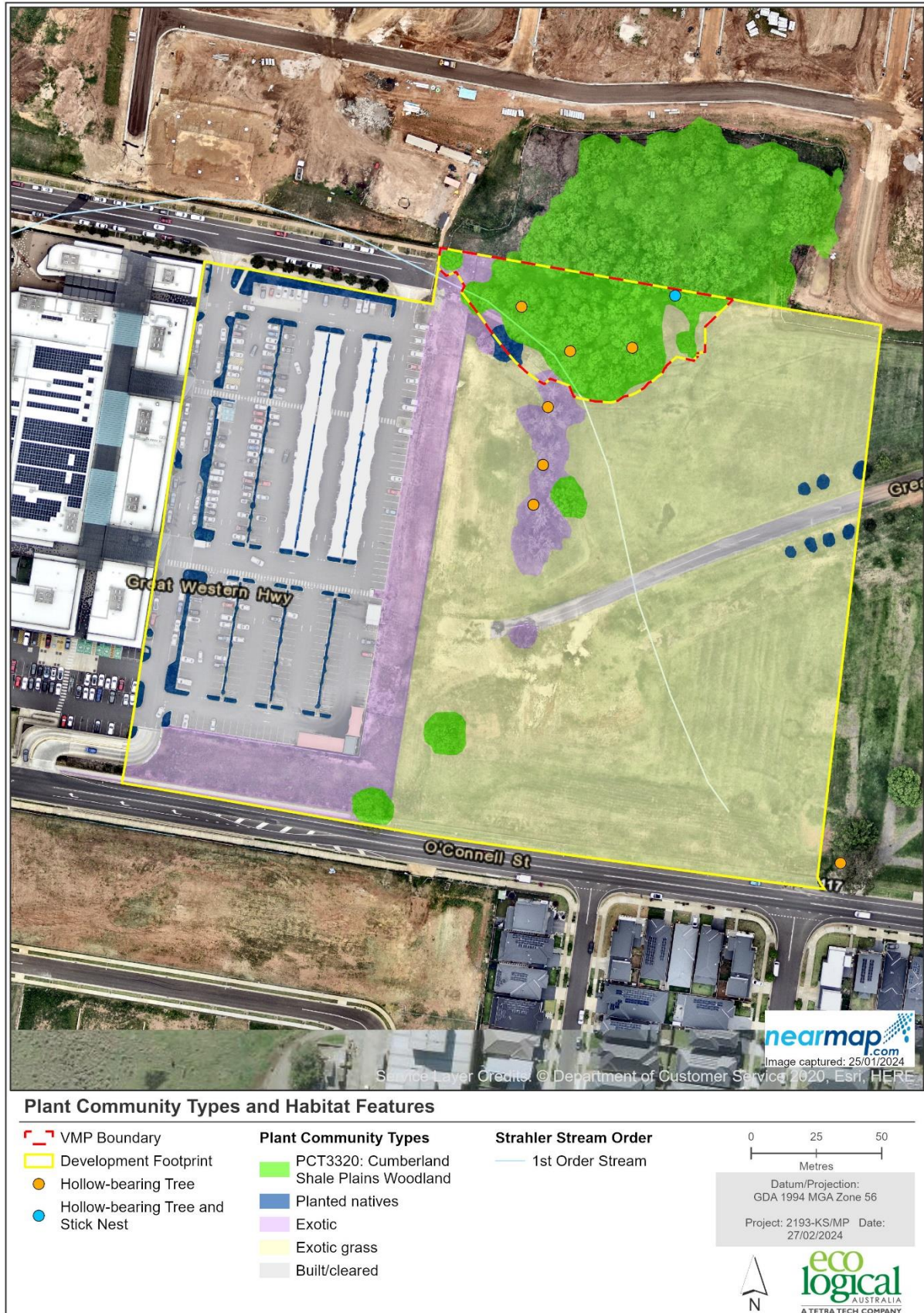


Figure 3 Plant Community Types and Habitat Features

3. Construction and Preliminary Works

3.1. Fencing and interpretation signage

3.1.1. Temporary Fencing

The edge of the VMP area where it borders the development footprint is to be fenced with temporary construction fencing to prevent civil construction machinery from entering the VMP area unless under supervision from a suitably qualified ecologist or bush regenerator (e.g. to remove the concrete drainage and section of road and guttering within the VMP area). Sediment fencing will also be required to prevent sediment movement into the VMP area. The existing fencing in the western corner of the VMP area (**Figure 2**) will need to be removed prior to the installation of temporary fencing along the VMP boundary.

Temporary fencing will allow for hollowed branches within the impact area to be easily relocated into the VMP area and to be used as habitat. It will also give the bush regeneration contractor easier access as tools and equipment will need to be used throughout the duration of the VMP implementation period. Fencing should be done in conjunction with the FMP implementation (ELA, 2024b).

3.1.2. Permanent Fencing

At the end of the construction period the perimeter of the VMP area should be protected from further disturbances using permanent fencing. A standard rural fence using 1.2m high star posts with a minimum four strands of plain wire is recommended. This fencing must allow for fauna movement but restrict motorised vehicle access into the VMP area.

3.1.3. Signage and Gates

Interpretative signage is recommended to be placed at strategic locations on the perimeter fencing to advise residents of the importance of the bushland area. Suggested text for the interpretative signage is as follows:

'The native vegetation within this precinct is of high habitat and biodiversity value and should be protected from damage. Activities such as firewood collection, picking of native flowers and dumping of garden waste or other forms of rubbish are prohibited.'

Access gates will be required to allow bush regeneration contractors access to the VMP area, including with vehicles if required. Suggested gate access points are for locations where MZs meet.

3.2. Soil and water management

An Erosion and Sediment Control Plan, preferably as part of a Construction Environmental Management Plan, must be established and implemented prior to the commencement of development works. These plans should be in accordance with best management practices as described in Landcom's 'Blue Book' (2004).

Prior to construction commencing, sediment fencing is to be installed at the base of the temporary construction fencing to prevent sediment running into the VMP area and limit the spread of weed propagules in soil sediments during the construction period.

3.3. Soil preparation

The success of survival, and reduced future costs, depend heavily on soil preparation during the development phase. Compaction and upturned soil profiles hamper later stages of revegetation and site establishment. It is highly advisable to use machinery with weight distributed evenly to reduce on ground pressure.

It is assumed that all areas of civil construction within the VMP area will be left in a suitable condition for revegetation by the civil contractor. This means that these areas will be shaped and levelled with suitable topsoil and ameliorants added and then ripped and cultivated to a light friable consistency.

Furthermore, environmental hygiene is highly recommended to prevent the introduction or the transfer of pathogens or noxious/WoNS seed. Safe Work Method Statements (SWMS) need to incorporate these measures for machinery and all pedestrians including work teams, monitoring/reporting etc.

Soil studies in Western Sydney have identified considerable chemical change in soils between the A and B horizons. The B horizons are highly sodic and are prone to deflocculation, erosion and water logging. B horizon soils also significantly reduce the success of revegetation works.

If excavation works are proposed to a level at or below the B horizon, then will be required to be treated in the following way:

- Stockpile topsoil in the A horizon
- Excavate to a level 300 mm below finished surface level
- Place stockpiled A horizon and topsoil on top of B horizon soils, minimum depth of 150mm
- Place a minimum of 150mm of topsoil (from stockpile or imported) on top of replaced A horizon and topsoil
- Add ameliorants, compost and fertiliser as appropriate and cultivate
- Water, allow weed seed to germinate and spray with herbicide
- Jute or mulch as required.

In addition, in any areas of new earthworks or compaction the following actions will be required:

- Ripping to a depth of 200mm to de-compact the topsoil
- Add topsoil as required to achieve levels
- Add ameliorants, compost and fertiliser as appropriate and cultivate
- Water, allow weed seed to germinate and spray with herbicide
- Jute or mulch as required.

3.4. Vegetation clearance and earthworks supervision

When clearing approved areas of existing native vegetation inside and outside the VMP area during construction activities, earthworks and tree removal should be undertaken with a fauna ecologist or wildlife carer present to capture and release any displaced fauna (i.e., in suitable habitat adjacent to the clearing footprint), and/or to care for injured fauna as needed.

Fallen logs and branches should be retained on-site for use within the VMP area (or potentially where needed in other bushland settings such as public reserves) as ground habitat for native fauna (see Section 3.6). It is highly recommended that where possible, seed and genetic material (i.e., cuttings or transplants) are collected in advance of clearance in the development footprint for use in the VMP area (as per planting or seeding recommendations). Proper planning, timelines and protocols should be established to facilitate this activity under the guidance and signoff of the project restoration ecologist.

3.5. Vertebrate Management

Evidence of impacts of vertebrates, notably Kangaroos should be monitored across the site and reported in the annual report noting any impacts on the implementation of this VMP. If tubestock is unable to establish, plant protection (e.g, 1200mm high tree guards or similar design) may need to be installed.

3.6. Fauna habitat enhancement

During vegetation removal, hollow stems or sections of trees if found, should be cut out and used as habitat in the VMP area. Likewise, large woody material (>10cm diameter) removed from within the development footprint/impact area can be used as habitat structures within the VMP area. Woody material provides microhabitat for fauna species, soil stability and nutrients cycling. Exotic vegetation is to be taken off-site and should not be used in habitat enhancement unless specifically advised by the project ecologist. The placement of all fauna habitat augmentation/relocation is to be carried out under the supervision and signoff of the project ecologist.

Three hollow bearing trees (HBT's) within exotic vegetation (*Populus nigra*) inside the development footprint are to be removed. The replacement of artificial hollows or nest boxes at a minimum of two nest box for each hollow removed will be required, to be placed within the VMP area. Boxes should be chosen to match the likely target species of each hollow. The placement of all nest boxes is to be carried out under the supervision and signoff of the project ecologist.

4. Vegetation Management Works

4.1. VMP Management Zones

The total area is approximately 0.36 ha and encompasses three (3) management zones, as shown in **Figure 7**.

- Zone 1: Assisted Regeneration (0.30 ha)
- Zone 2: Revegetation (0.03 ha)
- Zone 3: Channel Revegetation (0.03 ha)

Management specifications in these zones has been detailed in the following sections.

4.1.1. Management Zone 1: Assisted Regeneration

MZ1 (0.30 ha) consists of PCT 3320 *Cumberland Plain Shale Woodlands* (65% diagnostic species matched) with canopy trees consisting primarily of *Eucalyptus tereticornis*. There is no mid-storey present, with the vegetation either regularly mown or grazed down by herbivores. The dominant ground cover species recorded were native such as *Microlaena stipoides* var. *stipoides* and *Dichondra repens*.

Actions for this zone would focus on excluding herbivores to reduce grazing impacts and / or stopping mowing of the ground covers once the preliminary phase has been completed. It will also focus on the removal of any exotic grasses and other exotic species to promote opportunities for natural regeneration. Actions would also focus on the installation of native species, principally mid-storey species to re-introduce a fully structured vegetated area.

It is likely that some natural regeneration will occur following the exclusion of herbivores / prevention of mowing and primary and secondary weed control. As such a nominal revegetation proportion of 60% revegetation has been recommended but this will need to be reassessed at the end of Year 1.

Summary of management aims for MZ1 are:

- Assist natural regeneration through primary and secondary weed control
- Revegetate with native tube stock plantings (particularly mid-storey species) consistent with PCT 3320 *Cumberland Plain Shale Woodlands* to accommodate a fully structured vegetated community (see **Appendix C**)
- Irrigate until established and ongoing as needed
- Enhance habitat features across the zone (e.g. logs, rocks)
- Ongoing monitoring to track progress and identify potential issues.



Figure 4 MZ1 Current Condition

4.1.2. Management Zone 2: Revegetation

MZ2 (0.03 ha) comprises the southwest corner of the VMP area. Some small patches of PCT3320 are present closer to the drainage line however this zone features primarily exotic grasses such as *Cenchrus clandestinum* (Kikuyu) and woody weeds such as *Olea europaea* subsp. *cuspidata* (African Olive) and *Nerium oleander* (Oleander). There is an area along the southwest boundary line with planted native vegetation species *Callistemon viminalis* (Weeping Bottlebrush) and *Corymbia* cultivars. An area adjacent to the drainage line, features built infrastructure including the remnants of a gravel / concrete parking space and concrete kerb and gutter that will need to be removed prior to any rehabilitation works to the site.

Actions for this zone would initially target the removal of any existing built infrastructure. All civil works undertaken within this Zone are to be done under the supervision of an ecologist or bush regenerator. Following this, primary weed control should be undertaken, focussing on the removal of groundcover weeds, WoNs such as *Anredera cordifolia* (Madeira Vine) and *Lycium ferocissimum* (African Boxthorn) and other regional priority weeds such as African Olive, *Cirsium vulgare* (Spear Thistle) and *Araujia sericifera* (Moth Vine).

Primary weed control might include the 'cut and paint' method on woody weeds and hand pulling or stem-scraping vines and creepers. Herbaceous species such as *Conyza* sp. (Fleabane) will need to be sprayed with a glyphosate-based herbicide, formulated for use near waterways (e.g., Roundup Biactive®). Grasses can be hand-removed, or spot sprayed in low concentrations, however for larger areas it is best to slash then spray soon after, during active growth. For more information on specific weed control techniques to be applied, see **Appendix D**.

This zone is expected to require earthworks to remove built infrastructure and achieve its final form. Additionally, this zone is dominated by exotic species. As such, it is assumed that this zone will require 100% revegetation with appropriate canopy, mid-storey and groundcover species needing to be re-instated. Soil preparation should be undertaken as per the requirements of Section 3.3. Mulch is to be laid to a depth of 100mm to aid in the suppression of weeds and increase the soil organic matter.

Summary management aims for MZ2 are:

- Remove any build infrastructure within the zone
- Undertake soil preparation works
- Assist natural regeneration through primary and secondary weed control
- Revegetate canopy, mid-storey and groundcovers with tube stock plantings consistent with PCT 3320 *Cumberland Plain Shale Woodlands* to accommodate a fully structured vegetated community (see **Appendix C**)
- Install 100mm mulch
- Irrigate until established and ongoing as needed
- Enhance habitat features across this zone (e.g. logs, rocks).
- Ongoing monitoring to track progress and identify potential issues



Figure 5 MZ2 Current Condition

4.1.3. Management Zone 3: Channel Revegetation

MZ3 (0.03 ha) comprises the drainage channel mapped within the VMP area (**Figure 7**). This portion of the watercourse (running east to west through the VMP area) consists of an open concrete lined channel.

Actions for this zone would focus on the removal of the concrete lining within the channel and the installation of native species, primarily sedges, rushes and flaxes with a minimum width of 4m, to form thick erosion resistant root beds. Soil preparation should be undertaken as per the requirements of Section 3.3. Jute matting will be required on the banks of this zone to stabilise the topsoil and regulate the volume of runoff, in addition to reducing weed invasion.

Weed management in this zone should focus on the treatment of ephemeral weeds by deseeding, hand pulling or spraying with non-selective and non-residual herbicide to accommodate a broad range of aquatic, annual and perennial weeds such as Glyphosate 450 Xtraquatic® herbicide. For more information on specific weed control techniques, see **Appendix D**.

It is assumed that reshaping of these drainage lines is likely to be undertaken and existing native species will be impacted. Based on this assumption 100% of this zone is expected to require revegetation.

Summary of management aims for MZ3 are:

- Undertake excavation works to remove concrete lining along drainage channel
- Undertake soil preparation works
- Install jute matting
- Enhance habitat features across the zone (e.g. logs, rocks)
- Install native riparian rushes and sedges (see **Appendix C**)
- Irrigate until establishment and ongoing as needed
- Control exotic grasses and other exotic species
- Ongoing monitoring to track progress and identify potential issues.



Figure 6 MZ3 Current Condition

4.2. Weed Control

4.2.1. Preliminary

The local EGK population will likely need to access the VMP area throughout the duration of the construction period as a temporary additional refuge area. Because of this, a preliminary phase has been established where primary weed control will commence (i.e. the removal of woody weeds). It is assumed that this phase will run for a period of 6-months however, it may need to be extended if earthworks have not been completed.

4.2.2. Primary and Secondary weed control

All weeds, including woody weeds will require treatment. Secondary and maintenance weed control will be required following revegetation. During these works, care must be taken to avoid any off-target damage to the natural regeneration of native species. Care should also be taken around waterways, hand pulling or spraying with a non-selective and non-residual herbicide will accommodate a broad range of aquatic, annual and perennial weeds such as Glyphosate 450 Xtraquatic® herbicide.

Primary weed control is to be undertaken prior to any revegetation works and would include initial treatment of woody weeds, vines, exotic shrubs, and groundcovers. Species which should be a focus for control include WoNS, State Priority and Regional Priority weeds (predominantly Madeira Vine (*Anredera cordifolia*) and African Boxthorn (*Lycium ferocissimum*)). Woody weeds such as African Olive (*Olea europaea subsp. Cuspidata*), *Nerium oleander* (Oleander) and African Boxthorn (*Lycium ferocissimum*) can be effectively treated using the 'cut and paint' method. Creeper and climber (e.g. *Anredera cordifolia* (Madeira Vine), *Araujia sericifera* (Moth Vine) and *Ipomoea indica* (Blue Morning Glory)) weed control can vary depending upon the species however for most species' seedlings can be hand removed, while mature plants can be chemically controlled using the stem-scrape method or spot foliage sprays. In addition, other species considered problematic in bushland settings which are present at this site are herbaceous weeds such as Spear thistle (*Cirsium vulgare*), Oxalis (*Oxalis sp.*), Dock (*Rumex sp.*), fleabane (*Conyza sp.*) and Sticky nightshade (*Solanum sisymbriifolium*). Where isolated, herbaceous weeds can be hand removed or spot sprayed, they can also be slashed then sprayed when regrowing in areas of higher concentrations.

Annual and perennial grasses where isolated or in low concentrations should be hand removed or spot sprayed. Larger patches of annuals can be slashed after flowering but prior to seed set, and sprayed during the vigorous growth that follows. Perennials (e.g. African Lovegrass *Eragrostis curvula* and Kikuyu grass *Pennisetum clandestinum*) should be slashed prior to seed production in spring or summer, then the regrowth herbicide sprayed 2-3 weeks later when it is actively growing and approximately 10cm in length.

4.2.3. Maintenance

All management zones will require ongoing management for the five VMP maintenance period years to treat weed regrowth or weed emergence from the soil seed bank. Maintenance work is to be undertaken by a qualified bush regeneration contractor(s) as per specifications provided in **Appendix D**. Maintenance will be undertaken at a higher frequency during peak growing seasons (i.e., spring and summer), and with less frequency during cooler periods (i.e., autumn and winter). Maintenance may

also include (where appropriate) actions that assist native regeneration such as through the restriction of excessive grass biomass (e.g., slashing or burning), through niche seeding, or transplanting.

4.3. Revegetation

All zones are expected to require some level of revegetation and are to be undertaken in Year 2 of the maintenance period to allow sufficient time for natural regeneration to occur. Revegetation works will include planting of native groundcover, grass shrub and canopy species. All revegetation will be using tube stock and Hiko / Viro cells. The revegetation area within each management zone is shown in **Table 3**.

Propagation material for planting stock should be sourced from pre-clearance collections, nearby locations, or from within the catchment region following current Florabank Guidelines (Harrison et al. 2021). Appropriate planning and timelines for sourcing propagation and planting material should be allowed for. Suggested species in **Appendix C: Recommended Planting Scheme** should be used as a general guide, but other suitable species may be used if required.

Where required, mulch will should be laid to a depth of 100mm. Where possible it is preferred to use site obtained mulch from the clearance of native vegetation, although if this is not possible mulch can be externally sourced adhering to Australian Standards (i.e., AS4454 (2012): Compost soils conditioners and mulches). In addition, mulch should be comprised of un-composted wood preferably wood waste, with a particle size of about 15mm to 40mm with no fines and good air-filled porosity. Mulch should not contain and weed seeds, nor be derived from diseased trees or from any part of the tree lower than 1m above the ground. It is assumed site access will permit the delivery of mulch within 30m of the VMP area and spread via bobcat.

Jute matting will be required in areas of higher inundation of the site during high rainfall periods, particularly within Zone 3. Jute matting must be comprised of 100% biodegradable jute fibres with a minimum weight of 680g/m² (~6mm thickness). Jute must be pegged with at least 3x150mm pins per m² and each roll overlapped by 100mm.

Planting densities for each management zone are provided in **Table 4 Revegetation Densities**. A recommended planting list is provided in **Appendix C: Recommended Planting Scheme**. Revegetation will be done with species consistent with vegetation communities that would naturally occur in *Cumberland Shale Plains Woodland*. All plantings are to be sourced from a local provenance stock as per the Florabank guidelines (Mortlock, 2000).

Table 3 Revegetation Assumptions

| Zone | Sum of Area (m ²) | Reveg Area (%) | Reveg Area (m ²) | Jute (%) | Jute Area (m ²) | Mulch (%) | Mulch Area (m ²) |
|----------------------------|-------------------------------|----------------|------------------------------|----------|-----------------------------|-----------|------------------------------|
| MZ1: Assisted Regeneration | 3,029 | 60 | 1,817 | 0 | 0 | 0 | 0 |
| MZ2: Revegetation | 261 | 100 | 261 | 0 | 0 | 100 | 261 |
| MZ3: Channel Revegetation | 319 | 100 | 319 | 100 | 319 | 0 | 0 |
| Totals | 3,609 | - | 2,397 | - | 319 | - | 261 |

Table 4 Revegetation Densities

| Zone | Revegetation Area (m ²) | Revegetation densities (m ²) | | | | Totals |
|----------------------------|-------------------------------------|--|------------|--------------------|---------------|---------------|
| | | Tree | Shrub | Herbs / Scramblers | Sedge / Grass | |
| MZ1: Assisted Regeneration | 1,817 | - | 1/10 | 1.00 | 3.00 | 7,452 |
| MZ2: Revegetation | 261 | 1/50 | 1/10 | 1.00 | 3.00 | 1,075 |
| MZ3: Channel Revegetation | 319 | - | - | - | 6.00 | 1,914 |
| Totals | 2,397 | 5 | 208 | 2,078 | 8,150 | 10,441 |



Figure 7 Vegetation Management Zones within the VMP Area

5. Implementation Schedule

5.1. Implementation Schedule

The VMP area will be managed with an untimed preliminary period, assumed to be 6-months and a five-year maintenance period.

An indicative implementation schedule has been provided in **Table 5**.

| | |
|-----|-------------------------------|
| Key | Civil construction activities |
| | Vegetation management works |

5.2. Adaptive Management

An adaptive management approach will be implemented that enables the successful contractor to learn from and respond to successful and unsuccessful techniques used on the site. In its simplest form, this may include the substitution of species identified in the planting table or for undertaking advanced direct seeding techniques in place of manual planting techniques for revegetation works.

The success of the works will be determined by meeting the performance criteria identified in **Table 6**.

Contractors have the flexibility to implement different techniques to those specified here providing that performance criteria are met. Any major departures from the VMP or proposed changes to performance criteria must be approved in writing by the relevant consent authority.

5.3. VMP management after maintenance period (in perpetuity)

The VMP is to be re-evaluated upon completion of all works described within this VMP and at least every five years after that to ensure the site meets the performance criteria. Surveys at these inspections is to include both priority and environmental weed populations. Areas that do not conform to the performance criteria at the completion of works are required to be rehabilitated using the methods outlined within this VMP and may result in the extension of the VMP management period for a further 5 years.

5.4. Training

Construction staff will require training/inductions into the requirements of this VMP, including the location and requirements of tree/vegetation protection zones.

Table 5 Implementation Schedule

| Task | Preliminary works | Maintenance | | | | | | | | | | | | | | | | | | | | Ongoing | |
|---|-------------------|-------------|---|---|---|--------|---|---|---|--------|---|---|---|--------|---|---|---|--------|---|---|---|---------|--|
| | | Year 1 | | | | Year 2 | | | | Year 3 | | | | Year 4 | | | | Year 5 | | | | | |
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | | |
| Preliminary works | | | | | | | | | | | | | | | | | | | | | | | |
| Site mark out/fencing | | | | | | | | | | | | | | | | | | | | | | | |
| Earthworks | | | | | | | | | | | | | | | | | | | | | | | |
| Soil preparation | | | | | | | | | | | | | | | | | | | | | | | |
| Habitat enhancement | | | | | | | | | | | | | | | | | | | | | | | |
| Revegetation | | | | | | | | | | | | | | | | | | | | | | | |
| Seed collection, cleaning, storage | | | | | | | | | | | | | | | | | | | | | | | |
| Site Preparation | | | | | | | | | | | | | | | | | | | | | | | |
| Jute Matting / Mulch | | | | | | | | | | | | | | | | | | | | | | | |
| Tubestock, supply and install | | | | | | | | | | | | | | | | | | | | | | | |
| Replacement tubestock, supply and install | | | | | | | | | | | | | | | | | | | | | | | |
| Irrigation | | | | | | | | | | | | | | | | | | | | | | | |
| Weed control | | | | | | | | | | | | | | | | | | | | | | | |
| Preliminary | | | | | | | | | | | | | | | | | | | | | | | |
| Maintenance: Years 1-2 | | | | | | | | | | | | | | | | | | | | | | | |
| Maintenance - Years 3-5 | | | | | | | | | | | | | | | | | | | | | | | |
| Associated works | | | | | | | | | | | | | | | | | | | | | | | |
| Monitoring & Reporting | | | | | | | | | | | | | | | | | | | | | | | |

6. Monitoring and Reporting

It is recommended that the bush regeneration contractor (or the landowner) should be responsible for monitoring restoration actions and vegetation change over time. The aim of monitoring is to measure the effectiveness of restorative actions. Information gained through monitoring (and its reporting) will help to identify actions that have or have not been successful, and ideally highlight reasons for success or failure. It may also identify non-conformance of VMP recommendations. Information derived from monitoring will also inform adaptive management decisions. Finally, monitoring and the reporting of findings will be important in quantifying the various costs related to restoration and weed management and to determining the overall cost effectiveness of the VMP.

Monitoring will entail a combination of photo monitoring and vegetation surveys. To establish a benchmark for performance, monitoring must be implemented prior to works commencing, and thereafter on an annual basis until project completion to track change against the baseline and towards meeting performance criteria. Monitoring results must be presented in an annual progress report.

6.1. Photo Monitoring

Photo monitoring points should be set-up using a permanent reference point to provide a visual reference of changes in the vegetation. Photo monitoring to include:

- Set up four photo monitoring points within the VMP area as follows:
 - MZ1: two photopoints
 - MZ2: one photopoint
 - MZ3: one photopoint
- Mark the photo point with a six-foot star picket and map the location and bearing of each photo point.
- Take a digital photo of each photo point with the whole length of the star picket visible in the photo to act as a reference point; and
- Organise the digital photos logically with each image labelled with a unique reference number indicating the location of the photo point, the direction of the photo and the date the photo is taken.

Photo-monitoring points should be installed in the preliminary period to allow for the establishment of the baseline photos. Photopoint locations should be representative of the zone based on current condition and also planned VMP works. If works are staged then a minimum of one photopoint for each zone in each stage will be required, and potentially more depending on proportion.

6.2. Vegetation Surveys

Quadrat data points will be set up within the VMP area to monitor changes in the vegetation through time. The quadrat data forms the baseline for monitoring against the performance criteria for the duration of the VMP. Floristic plot data is to be collected including species richness, cover and abundance in a 5 x 5 m minimum sized quadrat.

Vegetation quadrats will be required at all photopoints. If works are staged then a minimum of two vegetation quadrats for each zone in each stage will be required, and potentially more depending on proportion.

6.3. Progress reports

Progress reports are to be provided at the end of the preliminary period, every 6-months through Year 1 and 2 then annually until the completion of the project. This reporting includes the implementation of the monitoring actions specified in sections 6.1 & 6.2 and a description of the works that have been undertaken. These reports will be submitted to the consent authority. Reports will include at a minimum:

- The time period the report relates to,
- Qualifications and experience of contractors,
- Certification of seed and local provenance stock,
- A summary of works carried out within the period including:
 - Date and time of site visits,
 - Works completed on the site at each visit,
 - A table detailing total person hours for each task carried out on-site,
 - Methods of weeding undertaken and details of herbicide use,
 - Numbers of tube stock planted if applicable,
 - Methods implemented for Assisted Natural Regeneration,
- Photo monitoring results to date,
- A description of any problems encountered in implementing the works outlined in this VMP and how they were overcome,
- Any observations made, including new plant species recorded (native and weed species), comments on rates of regeneration and any problems which impact on the implementation of the VMP,
- If applicable, the results of the implementation works in relation to the relevant performance criteria.

6.4. Performance criteria

The performance criteria are detailed in **Table 6**.

Failure to meet these performance criteria will mean that the maintenance period will be extended until they are achieved. Therefore, maintenance must continue until the consent authority agrees that the objectives and performance criteria have been met and the maintenance period has concluded. The author of this VMP, or an equally qualified and experienced person, must prepare a statement certifying the compliance of the performance criteria at the end of the VMP period.

If monitoring indicates that the VMP tasks are not resulting in achievement of the performance criteria, the task program will be revised. Caddens Estate Development Pty Ltd and the bush regeneration contractor, with approval from the consent authority, can adapt these criteria as required in response to the success of rehabilitation works.

The following performance criteria will need to be achieved in perpetuity:

- Across the VMP area, <2% priority weeds cover and <5% environmental weeds cover.
- No patches of the VMP greater than 2m x 2m without any surviving natives or with significant erosion present.
- No infiltration by exotic lawn species into the VMP area,
- No dumped garden waste or rubbish within the VMP area,

Table 6 Performance Criteria for all zones

| Management Zones | Preliminary | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|------------------|--|---|---|---|--|---|
| All Zones | <ul style="list-style-type: none"> Commencement of all tasks outlined in the VMP or evidence of planning for their implementation. <p><i>Civil construction works:</i></p> <ul style="list-style-type: none"> All Construction and sediment fencing installed Information signage installed Removal and disposal of all exotic vegetation throughout the VMP, completed under the supervision of a qualified ecologist All earthworks completed under the supervision of an ecologist or bush regenerator All rubbish and debris and debris are removed All soil preparation works completed to provide suitable conditions for revegetation <p><i>Vegetation management works:</i></p> <ul style="list-style-type: none"> Revegetation is to be undertaken with a minimum of 40% of the benchmark levels for species diversity provided in Table 7. 85% survival of vegetation and no areas with more than 2mx2m without surviving native plants Maintenance replanting is to replace plants by the same species or where that species is unavailable with the same growth form (i.e., tree for tree etc.) and must not decrease species diversity. Any new species must be from the community being emulated and of local provenance. Treatment of any new weed infestations No woody weeds present capable of producing seed No erosion or sedimentation beyond the boundary of the development lot Monitoring and reporting undertaken in accordance with Section 6 | | | | | |
| All Zones | Treat 100% of priority weeds Treat 95% of other weeds | No greater than 20% cover by priority weeds No greater than 30% cover by all weeds | Undertake all revegetation as per VMP or equivalent regeneration Native vegetation cover no less than 60% of non-rock areas No greater than 15% cover by priority weeds No greater than 20% cover by all weeds | Native vegetation cover no less than 70% of non-rock areas No greater than 10% cover by priority weeds No greater than 15% cover by all weeds | Native vegetation cover no less than 80% of non-rock areas No greater than 5% cover by priority weeds No greater than 10% cover by all weeds | Native vegetation cover no less than 90% of non-rock areas No greater than 2% cover by priority weeds. No greater than 5% cover by all weeds |

Table 7 PCT benchmark condition

| PCT ID | PCT Common name (community) (BioNet 2022) | Species richness | | | Cover (%) | | |
|--------|---|------------------|-------|--------------|-----------|-------|--------------|
| | | Canopy | Shrub | Ground cover | Canopy | Shrub | Ground cover |
| 3320 | Cumberland Shale Plains Woodland | 5 | 8 | 32 | 52 | 15 | 73 |

7. Costs

The indicative cost of implementation for establishment plus the Two-year period is approximately **\$140,000** exclusive of GST and CPI. An indicative annual costing timeline for preliminary to Year 5 is provided in **Table 8**. Costs should be reassessed at the end of Year 1 on the results of the management undertaken to that point. Rates and costs are based on typical commercial rates. Assumptions that have been made regarding the estimation of costs have been outlined below.

7.1. Preliminary works

7.1.1. Vegetation clearing and soil preparation

It is assumed that all soil preparation works and any vegetation clearing associated with construction works with the VMP area will be undertaken by the civil contractor under the supervision of the project restoration ecologist. No costs have been provided in this VMP for the soil preparation, vegetation clearing or supervision by a suitably qualified and experienced restoration ecologist.

7.2. Seed collection

Budget for the collection of seed has been included as a separate task. This is an indicative figure and does not consider seasonal and annual climatic variation which may increase or decrease the efficiency of seed collection. If further seed collection works are required, this may be an addition cost.

7.3. Vegetation Management Works

7.3.1. Site Preparation

This cost is based on works to be undertaken after the completion of any construction activities in the riparian corridor, including soil preparation works. Costs assume access for vehicles/trucks related to restoration actions (e.g., spraying out of revegetation areas, installation of jute/mulch). If access is not available, this may increase the cost of this item. Prior to mulching and revegetation, all exotic vegetation must be treated and controlled to an acceptable standard.

7.3.2. Weed control techniques

Bush regeneration contractors will implement the weed control treatments identified in this VMP. These works have been estimated to cost **\$1,250** for a team of two bush regenerators, including a supervisor, per day. The cost of bush regeneration works includes the cost of herbicide, vehicles and equipment which are required to implement the VMP.

Specific weed control techniques are available in **Appendix D**.

7.3.3. Revegetation treatments

Bush regeneration contractors will implement the revegetation treatments identified in this VMP. Tube stock costs have been budgeted at an estimated **\$3.50** per tree and shrub including planting and **\$2.50** per herb, grass, sedge, and groundcover including planting.

A total of approximately **10,400** plants are assumed to be required to achieve the densities identified in the VMP, plus a 10% rate for replacement plantings to be installed throughout the remainder of the VMP period after initial revegetation works.

7.3.4. Monitoring and reporting

Monitoring and reporting can be undertaken either by the bush regeneration contractor or by the project ecologist.

This includes:

- The initial set up of the photo points and conducting the baseline surveys at the end of the preliminary period;
- Preparing monitoring reports, including photo points and vegetation surveying biannually in Year 1 and 2, then annually until the end of Year 5.

Table 8 Indicative costing of VMP Implementation

| Task | Preliminary works | Maintenance | | | | | Total |
|---|-------------------|-------------|-----------|-----------|-----------|-----------|-----------|
| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | |
| Revegetation | | | | | | | |
| Seed collection, cleaning, storage | \$ 1,566 | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 1,566 |
| Site Preparation | \$ - | \$ 2,397 | \$ - | \$ - | \$ - | \$ - | \$ 2,397 |
| Jute Matting / Mulch | \$ - | \$ - | \$ 4,640 | \$ - | \$ - | \$ - | \$ 4,640 |
| Tubestock, supply and install | \$ - | \$ - | \$ 26,848 | \$ - | \$ - | \$ - | \$ 26,848 |
| Replacement tubestock, supply and install | \$ - | \$ - | \$ - | \$ 2,685 | \$ - | \$ - | \$ 2,685 |
| Irrigation | \$ - | \$ - | \$ 4,315 | \$ 479 | \$ - | \$ - | \$ 4,795 |
| Weed control | \$ 7,218 | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 7,218 |
| Preliminary | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| Maintenance - Years 1-2 | \$ - | \$ 16,376 | \$ 14,816 | \$ - | \$ - | \$ - | \$ 31,192 |
| Maintenance - Years 3-5 | \$ - | \$ - | \$ - | \$ 14,404 | \$ 12,803 | \$ 11,203 | \$ 38,410 |
| Associated costs | | | | | | | |
| Disbursements | \$ 722 | \$ 1,638 | \$ 1,482 | \$ 1,440 | \$ 1,280 | \$ 1,120 | \$ 7,682 |

| Task | Preliminary works | Maintenance | | | | | Total |
|------------------------|-------------------|------------------|------------------|------------------|------------------|------------------|-------------------|
| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | |
| Monitoring & Reporting | \$ 2,406 | \$ 2,406 | \$ 2,406 | \$ 2,406 | \$ 2,406 | \$ 2,406 | \$ 14,436 |
| Totals | \$ 11,912 | \$ 22,817 | \$ 54,508 | \$ 21,414 | \$ 16,490 | \$ 14,729 | \$ 141,870 |

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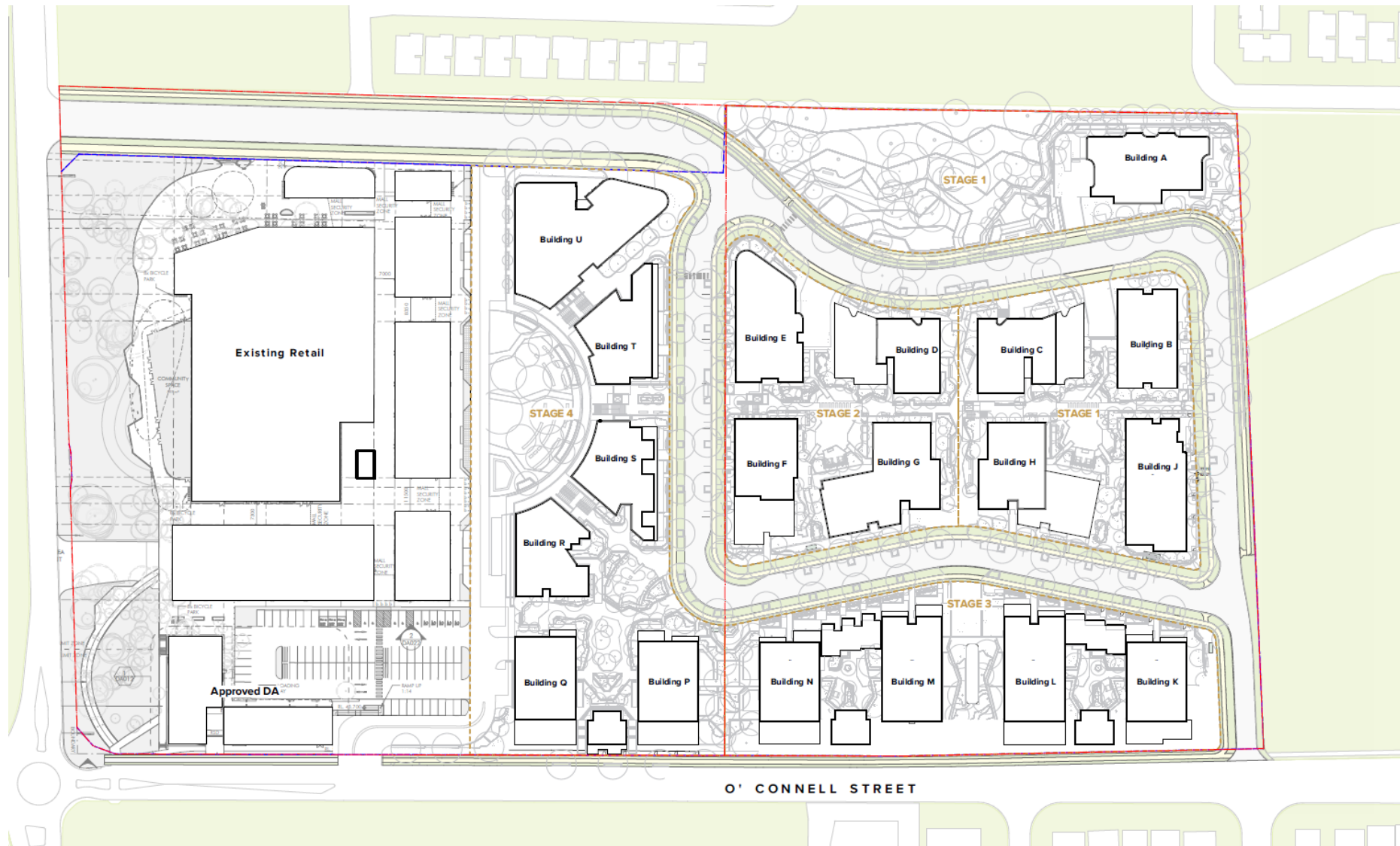
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Appendix A Development Plans



Appendix B Existing Vegetation

| | Botanical Name | Common Name |
|---------------------------|---------------------------------------|-----------------------|
| NATIVE VEGETATION SPECIES | <i>Asperula sp.</i> | Asperula |
| | <i>Austrodanthonia sp.</i> | Wallaby Grass |
| | <i>Bothriochloa sp.</i> | Bothriochloa |
| | <i>Brunoniella australis</i> | Blue Trumpet |
| | <i>Callistemon sp.</i> | Bottlebrush |
| | <i>Chloris ventricosa</i> | Plump Windmill Grass |
| | <i>Cynodon dactylon</i> | Couch / Bermuda Grass |
| | <i>Dichondra repens</i> | Kidney Weed |
| | <i>Einadia nutans</i> | Climbing Saltbush |
| | <i>Einadia trigonis</i> | Fishweed |
| | <i>Eragrostis brownii</i> | Brown's Lovegrass |
| | <i>Eriochloa pseudoacrotricha</i> | Early Spring Grass |
| | <i>Eucalyptus tereticornis</i> | Forest red gum |
| | <i>Microlaena stipoides</i> | Weeping grass |
| | <i>Paspalidium sp.</i> | Watercrown Grass |
| | <i>Commelina cyanea</i> | Scurvy weed |
| | <i>Glycine clandestina</i> | Twining glycine |
| | <i>Glycine tabacina</i> | Variable glycine |
| | <i>Phyllanthus similis</i> | Phyllanthus |
| WEED SPECIES | <i>Agave americana</i> | Century Plant |
| | <i>Anredera cordifolia</i> | Madeira Vine |
| | <i>Araujia sericifera</i> | Moth Vine |
| | <i>Bidens pilosa</i> | Coblers Pegs |
| | <i>Cenchrus clandestinum</i> | kikuyu grass |
| | <i>Cirsium vulgare</i> | Spear thistle |
| | <i>Conyza sp.</i> | Fleabane |
| | <i>Cyperus eragrostis</i> | Umbrella Sedge |
| | <i>Eragrostis curvula</i> | African lovegrass |
| | <i>Hypochaeris radicata</i> | Catsear |
| | <i>Ipomoea indica</i> | Blue Morning Glory |
| | <i>Lycium ferocissimum</i> | African boxthorn |
| | <i>Malva parviflora</i> | Mallow |
| | <i>Nerium oleander</i> | Oleander |
| | <i>Olea europaea subsp. cuspidata</i> | African olive |

| | Botanical Name | Common Name |
|--|--------------------------------|-------------------|
| | <i>Oxalis sp.</i> | Oxalis |
| | <i>Paspalum dilatatum</i> | Paspalum |
| | <i>Plantago sp.</i> | Plantain |
| | <i>Rumex sp.</i> | Dock |
| | <i>Sida rhombifolia</i> | Paddy's Lucerne |
| | <i>Solanum sisymbriifolium</i> | Sticky nightshade |
| | <i>Verbena bonariensis</i> | Purpletop |

Appendix C Recommended Planting Scheme

| Strata | Botanical Name | Common Name | MZ1 | MZ2 | MZ3 |
|-----------------|---------------------------------|---------------------------|-----|-----|-----|
| Tree | <i>Acacia parramattensis</i> | Parramatta wattle | | X | |
| | <i>Angophora floribunda</i> | Rough-barked apple | | X | |
| | <i>Angophora subvelutina</i> | Broad-leaved apple | | X | |
| | <i>Corymbia maculata</i> | Corymbia maculata | | X | |
| | <i>Eucalyptus amplifolia</i> | Cabbage gum | | X | |
| | <i>Eucalyptus baueriana</i> | Blue box | | X | |
| | <i>Eucalyptus fibrosa</i> | Red Ironbark | | X | |
| | <i>Eucalyptus moluccana</i> | Gum-topped box | | X | |
| | <i>Eucalyptus tereticornis</i> | Forest red gum | | X | |
| Shrub | <i>Acacia falcata</i> | Sickle wattle | X | X | |
| | <i>Acacia implexa</i> | Hickory wattle | X | X | |
| | <i>Astroloma humifusum</i> | Cranberry heath | X | X | |
| | <i>Breynia oblongifolia</i> | Coffee bush | X | X | |
| | <i>Bursaria spinosa</i> | Sweet Bursaria | X | X | |
| | <i>Daviesia ulicifolia</i> | Gorse bitter-pea | X | X | |
| | <i>Dillwynia sieberi</i> | Prickly parrot-pea | X | X | |
| | <i>Dodonaea viscosa</i> | Sticky hop bush | X | X | |
| | <i>Eremophila debilis</i> | Winter apple | X | X | |
| | <i>Exocarpos cupressiformis</i> | Native cherry | X | X | |
| | <i>Hibbertia aspera</i> | Rough guinea flower | X | X | |
| | <i>Hibbertia diffusa</i> | Wedge guinea flower | X | X | |
| | <i>Indigofera australis</i> | Austral indigo | X | X | |
| | <i>Leucopogon juniperinus</i> | Prickly beard-heath | X | X | |
| | <i>Lissanthe strigosa</i> | Peach heath | X | X | |
| | <i>Melaleuca decora</i> | White feather honeymyrtle | X | X | |
| | <i>Ozothamnus diosmifolius</i> | Sago bush | X | X | |
| | <i>Pultenaea microphylla</i> | Spreading bush-pea | X | X | |
| Grass&grasslike | <i>Aristida ramosa</i> | Purple wiregrass | X | X | |
| | <i>Aristida vagans</i> | threeawn speargrass | X | X | |
| | <i>Bothriochloa macra</i> | Red grass | X | X | |
| | <i>Carex inversa</i> | Knob sedge | | | X |
| | <i>Chloris ventricosa</i> | Blue Star Grass | X | X | |
| | <i>Cymbopogon refractus</i> | Barbed wire grass | X | X | X |
| | <i>Cynodon dactylon</i> | Bermuda grass | X | X | |
| | <i>Cyperus gracilis</i> | Slender flat-sedge | | | X |
| | <i>Dichelachne micrantha</i> | Shorthair plumegrass | X | X | X |
| | <i>Echinopogon caespitosus</i> | Bearded Grass | X | X | |
| | <i>Echinopogon ovatus</i> | Common Hedgehog grass | X | X | |
| | <i>Entolasia marginata</i> | Bordered Panic | X | X | |
| | <i>Entolasia stricta</i> | Wiry Panic | X | X | |
| | <i>Eragrostis brownii</i> | Browns lovegrass | X | X | |
| | <i>Eragrostis leptostachya</i> | Paddock Lovegrass | X | X | |

| Strata | Botanical Name | Common Name | MZ1 | MZ2 | MZ3 |
|--------|---|--------------------------|-----|-----|-----|
| | <i>Fimbristylis dichotoma</i> | Forked Fimbr | X | X | |
| | <i>Juncus usitatus</i> | Common rush | X | X | X |
| | <i>Lachnagrostis filiformis</i> | Pacific Bent Grass | X | X | |
| | <i>Lepidosperma laterale</i> | Variable Sword sedge | X | X | |
| | <i>Lomandra confertifolia</i> | Mat rush | | | X |
| | <i>Lomandra filiformis</i> | Wattle Mat Rush | | | X |
| | <i>Lomandra longifolia</i> | Spiny head mat rush | X | X | |
| | <i>Lomandra multiflora subsp. multiflora</i> | Many flowered mat rush | | | |
| | <i>Microlaena stipoides</i> | Weeping Grass | X | X | |
| | <i>Oplismenus aemulus</i> | Australian Basket Grass | X | X | |
| | <i>Panicum effusum</i> | Hairy panic | X | X | |
| | <i>Panicum simile</i> | Two colour panic | X | X | |
| | <i>Paspalidium distans</i> | Shotgrass | X | X | X |
| | <i>Poa labillardierei var. labillardierei</i> | Common Tussock-grass | X | X | |
| | <i>Rytidosperma racemosum</i> | Clustered wallaby-grass | X | X | |
| | <i>Rytidosperma tenuius</i> | Purplish wallaby grass | X | X | |
| | <i>Sporobolus creber</i> | Slender Rat's-Tail Grass | X | X | |
| | <i>Sporobolus elongatus</i> | Slender Rat's-Tail Grass | X | X | |
| | <i>Themeda triandra</i> | Kangaroo grass | X | X | X |
| Forb | <i>Arthropodium milleflorum</i> | Pale Vanilla Lily | X | X | |
| | <i>Asperula conferta</i> | Common woodruff | X | X | |
| | <i>Brunoniella australis</i> | Blue trumpet | X | X | |
| | <i>Centella asiatica</i> | Asiatic pennywort | X | X | X |
| | <i>Dianella longifolia</i> | Greater Blueberry Lily | X | X | X |
| | <i>Dianella revoluta</i> | Blueberry lily | X | X | X |
| | <i>Dichondra repens</i> | Kidney Weed | X | X | X |
| | <i>Einadia hastata</i> | Berry Saltbush | X | X | |
| | <i>Euchiton sphaericus</i> | Star cudweed | X | X | |
| | <i>Goodenia hederacea</i> | Ivy goodenia | X | X | |
| | <i>Hypericum gramineum</i> | Small st Johns wort | X | X | |
| | <i>Hypoxis hygrometrica</i> | Golden weather-grass | X | X | |
| | <i>Lobelia purpurascens</i> | White root | X | X | |
| | <i>Opercularia diphylla</i> | Twin leaf stinkweed | X | X | |
| | <i>Oxalis perennans</i> | Yellow wood-sorrel | X | X | |
| | <i>Phyllanthus virgatus</i> | Jointweed | X | X | |
| | <i>Poranthera microphylla</i> | Small poranthera | X | X | |
| | <i>Solanum prinophyllum</i> | Forest Nightshade | X | X | |
| | <i>Stackhousia viminea</i> | Slender stackhousia | X | X | |
| | <i>Tricoryne elatior</i> | Yellow autumn-lily | X | X | |
| | <i>Vernonia cinerea</i> | Common vernonia | X | X | |
| | <i>Veronica plebeia</i> | Creeping speedwell | X | X | |
| | <i>Wahlenbergia gracilis</i> | Australian bluebell | X | X | |
| Other | <i>Clematis aristata</i> | Old Man's Beard | X | X | |
| | <i>Clematis glycinoides</i> | Headache Vine | X | X | |

| Strata | Botanical Name | Common Name | MZ1 | MZ2 | MZ3 |
|------------|----------------------------------|----------------------|-----|-----|-----|
| | <i>Convolvulus erubescens</i> | Australian bindweed | X | X | |
| | <i>Desmodium varians</i> | Slender tick trefoil | X | X | |
| | <i>Glycine clandestina</i> | Twining glycine | X | X | |
| | <i>Glycine microphylla</i> | Small-leaf glycine | X | X | |
| | <i>Glycine tabacina</i> | variable glycine | X | X | |
| | <i>Hardenbergia violacea</i> | Purple coral-pea | X | X | |
| | <i>Polymeria calycina</i> | Slender bindweed | X | X | |
| Unassigned | <i>Wurmbea dioica</i> | Early Nancy | X | X | |
| | <i>Sphaeromorphaea australis</i> | Spreading nut-heads | X | X | |

Appendix D Techniques and Specifications

WEED CONTROL

Weed control involves a combination of mechanical, physical, and chemical techniques to remove the weeds and prevent regrowth. Weed control will be undertaken across the entire zone. A selection of the best suited weed control method within the site depends on a number of factors, including:

- The species or combination of weeds being targeted,
- The density of weeds present,
- Resources available (time, labour, equipment, and finances),
- Weather conditions on the day.

WEED CONTROL TECHNIQUES

Details of specific weed control techniques to be used such as cut-and-paint, scrape-and-paint, herbicide-spraying, and hand weeding are provided in Brodie (1999). The principles of bush regeneration and techniques to trigger natural regeneration are to be in accordance with the Bradley Method and other techniques described in Buchanan (2009). Management techniques for different types of weeds are provided below.

Annual grasses

Annual grasses should be hand removed or spot sprayed where isolated or in low concentrations. Larger patches of annual grasses may be slashed/brush cut in late spring to early summer, after flowering, but prior to seed set. For most species, slashing/brush cutting prior to late spring through to early summer will promote vigorous growth and should not occur. However, some annual grasses can grow and produce seed at any time of the year dependent on climatic conditions such as high rainfall and warm temperatures. Monitoring of annual species should be undertaken and if new growth occurs, the same treatment will be applied to the new growth to prevent seed production. Individual plants should be hand removed, bagged, and disposed of appropriately offsite.

Perennial grasses

Perennial grasses, such as *Pennisetum clandestinum* (Kikuyu) and *Eragrostis curvula* (African Love grass) will be hand removed where isolated or in low concentrations. Larger patches may be slashed prior to seed production in spring or summer (depending on the growth cycle of the species) and the regrowth spot-sprayed 2-3 weeks later when it is actively growing and approximately 10 cm in length. Monitoring of these species will occur and if new seed production occurs, the same treatment will be applied again as required. However, slashing will not reduce the presence of exotic grasses on its own and must always be combined with targeted removal to reduce densities and allow for native regeneration. Individual plants should be hand removed, bagged, and disposed of at a registered green waste facility.

Woody weeds

Primary control of woody weeds such as *Olea europaea ssp. cuspidata* (African Olive) and *Lycium ferocissimum* (African Boxthorn) following vegetation removal, should be implemented by using the cut

and paint or drill and fill method using a non-selective herbicide. The most appropriate method to be used depends on the size of the individual to be removed and will be determined by the bush regeneration contractor. Primary weed control should use techniques that will not encourage flushes of secondary weed growth. All seedlings of woody weeds will be hand pulled or spot-sprayed with a non-selective herbicide.

Follow up treatment of woody weeds, will be controlled by the cut and paint or drill and fill method using a non-selective herbicide.

The most appropriate method to be used depends on the size of the individual to be removed and will be determined by the bush regeneration contractor. Primary weed control should use techniques that will not encourage flushes of secondary weed growth. All seedlings of woody weeds will be hand pulled or spot-sprayed with a non-selective herbicide.

Creepers and climbers

The control of exotic vines should be managed by skirting at chest height then spraying the target once it is on the ground. This should be done with a dicot specific herbicide such as Grazon®. Follow up treatments will be necessary and should be done as the germinating vines are still saplings. The target species on site included, but are not limited to, *Araujia sericifera* (Moth vine), *Anredera cordifolia* (Madeira vine) and *Ipomoea indica* (Blue Morning Glory).

The control of creepers varies depending on the species. For the most part, seedlings will be hand pulled, while mature plants can be controlled by the stem-scrape method or spot spraying using a non-selective herbicide. The precise method to be used will be determined by the bush regeneration contractor depending on the species, size, and reproductive status of the individual. All vegetative material removed should be bagged, removed from site, and disposed of appropriately.

Herbaceous weeds

Where individual plants of herbaceous weeds, including *Conyza sp.* (Fleabane) and *Hypochaeris radicata* (Catsear) will be hand pulled prior to flowering. Where large swaths of these species occur, they will be sprayed using a non-selective herbicide. If high densities of mature stands occur, weeds may be slashed first using a brush cutter and any subsequent regrowth sprayed. Regular monitoring of these species will be required to prevent seed production. All vegetative material that is pulled out and has the potential to regrow if deposited on ground will be bagged and removed from site.

Management of weed waste

All weed propagules, especially priority weeds, will be bagged and disposed of as directed by legislation at facility licensed to receive green waste. All weed waste without propagules will be composted onsite in small unobtrusive piles.

Herbicide use

The use of herbicide to control weeds should be carefully considered. Herbicide must only be used for the purpose described on the product label, as per the NSW *Pesticides Act 1999*. Herbicide use should assess potential long-term impacts of the technique, including whether the proposed works address the

source of the weed infestation. However, herbicide application forms an important and useful component of an integrated weed management approach and can be the most appropriate method for the control and eventual eradications of some weed species.

Herbicide use should occur during the active growing season for plants to encourage the chemical uptake into the plant. The selection of herbicides should also consider the type of weed and the location. Where non-selective herbicides are required for use, glyphosate is the most suitable. A glyphosate-based herbicide, formulated for use near waterways, will be used if works require herbicide application near waterways, a (e.g., Roundup Biactive®).

Broad-leaf selective herbicide may be used as per the NSW Weed Control Handbook (DPI 2018). However, this type of herbicide is extremely toxic to aquatic life and must not be used in, or adjacent to, waterways.

Registration and records must be kept in accordance with the NSW *Pesticides Regulation 2017*.

Any works undertaken near native / threatened species within the VMP area should be undertaken by hand weeding only, to reduce the risk of off-target spraying herbicide around these species and their habitat.

REVEGETATION WORKS

Revegetation has the dual aim of both re-establishing the original native vegetation community at the site and reducing erosion along the length of the riparian corridor, which will carry greatly increased peak flows due to the increased run-off from the hard surfaces created by the associated residential development. Any plantings should consist of local provenance stock. Planting of Hiko for trees and shrub species and Hiko or Viro cells for grasses and other groundcover species is the preferred method. Planting should be done via a low impact method such as hand digging or hand auger. The holes dug for each plant should be at least 1.5x the width and 2x the depth of the root ball. Fertiliser should be added to each hole dug as per the label specifications. Water crystals or wetting agents should be added to each plant hole. This will increase the water holding capacity of the soil and reduce watering schedules. Initial irrigation of the plantings is essential to ensure that the soil forms around the root ball and air pockets are removed. This will be required unless sufficient rainfall (approx. 10mm) occurs on the day of planting.

Tree guards should be installed on each tree or shrub to protect seedlings from extreme weather (frosts and heat), herbivorous grazing and herbicide drift during maintenance works. Bio-degradable tree guards are recommended to protect the seedlings. Following the revegetation works, irrigation needs to be undertaken for at least 8 weeks following planting to ensure the establishment of the plants. The level of irrigation will be determined by rainfall and temperature experienced at the planting site.

A temporary irrigation system should be installed to assist in the establishment of vegetation. Timing of the planting of these areas will need to take into consideration surrounding civil works and erosion/sediment control requirements, these areas will not be planted until earthworks have been completed. A minimum rate of attrition of 10% is to be expected and should be allowed for.

Mulch can be derived from vegetation removed from the development area, if available. Alternately, mulch should be comprised of un-composted wood (preferably wood waste), with a particle size of 15

mm to 40 mm, with no fines, and good air-filled porosity. Mulch should not contain any weed seeds, nor be derived from diseased trees or from any part of the tree lower than 1 m above the ground. Mulch, where required, should be installed to a depth of 100 mm.

Jute matting, where required, must be comprised of 100% biodegradable jute fibres with a minimum weight of 680g/m² (~6 mm thickness). Jute must be pegged with at least 3 x 150 mm pins per m², and each roll overlapped by 100 mm.

Seed collection

For the growth of the plants used in the revegetation works, seed must be collected from local provenance species. Groundcovers, shrubs and trees should be collected as within close proximity (i.e., <20km) to the site. However, soil type, climate and aspect of the collection site(s) should also be considered. Native grasses typically have much larger dispersal mechanisms and are to be collected from within the Sydney basin.

Where species identified in this VMP cannot be sourced, they may be substituted for other species as identified by Tozer (2003). Species must be substituted with species of a similar form, e.g., trees for tree, grasses for grasses, etc. Only wild native species are to be used. Plants are not to be substituted with horticultural varieties under any circumstances.

Record keeping of seed collection and planting locations are to follow the Florabank guidelines (Mortlock, 2000). A Section 132C licence under the NSW *National Parks and Wildlife Act 1974* will be required to undertake seed collection works. The bush regeneration contractor is responsible for recording this information and providing it to SW.

BUSH REGENERATION CONTRACTORS

In accordance with Condition 34(d) of the Conditions of Consent, the rehabilitation and revegetation requirements detailed in this VMP must be implemented under the supervision of the supervising Ecologist or Bush Regenerator.

The supervising Bush Regenerator should be a member of AABR or should possess the required qualifications and experience for membership. In addition to this, they should have, as a minimum, a Certificate III in Conservation & Land Management or equivalent. The contractor will need to conduct best practice bush regeneration techniques as described by Buchanan (2009).

A flexible approach to this site is recommended since techniques may need to be changed or modified to suit site conditions. This approach is consistent with adaptive management and allows the contractor to develop and build on site knowledge whilst implementing this VMP. Monitoring will assist in the development of the VMP actions in subsequent years.

HYGIENE PROTOCOLS

To avoid introducing soil pathogens / diseases, in particular *Phytophthora cinnamomi* (Root rot disease), onto site a hygiene protocol should be undertaken as per the guidelines developed by the Royal Botanic Gardens in 'Best Practice Management Guidelines for *Phytophthora cinnamomi* with the Sydney Metropolitan Catchment Management Authority.'

For Bush Regenerators all tools and boots should be washed down and thoroughly cleaned of soil / mud using a solution of water and disinfectants prior to undertaking works onsite. All machinery should be thoroughly cleaned of all soil / mud / debris prior to working within the VMP area.

