Vegetation Management Plan: Riparian Zone

Proposed subdivision and general industrial development, Lot 2 DP 1070888 & Lot 51 DP 130176, Bowman Road, Moss Vale.

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HAYES ENVIRONMENTAL

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Contents

List of tables

List of figures

Shortened forms

BC Act	*Biodiversity Conservation Act 2016* (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
EEC	endangered ecological community
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia
NSW	New South Wales
PCT	plant community type
TEC	threatened ecological community
VMP	Vegetation Management Plan

Author and contributors

Name	Position/Role	Tasks performed	Relevant qualifications & experience
Ms Rebecca Hogan	Lead Ecologist Principal, Hayes Environmental	Project management; Report writing; GIS work & mapping; Identification of Plant Community Type/s; Revegetation strategy.	BSc (environmental biology), UTS Sydney, 1996 MEngMngt, UTS Sydney, 2000 Executive member of the Ecological Consultants Association of NSW. 26 years of ecological consulting experience in the Sydney and greater Sydney region.
Mr Daniel Clark	Project Botanist	Plant identifications Review and assistance with identification of plant community type/s; Revegetation strategy.	BSc (Hons) (Botany), University of Sydney, 2010 Cert. IV in General Horticulture, 2005 Cert. II in Bushland Regeneration, 2000 Cert. IV in Workplace Training and Assessment, 2011 Grad. Plant Science Internship, National Herbarium of NSW, Royal Botanic Gardens, 2009 Practicing member of the Ecological Consultants Association of NSW. 22 years of field botanist experience in the Sydney and greater Sydney region.

1. Introduction

1.1 Document context

This Vegetation Management Plan (VMP) has been prepared to accompany a development application for proposed subdivision and general industrial development across the northern portions of Lot 2 DP 1070888 and Lot 51 DP 130176, 2 &10 Bowman Road, Moss Vale.

The development would include subdivision to align lot boundaries with existing land use zones, road construction within the Bowman Road and Hutchison Road cadastral allocations, stormwater and drainage works, and construction of industrial buildings.

Some works are within the designated riparian setbacks for two first order[1] streams (present as grassy swales with no discernible channel) and include relocation of an existing in-line farm dam. Water sensitive urban design features would enhance stormwater quality passing through the site and would reduce existing flow and nutrient impacts on receiving waterways.

Refer to:

- *Concept External Civil Works Plan* (Eclipse Consulting Engineers, Revision F - 03/04/2024).
- *Concept Civil Works Plans* for Buildings 1, 2, & 3 (Eclipse Consulting Engineers, Revision E - 19/03/2024).
- *Stormwater Management Plan Report* (Eclipse Consulting Engineers, 31/07/2023).
- *Addendum to Stormwater Management Plan Report and Addendum to Flood Study Report* (Eclipse Consulting Engineers, 15/04/2024).

This VMP addresses the protection, restoration, and management of riparian lands that would be disturbed or indirectly affected by the proposed development.

1.2 Site details

The riparian zone is 2.1 hectares in size. It includes:

* proposed earth embankments around the relocated dam and for new roads in the south of the development;
* proposed stormwater outlet structures;
* a buffer area extending out to at least 20m from the toe of the embankments to incorporate land that may be temporarily or indirectly impacted during construction.

The riparian zone for this management plan excludes adjacent land to the east that is under separate private ownership.

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1 *Strahler classification*

The zone is currently managed as open exotic pasture for the grazing of dairy cattle. The zone does not support native vegetation.

A small farm dam is located within the zone, at the confluence of two ephemeral first order streams. Both streams are undefined grassy swales supporting thickets of woody weeds such as Willow *Salix* sp and Blackberry *Rubus* sp. A second farm dam is located on the southeastern edge of the zone.

Refer to Figure A (Riparian zone map).

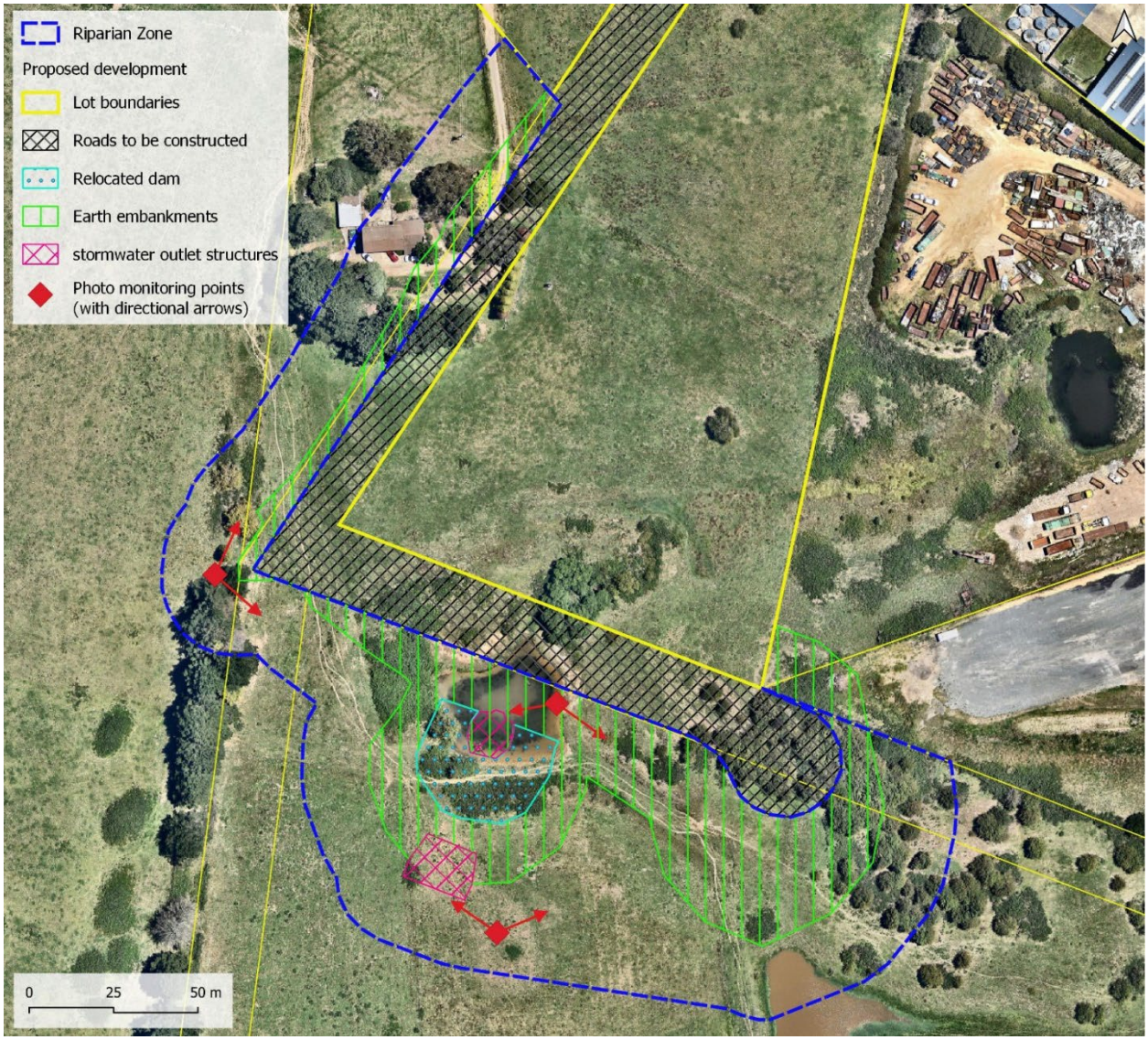

Figure A Riparian zone map (aerial image is from Nearmap, 16/12/2023).

1.3 Objectives of this VMP

The objectives of this Vegetation Management Plan are to:

* protect habitats downstream of the riparian zone during construction activities;
* stabilise and revegetate embankments and areas of bare ground within the riparian zone with native vegetation upon completion of earthworks;
* set out management and monitoring actions for a five year period to support the establishment of native vegetation within the riparian zone.

2. Preliminary actions

2.1 Engagement of contractors

A suitably experienced and qualified bush regeneration contractor shall be engaged to undertake the weed removal and revegetation programs set out in this VMP.

The contractor shall be engaged as soon as practicable once development consent has been granted, to enable propagation of sufficient appropriate plant stock for revegetation.

2.2 Sourcing of plant material

Plants shall be tubestock obtained from a reputable native plant nursery, and shall be suitably disease free and hardened off prior to planting.

Plants shall be of local provenance, *ie* grown from propagation material sourced in the Wingecarribee Local Government Area.

Plant species shall be appropriate to PCT 3302 *Southern Highlands Shale-Basalt Dry Forest*, using the list of characteristic species contained within the BioNet Vegetation Classification profile as a guide.

Selection of plant species should favour vigorous growing plants that will establish quickly to shade and compete with the exotic perennial grasses which surround the zone, and which are likely to be an ongoing threat to the zone.

3. Habitat protection

3.1 Sediment and erosion control

Sediment and erosion control features shall be installed in accordance with Council approved plans prior to commencement of earthworks.

Sediment and erosion control features shall be maintained throughout the construction period, and any issues rectified as a matter of priority, in accordance with the Council approved strategy.

Sediment and erosion control features shall be carefully removed once site works are complete and all exposed surfaces have been stabilised through vegetation or other means.

3.2 Contractor induction

A site induction shall be provided to all contractors working on site prior to commencement of their work.

Contractors should be advised that the riparian zone drains into sensitive downstream habitats and the following measures are required to minimise downstream impacts, including biosecurity risk of spread of diseases and weeds:

1. All machinery, equipment, boots and clothing must be thoroughly cleaned prior to working within the subject property (and specifically, within the riparian zone).
2. Temporary and incidental construction impacts such as storage of materials and equipment, and parking of vehicles, must be restricted to the development footprint as much as possible and must not extend beyond the mapped boundary of the riparian zone. No parking or storage of materials shall occur downslope of erosion control features.

3.3 Disposal of surplus material and waste product

Any surplus materials or waste products generated by the construction process shall be contained within the footprint of new buildings and roads, or completely removed from the site and disposed of at an appropriate waste disposal facility.

Concrete washings shall not be discharged into the riparian zone.

Refer to the approved Waste Management Plan for the development.

4. Site preparation

4.1 Removal of High Threat Weeds

Prior to commencement of earthworks within the riparian zone, a preliminary weed removal program shall be conducted to treat and/or remove High Threat Weeds[2]. This is to minimise the spread of High Threat Weed propagules during site earthworks.

Treatments shall be applied using control methods recommended for each species on the NSW WeedWise website[3] and in accordance with requirements of the *NSW Biosecurity Act 2015*.

The preliminary treatment shall be completed prior to commencement of site works.

High Threat Weeds present within the riparian zone include (but may not be limited to):

- Blackberry *Rubus anglocandicans*;
- Crack Willow *Salix fragilis*;
- Hawthorne *Crataegus monogyna*;
- Paspalum *Paspalum dilatatum*;

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[2] High Threat Weeds, being those species listed as such on the BAM-Calculator website: (https://www.lmbc.nsw.gov.au/bamcalc).

[3] NSW WeedWise website: (https://weeds.dpi.nsw.gov.au/)

- Giant Parramatta Grass *Sporobolus fertilis*;
- Umbrella Sedge *Cyperus eragrostis*;
- Kikuyu Grass *Cenchrus clandestinus*.

4.2 Stockpiling of topsoil

Topsoil shall be removed during site earthworks and stockpiled separately to subsoils.

Sufficient topsoil shall be stockpiled within the development footprint to re-spread over the finished contour of earth embankments and other exposed areas within the riparian zone.

Soil storage piles shall be covered with black plastic and be of a size that will permit heating of the soil and destruction of grass seeds within it.

4.3 Baseline record

Three (3) photo monitoring points shall be established at the locations shown on Figure A (Riparian zone map) upon completion of earthworks. Each photo point shall be clearly marked by flagged star picket.

Two photos shall be taken at each point, in the directions indicated by arrows on Figure A.

Location of points and direction of photos may be adjusted by the bush regeneration contractor when site works are complete, to ensure a comprehensive view of the riparian zone.

Each point shall be recorded with a GPS location, and a compass bearing for the photo directions.

5. Revegetation

5.1 Revegetation Sub-zones

Three (3) sub-zones are designated for revegetation treatments within the riparian zone:

Sub-zone 1 – Constructed road embankments and areas of bare ground.

Sub-zone 2 – Grassed buffer areas.

Sub-zone 3 – Stormwater discharge features.

Refer to Figure B (Revegetation sub-zones map).

Figure B Revegetation sub-zone map (aerial image is from Nearmap, 16/12/2023).

5.2 Sub-zone 1 – Constructed road embankments and bare ground

5.2.1 Ground stabilisation

Earth embankments and slopes shall be topsoiled and grass-seeded/hydromulched[4] within 10 days of completion of grading, in consultation with Council.

The bush regeneration contractor shall be consulted to determine the appropriate pH for topsoil, and the appropriate application of binders and ameliorants.

[4] *Using inert temporary grasses, or a mix of native grass seeds appropriate to Plant Community Type 3302 Southern Highlands Shale-Basalt Dry Forest.*

The bush regeneration contractor shall be consulted to determine the appropriate surface soil density, compaction, and surface roughness for finished surfaces.

Level areas of bare ground may initially be stabilised with mulch, prior to revegetation.

5.2.2 Plant species and density

Plant species have been selected from the list of characteristic species contained within the BioNet Vegetation Classification profile for PCT 3302 *Southern Highlands Shale-Basalt Dry Forest*.

The community structure would typically be a tall moist grassy sclerophyll open forest.

Sub-zone extent is proposed to be 7,147m^2. This extent may increase if areas of bare ground are created within the adjacent grassed buffer zone. Plant numbers should be extrapolated as required to revegetate all areas of bare ground to meet the density specifications set out in Table 1.

Table 1 Sub-zone 1 revegetation - plant species and density

Species	Common Name	Density	Number estimate
Trees:			
Eucalyptus radiata	Narrow-leaved Peppermint	Plant in equal quantities at 1 tree per 10m^2	Total = 715 plants. (179 plants of each of the 4 species)
Eucalyptus globoidea	White Stringybark		
Eucalyptus macarthurii	Paddy's River Box		
Acacia melanoxylon	Blackwood		
Shrubs:			
Acacia mearnsii	Black Wattle	Plant at least 4 species in equal quantities at 1 shrub per 5m^2	Total = 1,429 plants. (357 plants of each of 4 species)
Acacia longifolia	Sydney Golden Wattle		
Rubus parvifolius	Native Raspberry		
Olearia viscidula	Daisy Bush		
Cassinia aculeata	Common Cassinia		
Exocarpus cupressiformis	Native Cherry		
Groundlayer:			
Pteridium esculentum	Bracken Fern	Plant at least 6 species in equal quantities at 4 plants per m^2.	Total = 28,588 plants. (4,765 plants of each of 6 species)
Microlaena stipoides	Weeping Meadow Grass		
Lomandra longifolia	Mat-rush		
Lomandra filiformis	Perennial Tussock		
Themeda triandra	Kangaroo Grass		
Poa sieberiana	Blue Tussock Grass		
Hardenbergia violacea	Happy Wanderer		

5.2.3 Planting Method

Revegetation works shall be conducted in accordance with the following:

* Planting is to be undertaken by experienced revegetation contractors with strict adherence to this VMP;

* Plants to be moist in pots prior to planting;
* Planting holes to be dug to a size that allows for a minimum of 150mm soil cover around the root ball;
* On slopes, a small well shall be formed around the downslope side of the plant, to catch water run-off;
* Water retaining granules and a slow-release fertiliser tablet shall be incorporated into the soil prior to planting;
* After planting, the soil is to be gently firmed down, allowing for a slight depression around each plant for water collection;
* Plants are to be watered generously after installation;
* Plant guards and stakes shall be installed to tree and shrub units to deter grazing animals such as rabbits and kangaroos;
* Plants to receive additional watering until deemed to be successfully established.

5.3 Sub-zone 2 – Grassed buffer areas

5.3.1 Ground stabilisation

These areas are currently stabilised by a dense sward of exotic perennial grasses.

A long term revegetation approach is proposed for Sub-zone 2, to avoid unnecessary de-stabilising of the ground by removal of the existing sward, and avoid issues associated with herbicide use adjacent to a certified organic farming operation.

No further ground stabilisation works are required.

5.3.2 Weed control and management

Removal of all woody weeds shall be undertaken using hand tools and methods recommended on the NSW WeedWise website (https://weeds.dpi.nsw.gov.au/).

The exotic grassy groundlayer is to be retained at this time. A future weed removal and management program could be implemented when native shrubs and trees have established and provide sufficient shade to weaken the exotic perennial grasses and favour native groundlayer plants.

All weed material shall be removed from the site and disposed of at a waste management facility approved for that purpose. Receipts of disposal shall be retained.

5.3.3 Plant species and density

Plant species have been selected from the list of characteristic species contained within the BioNet Vegetation Classification profile for PCT 3302 *Southern Highlands Shale-Basalt Dry Forest*.

A range of hardier species have been selected to compete with the exotic grasses. It may be necessary to respond to plant failures during the maintenance period by replacement of failed species with more successful species.

The community structure would typically be a tall moist grassy sclerophyll open forest.

Sub-zone extent is proposed to be 12,382m^2. This extent may decrease if areas of bare ground are created during construction and thereby added to Sub-zone 1. Plant numbers for Sub-zone 2 should be reduced as required meet the density specifications set out in Table 2.

Table 2 Sub-zone 2 revegetation - plant species and density

Species	Common Name	Density	Number estimate
Trees:			
Eucalyptus macarthurii	Paddy's River Box	Plant in equal quantities at 1 trees per 10m^2	Total = 1,238 plants. (413 plants of each of the 3 species)
Eucalyptus ovata	Swamp Gum		
Acacia melanoxylon	Blackwood		
Shrubs:			
Acacia mearnsii	Black Wattle	Plant at least 4 species in equal quantities at 2 shrub per 5m^2	Total = 4,953 plants. (1,238 plants of each of 4 species)
Acacia longifolia	Sydney Golden Wattle		
Exocarpus cupressiformis	Native Cherry		
Podolobium ilicifolium	Prickly Shaggy-pea		
Indigofera australis	Australian Indigo		
Groundlayer:			
Pteridium esculentum	Bracken Fern	Plant in equal quantities with one plant placed close to each planted tree.	Total = 1,238 plants. (413 plants of each of the 3 species)
Lomandra longifolia	Mat-rush		
Themeda triandra	Kangaroo Grass		

5.3.4 Planting Method

Revegetation works shall be conducted in accordance with the following:

* Planting is to be undertaken by experienced revegetation contractors with strict adherence to this VMP;
* Plants to be moist in pots prior to planting;
* Planting holes to be dug to a size that allows for a minimum of 150mm soil cover around the root ball;
* On slopes, a small well shall be formed around the downslope side of the plant, to catch water run-off;
* Water retaining granules and a slow-release fertiliser tablet shall be incorporated into the soil prior to planting;

* After planting, the soil is to be gently firmed down, allowing for a slight depression around each plant for water collection;
* Plants are to be watered generously after installation;
* Plant guards and stakes shall be installed to tree and shrub units to deter grazing animals such as rabbits and kangaroos;
* Plants to receive additional watering until deemed to be successfully established.

5.4 Sub-zone 3 – Stormwater discharge features

5.4.1 Ground stabilisation

The energy dissipator structure for stormwater entering the new wet basin detention basin and the emergency spillway from the basin to the existing stream have been designed to receive short term heavy stormwater flows.

Design elements such as gabian rocks, riffle zones, and temporary fabrics shall be installed within the outlet structures in accordance with the approved construction plan.

5.4.2 Plant species and density

Plant species have been selected from the list of characteristic species contained within the BioNet Vegetation Classification profile for PCT 3302 *Southern Highlands Shale-Basalt Dry Forest*.

The community structure would typically be a tall moist grassy sclerophyll open forest, although in localised wet areas it may be present as a swamp-like community dominated by grasses and sedges, or thickets of woody shrubs.

Sub-zone extent is proposed to be 413m^2.

Table 3 Sub-zone 3 revegetation - plant species and density

Species	Common Name	Density	Number estimate
Shrubs:			
Leptospermum polygalifolium	Tantoon	Plant at least 2 species in equal quantities at 1 shrub per 5m^2.	Total = 83 plants. (28 plants of each of 3 species
Acacia mearnsii	Black Wattle		
Acacia longifolia	Sydney Golden Wattle		
Groundlayer:			
Pteridium esculentum	Bracken Fern	Plant at least 6 species in equal quantities at 6 plants per m^2.	Total = 2,478 plants. (413 plants of each of 6 species)
Microlaena stipoides	Weeping Meadow Grass		
Lomandra longifolia	Mat-rush		
Lomandra filiformis	Perennial Tussock		
Themeda triandra	Kangaroo Grass		
Poa sieberiana	Blue Tussock Grass		
Hardenbergia violacea	Happy Wanderer		

5.4.3 Planting Method

Revegetation works shall be conducted in accordance with the following:

* Planting is to be undertaken by experienced revegetation contractors and may require site specific adjustment to this plan to appropriately respond to finished site conditions;
* Plants to be moist in pots prior to planting;
* Plants to be placed in pockets of soil amongst rocks and water dispersal features;
* Where possible on slopes, a small well shall be formed around the downslope side of the plant, to catch water run-off;
* Water retaining granules and a slow-release fertiliser tablet shall be incorporated into the soil prior to planting;
* After planting, the soil is to be gently firmed down, allowing for a slight depression around each plant for water collection;
* Plants are to be watered generously after installation;
* Plant guards and stakes shall be installed to shrub units outside of primary flow zones, where practicable, to deter grazing animals such as rabbits and kangaroos;
* Plants to receive additional watering until deemed to be successfully established.

6. Riparian zone maintenance

6.1 Timing of maintenance visits

Maintenance visits shall be scheduled at two-monthly intervals for the first year from completion of earthworks, and then annually for a further 4 years.

6.2 Maintenance activities

Weed control maintenance shall include:

* follow-up control of seedling regrowth and failed kill of adult plants, in accordance with methods recommended on the NSW WeedWise website (https://weeds.dpi.nsw.gov.au/);
* Herbicide use shall be limited to the minimum necessary in Sub-zones 2 and 3.

Re-vegetation maintenance shall include:

* replacement of poorly growing or diseased individuals consistent with the prescribed planting recommendations contained in this VMP. It may be appropriate to vary the species selection, or the location of a species, if there is a pattern of failure of a particular species;

* review of plant protection from rabbits or other grazing animals, and replacement of stakes and protective sleeves, if required;
* control of insect damage;
* watering during dry periods.

7. Monitoring

7.1 Timing of monitoring inspections

Monitoring inspections shall be scheduled at two-monthly intervals for the first year from commencement of site works, and then annually for a further 4 years.

7.2 Performance criteria

1. Treatment/removal of all High Threat Weeds within the site prior to commencement of site works (Ch 4.1).
2. Sediment and erosion control features shall be installed in accordance with Council approved plans prior to commencement of vegetation clearing or site works. Features shall be maintained to ensure correct functioning at all times (Ch 3.1).
3. Follow-up weed treatments shall be undertaken by the bush regeneration contractor, and shall result in reduction of weeds to less than 5% of the plant foliage cover following each maintenance visit (Ch 5.1.2, Ch 6.1.2, Ch 7.1.2);
4. Establishment of three photo-monitoring points (Ch 4.3).
5. Survival of 100% of trees and shrubs planted within the Riparian Zone. Dead or poor plants shall be replaced during maintenance visits (Ch 5.2.2, Ch 5.3.2, 5.4.2).
6. Survival of 90% of groundcover plantings within Riparian Zone. Dead or poor plants shall be replaced during maintenance visits (Ch 5.2.2, Ch 5.3.2, 5.4.2).
7. Projected foliage cover of 70% for the Riparian Zone at the completion of the 5 year maintenance and monitoring period.

7.3 Reporting and assessment

A monitoring report shall be prepared at the end of each year of the 5 year maintenance period (the first report is due 1 year from completion of site works). The report shall be provided to Council, and if required, to the NSW Office of Water.

Recommendations within the report shall trigger actions to employ a suitably qualified bush regeneration contractor where required, to control weed infestations or undertake replanting.

Monitoring reports shall include:

* a photographic record with two photos from each of the photo-monitoring points (a photo in each of two directions);
* a weed map showing any extant problem areas within the Riparian Zone;
* a quantified measure of success of works compared against each of the performance criteria;
* tabulated results from each monitoring visit, so that trends can be identified and discussed;
* recommendations (as appropriate) for remedial works, or for a change to the maintenance program to ensure performance criteria are being met;
* notes regarding any new weed issues or threats to native vegetation and habitats within the site.

A final report shall be prepared 5 years from completion of site works, to assess whether the performance criteria have been met. The final report shall include recommendations for ongoing long term maintenance, to enable the land to continue to be managed in an appropriate manner.

8. Budget estimate

Details of plant quantities, sizes and materials to be used are set out within this VMP.

A budget for implementation of the VMP works shall be obtained from a bush regeneration contractor, if required.

9. Schedule of Works

Table 4 Timing, duration and schedule of implementation of the VMP.

VMP tasks in order of implementation						
Task	Description	VMP Chapter	Relevant Zones	Performance Criteria	Timing and Duration	Person Responsible
PRIOR TO CONSTRUCTION						
1. Engage bush regeneration contractors	A suitably experienced and qualified bush regeneration contractor shall be engaged to undertake the weed removal and revegetation programs set out in this VMP.	2.1	All		To be engaged as soon as practicable once development consent has been granted.	Project Manager
2. Sourcing of plant stock for revegetation	Plants for revegetation works shall be of local provenance. This may require collection and propagation of stock specifically for this project.	3.4.2	A, B, C		To commence as soon as practicable. Sourcing of plant stock may take up to a year.	Bush regeneration Contractor
3. Removal of High Threat Weeds	Preliminary weed removal program shall be conducted to treat and/or remove High Threat Weeds.	4.1	All		To be completed prior to commencement of works on the property.	Bush Regeneration Contractor

Task	Description	VMP Chapter	Relevant Zones	Performance Criteria	Timing and Duration	Person Responsible
4. Sediment and erosion control	Features installed in accordance with Council approved plans	3.3	Whole property		To be installed prior to commencement of vegetation clearing or other works on the property.	Site Superintendent
DURING CONSTRUCTION						
5. Contractor induction	Site induction for all contractors to include information relating to biosecurity and disposal of wastes.	3.2	Work site	-	Induction of contractors prior to commencement of their work	Site Superintendent
6. Stockpiling of topsoil	Preliminary weed removal program shall be conducted to treat and/or remove High Threat Weeds.	4.1	All		To be completed prior to commencement of works on the property.	Bush Regeneration Contractor
FOLLOWING COMPLETION OF EARTHWORKS						
7. Stabilisation of banks and bare ground	Stablisation of ground using geofabric or mulch as specified in the VMP	5	Subzones 1 and 3		Immediately following completion of road embankment works	Site Superintendent

Task	Description	VMP Chapter	Relevant Zones	Performance Criteria	Timing and Duration	Person Responsible
8. Revegetation	Planting in accordance with the VMP.	5	All		To commence as soon as practicable following completion of road embankment works	Bush Regeneration Contractor
9. Baseline record	Three (3) photo monitoring points shall be established at the locations shown on Figure A (Riparian zone map).	4.3	Subzone 1		Upon completion of revegetation (Task ?).	Bush Regeneration Contractor
MAINTENANCE & MONITORING						
10. Follow-up weed control	follow-up control of seedling regrowth and failed kill of adult plants, in accordance with methods recommended on the NSW WeedWise website.	6.2	All		To be conducted every 2 months for the first year from completion of earthworks, and then every annually for a further 4 years.	Bush Regeneration Contractor
11. Maintenance of plantings	Maintenance and replacement of new plantings.	6.2	All		To be conducted every 2 months for the first year from completion of earthworks, and then every annually for a further 4 years.	Bush Regeneration Contractor

Task	Description	VMP Chapter	Relevant Zones	Performance Criteria	Timing and Duration	Person Responsible
12. Monitoring	Inspections and measuring of progress against performance criteria. Taking of photo-monitoring photos.	7.1	All	All	To be conducted every 2 months for the first year from completion of primary weeding, and then every 6 months for a further 4 years.	Bush Regeneration Contractor
13. Removal of temporary features	Removal of sediment and erosion control features.	3.3	-	-	To be carefully removed following completion of works and stabilisation of bare surfaces.	Site Superintendent
14. Monitoring reports	Preparation of annual monitoring reports for Council. Final monitoring report 5 years from completion of Stage 1 works.	7.3	All	-	To be prepared at the end of each year of the 5 year maintenance period (the first report is due 1 year from completion of site works).	Bush Regeneration Contractor/ Project Manager

Table 5 Gantt Chart for implementation of the VMP.

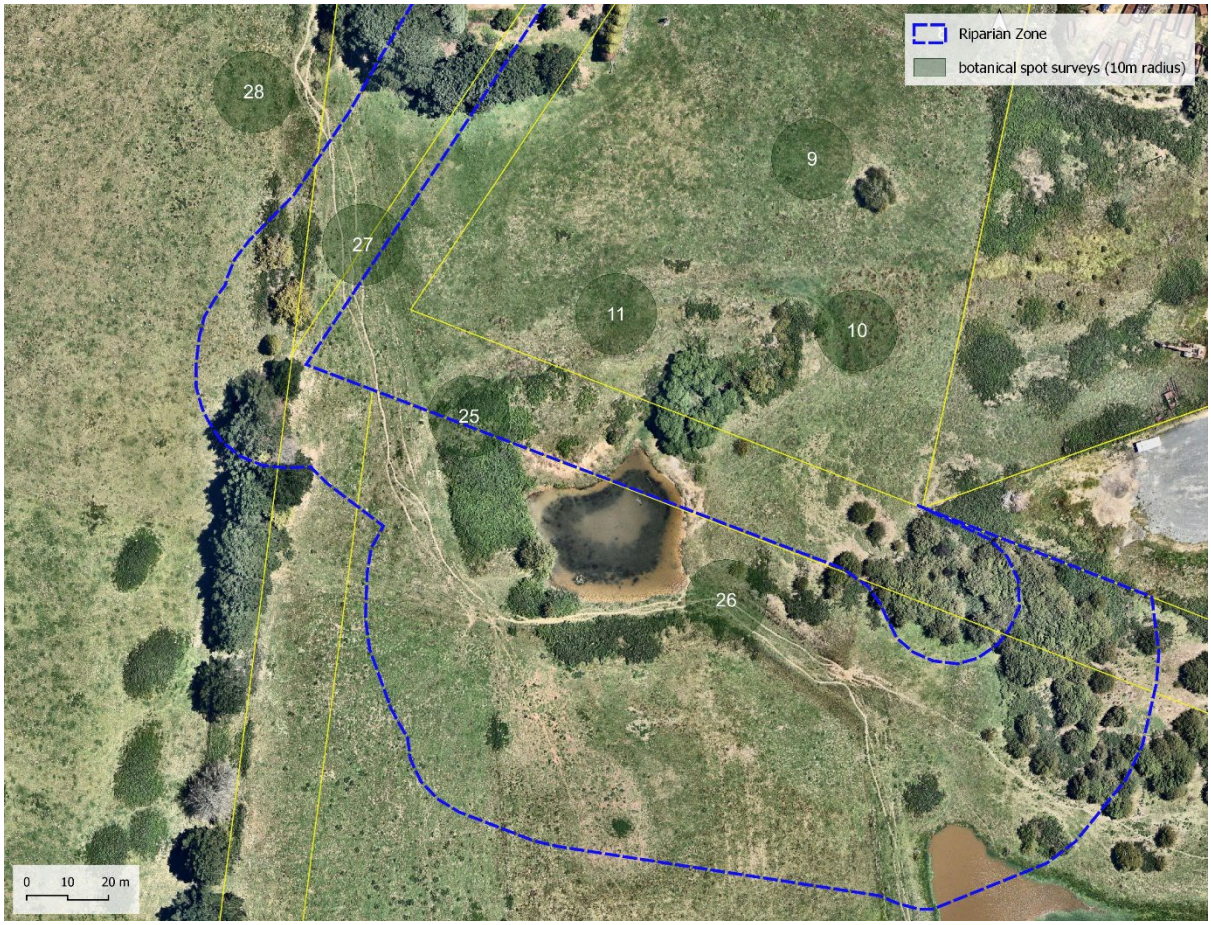
ACTIVITIES	CONSTRUCTION							FIVE YEAR MAINTENANCE POST CONSTRUCTION																			
DESCRIPTION	Order of tasks, timing not available							Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PRIOR TO CONSTRUCTION																											
Task 1. Engage contractors	■																										
Task 2. Source plant stock		■	■	■	■	■																					
Task 3. Removal of High Threat Weeds			■																								
Task 4. Install sediment control features			■																								
DURING CONSTRUCTION																											
Task 5. Contractor inductions				■	■	■	■																				
Task 6. Stockpiling of topsoil				■																							
FOLLOWING COMPLETION OF EARTHWORKS																											
Task 7. Stabilisation of banks and bare ground					■																						
Task 8. Revegetation						■	■																				
Task 9. Establish photo-monitoring points							■																				
MAINTENANCE & MONITORING																											
Task 10. Follow-up weed control								★	★	★	★	★	★		■		■		■		■		■		■		■
Task 11. Maintenance of plantings								★	★	★	★	★	★		■		■		■		■		■		■		■
Task 12.Monitoring								★	★	★	★	★	★		■		■		■		■		■		■		■
Task 13. Remove sediment control features																											■
Task 14. Monitoring reports											★				★				★				★			★	★

Appendix 1: Baseline condition

March site inspections:

Figure C Baseline condition.

Aerial image is from Nearmap (16/12/2023)



Across the riparian zone and surrounding areas generally:

* Some native groundlayer plants are present, but with very low cover and abundance. These include Finger Rush *Juncus subsecundus*, Knob Sedge *Carex inversa*, Water Couch *Paspalum distichum*, and Weeping Meadow Grass *Microlaena stipoides*.
* Dominant exotic groundlayer species recorded include Paspalum *Paspalum dilatatum*, Yorkshire Fog *Holcus lanatus*, Meadow Fescue *Festuca pratensis*, Cocksfoot Grass *Dactylis glomerata*, White Clover *Trifolium repens*, Catsear *Hypochaeris radicata*, Rye Grass *Lolium rigidum,* Kikuyu *Cenchrus clandestinus*, Kentucky Blue Grass *Poa compressa*, Bristlegrass *Setaria parviflora* and Spear Thistle *Cirsium vulgare*.

Within the riparian zone and associated with drainage lines:

* There are low lying areas where water may flow to and from the dam when the dam overflows. These areas are dominated by exotic species, mainly Paspalum *Paspalum dilatatum* and Wimmera Rye Grass *Lolium rigidum*. There are patches of Blackberry *Rubus fruticosus* in the drainage lines, scattered individuals of Hawthorne *Crataegus monogyna*, and a patch of Crack Willow *Salix fragilis* associated with the dam.

Survey Point	Photo taken 26th March 2024
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Appendix 2: Plant Community Type

PCT 3302 Southern Highlands Shale-Basalt Dry Forest

A tall to very tall moist grassy sclerophyll open forest found on the Southern Highlands plateau, restricted to undulating landscapes with fertile soils derived from Wianamatta Group shales and occasionally on the margins of basalts and microsyenite intrusions.

A mid-dense canopy commonly includes *Eucalyptus radiata*, occasionally with *Eucalyptus cypellocarpa* or rarely *Eucalyptus globoidea*, *Eucalyptus elata* or *Eucalyptus obliqua*, and a sparse to very sparse mid-stratum that commonly contains scattered tall *Acacia melanoxylon* and occasional smaller *Acacia mearnsii* or rarely *Leucopogon lanceolatus*.

The ground layer is predominantly grassy, very frequently including a high cover of *Microlaena stipoides*, commonly with *Austrostipa rudis* and *Themeda triandra*, and occasionally *Poa sieberiana* or *Poa labillardierei* var. *labillardierei*. Other common species include *Pteridium esculentum*, *Lomandra longifolia*, *Desmodium varians*, *Clematis aristata*, *Hardenbergia violacea*, *Dichondra repens*, *Veronica plebeia*, *Oxalis perennans*, *Asperula conferta*, *Lomandra filiformis*, *Stellaria pungens* and *Viola betonicifolia*.

Growth Form	Species	Median Cover	Frequency
Tree (TG)	Eucalyptus radiata	3	70
Tree (TG)	Acacia melanoxylon	1	60
Tree (TG)	Eucalyptus cypellocarpa	3	37
Tree (TG)	Eucalyptus globoidea	3	34
Tree (TG)	Eucalyptus elata	3	24
Tree (TG)	Eucalyptus obliqua	3	24
Tree (TG)	Angophora floribunda	3	14
Tree (TG)	Eucalyptus fastigata	4	7
Tree (TG)	Eucalyptus piperita	3	7
Tree (TG)	Eucalyptus punctata	3	7
Tree (TG)	Eucalyptus sieberi	3	7
Tree (TG)	Eucalyptus tereticornis	1	7
Tree (TG)	Eucalyptus viminalis	1	7
Tree (TG)	Acacia parramattensis	1	4
Tree (TG)	Allocasuarina littoralis	2	4
Tree (TG)	Eucalyptus amplifolia	1	4
Tree (TG)	Eucalyptus dalrympleana	3	4
Tree (TG)	Eucalyptus macarthurii	1	4
Tree (TG)	Eucalyptus ovata	1	4
Tree (TG)	Eucalyptus pauciflora	3	4
Tree (TG)	Eucalyptus quadrangulata	3	4
Tree (TG)	Eucalyptus smithii	3	4
Tree (TG)	Notelaea longifolia	1	4
Shrub (SG)	Acacia mearnsii	1	37

Growth Form	Species	Median Cover	Frequency
Shrub (SG)	Rubus parvifolius	1	34
Shrub (SG)	Leucopogon lanceolatus	1	24
Shrub (SG)	Olearia viscidula	1	24
Shrub (SG)	Podolobium ilicifolium	1	14
Shrub (SG)	Solanum aviculare	1	14
Shrub (SG)	Bursaria spinosa	2	10
Shrub (SG)	Cassinia aculeata	2	10
Shrub (SG)	Exocarpos cupressiformis	1	10
Shrub (SG)	Indigofera australis	1	10
Shrub (SG)	Acacia longifolia	1	7
Shrub (SG)	Acacia stricta	2	7
Shrub (SG)	Daviesia latifolia	1	7
Shrub (SG)	Hibbertia empetrifolia subsp. empetrifolia	1	7
Shrub (SG)	Persoonia linearis	1	7
Shrub (SG)	Polyscias sambucifolia	2	7
Shrub (SG)	Acacia floribunda	1	4
Shrub (SG)	Cassinia quinquefaria	1	4
Shrub (SG)	Cassinia uncata	1	4
Shrub (SG)	Coprosma quadrifida	1	4
Shrub (SG)	Daviesia corymbosa	1	4
Shrub (SG)	Daviesia ulicifolia	3	4
Shrub (SG)	Exocarpos strictus	1	4
Shrub (SG)	Hibbertia obtusifolia	2	4
Shrub (SG)	Leptospermum polygalifolium	1	4
Shrub (SG)	Notelaea venosa	1	4
Shrub (SG)	Olearia erubescens	1	4
Shrub (SG)	Phyllanthus hirtellus	2	4
Shrub (SG)	Pimelea linifolia	1	4
Shrub (SG)	Pittosporum undulatum	1	4
Fern (EG)	Pteridium esculentum	2	60
Fern (EG)	Adiantum aethiopicum	2	14
Fern (EG)	Lindsaea linearis	2	7
Fern (EG)	Doodia aspera	3	4
Fern (EG)	Pellaea falcata	1	4
Fern (EG)	Pyrrosia rupestris	1	4
Grass & grasslike (GG)	Microlaena stipoides	4	100
Grass & grasslike (GG)	Austrostipa rudis	3	67
Grass & grasslike (GG)	Lomandra longifolia	2	57
Grass & grasslike (GG)	Themeda triandra	2	50
Grass & grasslike (GG)	Poa sieberiana	2	44
Grass & grasslike (GG)	Lomandra filiformis	2	40
Grass & grasslike (GG)	Lomandra multiflora subsp. multiflora	1	34
Grass & grasslike (GG)	Poa labillardierei var. labillardierei	2	34
Grass & grasslike (GG)	Entolasia marginata	2	30
Grass & grasslike (GG)	Dichelachne inaequiglumis	2	27

Growth Form	Species	Median Cover	Frequency
Grass & grasslike (GG)	Rytidosperma racemosum	2	27
Grass & grasslike (GG)	Echinopogon caespitosus	2	24
Grass & grasslike (GG)	Echinopogon ovatus	2	24
Grass & grasslike (GG)	Entolasia stricta	2	17
Grass & grasslike (GG)	Carex appressa	2	14
Grass & grasslike (GG)	Carex inversa	2	14
Grass & grasslike (GG)	Carex breviculmis	1	10
Grass & grasslike (GG)	Elymus scaber	2	10
Grass & grasslike (GG)	Eragrostis leptostachya	2	10
Grass & grasslike (GG)	Panicum effusum	2	10
Grass & grasslike (GG)	Poa meionectes	2	10
Grass & grasslike (GG)	Rytidosperma pallidum	2	10
Grass & grasslike (GG)	Cynodon dactylon	2	7
Grass & grasslike (GG)	Dichelachne micrantha	2	7
Grass & grasslike (GG)	Lomandra confertifolia	1	7
Grass & grasslike (GG)	Aristida ramosa	2	4
Grass & grasslike (GG)	Austrostipa aristiglumis	2	4
Grass & grasslike (GG)	Austrostipa scabra	3	4
Grass & grasslike (GG)	Carex incomitata	2	4
Grass & grasslike (GG)	Carex longebrachiata	2	4
Grass & grasslike (GG)	Deyeuxia quadriseta	2	4
Grass & grasslike (GG)	Digitaria diffusa	2	4
Grass & grasslike (GG)	Juncus subsecundus	1	4
Grass & grasslike (GG)	Lachnagrostis aemula	1	4
Grass & grasslike (GG)	Lachnagrostis filiformis	2	4
Grass & grasslike (GG)	Lepidosperma laterale	2	4
Grass & grasslike (GG)	Luzula flaccida	1	4
Grass & grasslike (GG)	Poa tenera	2	4
Grass & grasslike (GG)	Rytidosperma pilosum	1	4
Grass & grasslike (GG)	Schoenus apogon	2	4
Grass & grasslike (GG)	Sorghum leiocladum	1	4
Forb (FG)	Dichondra repens	2	90
Forb (FG)	Veronica plebeia	1	67
Forb (FG)	Oxalis perennans	1	57
Forb (FG)	Stellaria pungens	2	44
Forb (FG)	Asperula conferta	2	40
Forb (FG)	Hypericum gramineum	2	40
Forb (FG)	Viola betonicifolia	2	40
Forb (FG)	Acaena novae-zelandiae	2	37
Forb (FG)	Hydrocotyle laxiflora	2	37
Forb (FG)	Desmodium gunnii	2	34
Forb (FG)	Gonocarpus tetragynus	1	30
Forb (FG)	Opercularia diphylla	1	27
Forb (FG)	Geranium solanderi	2	24
Forb (FG)	Poranthera microphylla	1	24

Growth Form	Species	Median Cover	Frequency
Forb (FG)	Viola hederacea	2	24
Forb (FG)	Wahlenbergia gracilis	1	24
Forb (FG)	Dianella caerulea	1	20
Forb (FG)	Einadia nutans	2	20
Forb (FG)	Hydrocotyle sibthorpioides	2	20
Forb (FG)	Lobelia purpurascens	2	20
Forb (FG)	Plantago varia	2	20
Forb (FG)	Dianella longifolia	1	17
Forb (FG)	Euchiton involucratus	2	17
Forb (FG)	Geranium potentilloides	1	17
Forb (FG)	Ranunculus lappaceus	1	17
Forb (FG)	Senecio prenanthoides	1	17
Forb (FG)	Coronidium scorpioides	1	14
Forb (FG)	Einadia trigonos	2	14
Forb (FG)	Galium leiocarpum	2	14
Forb (FG)	Goodenia hederacea	2	14
Forb (FG)	Oreomyrrhis eriopoda	2	14
Forb (FG)	Rumex brownii	1	14
Forb (FG)	Senecio linearifolius	1	14
Forb (FG)	Wahlenbergia stricta	2	14
Forb (FG)	Ajuga australis	2	10
Forb (FG)	Ranunculus plebeius	1	10
Forb (FG)	Schelhammera undulata	2	10
Forb (FG)	Acaena echinata	1	7
Forb (FG)	Asperula scoparia	1	7
Forb (FG)	Bossiaea prostrata	2	7
Forb (FG)	Brachyscome angustifolia	2	7
Forb (FG)	Brachyscome mittagongensis	2	7
Forb (FG)	Cynoglossum australe	2	7
Forb (FG)	Dianella tasmanica	2	7
Forb (FG)	Einadia hastata	2	7
Forb (FG)	Euchiton japonicus	2	7
Forb (FG)	Galium binifolium	2	7
Forb (FG)	Gonocarpus micranthus	2	7
Forb (FG)	Gonocarpus teucrioides	2	7
Forb (FG)	Helichrysum rutidolepis	2	7
Forb (FG)	Lagenophora stipitata	1	7
Forb (FG)	Libertia paniculata	2	7
Forb (FG)	Opercularia hispida	2	7
Forb (FG)	Oxalis exilis	2	7
Forb (FG)	Plantago gaudichaudii	2	7
Forb (FG)	Ranunculus collinus	1	7
Forb (FG)	Senecio quadridentatus	2	7
Forb (FG)	Stackhousia monogyna	2	7
Forb (FG)	Stellaria flaccida	2	7

Growth Form	Species	Median Cover	Frequency
Forb (FG)	Tricoryne elatior	2	7
Forb (FG)	Asperula gunnii	2	4
Forb (FG)	Caesia parviflora	2	4
Forb (FG)	Chrysocephalum apiculatum	2	4
Forb (FG)	Cymbonotus lawsonianus	1	4
Forb (FG)	Daucus glochidiatus	1	4
Forb (FG)	Dipodium punctatum	1	4
Forb (FG)	Dysphania pumilio	1	4
Forb (FG)	Epilobium billardierianum	2	4
Forb (FG)	Euchiton sphaericus	2	4
Forb (FG)	Galium gaudichaudii	1	4
Forb (FG)	Galium leptogonium	2	4
Forb (FG)	Gastrodia sesamoides	1	4
Forb (FG)	Geranium homeanum	2	4
Forb (FG)	Helichrysum leucopsideum	2	4
Forb (FG)	Hydrocotyle tripartita	2	4
Forb (FG)	Lagenophora gracilis	2	4
Forb (FG)	Microtis unifolia	2	4
Forb (FG)	Opercularia aspera	1	4
Forb (FG)	Oxalis chnoodes	1	4
Forb (FG)	Oxytes brachypoda	2	4
Forb (FG)	Pomax umbellata	2	4
Forb (FG)	Pterostylis alveata	2	4
Forb (FG)	Pterostylis coccina	1	4
Forb (FG)	Pterostylis laxa	1	4
Forb (FG)	Pterostylis reflexa	1	4
Forb (FG)	Scleranthus biflorus	1	4
Forb (FG)	Scleranthus diander	1	4
Forb (FG)	Senecio diaschides	1	4
Forb (FG)	Senecio hispidulus	2	4
Forb (FG)	Senecio minimus	1	4
Forb (FG)	Solanum prinophyllum	2	4
Forb (FG)	Solanum pungetium	2	4
Forb (FG)	Stackhousia viminea	1	4
Forb (FG)	Veronica calycina	1	4
Forb (FG)	Veronica gracilis	1	4
Forb (FG)	Veronica notabilis	1	4
Forb (FG)	Viola banksii	2	4
Forb (FG)	Viola silicestris	2	4
Forb (FG)	Wahlenbergia luteola	2	4
Other (OG)	Clematis aristata	2	57
Other (OG)	Hardenbergia violacea	2	50
Other (OG)	Glycine microphylla	2	44
Other (OG)	Glycine tabacina	1	34
Other (OG)	Billardiera scandens	1	30

Growth Form	Species	Median Cover	Frequency
Other (OG)	Glycine clandestina	2	30
Other (OG)	Desmodium varians	2	27
Other (OG)	Clematis glycinoides	2	24
Other (OG)	Tylophora barbata	2	17
Other (OG)	Eustrephus latifolius	1	7
Other (OG)	Amyema pendula	1	4
Other (OG)	Kennedia rubicunda	1	4
Other (OG)	Parsonsia straminea	1	4
Other (OG)	Smilax australis	1	4
Other (OG)	Xanthorrhoea concava	1	4