VEGETATION MANAGEMENT PLAN
Sunnybright Stage 2

Kelso, NSW

Prepared for Bathurst Regional Council

the environmental factor

Vegetation Management Plan – Sunnybright Estate, Stage 2

Document Verification

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Abbreviation	Description
APVMA	Australian Pesticides and Veterinary Medicines Authority
AHIP	Aboriginal Heritage Impact Permit
AOBV	Areas of Outstanding Biodiversity Value
BC Act	*Biodiversity Conservation Act 2016*
BRC	Bathurst Regional Council
CBD	Central Business District
EEC	Endangered Ecological Community
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LEP	*Local Environment Plan*
LLS Act	*Local Land Services Act 2013*
MNES	Matters of National Environmental Significance
NRAR	Natural Resources Access Regulator
NSW	New South Wales
OEH	Office of Environment and Heritage
SEPP 44	State Environmental Planning Policy 44 – Koala habitat protection
TBC	To be confirmed
TEC	Threatened Ecological Community
TEF	The Environmental Factor
VMP	Vegetation Management Plan
WM Act	*Water Management Act 2000*
WoNS	Weed of National Significance
WSUD	Water Sensitive Urban Design

1 INTRODUCTION

The Environmental Factor (TEF) was commissioned by Bathurst Regional Council (BRC or Council) to produce a Vegetation Management Plan (VMP) to fully consider the issues relating to vegetation management associated with the development of Stage Two (2) of the Sunnybright Estate subdivision (hereafter Sunnybright Stage 2), to both protect water quality objectives as required under the *Water Management Act 2000* (WM Act) and to provide guidance on revegetation of the site.

BRC intends to subdivide Lot 5, DP847225 (Figure 1), located in Kelso, approximately 4 km east of the Bathurst CBD within the Bathurst Local Government Area (NSW) (refer Appendix A). Sunnybright Stage 2 involves construction of a new residential subdivision in addition to the already existing 150 lots that were part of Stage 1, with access to the new estate from Limekilns Road to the south, and Marsden Lane to the north.

Construction activities associated with the subdivision will include the following:

- Establishment of appropriate erosion and sediment controls prior to commencement of works
- Removing and appropriately disposing of woody vegetation
- Stripping cover vegetation and stockpiling topsoil
- Reforming the landscape using fill materials available on site, including filling in and levelling the northernmost dam, and reshaping the other dams into stormwater runoff controlling devices
- Excavation and addition of road base materials to establish new roadways
- Excavation and laying of pipe to establish the new stormwater system
- Excavation and laying of pipe containing essential services to each new lot boundary

Remediation activities post completion of excavation and construction activities will include:

- Final formation of stormwater runoff areas and trunk drainage including flow dissipation devices
- Establishment of shared pathways (bike and pedestrian) through the southern and central portions of the subdivision
- Final formation of each lot, including slope for drainage and revegetation
- Landscaping activities, to stabilize and beautify the site.

As the site contains a first order, unnamed stream that runs roughly northeast – southwest through the site, Council has also allowed for the design of 'trunk drainage' to direct and control flows from the site, both during and post completion of the subdivision. As infiltration of rainfall to groundwater will be greatly reduced with the addition of multiple hardstand areas (e.g. sealed roads, houses, sheds and driveways) on each block, it is anticipated that runoff will be greatly increased, placing pressure on downstream waterways and the stormwater system. Careful consideration of this has guided the development of this VMP, with minimization of erosion and control of resultant sediments kept in mind, through appropriate revegetation of the site and sensitive stormwater management.

1.1 Definitions

Subject site The area to be directly affected by the development.

Study area Includes the subject site (as described above) and any proximal areas that could be potentially directly or indirectly impacted by the proposal including a 10 m buffer zone. The study area and subject site are shown in Figure 1.

Locality Includes the area within 10 kilometres of the study area.

1.2 Aims and objectives

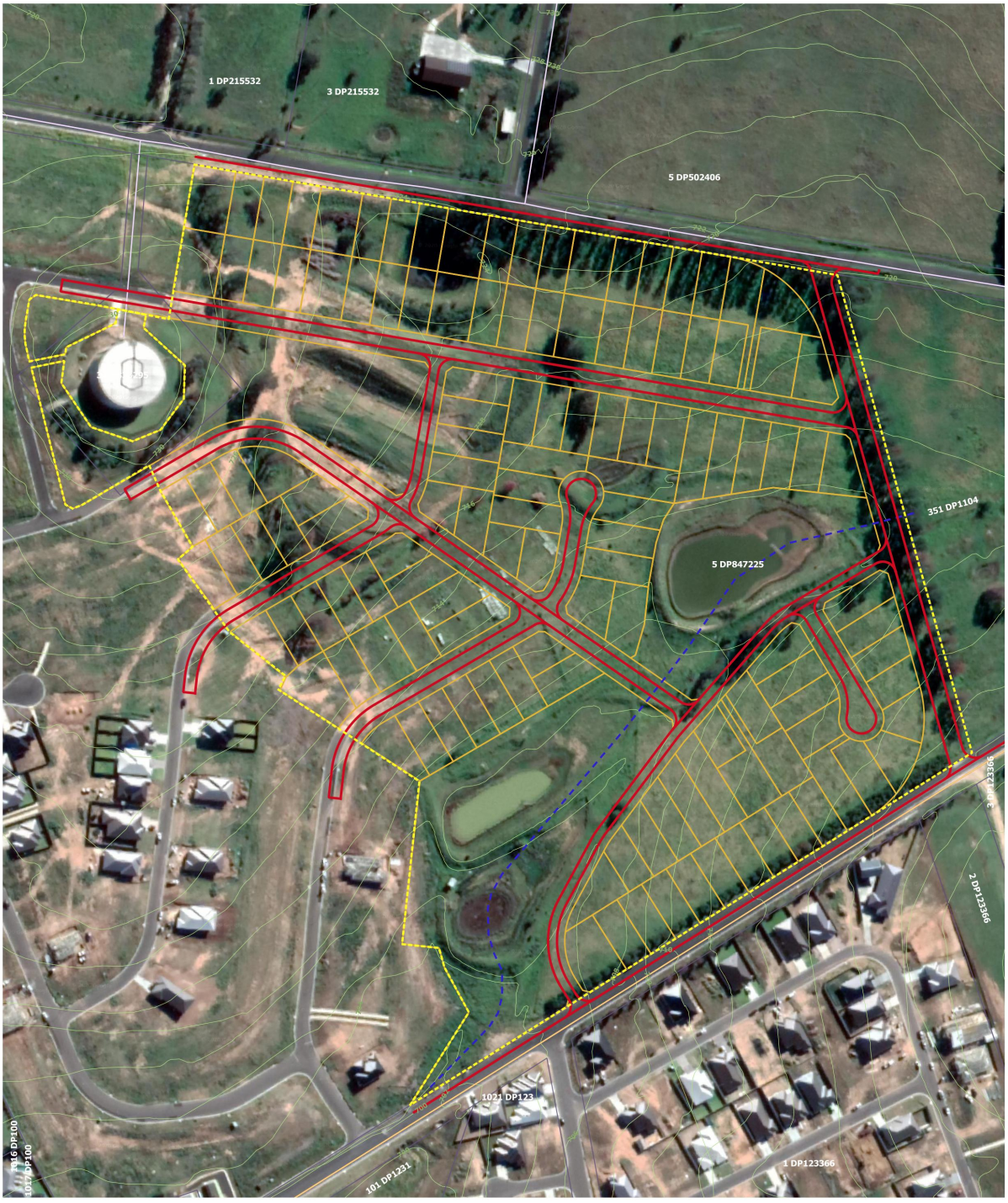
The aim of this VMP is to address issues relating to vegetation removal and provide advice and plans for new vegetation and subsequent landscape design, to support urban biodiversity and create a pleasant environment for the future residents of Sunnybright Estate. This VMP also aims to provide strategies for vegetation management in relation to stormwater and runoff, particularly as this relates to temporary site stabilization using natural means (i.e. revegetation of exposed areas); and, meeting water quality objectives in downstream Macquarie River, within the Macquarie-Bogan catchment, through long-term site stabilisation and filtration of runoff by vegetation.

The main objective of this VMP is to provide ecological advice surrounding the planting and maintenance of vegetation in the new Sunnybright Estate in a well-designed, community oriented green space, incorporating elements of natural filtration of runoff, and flow dissipation. This will help to provide a stable water course and riparian corridor to protect waters downstream.

1.3 Assumptions and Limitations

The following assumptions and limitations have impacted the development of this VMP:

- This VMP has been prepared based on the NSW DPI 'Guidelines for vegetation management plans on waterfront land'.
- It is noted that there are sensitive landscape design and community perception issues pertaining to the removal of established Radiata Pine (*Pinus radiata*) wind breaks surrounding the subject site; these concerns were raised during development of the Stage 1 area. It is assumed that Council will undertake community engagement to forewarn of plans to remove this site feature, and that emphasis is placed on the resultant formation and landscaping that will occur as part of the finalization of the subdivision. A separate landscape architecture plan has been prepared concurrently to this VMP and will be made available to the community for viewing as part of engagement in the subdivision process (Appendix F).
- Lack of finalised designs available during development of the VMP – assumptions have been made regarding vegetation management based on the current site and the preliminary designs for the subdivision, which did not show details of the drainage areas.



Sunnybright Stage 2 - Subject Site

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1:3000

Legend

- Subject Site
- Lot Boundary
- Contours
- Local Road
- Sub Arterial Road
- 1st order unnamed waterway
- Riparian corridor
- Proposed lot boundaries
- Proposed vegetation
- Proposed roads

Figure 1 Sunnybright Stage 2, Subject Site

2 LEGISLATION AND POLICY REQUIREMENTS

The relevant Acts of legislation and policies applicable to the VMP were reviewed, and the implications have been assessed accordingly. A summary of how requirements have been addressed is provided in Table 1 below.

Table 1 Legislation and policy requirements for the Sunnybright Stage 2 VMP

Legislation	Authority	Approval / licence	Criteria	Comments
Federal Legislation				
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Commonwealth Department of Environment	EPBC Referral	Impacts to listed threatened and / or migratory species	The subject site does not provide significant habitat for any EPBC Act threatened flora and/or fauna or any EPBC Act listed migratory species. No threatened species were recorded on the subject site. An EPBC Referral is not required.
NSW Legislation, Regulations and Policies				
National Parks and Wildlife Act 1974 (NPW Act)	OEH	Section 90 AHIP Consent to destroy	Section 90 AHIP Consent to move or destroy Aboriginal heritage	No Aboriginal Heritage items or places were identified on site; an AHIP is not required.
Local Land Services Act 2013	LLS	N/A	Minimal native vegetation clearing	The subject site does not contain any native plant community type. Vegetation is dominated by introduced grasses and forbs that are common in areas with a land use history of intensive agriculture (OzArk, 2018). As such, the proposal does not impact on any native vegetation and no clearing of native vegetation is required.
Local Land Services Amendment Act 2016 (LLSA Act)	LLS	Land Management (Native Vegetation) Code 2018 (Div 5, Sch 1) to authorise clearing of native vegetation on Category 2 regulated land under certain conditions and	If the proposal occurs on Category 2 land on the Native Vegetation Regulatory (NVR) Map, approval to clear native vegetation is required	The site occurs entirely on land excluded under the LLS Act (NVR Map, accessed14/03/2019); also, the site was found to contain no native vegetation communities as part of the biodiversity assessment completed (OzArk, 2018).

Legislation	Authority	Approval / licence	Criteria	Comments
		provide for the establishment and maintenance of set aside areas		
Biosecurity Act 2015 (Act)	NSW DPI	N/A	Management of declared weeds	Several declared weeds occur within the subject site, which require active and sensitive management in line with the legislation.
Biodiversity Conservation Act 2016 (BC Act)	OEH	Part 2 BC Act. Licence to harm a threatened species, population or ecological community	Impacts to listed threatened terrestrial species	The subject site does not provide important habitat for any BC Act threatened flora and/or fauna. No threatened species were recorded on the subject site (OzArk, 2018).
Water Management Act 2000 (WM Act)	Water NSW	Controlled Activity Approval	Impacts to waterfront land	OzArk (2018) have indicated that the proposal does not impact on or occur within any protected riparian area.
Fisheries Management Act 1994 (FM Act)	DPI Fisheries	Part 7 Fisheries Permit	Impact to Key Fish Habitat (3rd order stream or higher)	The proposal does not impact on or occur within key fish habitat or threatened fish habitat.
State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44)	DPIE (formerly OEH)	Koala Plan of Management (PoM) must be prepared before Development Consent can be granted	Area must contain core koala habitat	The Bathurst LGA is listed under Schedule 1 of SEPP 44, as an LGA to which the SEPP applies; however, no koala habitat was identified on site.
NSW Pesticides Act 1999 and *NSW Pesticides Regulation 2009*	NSW EPA	Obtain an APVMA permit if a pesticide will be used in a way not covered by the label	Pesticides are likely to be used as part of the vegetation management of the site.	Council must adhere to the usage requirements of pesticides to avoid a breach and penalty notice under the Pesticides Act 1999.
Local Government provisions				
BRC – Local Environmental Plan (LEP)	BRC	N/A	Maintain high biodiversity areas	The area is not mapped as containing high biodiversity value in the BRC LEP

3 EXISTING ENVIRONMENT

3.1 Region and climate

The Sunnybright Stage 2 subdivision is occurring in the Bathurst Regional Council LGA, at 197 Limekilns Road, Kelso. The subject site is situated in the Bathurst subregion of the South Eastern Highlands bioregion, as per the Interim Biogeographic Regionalisation of Australia (IBRA) categories. The Bathurst subregion is characterized by specific geology, landforms, soil types and vegetation as described by the NSW Office of Environment and Heritage (OEH, 2018; Table 2).

Table 2 South Eastern Highlands, Bathurst IBRA subregion (OEH, 2018)

South Eastern Highlands Bioregion				
Subregion	**Geology**	**Landform**	**Soils**	**Vegetation**
Bathurst Subregion	Carboniferous granite with areas of Tertiary basalt caps and Quaternary sands along the Macquarie River	Rounded hills in a granite basin surrounded by steep slopes. Outcrops with tors near margins. Chain of ponds streams in wide, flat valleys. Terrace alluvium along the Macquarie River	Shallow red earths on yellow texture contrast soils on all slopes and deep coarse sands in alluvium	Yellow Box, Red Box and Blakely's Red Gum on lower areas. Red Stringybark, Broad-leaved Peppermint and White Gum on hills. Areas of White Box and River Oak along main streams.

Bathurst experiences four (4) distinct seasons, with extremes of heat and cold in summer and winter respectively. Bathurst experiences an average monthly maximum temperature in January of 28.6 degrees, and a minimum monthly temperature in July of 0.9 degrees (BOM, 2019).

Average annual rainfall in summer (December) is 73.7 mm, with no regular 'dry season' as occurs in other temperate climate of the South Eastern Highland bioregion.

Severe frosts are common throughout winter.

3.2 Historical land use and condition

The proposed subdivision will occur at 197 Limekilns Road, Kelso, which comprises an area of approximately 17.75 ha formerly used for intensive agriculture. The site was most recently grazed by stock, and previously constituted an orchard. Several of the removed fruit trees have coppiced across the site since grazing has ceased (Plate 1).

The site is mostly covered in exotic vegetation, predominantly introduced pasture grasses and broad-leaf weeds, and is bounded and bisected with Radiata Pine (*Pinus radiata*) shelter belts (Plate 2), which are pocketed with woody weeds.

Plate 1 Coppiced fruit trees across the northwest quadrant of the site (facing south towards Bathurst)

Plate 2 Planted *Pinus radiata* windbreak along northern and eastern boundaries of the site

3.3 Site description – Vegetation types, habitat features and connectivity

The site is located between Limekilns Road and Marsden Lane and is approximately 18.13 ha in size. The site is sloped, ranging from 700 – 730 mASL, and contains five (5) existing farm dams, three (3) of which are fed by the unnamed, first order stream that bisects the site. The first order stream flows downslope, from north east to southwest, connecting to Raglan Creek beyond the site extent, which flows into the Macquarie River, as shown in Figure 2.

The vegetation on site is mostly exotic, due to the history of grazing and agriculture – consequently, the site is primarily disturbed exotic open grassland. During the ecological investigation undertaken by OzArk (2018), nine (9) native species were observed to be present, although the biodiversity assessment completed following this field investigation for the project confirmed there were no native Plant Community Types (PCT's) within the study area. Vegetation connectivity is low and little vegetation is left within 10 km, except for the Macquarie River riparian corridor, and isolated patches of Box Gum Woodland (Figure 2).

The site was found to contain little to no habitat features to support native species. Key observations included:

- Five (5) existing farm dams, which had turbid water and little fringing vegetation or visible snags (Plate 3 and Plate 4)
- No large, native hollow bearing trees remain
- No logs or fallen native debris were observed on site
- No native mid stratum vegetation, though several species of woody weeds and coppiced fruit trees were observed to be present (Plate 1 and Plate 6)

Several species of weeds were observed on site, included several listed under the *Biosecurity Act 2015*, and Weeds of National Significance (WoNS), which will require careful consideration and handling as part of project delivery to prevent weed spread, and to meet Council's stewardship requirements and obligations under the relevant legislation. Weeds observed included:

- *Emex australis* (Cats Head or Caltrop)
- *Hibiscus trionum* (Bladder Weed)
- *Xanthium spinosum* (Bathurst Burr)

- *Datura stramonium* (Thorn Apple)
- *Solanum linnaeanum* (Spiny Nightshade)
- *Solanum* sp. (potentially Silverleaf Nightshade – no flowers or fruits present at time of inspection, so should be treated as a weed of concern)
- *Lycium ferocissimum* (African Boxthorn)
- *Salix* sp. (Willow)
- *Rubus fruticosus* sp. agg. (Blackberry)
- *Rosa canina* (Dog Rose or Briar Rose), and
- *Hypericum perforatum* (St John's Wort)

Species of weeds with specific management requirements observed during the site inspection completed on 26 February 2019 are presented in Table 3 below.

Table 3 Listed weeds identified on site and their relevant management requirements

Common Name	Scientific Name	Management Requirements	Photo
Caltrop or Cat's Head	*Emex australis*	1. General Biosecurity Duty *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 is reasonably practicable.*	
Bathurst Burr	*Xanthium spinosum*	1. General Biosecurity Duty	

Common Name	Scientific Name	Management Requirements	Photo
Thorn Apple	*Datura stramonium*	1. General Biosecurity Duty	
Silverleaf Nightshade	*Solanum elaeagnifolium*	1. General Biosecurity Duty 2. Prohibition on dealings *Must not be imported into the Sate or sold* 3. Regional Recommended Measure (Central Tablelands) *Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Land managers should mitigate the risk of the plant being introduced to their land. Core infestation area: Land managers should mitigate spread from their land. Land managers reduce impacts from the plant on priority assets.*	
African Boxthorn*	*Lycium ferocissimum*	1. General Biosecurity Duty 2. Prohibition on dealings 3. Regional Recommended Measure (Central Tablelands) *Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. The plant should not be bought, sold, grown, carried or released into the environment.* **Protect primary production lands that are free of African boxthorn**	

Common Name	Scientific Name	Management Requirements	Photo
St John's Wort	*Hypericum perforatum*	1. General Biosecurity Duty 2. Regional Recommended Measure Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. The plant should not be bought, sold, grown, carried or released into the environment. **Protect grazing land that is free of St. John's wort**	
Willow*	*Salix* sp.	1. General Biosecurity Duty 2. Prohibition on dealings *Must not be imported into the State or sold* All species in the Salix genus have this requirement, except *Salix babylonica* (Weeping Willows), *Salix x calodendron* (Pussy Willow) and *Salix x reichardtii* (Sterile Pussy Willow)	
Blackberry*	*Rubus fruticosus* species aggregate	1. General Biosecurity Duty 2. Prohibition on dealings *Must not be imported into the State or sold* All species in the *Rubus fruiticosus* species aggregate have this requirement, except for the varietals Black Satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem, and Thornfree 3. Regional Recommended Measure *Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. The plant should not be bought, sold, grown,*	

Common Name	Scientific Name	Management Requirements	Photo
		carried or released into the environment. **Protect conservation areas, natural environments and primary production lands that are free of blackberry**	

*denotes Weeds of National Significance (WoNS)

Previously disturbed areas occur on the boundary to Stage 1 works on the western side of the subject site. These areas have been used for stockpiling materials, including building wastes and topsoil. Recent excavations for pipeline installation resulted in the removal of all vegetation within the impact footprint (OzArk, 2017). All other remaining vegetation on site has been subject to disturbance in the past.

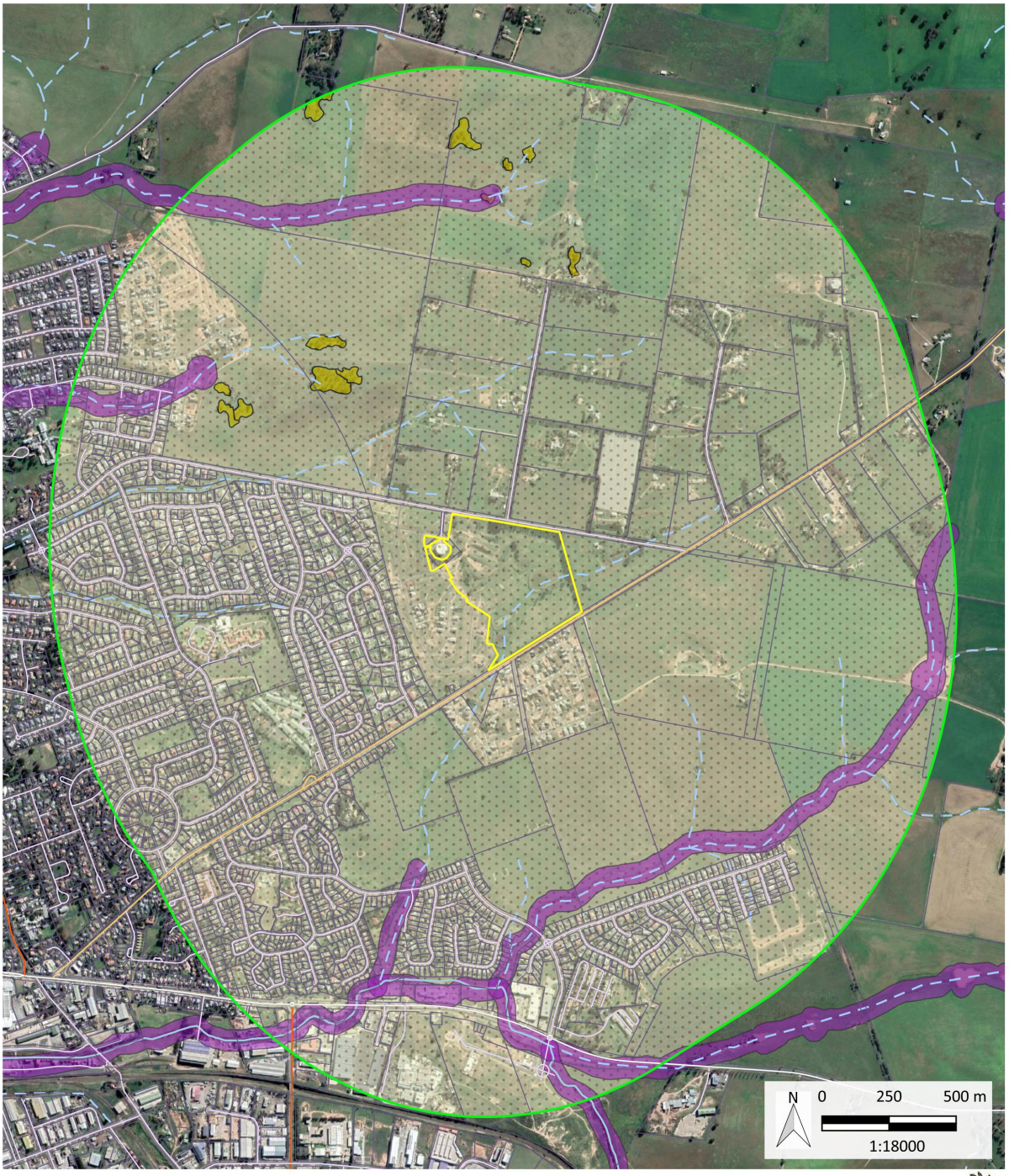
Plate 3 Farm dam no.3, facing east, showing turbid water and a lack of native riparian or fringing vegetation

Plate 4 Farm dam no.5, facing west towards the abandoned pump house

Plate 5 View of the subject site from the base of the slope, facing northwest, showing mature exotic overstorey vegetation in the background, and common pasture grasses and weeds in the foreground

Plate 6 Southern extent of the site, with the entrance to Sunnybright Estate in the mid-ground, and a *Rosa canina* in the foreground

Plate 7 Existing disturbed area of the site, stripped and used for stockpiling as part of Sunnybright Stage 1 works



Sunnybright Stage 2 - PCTs and Waterways within a 1.5km radius of the proposal location

Legend

- Subject Site
- Lot Boundary

Roads

- Arterial Road
- Local Road
- Primary Road
- Sub Arterial Road

Waterways

- Creek
- 1st & 2nd unamed waterways

- Key Fish Habitat

Central Tablelands PCT

- Non Native
- Yellow Box - Blakelys Red Gum grassy woodland on the tablelands; South Eastern Highlands Bioregion

Figure 2 Plant Community Types and Waterways within a 1.5 km radius from the Subject Site

4 VEGETATION MANAGEMENT PLAN

4.1 Overview

The aim of this VMP is to address issues relating to vegetation removal and provide advice and plans for new vegetation and subsequent landscape design, to support urban biodiversity and create a pleasant environment for the future residents of Sunnybright Estate. This VMP also aims to provide strategies for vegetation management in relation to stormwater and runoff, particularly as this relates to temporary site stabilization using natural means (i.e. revegetation of exposed areas); and, meeting water quality objectives in downstream Macquarie River, within the Macquarie-Bogan catchment, through long-term site stabilisation and filtration of runoff by vegetation.

The main objective of this VMP is to provide ecological advice surrounding the planting and maintenance of vegetation in the new Sunnybright Estate in a well-designed, community oriented green space, incorporating elements of natural filtration of runoff and flow dissipation to provide a stable water course and riparian corridor to protect waters downstream and align with requirements of Water NSW.

When a proposed controlled activity disturbs or substantially modifies the riparian corridor, the controlled activity approval typically requires the watercourse to be rehabilitated, in order to emulate local native vegetation communities – the role of the VMP is to describe how this rehabilitation will be completed.

4.2 Species selection and plant supply

Plants making up urban landscapes in the local region need to meet several specific targets, including:

- Preferably being native species endemic to the region in order to maximize benefits to native fauna.
- Being drought tolerant in order to withstand periods of low rainfall and tolerate severe winter frosts.
- Being maintenance friendly and requiring minimal upkeep (ie. not shedding leaves).
- For plants near houses, these must not be prone to dropping limbs/ easily uprooted.
- Have low fire risk.
- In addition, the local heritage of the region may be incorporated into the new estate through the planting of orchard species. The property was originally an orchard and such species may provide historical meaning and value to the area, and although they may require more maintenance in comparison to native species, harvests may add value to the community, and
- Enhance seasonal feeding resources for fauna in the area – planting of nectar-rich flowering plants.

In consideration of this, the Plant Community Types (PCT) recorded for the locality were analysed to determine which native assemblage might be most appropriate to replant on site, to the best advantage of local fauna species, and with regard to the likelihood of success of plantings given the local climate and soil conditions. Remnant patches of *Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion* PCT were recorded within the 1.5 km locality of the subject site, as shown in Figure 2.

Given the large areas of exposed earth requiring re-seeding that are included in the Sunnybright Stage 2 works, and the connectivity of the site to downstream Raglan Creek and the Macquarie River, it is preferable that appropriate native species of grasses are used to rehabilitate exposed areas where possible, to prevent the spread of exotic grass seed downstream. As such, extensive exposed areas

are recommended to be planted with a seed mix containing both early establishing sterile cover crops such as Japanese Millet (*Echinochloa esculenta*), in combination with the following native grass species:

- Foxtail spear grass (*Austrostipa densiflora*)
- Red-anther wallaby grass (*Rytidosperma pallida*)
- Three-awn grass (*Aristida ramosa*)
- Hill Wallaby grass (*Rytidosperma erianthum*)
- Redleg grass (*Botrochloa macra*)
- Kangaroo grass (*Themeda australis*)
- Windmill grass (*Chloris truncata*)
- Rough speargrass (*Austrostipa scabra*)
- Common wheat grass (*Elymus scaber*) also known as *Anthosachne scaber*

A complete recommended species list is provided in Table 4.

4.3 Site management

As the site will become a series of privately held allotments, interspersed with shared green areas, and foot/bike paths, public safety and general amenity do need to be considered in the development of the site. The following site management activities should be undertaken as a minimum:

- Security fences may be erected to prevent public access while wet works are being undertaken.
- Weed management to increase the likelihood of success of native plantings and to limit the spread of listed weeds.
- Appropriate site preparation, to provide an appropriate growing medium for plants and increase the likelihood of plants surviving.
- Installation, maintenance and eventual removal of ERSED measures/barriers.
- Covering of topsoil/ stockpiles to prevent erosion.
- Collaboration with other stages/works i.e. to facilitate establishment of trees and grasses.
- Stakeholder engagement should be completed, prior to clearance works commencing, and periodically throughout project delivery as required.

Further detail on weed management and site preparation is provided below.

4.3.1 Weed management

Currently, the subject site has a high weed burden which needs to be controlled to enable successful revegetation and survival of plants into the future. Following initial weed control (see section 4.3.2 below), weeds should be proactively removed at every opportunity, with monthly spraying/spot removal using minimal impact herbicide as needed in the first 12 months. This can be reduced to 4-6 monthly checks after the first 12 months. Tubestock will be most vulnerable to competition with weeds in the first 12 months.

Site managers are to ensure that vehicles, personnel and machinery only enter the site after ensuring their vehicles and equipment are free of weeds, seeds, mud (potentially holding seeds) and other contaminants. This is to minimize the spread of weeds between sites.

4.3.2 Site preparation

Site preparation is critical for ensuring the success of any revegetation effort and should always be completed prior to planting occurring. Herbicide should be used to treat dense weed cover and is most effective if applied two to three months prior to planting.

Herbicide application

Planting locations should be sprayed at least two (2) weeks prior to revegetation, as a 'pre-plant knock down' activity to ensure competition between desired natives and opportunistic exotics is prevented or kept to a minimum. Weed treatments to combat existing weeds and seed bank should be performed a minimum of two (2) times with a two (2) week period between each treatment. Appropriate notification of proposed weed spraying and timing must be provided to nearby residents, and contractors must comply with all safety requirements and precautions as outlined in current Workplace Health and Safety legislation requirements and the *NSW Pesticides Regulation 2009*. Pesticides or chemicals to be used adjacent riparian areas must be registered for use in aquatic environments. Table 3 and Appendix B describe in detail the appropriate methods to control and remove the weeds on site prior to commencement of planting activities.

Planting bed preparation

Surface preparation and stabilisation techniques should be used on disturbed or sloping sites. Techniques can include ripping, erosion matting, levelling and mulching. Basic soil testing is recommended to gauge what soil treatments may be required. Appendix C describes in detail the appropriate methods to prepare each zone for planting, post completion of the initial vegetation removal and management works.

4.4 Planting arrangement

Planting arrangement within the Management Zones should mimic that of a 'natural' community wherever possible. Different layers (groundcover, mid-sized trees and shrubs and tall trees) should be planted in a mosaic pattern where appropriate. Vegetation clusters of varying species will not only mimic natural habitat diversity and concentration but will lead to a natural appearance and facilitate the intended use of the green spaces, while blocking other areas with a natural visual screen.

Tubestock seedlings of various native species should be planted in random clusters with larger trees planted towards the centre of the garden bed to retain leaf litter that falls once trees reach maturity. Ideally, different aged tubestock should be planted to fast track the establishment of the planted areas. Large trees to be planted with a minimum spacing of six (6) metres centre to centre and six (6) metres spacing from lot boundaries to facilitate mowing. Plantings with lower, middle and upper stratum species are to be clearly identifiable to prevent damage occurring during mowing.

Overall, the subject site will contain the following quantities of plants, using a mixture of species as detailed in Table 4 (according to availability), and following the arrangement shown in Appendix F:

- 55 upper stratum plants (trees)
- 4,900 mid stratum plants
- 19,000 grasses and groundcovers
- 26,000 'swampy meadow' grasses, rushes and groundcovers

Plantings will only occur in the trunk drainage reserve in the stormwater management area created by the reshaped dams, and along the shared pedestrian/bike paths.

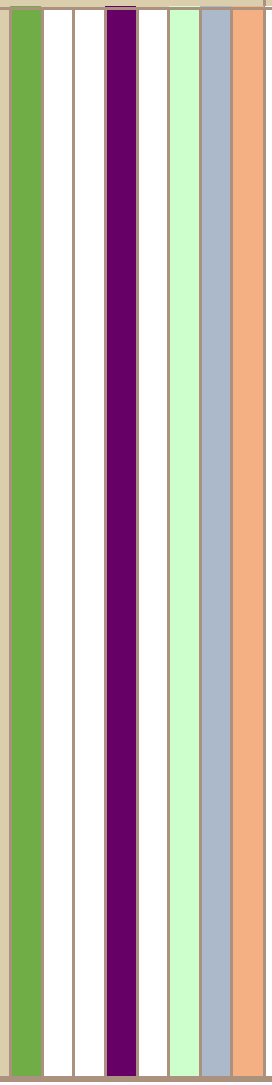
4.4.1 Planting methodology

Planting should be timed to occur in Autumn or Spring, to avoid the extreme temperatures experienced in summer and before the winter frosts. Tubestock should be sun-hardened and should have been kept in the elements for a minimum of four (4) weeks prior to planting to maximize chances of survival. All surrounding weeds should be cleared, and holes dug to approximately 30-40 cm in depth, taking care not to damage surrounding plant roots. Seedlings should be soaked in water prior to planting and the hole should be watered and allowed to drain. Potting mix containing native fertilizer is to go in the hole and then a bed of pre-soaked water crystals upon which the plant is placed before backfilling occurs; it is important that water crystals be soaked prior to use. A dish like depression around the base of the plant can be created out of the soil in order to maximize water capture and retention. Wood-chip or mulch (weed free) should be placed around the base of plants and across planted areas at a depth of 8 – 10 cm. Care should be taken to ensure mulch does not rest against the plant stems. Tree guards may be installed around all planted seedlings to protect against wind damage, evaporative losses and trampling. All plants should be watered generously following planting.

All vegetation types should be planted concurrently to allow groundcovers and smaller plants to establish before the larger trees reach maturity.

Table 4 Recommended species list and indicative flowering/seeding seasons

Flowering Season	Upper stratum	Mid stratum	Ground stratum	Grasses and sedges
Spring September-November **Summer** December - February **Autumn** March - May **Winter** June - August	*Yellow Box (*Eucalyptus melliodora*) *Blakely's Red Gum (*Eucalyptus blakelyi*) *Broad–leaved Peppermint (*Eucalyptus dives*) *Snow Gum (*Eucalyptus pauciflora*) Red Box (*Eucalyptus polyanthemos*) Inland Scribbly Gum (*Eucalyptus rossii*) * *Eucalyptus rubida subsp.rubida* *Apple Box (*Eucalyptus bridgesiana*) *Red Stringybark (*Eucalyptus macrorhyncha*) *Ribbon Gum (*Eucalyptus viminalis*) *Brittle Gum (*Eucalyptus mannifera*)	Egg and Bacon Pea (*Dillwynia sericea*) Heathy Bush Pea (*Pultenaea procumbens*) Common Fringe Myrtle (*Calytrix tetragona*) *Hairy Geebung (Persoonia rigida*) Myrtle Teatree (*Leptospermum myrtifolium*) Native blackthorn (*Bursaria spinosa subsp . lasiophylla*) *Urn Heath (*Melichrus urceolatus*) Silver banksia (*Banksia marginata*) Spider flower (*Grevillea arenaria* Native Fuchsia (*Correa reflexa*) *Peach Heath (*Lissanthe strigose*) Silver Wattle (*Acacia dealbata*)	*Wattle Matt-rush (*Lomandra filiformis subsp. coriacea*) Native Violet- (*Viola betonicifolia)* *Amyema cambagei+* Common reed *(Phragmites australis)+* Snake Vine *(Stephania japonica var. discolour)+* *Common raspwort (*Gonocarpus tetragynus*) *Ivy goodenia (*Goodenia hederacea*) Spiny-headed mat-rush (*Lomandra longifolia*) *Flax lily (*Dianella revoluta*) Tall sedge (*Carex appressa*) Australian Brooklime (*Gratiola peruviana*)+ Juncus usitatus.	Foxtail spear grass (*Austrostipa densiflora*) Red-anther wallaby grass (*Rytidosperma pallidum)* *Kangaroo Grass (*Themeda australis*) Common wheat grass *(Elymus scaber*) also known as *Anthosachne scaber* *Red Grass (*Bothriochloa macra*) Purple Wiregrass (*Aristia ramose*) *Three-awn grass (Aristida ramosa)* *Couch (Cynodon dactylon)+* Slender Bamboo Grass (*Austrostipa verticillata*)+ Australian Basket Grass (*Oplismenus aemulus*)+ *Weeping Grass (*Microlaena stipoides var. stipoides*)

Flowering Season	Upper stratum	Mid stratum	Ground stratum	Grasses and sedges
	Bundy (*Eucalyptus goniocalyx*) Mugga Ironbark (*Eucalyptus sideroxylon*) Drooping sheoak (*Allocasuarina verticillate*)	Daphne Heath (*Brachyloma daphnoides*) Austral indigo (*Indigofera autralis*) Ploughshare Wattle (*Acacia gunnii*) Early Wattle (*Acacia genistifolia*)	*Amyema miraculosum subsp. Boormanii+* *Stinking Pennywort (*Hydrocotyle laxiflora*) *Commelina cyanea+* Many flowered mat-rush (*Lomandra multiflora*) Trigger plant (*Stylidium graminifolium*) False Sarsparilla (*Hardenbergia violacea*) Native Geranium *(Geranium solanderi var. solanderi)+* *Tussock (Poa labillardierei)* Swamp Dock, (*Rumex brownii)+* Sickle fern (*Pellaea falcata*)+ Bidgee-widgee (*Acaena novae-zelandiae*)+ Slender Knotweed (*Persicaria decipiens*)+ *Austrodanthonia racemosa var. racemosa+*	Tufted Hedgehog Grass (*Echinopogon caespitosus var. caespitosus*)+ Hill Wallaby grass (*Rytidosperma erianthum*)^ Windmill grass (*Chloris truncata*)^ Rough speargrass (*Austrostipa scabra*)^

* Denotes species found in *Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion* PCT (OEH, 2019); all other species included in line with species list provided in the Sunnybright Stage 1 VMP (OzArk, 2017) as per Council request

+ *River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion*

^ flowers in response to rain

4.5 Management Zones and Phasing of Works

Following the site inspection completed in February 2019, the site was divided into broad management zones according to the current conditions at the site. Ultimately, the entire subject site will be cleared and landscaped, however a staged approach is recommended, due to the significant volume of plant and weed matter, as well as existing wetland areas that will need to be sensitively managed (refer Appendix B for further detail).

Landscaping will include:

- Three (3) out of the five (5) dams will be filled in, with the larger dams in the southern section to be reshaped and retained.
- 14,600 m^2 of revegetation/native plantings within 17 garden beds (detail provided in accompanying Landscape Plan; Appendix F).
- 21,650 m^2 of turfed/native seeded areas throughout the estate, to stabilize the proposed housing allotments and prevent erosion (native grass varieties may be used as these require little maintenance and are more resistant to drought).

4.5.1 Work phases

Given the complex, though predominantly non-native vegetation types on site, and the management actions these will require, the site has been grouped into broad 'management zones' across two distinct stages, namely:

Phase 1: 'site set-up' (Appendix B), and

Phase 2: 'final formation rehabilitation' (Appendix C)

Broad descriptions of each work Phase are provided below.

Phase 1: Site Set-up

In order to prepare the site for subdivision, and to pave the way for road formation, establish effective stormwater management and provide green space, initial management actions need to be completed to remove weed and other exotic vegetation material in line with legislative requirements with regard to biosecurity, and establish erosion and sediment controls.

Consequently, the Contractor will need to go through the site and sensitively and appropriately remove the weeds identified during the site inspection, as well as any others which may have germinated since then. Weeds identified, and their appropriate management actions are listed in Table 3, with weed locations also marked on the Environmental Control Plan (ECP) provided in Appendix B. Care should be taken to identify and control any other weeds on site as part of this process.

Prior to undertaking site disturbance/excavation activities, appropriate erosion and sediment (ERSED) controls must be installed in strategic locations across the site. Careful preparation and planning surrounding dams and drainage lines will ensure appropriate management of runoff, and implementation of ERSED controls will reduce erosion and assist with revegetation efforts. Where possible, native reeds and fringing vegetation will be retained and re-planted to assist with bank stabilization and to promote biological uptake of pollutants.

After weed removal has occurred and ERSED controls installed, each of the five (5) identified 'zones' will need to be managed in order of priority. Priorities have been allocated in the Management Actions table in Appendix B; Zones are listed here in no particular order.

Note – a pre-clearing assessment should be completed prior to commencement of works, to ensure native species of fauna are not injured or killed as part of vegetation removal and replacement associated with the establishment of Sunnybright Estate.

A summary of the management actions for each 'zone' is provided below.

Zone 1 **Dams/wet areas to be levelled**

ERSED controls must be installed to capture any sediment that may otherwise migrate downstream into the first order waterway that bisects the site. Weed materials will then be removed, with any native reeds and fringing vegetation removed and set aside for reuse. The area may then be levelled using clean fill, spread with topsoil and reseeded to ensure stabilisation of sediments. ERSED controls to heavily rely upon the 8000m^3 dam at the downstream end of the site. This dam will have a spillway constructed and remain as is for the duration of construction and will then be re-shaped as a detention basin towards the end of the project.

Zone 2 **Dams/wet areas to be reshaped**

Excavate native reeds and fringing vegetation and set aside. Re-shape area and install drainage per design drawings. Spread area with topsoil material and undertake seedbed preparation.

Re-plant reeds and fringing vegetation to assist with site stabilisation, sediment laden water filtration, and to assist with biological uptake of pollutants arising from the development. Install permanent ERSED controls, including rock armouring at culvert entrances and exits to dissipate water flows, and rock-check dams at appropriate intervals, with swales along banks to catch and slow runoff.

Zone 3 **Previously disturbed area/stockpile sites**

Remove reusable materials to alternative locations and dispose of wastes appropriately at a licensed waste management facility. Spread area with topsoil and undertake seedbed preparation, seeding with an appropriate seed mix.

Zone 4 **Large woody weeds/mature vegetation**

The site is bordered by mature Radiata Pine (*Pinus radiata*), which provide privacy, act as a windbreak and improve the aesthetics of the area. These will be removed from a safety perspective, with new green spaces included in the Landscape Plan (Appendix F) for the subdivision. Fruit tree stumps and regrowth, Willows and various other patches of weeds occur throughout the site.

No native vegetation communities remain within the subject site, however small patches and individual native plants were observed on site, typically around the dams as riparian and fringing vegetation.

Zone 5 **Paddocks**

Paddock areas on site are mostly grassy, with scattered, common agricultural weeds. As such, keep disturbance of these areas to a minimum, to avoid additional rehabilitation efforts further down the track. Undertake broad-leaf weed control using appropriate herbicides registered for use adjacent to waterways, and prune coppiced fruit trees at base and chip. After broadleaf herbicide application has proven effective, slash the general area to promote growth of pasture species and out-compete weeds as they re-emerge.

Phase 2: Final Formation Rehabilitation and Landscaping

After the site is prepared and reshaped to the design formation, new zones, according to the subdivision designs, will be created for individual management.

In addition to the formation of sealed roads and the installation of services and the stormwater system, new vegetation will be planted in order to replace that lost due to clearing, to enhance the visual amenity of the site and to provide residents with green space for wellbeing and recreational use. The aim is to recreate areas of native vegetation, resembling the diversity and age structures seen in nature, to attract native wildlife, including threatened species and insects. A diversity of flora types/stages contribute to high quality vegetation communities, including:

- Native groundcover
- Tall and short native shrubs
- Saplings
- Seedlings
- Younger trees
- Different species of trees
- Mature trees with hollows
- Water
- Fallen logs and branches
- Mistletoe

Not all of these 'layers' can be artificially created through planting, however, diversity in species and vegetation types and varied strata levels can be achieved.

The purpose of this phase in the VMP is to establish a stable subject site which is protected from erosion through the establishment of grassed housing allotment areas and sealed roads, and a stabilized watercourse and riparian corridor, which will emulate native vegetation communities in the area. The detail provided for revegetation in this VMP for Phase 2 is for groundcovers and other low-growing, multi-trunked plants with matted roots to bind the streambed – design for strategic placement of garden beds and mid and upper stratum species is provided in the accompanying Landscape Plan (Appendix F) for the Sunnybright Stage 2 works. However, desired species for use in these garden beds has been provided in Appendix C.

A summary of the management actions for each identified 'zone' is provided below:

Zone 1 **Housing allotments**

Ensure soils are level and evenly sloping, with swale drains on any steep blocks (fall of 1:4 or greater). Where required, spread topsoil from stockpiles created during Phase 1 over bare areas, to create a friable tilth and growing medium for planting. Ensure even coverage of grass seed (both native and sterile exotic acceptable) to prevent sediment laden runoff entering the stormwater system; and, water seeded areas until grasses germinate evenly across bare patches.

Zone 2 **Access roads**

Completely strip the area prior to construction of stormwater drainage and kerb and guttering. Form the roadway, ensure it is adequately compacted and capped/sealed to prevent erosion and sediment laden runoff, and to allow all weather access as soon as practicable.

Zone 3 **Riparian corridor of 1st order drainage line and stormwater management areas**

Ensure sediment barriers are in place at the base of each section prior to undertaking final shaping activities – a water diversion drain, or temporary pumping set-up may be necessary to be used during site establishment works. Soils should then be formed to desired levels, using clean sub-soil material from stockpiles or other certified or reputable sources. Install permanent flow dissipation devices, such as rock check dams and riffle areas, ensuring rocks are appropriately keyed into place. Lay appropriate erosion control device (jute matting, coir logs, erosion control blanket or hydromulch, or other appropriate alternative to be approved by Council) along base of stream, to 10 m either side of centerline of waterway, before planting appropriate aquatic and semi-aquatic native tubestock in the area to provide rapid stabilisation. Create 'garden beds' on upper slopes using remaining topsoil and clean mulch from stockpiles or other reputable sources, to form green spaces for the community and to replicate natural vegetative 'layers'. Ensure soils are level and evenly sloping, with swale drains on any steep blocks (fall of 1:4 or greater) on all remaining surfaces; Seed any remaining exposed areas with native seed mix.

Further detail on the planting arrangements is provided in Appendix F.

5 MONITORING AND MAINTENANCE

5.1 Performance criteria

The following performance criteria will be used to measure achievement of the objectives:

- The percentage area of grass cover across all exposed areas 3 months post seeding
- Evidence of erosion and establishment of swampy vegetation in stormwater management areas 3 months post installation
- Species diversity and growth and survival of any mixed seed plantings on the site
- Growth and survival of any tubestock planted 12 months following installation
- The percentage area of weed coverage 12 months following primary weed control

5.2 Monitoring and reporting

5.2.1 Vegetation surveys

Assessment of vegetation cover should be completed quarterly, until plants are well established. For housing allotments, vegetation/grass cover should be assessed until each allotment has been sold and becomes the responsibility of the new owner.

Weed cover should also be assessed annually, particularly for high threat weeds and Weeds of National Significance (WoNS). This can be done by measuring the cover of weeds along transects; at every metre interval along a 100 m transect record whether the species was native or introduced and its species. From the 100 measurements taken, work out a percentage of weed cover (e.g. weeds recorded at 23 points = 23 per cent weed cover). At least three (3) transects should be undertaken for each vegetation management type and results should be averaged. For more information see *Guidelines for monitoring weed control* (DPI, 2009).

Growth (in decimeters for upper stratum species) and survival (dead/alive) measurements should be taken for all tubestock planted within the maintenance period. Infill plantings should be completed based on the results to ensure a minimum 80 % survival rate.

5.2.2 Photo point monitoring

Photo monitoring points can be established to record success of revegetation in a holistic way, that is, to show general improvements in vegetative structure over time. It is recommended that these be established in the centre of each open-space area, as indicated on the Environmental Control Plan (ECP) figure in Appendix C, at the following locations:

- Northeast area 149.624478 -33.404659
- Southwest area 149.622592 -33.406999

Photos should be taken facing upstream and downstream at each location.

Photo monitoring is most useful for longer term monitoring, as mid and upper stratum species establish. However, photo point monitoring is also useful for early establishment of areas to track any trends in groundcovers establishing over the shorter term (to demonstrate stabilisation of the area), and to keep as a record of maintenance activities undertaken by the Contractor as part of their contractual obligations, e.g. re-seeding, patching, infill planting, weed control, streambed stabilisation.

Photo monitoring should occur every quarter for the maintenance period of twelve (12) months. Photo records should be kept by the Contractor and provided to Council at site handover.

5.2.3 Reporting

At the end of the twelve (12) month maintenance period, the Contractor should produce a report. The Contractor must contact Council to organise inspections associated with critical stages or milestones. After this, any required monitoring and reporting will be undertaken annually, and documented in report form; this will be the responsibility of BRC.

Council may choose to include photographs from the nominated photo reference points to demonstrate the progress of the works, if required as part of third-party project approvals. Where actions have changed, not been undertaken or not completed within the specified timeframes, they may need to be reported with justifiable explanation.

5.3 Timeframes and budget

Stabilisation of disturbed areas should happen progressively, immediately after the final formation for that section has been completed.

Ideally, the entire site will be prepared and seeded within one (1) month of construction/excavation activities ceasing, with over-storey plantings completed shortly thereafter, and monitoring and maintenance activities completed for an establishment period of up to two (2) years. An initial 12 month maintenance period by the Contractor has been nominated by Council, with the second year maintenance to be handled directly by BRC.

An indicative schedule and budget are provided as Appendix D and Appendix E. The annual maintenance budget, once the site has been handed over to Council following the initial twelve (12) month period, is estimated to be $21,326.50; however, this is anticipated to drop to <$15,000 once all infill planting has been completed and the site is established and stabilised.

5.4 Maintenance

5.4.1 Initial maintenance

The rehabilitated areas will be maintained by Sunnybright appointed Contractor for the first 12 months following planting.

- Seeded/turfed areas will require watering and mowing – frequency of this will depend on weather.
- Planted areas will require weekly watering (approx. 10 l/ plant) and more frequently in dry times. Watering should occur in the early morning or late afternoon to minimize evaporative loss. Deep drenchings once or twice per week are better than frequent shallow watering.
- Plants that have perished should be replaced in the appropriate season.
- Mulching top-up to occur as required.
- Monthly spot weeding (manual or chemical) to be performed by trained staff.

5.4.2 Long term maintenance

Vegetated areas will require minimal maintenance once established. An 80 % seedling survival rate and maximum 5 % weed cover should be aimed for. Ongoing maintenance by BRC will involve:

- Spot weed control.
- Pruning of plants once adequately established to increase flowering in the following season and to allow plants to 'bush out'.
- Ensuring the retention of leaf litter, fallen branches and logs in the planted areas to encourage biodiversity and create habitat for fauna.

6 REFERENCES

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7 APPENDICES

Appendix	Item
Appendix A	Civil Drawings
Appendix B	Phase 1 'set-up' Environmental Control Plan
Appendix C	Phase 2 'final formation rehabilitation' Environmental Control Plan
Appendix D	Vegetation Management Schedule
Appendix E	Indicative Sunnybright Stage 2 VMP Budget
Appendix F	Sunnybright Stage 2 Landscape Plan

Appendix A Civil Drawings

Appendix B Phase 1 'set-up' Environmental Control Plan

Sunnybright Stage 2 - Phase 1 Set-up

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1:1800 (A3)

Bathurst Burr, Thorn Apple and Spiny Nightshade

Briar rose

Blackberry

Boxthorn

Legend

- Subject site
- Lot Boundary
- Contours
- Waterway
- Local Road
- Sub Arterial Road

Management Zones

- Zone 1: Dams/wet areas to be levelled
- Zone 2 : Dams/wet areas to be reshaped
- Zone 3: Previously disturbed area/stockpile sites (Stage 1 works)
- Zone 4: Large woody weeds/mature vegetation
- Zone 5: Paddocks

- Riparian Corridor
- Stockpile location: sub-base material
- Stockpile location: topsoil
- Stockpile location: wood-chip/mulch
- ERSED control/s
- Rock-check dam

- Bathurst Burr, Thorn Apple and Spiny Nightshade
- Blackberry
- Bladder Weed
- Boxthorn

- Briar rose
- Caltrop patch
- Fruit trees
- Nightshade
- Willow
- Boxthorn
- St John's wort
- Native Poa sp. (Tussock Grass)

Table 5 Phase 1 Management Actions and Priority

Zone/ Item	Description	Management Actions	Priority
	Caltrop/Cat's Heads patch	Caution to avoid spreading – foliar spray or chip and bag. NSW DPI recommendations for control of *Emex australis*: https://weeds.dpi.nsw.gov.au/Weeds/Details/132	1
	Nightshade sp. (potentially Silverleaf Nightshade)	Depending upon patch size at time of works, foliar spray or chip and bag as up to 80% of seeds are viable. NSW DPI recommendations for control of *Solanum elaeagnifolium*: https://weeds.dpi.nsw.gov.au/Weeds/Details/126	1
	Boxthorn*	Weed of National Significance (WoNS). Mechanically remove the top growth and as many roots as possible; apply herbicide. African Boxthorn root fragments can sucker and produce new growth. Reform area and plant with mixed pasture and native seed mix as soon as possible to out-compete new growth. NSW DPI recommendations for control of *Lycium ferocissimum*: https://weeds.dpi.nsw.gov.au/Weeds/AfricanBoxthorn	1
	Fruit trees	Non-weed material; however, lop or dig up root ball, chip and segregate to avoid fruit trees seeding across site.	1
	Willow*	Weed of National Significance (WoNS). Conduct pre-clearance survey to determine if nests/hollows present and occupied. Depending upon size, mechanically remove (>2m) or foliar spray entire plan (<2m). NSW DPI recommendations for control of *Salix* sp.: https://weeds.dpi.nsw.gov.au/Weeds/Details/147	1
	Bladder Weed	*Hibiscus trionum* (Bladder Weed); foliar spray during active growth.	1
	Briar rose	Cut at base and paint with herbicide. Ensure fruits are not spread (collect and bag if necessary).	1

Zone/ Item	Description	Management Actions	Priority
●	Blackberry*	Weed of National Significance (WoNS). Use of herbicide is the most reliable blackberry control method. Conduct an initial foliar spray, with a follow up 4 – 6 weeks later to ensure any new propagules are treated. A third spray may be necessary. Once plant is effectively treated, the thicket may be mechanically removed or buried, depending on location. NSW DPI recommendations for the treatment of *Rubus fruticosus* species aggregate: https://weeds.dpi.nsw.gov.au/Weeds/Details/18	1
◆	Bathurst Burr, Thorn Apple and Spiny Nightshade	Large Bathurst Burr, Thorn Apply and Spiny Nightshade infestation in channel, posing risk to being washed downstream into the stormwater system; chip and bag, or foliar spray and allow to die back before bagging.	1
🔥	Native Poa sp. (Tussock Grass)	Chip out and retain Poa for use in re-stabilising other wet areas and in landscaping.	1
✚	St Johns Wort	Foliar spray prior to seed setting; slash dead plants as part of site management in areas not stripped of vegetation.	1
═══	First Order Waterway	In accordance with the WM Act, a 10 m riparian buffer zone must be maintained and managed to protect water quality objectives downstream. Establish erosion and sediment controls, including laying jute matting/erosion control blanket/seed embedded matting/hydromulch as soon as final formation of drainage line created. For further action in this area, refer Table 6.	1
▭	Zone 1: Dams/wet areas to be levelled	a. Install ERSED controls downslope of work area. The downstream dam will have a spillway constructed and remain as is for the duration of construction, and will then be re-shaped as a detention basin towards the end of the project. b. Undertake pre-clearing assessment to ensure native fauna moved on from area, and to flag any native vegetation to carefully remove & retain.	5

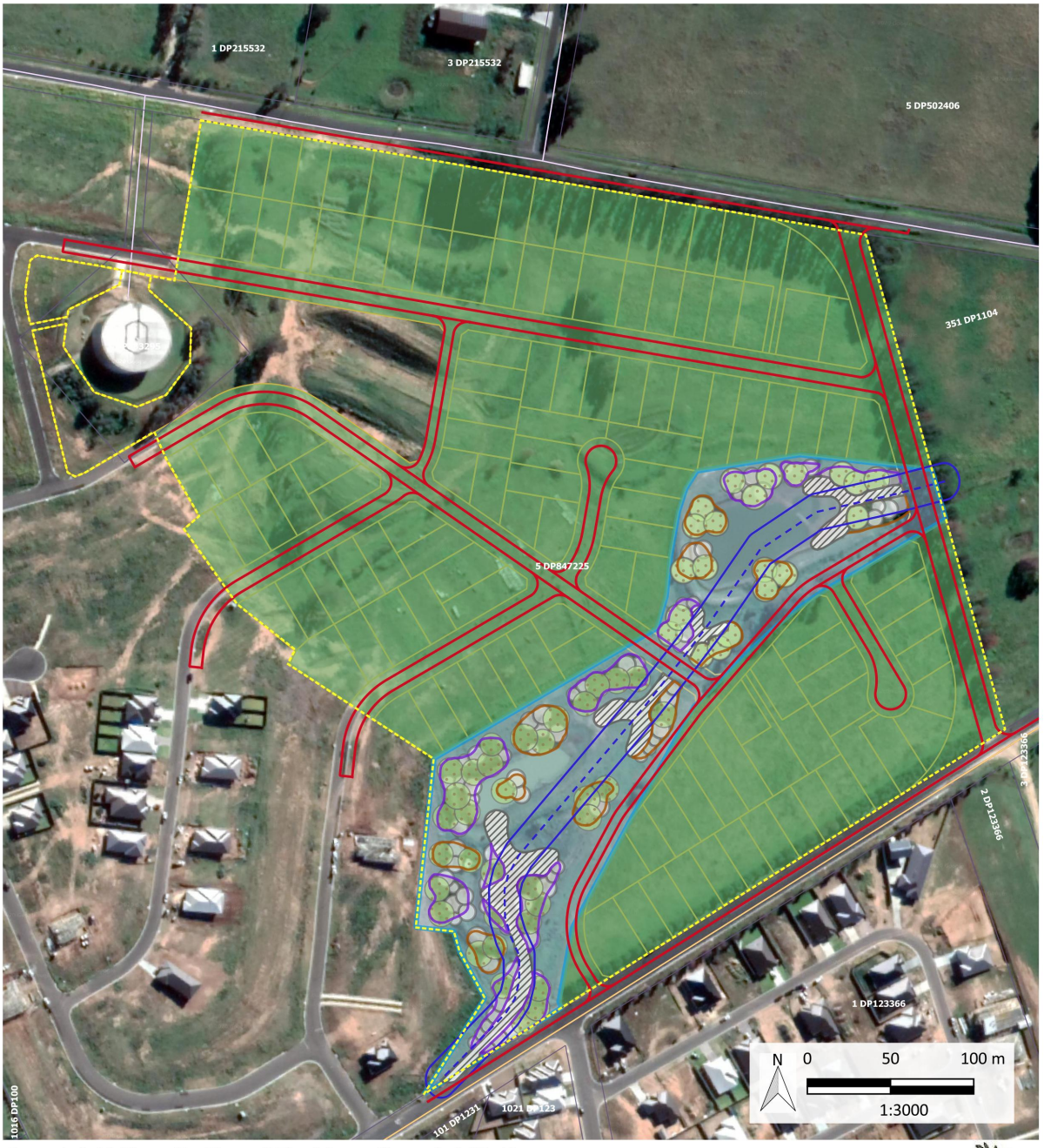
Zone/ Item	Description	Management Actions	Priority
		c. Remove weed material by hand, according to requirements under the *Biosecurity Act*; note, listed weeds may have restrictions on handling and transportation and may need to be managed on site. d. Excavate native reeds & fringing vegetation & set aside. e. Bring clean fill material in and compact. f. Spread area with topsoil material and undertake seedbed preparation & seed with appropriate seed mix. Ensure an early-colonising grass species is used to ensure rapid establishment. The use of a hydromulch, polymer or other stabilising product may be necessary whilst vegetation establishes. Water regularly if necessary, until grass has germinated/struck.	
	Zone 2: Dams/wet areas to be reshaped	a. Undertake pre-clearing assessment to ensure native fauna moved on from area, and to flag any native vegetation to carefully remove & retain. b. Excavate native reeds and fringing vegetation & set aside. c. Re-shape area & install drainage per design drawings. d. Install coir logs, jute matting and other stabilisation ERSED controls to assist with revegetation efforts and to reduce slumping and erosion. e. Spread area with topsoil material and undertake seedbed preparation. f. Re-plant reeds & fringing vegetation to assist with site stabilisation, sediment laden water filtration, and to assist with biological uptake of pollutants arising from the development. g. Install permanent ERSED controls, including rock armouring at culvert entrances and exits to dissipate water flows; rock-check dams at appropriate intervals, and swales along banks to catch and slow runoff.	4
	Zone 3: Previously disturbed area/stockpile sites (Stage 1 works)	a. Remove reusable materials to alternative locations and dispose of wastes appropriately at a licensed facility. b. Spread area with topsoil and undertake seedbed preparation, & seed with an appropriate seed mix.	3

Zone/ Item	Description	Management Actions	Priority
	Zone 4: Large woody weeds/mature vegetation	a. Undertake pre-clearing survey to locate nests and roosts, and ensure native fauna are sensitively moved on from the area. b. Carefully remove individual branches containing hollows or nests and retain for placement in nearby/offsite vegetation. c. Fell and segregate woody weeds, ensuring seed/fruit material is collected to prevent spread. Treat weed material appropriate. d. Fell and chip large pine trees; retain mulch/wood-chip in stockpiles for spreading over site once formations are completed per designs, and topsoil has been reinstated.	2
	Zone 5: Paddocks	a. Keep disturbance to a minimum, as Zone 5 areas relatively stable with a mixture of native and exotic pasture grasses. b. Undertake careful overspray to control broad-leaf weeds on site. c. Prune coppiced fruit trees at base and chip. d. After appropriate rest period for broad-leaf spray, slash area to promote growth of pasture grasses and out-compete re-emergence of weeds.	1
	Stockpile location: topsoil	Immediately install ERSED controls and ready area for stockpiling; place weed-free topsoil material into stockpiles, ready to be re-spread once formations are completed per designs	1
	Stockpile location: sub-base material	Immediately install ERSED controls and ready area for stockpiling; place weed and building material free sub-soil material into stockpiles, ready to be used in final formation per designs	4/5
	Stockpile location: wood-chip/mulch	Immediately install ERSED controls and ready area for stockpiling; place chipped woody vegetation material in stockpile, ready for use in spreading over topsoil once respread. NO woody weed material (i.e. berries, fruits, seeds or flowers, or Willow branches) is to be placed into wood-chip/mulch stockpile.	2

Zone/ Item	Description	Management Actions	Priority
	Rock-check dam	Installed at appropriate intervals according to slope and predicted water flows.	4/5
	ERSED control/s	Installed at base of each dam to be treated, prior to work commencing	4/5

*Denotes Weed of National Significance

Appendix C Phase 2 'final formation rehabilitation' Environmental Control Plan



Sunnybright Stage 2 - Phase 2 Final formation rehabilitation

Legend

- Subject Site
- Lot Boundary
- Local Road
- Sub Arterial Road
- 1st order unnamed waterway
- Riparian corridor
- Proposed lot boundaries
- Proposed roads

Management Zones

- House/Allotments
- Waterfront land and stormwater mangement areas

Garden beds

- Mix A
- Mix B
- Plant Mix C swampy meadow
- Hydroseed native grass mix for mowing
- Shrub
- Tree
- Photo monitoring point: East
- Photo monitoring point: West

Table 6 Phase 2 Management Actions and Recommended Species Lists

Zone	Description	Management Actions	Plant species to be used
	House allotments	• Ensure soils are level and evenly sloping, with swale drains on any steep blocks (fall of 1:4 or greater) • Where required, spread topsoil from stockpiles over bare areas to create a friable tilth and growing medium for planting • Ensure even coverage of grass seed (both native and sterile exotic acceptable) to prevent sediment laden runoff entering the stormwater system • Water seeded areas until grass strikes evenly across bare patches.	Lower Stratum Plant species to be used for residential properties as follows: • Victorian Rye Grass • Tall Fescue • Kentucky Blue grass It is recommended that locally native grasses be used where possible, including • Wallaby grass (*Rytidosperma* spp.), • Microlaena (*Microlaena stipoides*) • Redgrass (*Bothriochloa macra*) • Poa tussock (Poa spp.), • Kangaroo grass (*Themeda triandra*), • Speargrass (*Austrostipa scabra*) and • Wiregrass (*Aristida ramosa*). Sterile cover crops should also be used to ensure rapid stabilisation of the site, such as • Japanese Millet (*Echinochloa esculenta*) Mid-Stratum Nil Upper-Stratum Nil **NB: Council may later elect to plant street trees as part of development of the Sunnybright subdivision. No street trees**

Zone	Description	Management Actions	Plant species to be used
			or garden beds were included in the designs used to guide this VMP.
	Riparian corridor and stormwater management areas	• Ensure sediment barriers are in place at the base of each section prior to undertaking final shaping activities – a water diversion drain or temporary pumping set-up may be necessary during site establishment works • Form soil to desired levels, using clean sub-soil material from stockpiles or elsewhere • Install permanent flow dissipation devices, such as rock check dams and riffle areas, ensuring rocks are appropriately keyed into place • Lay erosion control device (jute matting, coir logs, erosion control blanket or hydromulch etc. or combination) along base of stream, to 10 m either side of centerline of waterway • Plant appropriate aquatic and semi-aquatic native tubestock in base of streambed over/through erosion control devices • Create garden beds on upper slopes using remaining topsoil and clean mulch from stockpiles • Ensure soils are level and evenly sloping, with swale drains on any steep blocks (fall of 1:4 or greater) on all remaining surfaces • Seed any remaining exposed areas with native grass seed mix.	Various – refer planting 'Mixes' below, and accompanying Landscape Plan (Appendix F)
	Riparian Corridor	• Ensure the stream bed is stabilised to the minimum riparian corridor width (10 m either side of the centreline for a 20 m wide corridor) using jute matting, rock armouring or other means as appropriate.	Various – refer planting 'Mixes' below, and accompanying Landscape Plan (Appendix F)

Zone	Description	Management Actions	Plant species to be used
	Plant Mix 'A'	• Prepare garden bed to desired shape using appropriate soil material • Spread mulch to desired depth • Allow garden bed to settle prior to planting, preferably 2 – 4 weeks. Undertake pre-plant knock-down of herbicide if weed/s sprouted during this time • Plant shrubs at recommended densities/spacing • Prepare planting bowls for the large overstorey species per Landscape Plan and install wind/weather supports	<u>Upper Stratum</u> • Drooping Sheoak • Apple Box • Red Stringybark • Brittle Gum • Yellow Box • Snow Gum • Red Box • Inland Scribbly Gum • Mugga Ironbark • Ribbon Gum <u>Plant Mix A Shrubs</u> • Silver Wattle • Early Wattle • Silver Banksia • Common Fringe Myrtle • Egg & Bacon Pea Lemon-scented • Tea-tree Australian Indigo
	Plant Mix 'B'	As above for Plant Mix 'A'	<u>Upper Stratum</u> • Drooping Sheoak • Apple Box • Red Stringybark • Brittle Gum • Yellow Box • Snow Gum • Red Box

Zone	Description	Management Actions	Plant species to be used
			• Inland Scribbly Gum • Mugga Ironbark • Ribbon Gum <u>Plant Mix B Grasses and Groundcovers</u> • Native fuschia • Black Anther Flax Lily • Prostrate Grevillea • Happy Wanderer • Spiny-headed Mat-Rush • Tussock Grass
	Plant Mix 'C'	• Form soil to desired levels, using clean sub-soil material from stockpiles or elsewhere • Install permanent flow dissipation devices, such as rock check dams and riffle areas, ensuring rocks are appropriately keyed into place • Lay erosion control device (jute matting, coir logs, erosion control blanket or hydromulch etc. or combination) along base of stream, to 10 m either side of centerline of waterway • Plant appropriate aquatic and semi-aquatic native tubestock in base of streambed over/through erosion control devices.	<u>Plant Mix C Swampy Meadow</u> • Tall Sedge • Black Anther Flax Lily Club Rush • Mat Rush • Wattle Mat Rush Tussock Grass Kangaroo Grass
	Hydroseed Native Grass Mix for mowing	• Ensure area is weed free and shaped to desired level • Apply hydromulch at recommended rates	<u>Hydroseed native grass mix for mowing</u> • Foxtail spear grass (*Austrostipa densiflora*) • Red-anther wallaby grass (*Rytidosperma pallidum)* • Kangaroo Grass (*Themeda australis*) • Common wheat grass *(Elymus scaber*) also known as *Anthosachne scaber*

Zone	Description	Management Actions	Plant species to be used
			• Red Grass (*Bothriochloa macra*) • Purple Wiregrass (*Aristia ramose*) • *Three-awn grass (Aristida ramosa)* • *Couch (Cynodon dactylon)* • Slender Bamboo Grass (*Austrostipa verticillata*) • Australian Basket Grass (*Oplismenus aemulus*) • Weeping Grass (*Microlaena stipoides var. stipoides*) • Tufted Hedgehog Grass (*Echinopogon caespitosus var. caespitosus*) • Hill Wallaby grass (*Rytidosperma erianthum*) • Windmill grass (*Chloris truncata*) • Rough speargrass (*Austrostipa scabra*)
	Road	• Area to be stripped prior to construction of stormwater drainage and kerb/guttering • Roadway to be formed, compacted and capped/sealed to prevent erosion and sediment laden runoff, and to allow all weather access as soon as practicable	N/A

Appendix D Vegetation Management Schedule

	2020–2021												2021–2022											
Activity/Location	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*
Stormwater Management & Riparian Corridor																								
Identify planting bed locations and planting schedule							x	x	x															
Propagate tubestock using locally sourced seed according to species lists provided							x	x	x															
Prepare planting locations							x	x	x															
Plant tubestock using plant protection measures							x	x	x															
Undertake maintenance and replace planting losses														x	x	x								
Monitor, review and report to Council															x	x	x							
Garden Beds																								
Propagate tubestock for garden bed							x	x	x															
Install and program automated irrigation system							x	x	x															
Plant tubestock							x	x	x															
Irrigate								x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Undertake maintenance and replace planting losses														x	x	x								
Remaining Disturbed Areas																								
Prepare and seed exposed areas of earth using hydromulch							x	x	x															
Water									x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Residential Housing Allotments																								
Undertake weed control activities per the VMP			x	x	x																			
Undertake excavation activities, shape and seal roads etc						x	x	x	x															
Reform, stabilize and seed all disturbed areas progressively; water until grasses germinate							x	x	x	x														
Undertake maintenance and re-seed areas that did not germinate/establish														x	x	x								
Overall site																								
Install security fencing							x	x	x															
Weed removal and maintenance					x	x	x	x	x							x	x	x	x					

Appendix E Indicative Sunnybright Stage 2 VMP Budget

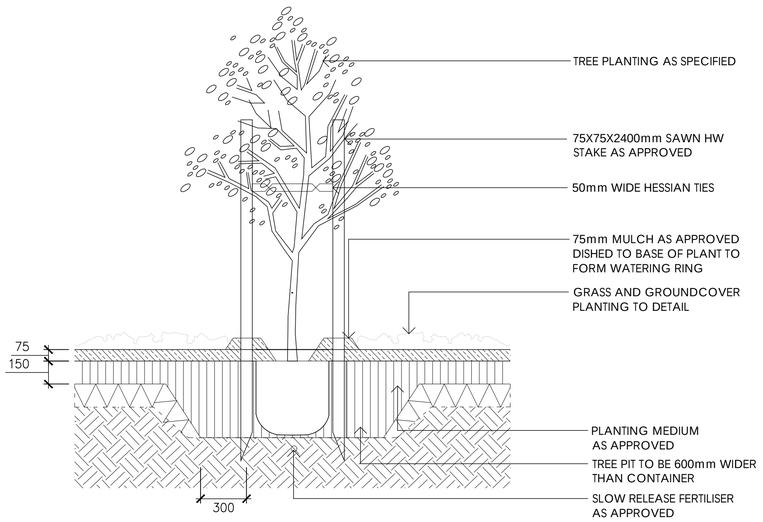
Activity	Description	Quantities/pricing	Cost
Implementation - Site Preparation, all sites			
Herbicide application	5 L / ha spot spray to target broadleaf weeds; use waterway registered herbicide (e.g. Biactive), across whole site (~18 ha)	$10/ L	$900.00
Fencing to prevent vehicular access	2.4 x 1.8 m panel to fence approx 1 km = ~420 panels	$16 per panel per week for 12 weeks	$80,640.00
Machinery hire for establishment	3.5 ton excavator with auger attachment & bucket	$1600 pw for 2 week	$3,200.00
Mulch 2T/ha (wood chip or similar)	1.4 ha x 60 m3 = 84 m3 at a depth of 800 mm	$48 / m3	$4,032.00
Labour / Salary	Undertake spot spraying of weeds, spread mulch, rip/plough planting areas as needed; 3 days x 2 personnel	$40 per hour per staff	$1,920.00
Implementation - Open space and waterway (3.62 ha to be revegetated)			
Native tubestock ($2-$5 / stem) at 'benchmark' density (in 17 garden beds, per Landscape Plan)	19,000 shrubs & groundcovers, + 26,000 swampy meadow species, + 55 trees at $300 each	Shrubs & groundcovers @ $2 each, + long-stem or mature tree seedlings @ $300/each	$106,500.00
Native seed mix & cover crop	Total area to be seeded @ rate of 3 kg/ha native seed, + 25 - 35 kg/ha cover crop (Japanese Millet or similar)	$110.91 / kg @ 3 kg/ha x 2.16 ha, + $396/ha x 2.16 ha	$1,311.71
Rock armouring	Limestone or Andesite (300 mm sizing minimum), 510 tonnes	0.17 ha @ $175/tonne	$15,172.50
Machinery hire for planting & rock armouring	3.5 ton excavator with auger attachment & bucket	$1600 pw for 2 weeks	$3,200.00
ERSED control	Jute matting and steel pins to cover 1.5 ha		$19,000.00
Hardwood stakes	For long-stem trees	10,000	$4,840.00
Tree guards	For long-stem trees and vulnerable shrubs	10,000 guards	$13,200.00
Irrigation	TBC - dependent on irrigation method	Nominal fee of $3,000	$3,000.00

Labour / Salary	10 days x 4 personnel to plant and set up irrigation/rock armouring	$40 per hour per staff	$12,800.00
Implementation – Residential housing allotments (13.24 ha, not including roads)			
Seed mix (13.24 ha)	Native seed spray 5 kg / ha with cover crop 25-35 kg / ha	$110.91 / kg @ 3 kg/ha x 13.24 ha, + $396/ha x 13.24 ha	$9648.39
Irrigation	TBC - dependent on irrigation method	Nominal fee of $3,000	$3,000.00
Labour / Salary	Prepare ground and distribute seed, undertake irrigation; 3 days x 2 personnel	$40 per hour per staff	$1,920.00
		Year 1 Sub-total	**$181,348.09**
Maintenance – riparian area ^			
Supplementary planting* $3.50/stem	30% die off rate after 1st year; 80% survival rate = 4,500 groundcovers & 60 trees to replant (based on recommended density)	$2 -$300 / stem	$10,500.00
Herbicide $10/L spot application	5 L / ha spot spray to target broadleaf weeds; use waterway registered herbicide (e.g. Biactive), across whole site (~30 ha)	$10/ L	$906.50
Annual VMP reporting & monitoring	Brief site inspection to inform survival rates (calculated per 20 x 20 m quadrats & extrapolated)	Nominal fee of $3,000	$3,000.00
Irrigation	TBC - dependent on irrigation method	Nominal fee of $3,000	$3,000.00
Equipment hire & Fuel /L	Water cart & truck hire, tractor/slasher hire	$1000/day x 2 days	$2,000.00
Labour / Salary	Mowing/slashing the site, infill planting; 3 days x 2 personnel	$40 per hour per staff	$1,920.00
		Year 2 Sub-total	**$21,326.50**
		GRAND TOTAL	**$202,674.59**

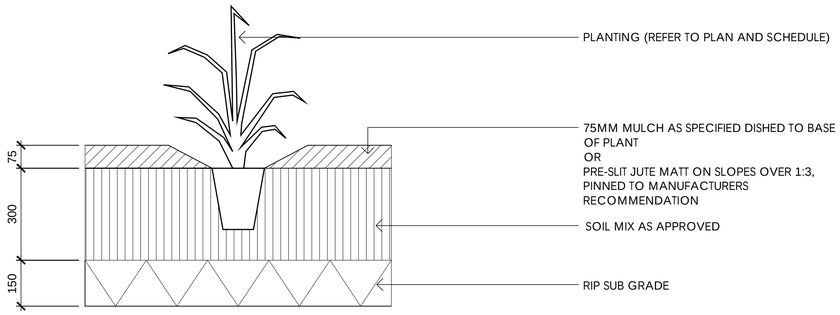
^ It is assumed that these initial tasks / costs will be undertaken by the appointed Contractor to ensure performance targets are met prior to hand over to Council.

*assumed 30% mortality rate in the first year reducing by half in subsequent years

Appendix F Sunnybright Stage 2 Landscape Plan



TREE PLANTING DETAIL 1:20



SHRUB, GRASS AND GROUNDCOVER PLANTING DETAIL 1:10

Botanic Name	Common Name	Pot Size: Tube	140mm	200mm	75L	Mature Height x Width	Spacing
Trees							
Allocasuarina verticillata	Drooping Sheoak				X	9 x 5	varies
Eucalyptus bridgesiana	Apple Box				X	20 x 10	varies
Eucalyptus macrorhyncha	Red Stringybark				X	12 x 10	varies
Eucalyptus mannifera	Brittle Gum				X	15 x 9	varies
Eucalyptus melliodora	Yellow Box				X	12 x 9	varies
Eucalyptus pauciflora	Snow Gum				X	12 x 6	varies
Eucalyptus polyanthemos	Red Box				X	12 x 5	varies
Eucalyptus rossii	Inland Scribbly Gum				X	15 x 8	varies
Eucalyptus sideroxylon	Mugga Ironbark				X	20 x 12	varies
Eucalyptus viminalis	Ribbon Gum				X	20 x 15	varies
Plant Mix A Shrubs							
Acacia dealbata	Silver Wattle			X		10 x 7	3.0m
Acacia genistifolia	Early Wattle			X		2 x 2	1.5m
Banksia marginata	Silver Banksia			X		5 x 2.5	2.0m
Calytrix tetragona	Common Fringe Myrtle			X		1.5 x 1.5	1.0m
Dillwynia sericea	Egg & Bacon Pea			X		1.5 x 1.5	1.0m
Leptospermum petersonii	Lemon-scented Tea-tree			X		5 x 3	0.5m
Indigofera australis	Australian Indigo			X		1.5 x 1.5	2.0m
Plant Mix B Grasses & Groundcovers							
Correa reflexa	Native fuschia		X			0.5 x 1	0.5m
Dianella revoluta	Black Anther Flax Lily	X				0.3 x 1.0	0.5m
Grevillea 'Gaudichaudii'	Prostrate Grevillea		X			0.2 x 3	1.0m
Hardenbergia violacea	Happy Wanderer		X			0.8 x 1.5	1.0m
Lomandra longifolia	Spiny-headed Mat-Rush	X				1 x 1	0.5m
Poa labillardieri	Tussock Grass	X				1 x 1	0.5m
Plant Mix C Swampy Meadow							
Carex appressa	Tall Sedge	X				1 x 1	0.5m
Dianella revoluta	Black Anther Flax Lily	X				0.3 x 1.0	0.5m
Ficinia nodosa	Club Rush	X				0.8 x 0.8	0.5m
Lomandra nyalla	Mat Rush	X				0.8 x 0.8	0.5m
Lomandra filiformis	Wattle Mat Rush	X				0.5 x 0.5	0.3m
Poa labillardieri	Tussock Grass	X				1 x 1	0.5m
Themeda australis	Kangaroo Grass	X				0.5 x 0.4	0.3m

PLANT SCHEDULE

LANDSCAPE CONCEPT PLAN 1:750

sala4D
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shah@sala4D.com
0421860186
LANDSCAPE ARCHITECT

DATE	DESCRIPTION	REV
22/05/19	CONCEPT FOR APPROVAL	A
28/05/19	DA SUBMISSION	B
01/09/20	Revised area DA	C

REVISIONS

CLIENT: BATHURST REGIONAL COUNCIL, BATHURST NSW 2795

ARCHITECT

PROJECT: SUNNYBRIGHT ESTATE, STAGE 2

DRAWING TITLE: LANDSCAPE PLAN

DRAWING PURPOSE: DEVELOPMENT APPLICATION

DRAWING INFORMATION			
SCALE	AS SHOWN @ A1	DRAWN BY	SA
DATE	1/09/2020	CHECKED BY	SA
JOB NO.	BRC01	APPROVED BY	SA

NORTH

DRAWING NO.: DA L-01

REV.: C

A1