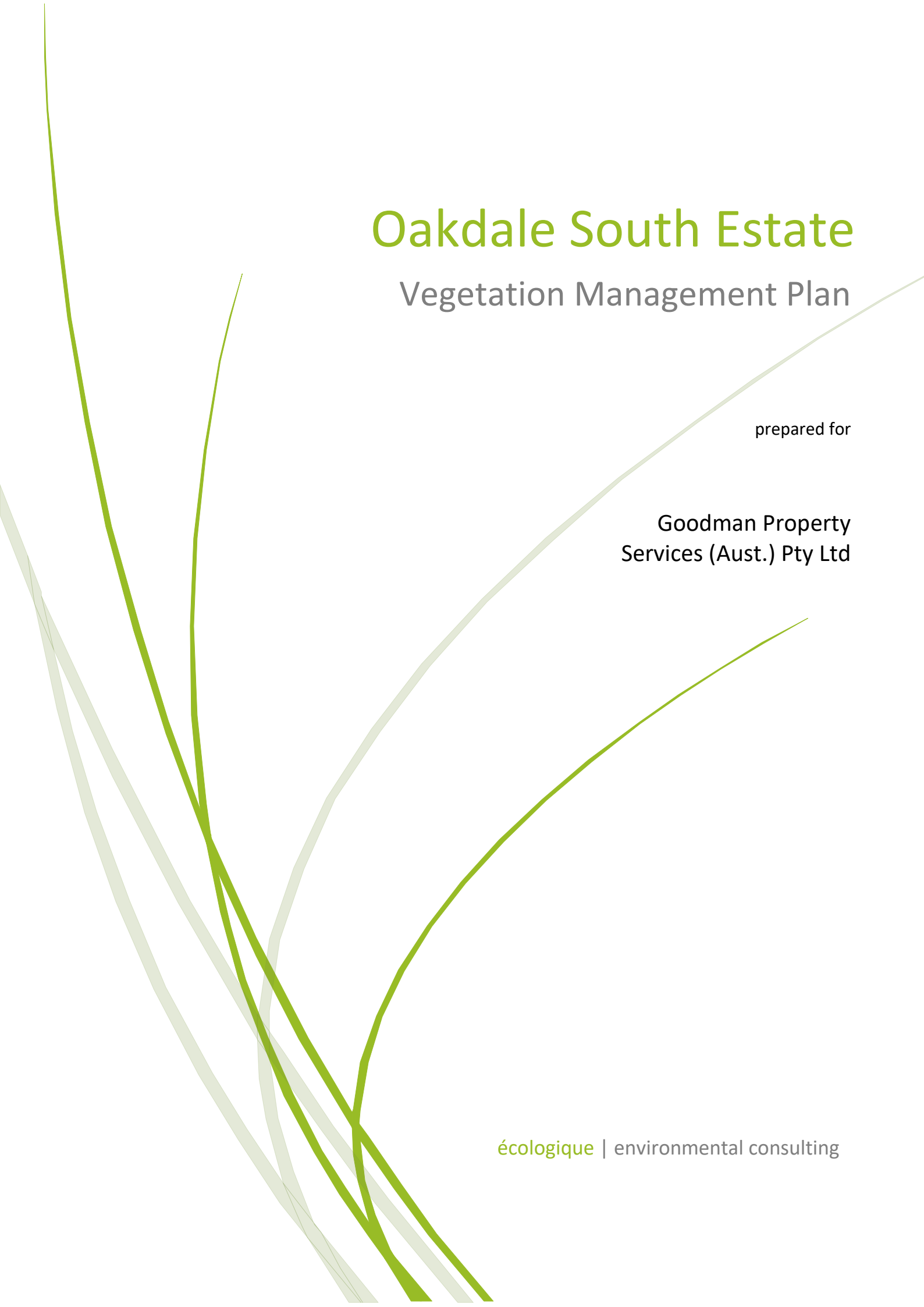




Oakdale South Estate

Vegetation Management Plan

prepared for

Goodman Property
Services (Aust.) Pty Ltd

écologique | environmental consulting

Oakdale South Estate – Vegetation Management Plan

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18/12/2017

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Revision Schedule

Rev No	Date	Description	Issued to
1	18/12/2017	For MOD 6 Submission	Goodman

Executive Summary

Goodman Property Services (Aust) Pty Ltd (Goodman) are currently developing approximately 117 hectares (ha) under State significant development approval (SSD 6917).

The Oakdale South development (SSD 6917) comprises a Concept Proposal and Stage 1 Development Application. Consent for the Stage 1 DA approved: the removal of 3.58 ha of native vegetation; the filling of two tributaries of Ropes Creek; and the realignment of Drainage Line 1.

Development approval was granted subject to the implementation of the following plans and strategy (as relevant to Biodiversity):

- Biodiversity Assessment Report (Cumberland Ecology, 2016a)
- Biodiversity Offsetting Strategy (Cumberland Ecology, 2016b);
- Watercourse Realignment Works Plans (AECOM, 2016); and
- Vegetation Management Plan (Ecohort, 2015).

Since this time, the Vegetation Management Plan (Ecohort, 2015) has been the subject of two approved amendments (Ecohort 2016 & 2017) in response to: submissions made by the NSW Office of Environment (OEH); and to accommodate future tenant's site layout requirements (SSD 6917 MOD 1).

Initially OEH raised concerns that the 2015 Vegetation Management Plan (VMP) could be perceived as an 'existing obligation' and potentially prejudice the creation of a biodiversity offset area at Oakdale South.

The subsequent 2016 and 2017 versions of the VMP removed the geographic overlap between the VMP management zones and biodiversity offset area, enabling construction certification and the development to proceed in December 2016.

During consultation with the Department of Planning (the Department) and OEH it was agreed that the geographic boundaries would eventually be removed via a S96 modification to ensure that the proposed offset area and riparian corridor lands are managed comprehensively.

This Vegetation Management Plan (VMP) has been prepared to support the submission for S96 modification to SSD 6917. The modification seeks to formalise the various biodiversity management areas, such that:

1. The main area of the Ropes Creek riparian zone is incorporated into the biodiversity offset area (BOA) and will be managed in perpetuity under the relevant Biodiversity Management Action Plan and biobanking agreement, and
2. The amended VMP applies only to the riparian zones of the watercourse realignment and a smaller section of the Ropes Creek riparian corridor adjacent to Precinct 6, which is disjunct from the main Ropes Creek riparian zone (as they occur within Oakdale South).

This VMP does not change the intent of the restoration/reconstruction measures recommended by Ecohort (2015). Rather it only affects the boundaries and responsibility of various management zones as outlined in Section 1.3 and shown in Figure 2-1 (i.e. basin, landscape, landscape screening, biodiversity offsetting and VMP management areas).

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1. Introduction

1.1 Background

Goodman Property Services (Aust) Pty Ltd (Goodman) were granted a Staged Development Application consent for the Oakdale South Industrial Estate, by the Department of Planning and Environment (the Department) on 26th October 2016. The development is State significant development (SSD) pursuant to section 89C of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Oakdale South Industrial Estate (Oakdale South) is located in the suburb of Kemps Creek in the Penrith local government area (LGA). The site is also located in Precinct 8 of the Western Sydney Employment Area (WSEA) which is strategically identified industrial land under State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP).

Oakdale South covers approximately 117 hectares (ha) of land which is predominantly zoned IN1 – General Industrial and land zoned E2 – Environmental Protection under the WSEA SEPP. Lands zoned as E2 are associated with remnant vegetation and riparian corridors of Ropes Creek and its tributaries.

The development (SSD 6917) comprises a Concept Proposal and Stage 1 Development Application. Consent for the Stage 1 DA approved: the removal of 3.58 ha of native vegetation; the filling of two tributaries of Ropes Creek; and the realignment of Drainage Line 1.

1.2 Consent Conditions

Consent for the Stage 1 DA approved the removal of 3.58 ha of native vegetation, the filling of two tributaries of Ropes Creek, and the realignment of Drainage Line 1 to accommodate the proposed estate road layout.

Development approval was granted subject to the implementation of the following plans and strategy (as relevant to Biodiversity):

- Biodiversity Assessment Report (Cumberland Ecology, 2016a)
- Biodiversity Offsetting Strategy (Cumberland Ecology, 2016b);
- Watercourse Realignment Works Plans (AECOM, 2015); and
- Vegetation Management Plan (Ecohort, 2015).

1.2.1 Biodiversity Offset Strategy

The Secretary's Environmental Assessment Requirements (SEARs) issued on 22 April 2015 for the SSDA required that an assessment of impacts on the site's flora and fauna be undertaken in accordance with the Framework for Biodiversity Assessment (2014) and proposed measures to avoid, mitigate or offset any significant impacts be undertaken in accordance with the then draft Biodiversity Offset Policy for Major Projects.

A Biodiversity Assessment Report (BAR) was prepared for the proposal (Cumberland Ecology, 2015a), which identified the plant community types (PCTs) that were removed as a result of the development, and calculated and offset requirement of 160 ecosystem credits.

Consent condition E46 required that:

Within 12 months of the date of this consent, or as otherwise agreed by the Secretary, the Applicant shall retire 160 ecosystem credits to offset the removal of native vegetation on-site.

The Biodiversity Offsetting Strategy (Cumberland Ecology, 2015b) specifies how Goodman will retire the 160 ecosystem credits, which in summary includes:

- Purchasing and retiring 13 ecosystem credits; and
- Establishing a biodiversity offset area adjacent to the development footprint of the Stage 1 DA, which will enable the retirement of the 147 ecosystem credit balance.

Goodman were granted an extension to the 12 month timeframe on 25 October 2017 by the Department, with the retirement of 160 ecosystem credits now due by the 26 January 2018.

1.2.2 Watercourse Realignment Works Plans

The Oakdale South Watercourse Realignment Works Plans (AECOM 2015) Drawing Set 60333552 have: informed the design of the master plan; the EIS prepared for the SSDA; and formed the basis of later detailed construction drawings and specifications, with the watercourse riparian zone addressed specifically within the Vegetation Management Plan prepared by Ecohort (2015).

1.2.3 Vegetation Management Plan

The Vegetation Management Plan (VMP) (Ecohort, 2015) was submitted as part of the SSDA documentation by Goodman to demonstrate how the construction impacts associated with the filling of two tributaries of Ropes Creek and the realignment of Drainage Line 1 would be managed.

The VMP was prepared commensurate with the NSW Department of Primary Industries -Water (DPIW) guidelines for controlled activities on waterfront land, specifically the “Guidelines for vegetation management plans on waterfront land” (July 2012).

Controlled activities carried out in, on or under waterfront land are regulated by the *Water Management Act 2000* (WM Act). However, it should be noted that:

1. Under Part 4 Division 4.1 Section 89J of the EP&A Act, controlled activity approval is not required for SSD proposals,
2. Preparation of the VMP was not a requirement identified in the SEARs or submissions made by DPIW during the preparation of the SEARs, and
3. In addition to the riparian restoration works associated with the watercourse realignment, the VMP addressed the main riparian zone of Ropes Creek whilst acknowledging that this zone was intended to be an integral component of the proposed biodiversity offset area.

During the assessment of SSD 6917, the NSW Office of Environment and Heritage (OEH) requested the five year vegetation management restoration / rehabilitation measures proposed under the VMP not be included in the proposed biodiversity offset area to avoid precluding the creation of the proposed biobank site under clause 11 of the *Threatened Species Conservation (Biodiversity Banking) Regulation 2008*.

In response the Department amended consent condition E47 to the following:

Prior to the issue of any Construction Certificate that includes the creek realignment works, the Applicant shall submit a revised Vegetation Management Plan (VMP). The revised VMP:

- (a) Be submitted to the satisfaction of the Secretary*
- (b) Be prepared in consultation with the OEH*
- (c) Remove any geographic overlap with Figure 4.3 in the Biodiversity Offset Strategy, prepared by Cumberland Ecology, dated 16 September 2015, and*
- (d) Be consistent with the management measures and recommendations of the draft VMP prepared by EcoHort Pty Ltd dated 31 August 2015.*

Note: the intention of Condition E47 was to ensure the 5yr vegetation management restoration / rehabilitation measures proposed under the VMP were not included in the proposed biobank area to avoid precluding the creation of the proposed biobank site under clause 11 of the Threatened Species Conservation (Biodiversity Banking) Regulation 2008

Clause 11(e) of the Biodiversity Banking Regulation excludes land from being designated as a biobank site if there is an existing conservation obligation for the purpose of complying with requirements imposed by or under any Act (including the requirements of any authority granted by a public authority under any Act).

By separating the geographic overlap of the VMP and the biodiversity offset area, the Department was able to condition the implementation of the VMP without prejudicing the creation of the biodiversity offset area under the BioBanking Regulation. The works would therefore not constitute an 'existing obligation' other than the 5 year vegetation management measures in the riparian corridor to which the VMP applies, which would have otherwise been required by the consent in order to be consistent with the application of the guidelines as if they were to apply.

During consultation conducted to meet condition E47, OEH advised it preferred an approach where the VMP encompassed both the proposed offset area and riparian corridor to ensure the lands are managed comprehensively.

To clarify this arrangement, Goodman submitted an amended VMP (Ecohort 2016), which details the VMP and biodiversity offset areas (i.e. with the geographic overlap removed) as shown in Figure 1-1.

The amended VMP (Ecohort 2016) identified the intent to eventually removed the geographic boundaries between the VMP and biodiversity offset areas via a S96 modification in consultation with OEH, and a separate BioBanking agreement entered into that includes the VMP management zones (as relevant to the main riparian zone of Ropes Creek).

The VMP (Ecohort 2016) was approved by the Department in December 2016 subject to minor amendments (such as provision of updated figures, removal of references to on-going management requirements after a 5 year period).

A revised VMP (Ecohort 2017), which provided the amendments required by the Department in December 2016 was submitted and approved as part of the SSD 6917 MOD 1 (refer Section 1.2.4).

1.2.4 SSD 6917 MOD 1 Consent Conditions

On 21 April 2017, the Department granted approval for amendments to the Concept Proposal and Stage 1 DA layouts to accommodate future tenant's site layout requirements for access, loading and unloading and building orientation (SSD 6917 MOD 1).

The approved amendments increased the area of site clearing by approximately 0.42 ha. The clearing did not impact on native vegetation but did impact on exotic grassland which is part of the biodiversity offset area. The result has been a reduction in the total number of ecosystem credits generated in the proposed offset area. However there is still sufficient ecosystem credits generated to offset the 147 ecosystem credits required.

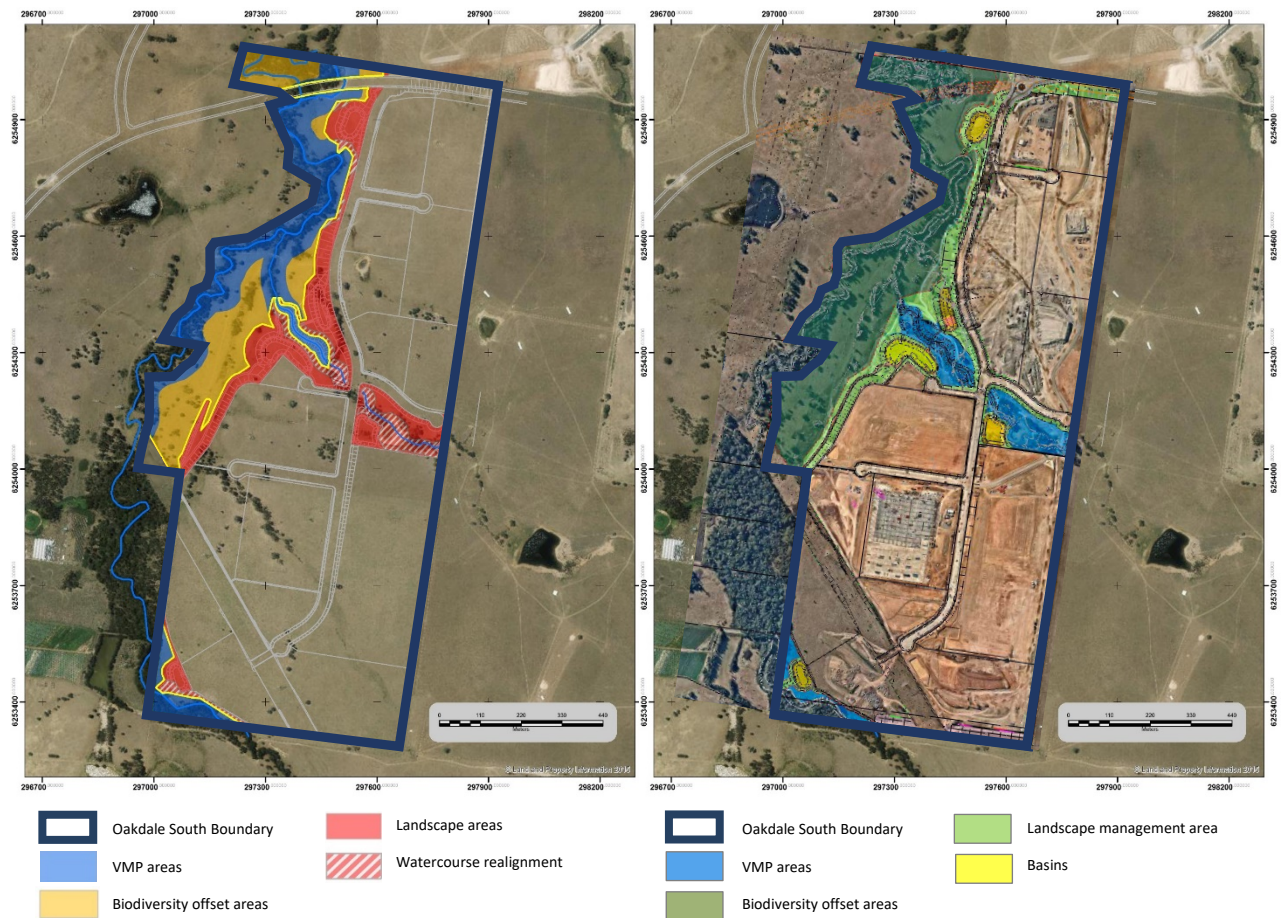


Figure 1-1. SSD 6917 MOD 1 VMP areas (left) and amended VMP areas (right)

1.3 Purpose of this VMP

This VMP has been prepared to support the submission for a modification to SSD 6917. The modification seeks to formalise the various biodiversity management areas, such that:

3. The main area of the Ropes Creek riparian zone is incorporated into the biodiversity offset area (BOA) and will be managed in perpetuity under the relevant Biodiversity Management Action Plan and biobanking agreement, and
4. The amended VMP applies only to the riparian zones of the watercourse realignment and a smaller section of the Ropes Creek riparian corridor adjacent to Precinct 6, which is disjunct from the main Ropes Creek riparian zone (as they occur within Oakdale South).

SSD 6917 consent condition F4 requires the preparation of an Operational Environmental Management Plan (OEMP) prior to the commencement of Oakdale South operations. The OEMP provides the strategic framework for environmental management at the Oakdale South and outlines all environmental management practices and procedures to be followed. Relevantly, this VMP is one of several supporting management plans to the OEMP.

1.4 VMP Objectives

The specific objectives of this VMP align with those prescribed by DPIW guidelines for (July 2012) “vegetation management plans on waterfront land” (the guidelines). The main objective being to provide a stable watercourse and riparian corridor which will emulate local native vegetation communities. Figure 1-2 provides a schematic of a typical riparian cross section extracted from the guidelines.

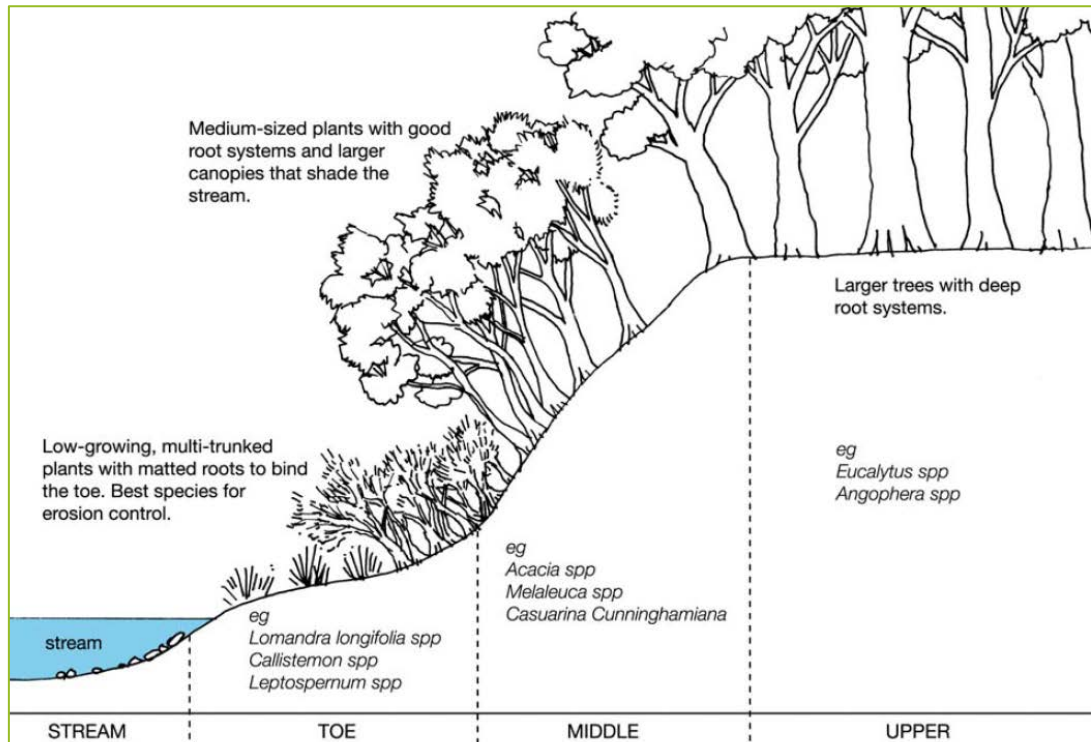


Figure 1-2. Typical riparian cross section (extract from the guidelines)

Specific issues that need to be addressed within the VMP include:

- Conserve and protect environmentally sensitive areas and biodiversity values;
- Restore and rehabilitate degraded bushland and areas of significant vegetation;
- Ensure the protection of threatened species, populations or ecological communities;
- Limit the impact of development upon existing native vegetation;
- Provide habitat connectivity and fauna corridors;
- Promote sustainable vegetation management;
- Undertake responsive site management and landscaping to ensure that bushland values are conserved; and
- Specify appropriate environmental protection works to enhance the ecological and bushland amenity value of the site.

2. Site Extent and Features

2.1 Area to which this VMP applies

Oakdale South contains approximately 34.8 hectares of non-developable land that are reserved for biodiversity conservation and various landscaping treatments. How each area will be managed are detailed in separate management plans which support an overarching OEMP. These areas are shown in Figure 2-1 and include the following:

Basin Management Plan	1.8 ha
Landscape Management Plan	6.3 ha
Landscape Boundary Screening Plan	2.8 ha
Vegetation Management Plan –this plan	4.8 ha
Biodiversity Management Plan	19.2 ha
	34.8 ha

The VMP applies to an area of approximately 4.8 hectares, which comprises two separate management areas shown on Figure 2-1, as follows:

- Watercourse realignment (approximately 3.9 ha); and
- Ropes Creek adjacent Precinct 6 (approximately 0.9 ha).

2.1.1 Watercourse realignment

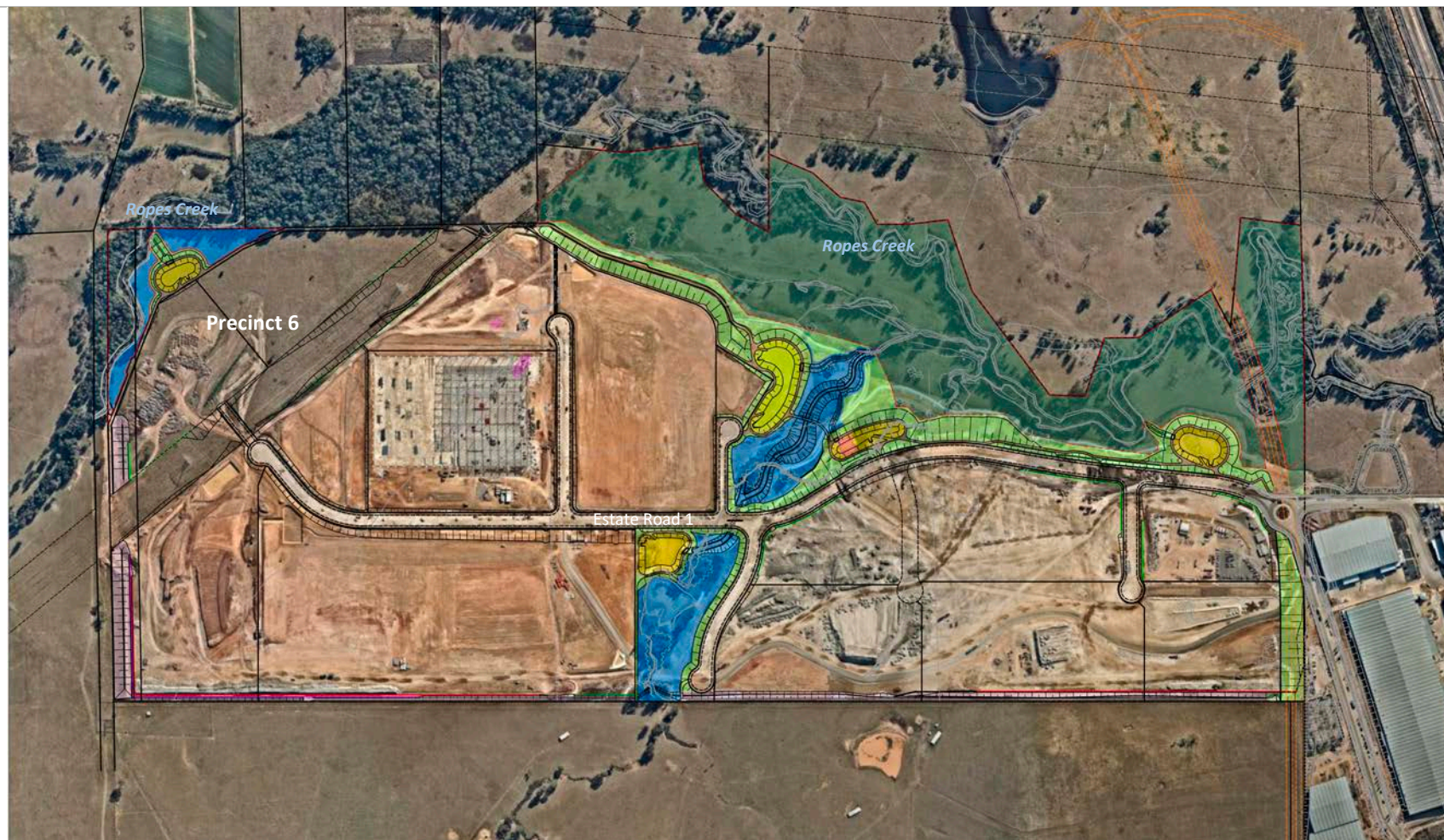
The realigned watercourse is a 1st order stream and tributary to Ropes Creek. Its realignment was required to enable a local perimeter road to be incorporated into Oakdale South, as well as providing a location to construct bio-retention basins (specifically Basins C and E). A single road crossing has been included in the waterway design, which consists of a single culvert structure under Estate Road 01. A temporary crossing located near the eastern boundary of the site will be decommissioned and be restored in accordance with this VMP.

The watercourse originates on the neighbouring Lot A DP392643 from the east, flowing through the site in a west and then northerly direction before discharging into Ropes Creek. The northern section of the watercourse has been filled for development and a new section constructed between Estate Road 01 and the biodiversity offset area (Watercourse west of Road 01).

The realigned watercourse has been situated to connect at the downstream end with an existing smaller tributary stub of Ropes Creek. The smaller tributary is located within the biodiversity offset area and will be restored under the BOS (i.e. is not included within this VMP).

2.1.2 Ropes Creek adjacent Precinct 6

The majority of Ropes Creek within Oakdale South is located in the biodiversity offset area with the exception of a small section of Ropes Creek, which passes through the southwestern corner of the site. Approximately 0.9 ha this area is situated between Ropes Creek, the southwestern boundary of Precinct 6, and either side of the precinct's bio-retention basin (Basin D) and associated inflow to Ropes Creek.



Oakdale South Estate – Vegetation Management Plan

Figure 2-1. OEMP Management Zones

Imagery source: AT&L 11/12/2017

2.2 Existing Vegetation

Existing remnant native vegetation within Oakdale South was assessed by Ecohort (2015) and more recently by way of ground truthing the riparian corridor of the watercourse realignment in December 2016 and January 2017, and the Ropes Creek adjacent Precinct 6 (RC riparian corridor) on the 14th February and 22nd November 2017.

2.2.1 Watercourse realignment

The watercourse realignment consists of four disjunct remnant pockets of native vegetation associated with the existing Ropes Creek tributary. The overstory is dominated by a canopy of *Casuarina glauca*, with occasional *Eucalyptus tereticornis*, *Angophora floribunda* and *Melaleuca styphelioides*. The shrub layer largely comprises the introduced *Lycium ferocissimum* (African boxthorn) with only very occasional patches of the native *Bursaria spinosa* (Blackthorn).

The ground layer is largely made up of introduced grass species, including *Paspalum dilatatum* (paspalum), *Pennisetum clandestinum* (kikuyu), *Lolium perenne* (ryegrass), with the introduced *Juncus acutus* (spiny rush) and *Solanum linnaeanum* (Apple of Sodom) widespread. Other introduced (weed) species observed include: *Bidens pilosa* (Patterson's curse), *Plantago lanceolatum* (plantago) and a small area of *Rubus fruticosus* agg. (Blackberry). Native ground layer species occur in sporadic patches and include *Microleana stipoides* (weeping meadow grass), *Echinopogon ovatus* (forest hedgehog grass) and *Themeda triandra* (kangaroo grass).

Outside of the vegetated riparian corridor is former pasture land which contains a high percent cover of introduced grasses with *Paspalum dilatatum* (paspalum), *Pennisetum clandestinum* (kikuyu), *Digitaria sanguinalis* (crab grass) and the naturalised *Cynodon dactylon* (common couch), most commonly occurring. Other weed species present include *Senecio madagascariensis* (fireweed), *Sida rhombifolia* (Paddys lucerne), *Solanum linnaeanum* (Apple of Sodom), *Plantago lanceolatum* (plantago).

Native vegetation associated with the farm dam at the upstream end of the watercourse realignment fluctuates in response to climatic conditions and water levels. Aquatic macrophytes commonly



Upstream section of the retained tributary



Area adjacent to retained dam



Downstream section of retained tributary

present all year round are the emergent species *Typha orientalis* (cumbungi) and *Juncus usitatus* (common rush) and the floating attached *Potamogeton ochreatus* (blunt pondweed). Other species that have been observed less frequently include *Ottelia ovalifolia* (swamp lily), *Ranunculus inundatus* (river buttercup), *Myriophyllum papillosum*, *Triglochin procerum* (water ribbons), and *Damasonium minus* (starfruit).



Downstream extent of retained tributary

2.2.2 Ropes Creek

Native overstory vegetation consists of mature canopy dominated by *Casuarina glauca* (swamp oak), with scattered *Eucalyptus tereticornis* (forest red gum), *Eucalyptus amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple), *Eucalyptus crebra* (narrow-leaved ironbark) and *Melaleuca styphelioides* (prickly-leaved paperbark). With the exception of juvenile swamp oaks, a native shrub layer is absent, with widespread African boxthorn.

The ground layer is dominated by introduced grasses, shrubs and weeds, with the naturalised *Cynodon dactylon* (common couch) dominant. Instream weeds include *Alternanthera philoxeroides* (alligator weed) and *Juncus acutus* (spiny rush).

Outside of the canopied areas is former pasture land with the ground layer dominated by introduced grasses and occasional small patches of native grass species such as *Themeda triandra* (kangaroo grass), *Austrodanthonia* sp. (wallaby grass) and *Microlaena stipoides* var *stipoides* (weeping meadow grass) and sporadic occurrences of native herbs (*Dichondra repens*, *Wahlenbergia gracilis*, *Oxalis perennans*, *Tricoryne elatior*, *Brunoniella australis*).

Suckering juvenile swamp oak is beginning to emerge from the canopied areas into the pasture.



Upstream section of the retained tributary



Pasture

2.2.2 Threatened species and ecological communities

Threatened species, populations and ecological communities were assessed during the preparation of the Oakdale South Biodiversity Assessment Report (Cumberland Ecology 2016a). No threatened species or populations were found within the riparian zone of Ropes Creek and its tributaries.

Cumberland Ecology identified two plant community types within the riparian zones:

- HN 594 Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion; and
- HN 526 Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion.

Ecohort (2015) and ground truthing for this VMP support the presence of HN 526 Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion.

HN 526 is commensurate with River-flat Eucalypt Forest on the Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (RFEF), listed as an endangered ecological community (EEC) in NSW under the *Threatened Species Conservation Act 1995* (TSC Act).

2.2.3 Threatening processes

The most significant threatening processes that contribute or contributed to degradation of the site's riparian corridors include: past clearing of native vegetation; grazing; weed infestations, and disturbance of soil and soil-stored native seed from various works associated with past and current land uses.

The site's boundary is now securely fenced and grazing cattle removed. The existing natural riparian corridors have been demarcated as 'no go' zones and silt fencing installed to prevent movement of sediments in runoff entering these zones.

2.2.3.1 Weed infestations

Weed infestations will be managed as outlined in this VMP and in accordance with the *Biosecurity Act 2015*. The *Biosecurity Act 2015* replaces the *Noxious Weeds Act 1993*, which was repealed in August 2017.

The *Biosecurity Act 2015* itself is tenure neutral, in that unlike the previous *Noxious Weeds Act 1993* there is no scheduled "list" of weeds. As such all weeds need to be categorised by a risk they pose in relation to human health, biodiversity or agricultural production. The General Biosecurity Duty (GBD) is a key feature of the *Biosecurity Act 2015* (S22). Simply put, it means that all private and public land managers (or anyone who deals with weeds) must prevent, eliminate or minimise the risk those weeds present (HRCC 2017).

Oakdale South is located within the Penrith Council local government area, for which the Hawkesbury River County Council (HRCC) is the Local Control Authority for weeds under the *Biosecurity Act 2015* for the Councils of Blacktown, Hawkesbury, The Hills Shire and Penrith. HRCC has developed the Biosecurity Priority Weeds Local Plan (HRCC 2017) which guides how each priority weed needs to be managed. Priority weed species are categorised in accordance with the following Schedules:

1. Schedule 1. State priority weeds
2. Schedule 2. Regional priority weeds, and
3. Schedule 3. Local priority weeds.

Within each of the above schedules there are further sub-categories that relate to management measures, which include: eradication, containment, and asset protection. All other weed species (i.e. those not listed in Schedule 1, 2 or 3) are not considered to warrant the priority attention and resources of the HRCC, unless they become deemed a biosecurity risk by an Authorised Officer.

Table 2-1 lists weed species identified by HRCC (2017) relevant to this VMP and that are identified in Schedule 1, 2 or 3. Table A in Appendix A lists all weed species, including those not listed in Schedule 1, 2 or 3, and relevant management measure subcategories.

Table 2-1. Oakdale South VMP weed species, categories and management measures (HRCC 2017)

Species / Common names	Management measures
Shrubs	
<i>Cestrum parqui</i> Green cestrum	Schedule 2: Regional Priority Weed, and Schedule 3: Local Priority Weed
<i>Dovyalis caffra</i> Kei apple	Schedule 2: Regional Priority Weed
<i>Lantana camara</i> Lantana	Schedule 1: State Priority Weed
<i>Lycium ferocissimum</i> African boxthorn	Schedule 1: State Priority Weed
<i>Olea europaea</i> subsp. <i>cuspidata</i> African olive	Schedule 2: Regional Priority Weed
<i>Rubus fruticosus</i> agg Blackberry	Schedule 1: State Priority Weed
<i>Ulex europaeus</i> Gorse	Schedule 1: State Priority Weed, and Schedule 2: Regional Priority Weed
Aquatic and semi-aquatic	
<i>Alternanthera philoxeroides</i> Alligator weed – Weed of National Significance	Schedule 1: State Priority Weeds
Vines/scramblers	
<i>Anredera cordifolia</i> Madeira vine	Schedule 1: State Priority Weed
<i>Asparagus aethiopicus</i> , <i>A. africanus</i> , <i>A. asparagoides</i> , <i>A. plumosus</i> , <i>A. scandens</i> Asparagus weeds	Schedule 1: State Priority Weed
<i>Senecio madagascariensis</i> Fireweed	Schedule 1: State Priority Weed
Herbs	
<i>Senecio madagascariensis</i> Fireweed	Schedule 1: State Priority Weed

3. Restoration Approach

3.1 Overview

The VMP has been prepared in accordance with DPI Water 'Guidelines for Vegetation Management Plans on Waterfront Land'. The main objective of these guidelines and this VMP is to provide a stable watercourse and riparian corridor which will emulate local native vegetation communities.

Ecohort (2015) recommended a range of treatments for the abatement of threats and restoration/reconstruction in the VMP riparian zones, taking into consideration the following factors:

- Adapting best practice restoration principles and techniques and conforming to statutory requirements.
- Liaison with various practitioners and providers of established and innovative restoration and rehabilitation techniques and products.
- Feedback from the client to assist in the formulation of the most appropriate restoration and rehabilitation designs and strategies for the project.

Since this time a number of amendments have been necessary to the Oakdale South SSD 6917 to accommodate the needs of future tenants (i.e. layout of roads and lot boundaries). These amendments and this VMP have not changed the intent of the restoration/reconstruction measures recommended by Ecohort (2015). Rather they have only affected the boundaries and responsibility of various management zones as outlined in Section 1.3 and shown in Figure 2-1 (i.e. basin, landscape, landscape screening, biodiversity offsetting and VMP management areas).

A combination of assisted bushland regeneration shall be undertaken in areas of remnant native vegetation and reconstruction through revegetation shall be undertaken in areas of pasture land within the VMP riparian zones.

3.2 Assisted bushland rehabilitation/reconstruction measures

Assisted bushland regeneration works shall be implemented in areas where natural regeneration is likely, by removing obstacles and making amendments to abiotic conditions to effect the regeneration of remnant native vegetation.

The aim of assisted bushland regeneration is to create conditions that favour the ecosystem's own recovery processes. The following principles from OEH's Conservation Management Notes (OEH 2011) apply to this VMP:

- Working where the natives are stronger, i.e. looking after the good areas and creating the conditions that promote their expansion into adjoining more degraded areas. An exception to this approach in the VMP riparian corridors will be targeting weed species in all areas that are a particular threat, for example: *Juncus acutus* (spiny rush), which is widespread in the creek lines; and weeds identified by HRCC on Schedules 1, 2 and 3 (refer Section 2.2.3.1);
- Avoiding excessive disturbance because it often favours weed regrowth. But employing some disturbance where it is needed to trigger native plant regeneration or to treat compacted soil;
- Avoiding mulching (mostly) because mulch suppresses germination of seedlings, although it should be used in the following circumstances:
 - Small, low resilience patches within the regeneration area where natural leaf litter is available from nearby sources, and

- On the edges of bushland areas to define the limits of the regeneration zone, and to suppress the encroachment of exotic grasses.
- Above all, mulching shall avoid burying resilient areas where natural recruitment from the soil seed bank is evident.

Management activities relating to the assisted bushland regeneration areas are detailed in Section 4.

3.3 Reconstruction through revegetation

Where areas are found to have a low capacity for natural regeneration (i.e. former pasture land), these shall be fully reconstructed through revegetation of canopy, shrub and ground layer plant species constituent of RFEF communities. Reconstruction activities generally entail the following:

- Non-selective mechanical and herbicide weed control;
- Soil tilling/preparation and amelioration, where required;
- Jute matting or mulching, depending on the location in relation to creek flows; and
- Planting of native tree, shrub and ground layer species in highly degraded areas.

Management activities relating to the restoration through revegetation areas are detailed in Section 4.

3.4 Management zones

The VMP applies to two separate riparian corridor management zones: Zone 1 watercourse realignment (WR); and Zone 2 Ropes Creek adjacent Precinct 6 (RC).

3.4.1 Zone 1 watercourse realignment

Zone 1 watercourse realignment (WR) is the subject of separate planning drawings and specifications that delineate several areas with respect to location, treatment, and planting schedule. Due to the stage of the development, civil and landscape restoration works in Zone 1 (WR) have already received construction certification. These works area are included in this VMP to ensure consistency with the NSW Department of Primary Industries – Water (DPIW) guidelines for works on waterfront land, and as originally planned in consultation with the DPIW during the approvals process for the development.

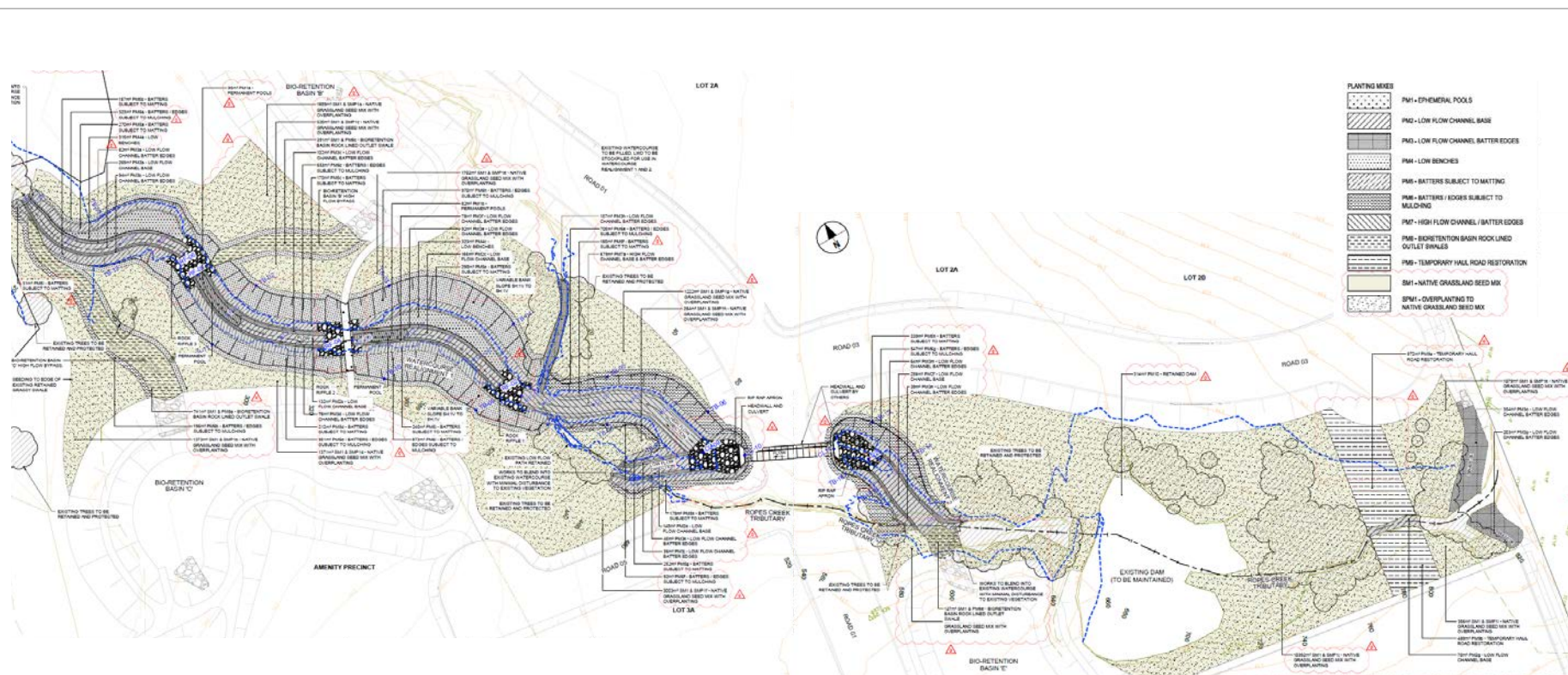
The various management treatments for Zone 1 (WR) are shown in Figure 3-1.

3.4.2 Zone 2 Ropes Creek adjacent Precinct 6

Zone 2 Ropes Creek adjacent Precinct 6 (RC) will be undertaken at a later stage of the development. , is not subject to realignment works and the level of planning already undertaken for Zone 1 WR. Zone 2 RC was also previously included in the biodiversity offsetting area (BOA) but later excluded due to:

- Its isolation and distance from the main BOA area;
- and difficulties with its future management due to a lack of access to both sides of Ropes Creek at this location. Further the accessible area of Zone2 (RC) is less than one hectare in size, and considered too small an area for inclusion as a biobanking offset area.

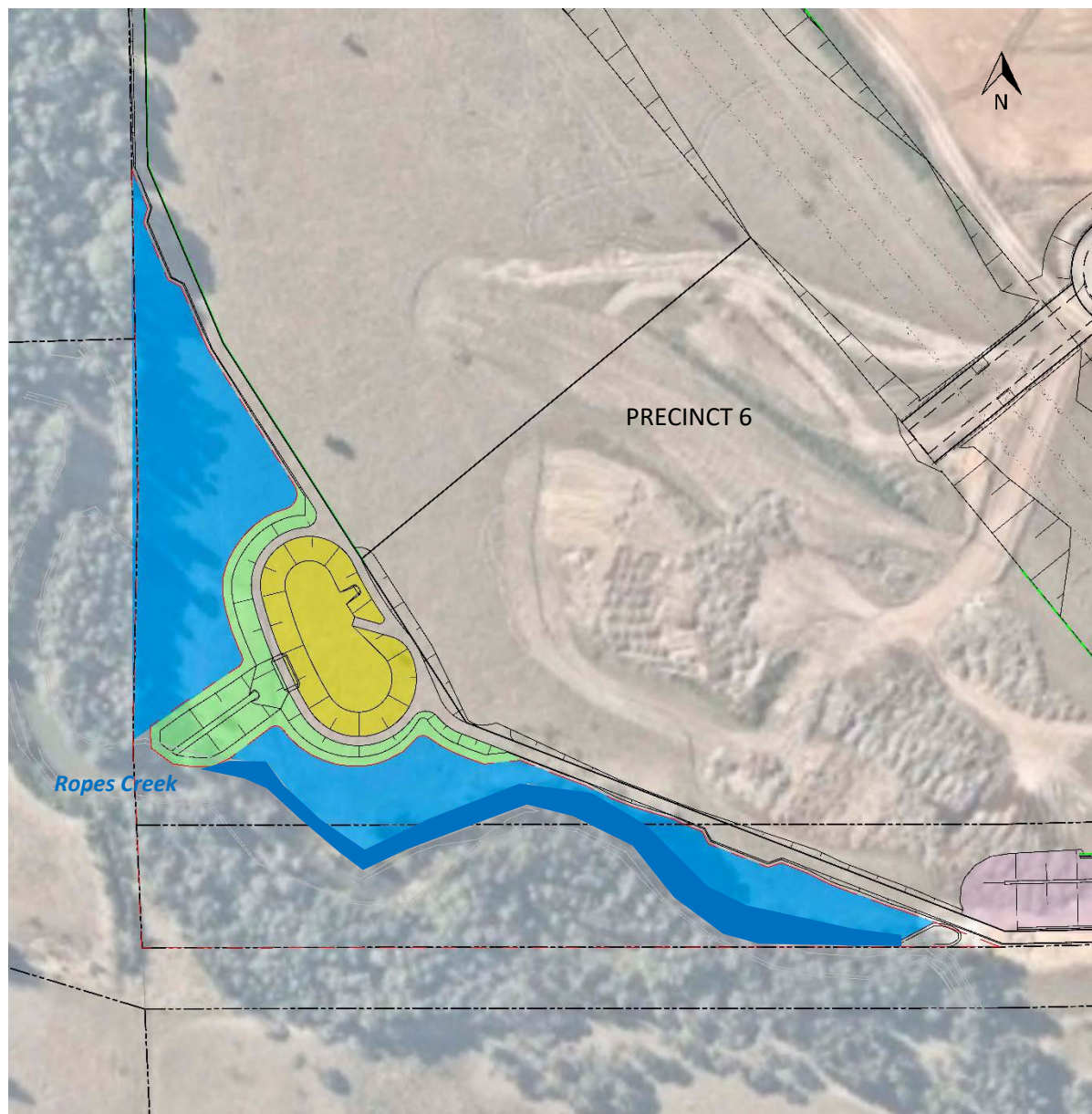
Zone 2 (RC) is divided into two management subzones: (a) assisted bushland regeneration, and (b) reconstruction through revegetation (Figure 3-2).



Oakdale South Estate – Vegetation Management Plan

Figure 3-1. Watercourse Realignment Management

Imagery source: AECOM Dwgs 60333552 DRG P 1070 & 10781 (2016)



Oakdale South Estate – Vegetation Management Plan

Figure 3-1. Watercourse Realignment Management Zones

Imagery source: AT&L 11/12/2017

4. VMP Implementation

4.1 Management Zone 1

In its entirety the watercourse realignment (WR) works include a range of civil, landscape and restoration activities for which Construction Certification (CC) has been obtained. Specifications for these works are summarised in Table 4-1 and documented in the following:

- Oakdale South Watercourse Realignment – Specification (AECOM, 8 November 2016); and
- Oakdale South Watercourse Realignment –Drawing Set 60333552 (AECOM, 23 September 2016).

Work activities specific to the management of WR zones 1a and 1b are summarised in Table 4-1, further detailed in Sections 4.3 to 4.8 and relevant work areas shown in Figure 3-1 of this VMP.

Table 4-1. Summary of watercourse realignment works and responsibilities

Work activity	Tasks	Responsibility
Civil Works	• Stripping, stockpiling, amelioration, and reinstatement of topsoil (A horizon) and B horizon sub-soil • Excavation and/or filling of the site to the levels shown on the Drawings • Supply, delivery and placement of rock material • Provision and installation of erosion control matting to all areas downslope of the 1 in 2 year ARI • Supply and placement of temporary vegetation (cover crop) over all disturbed works areas until restoration can take place • Removal of temporary access tracks, signage and fencing, cleaning up and site restoration	Civil contractor
Landscape Restoration Works	• Provision / installation of large woody debris (LWD) and LWD log clusters • Supply and placement of mulch and jute mesh to be installed over all mulched areas placed in batter areas • Provision of temporary irrigation system.	Landscape contractor
VMP Works	• Procurement of provenance plant material (as per Planting Schedule, Appendix B) • Weed control (refer Section 4.3) • Supply and placement of mulch in reconstruction areas within the riparian corridor (refer Section 4.5) • Planting program in all areas (as per Planting Schedule, Appendix B and Section 4.6) • Ongoing maintenance in all areas to achieve performance targets (refer Section 4.7)	Bush regeneration contractor

4.2 Management Zone 2

Riparian rehabilitation and restoration works required in management zone 2 (RC zones 2a and 2b) will solely be the responsibility of the Bushland Regeneration Contractor (i.e. there are no civil or landscaping works that overlap with the VMP works areas as is the case for WR zone 1).

Work activities specific to the management of RC zones 2a and 2b are summarised in Table 4-2 and detailed in Sections 4.3 to 4.8 with relevant work areas shown in Figure 3-2.

Table 4-2. Summary of VMP watercourse realignment works

Zone	Tasks	Summary of works activity
RC zone 2a	Weed control	Targeted instream spiny rush and alligator weed control and assisted bush regeneration methods, including primary weeding and ongoing follow up weeding (refer Section 4.3)
	Monitoring and adaptive management	- Monitoring of natural plant recruitment following the first year of bush regeneration; - Using site resources to assist in native plant recruitment (such as opportunistic collection and direct application of native seeds or brush matting); and - Supplemental planting of areas where natural plant recruitment fails to occur following the first year of bush regeneration.
RC zone 2b	Procurement of provenance plant material	Sourcing of seeds and / or plant propagules for growing of plant species (as per Planting Schedule, Appendix B), or sourcing of locally sourced plant stock from a suitable nursery
	Weed control	Primary broadscale weed control and secondary weeding (refer Section 4.3)
	Soil amelioration	As required (refer Section 4.4)
	Mulching	Placement of site mulch to areas where primary and secondary weeding has taken place in preparation of planting program (refer Section 4.5)
	Planting program	Installation of canopy, shrub and ground layer species and establishment (refer Section 4.6)
	Maintenance	Recurrent tasks required to meet the VMP performance targets (refer Section 4.7)

4.3 Weed control

4.3.1 Primary weeding

Primary weeding is the first stage of bushland regeneration and reconstruction, which will require a range of techniques such as: the selective spraying of weeds with herbicides; cutting/scraping and painting deep rooted woody weeds and climbers with hand tools, chainsaws and brushcutters and painting cut stumps with herbicide; and selective hand removal of weeds.

Primary weeding is required in all VMP zones with a priority given to:

- Species scheduled under the *Biosecurity Act 2015* (see Table A, Appendix A);
- Widespread growth of spiny rush; and
- Woody weeds and climbers.

Additionally:

- Herbicide should not be allowed to fall into a watercourse or when wind conditions could cause drift outside the area to be treated or onto desirable plants.
- Weeds that cannot be removed by hand are to be manually removed, ensuring that the entire weed including all roots is removed.
- Damage to native plant species should be avoided during any weeding works.
- All seed, flowering and invasive vegetative parts of weeds should be bagged and disposed of appropriately off site.

4.3.2 Secondary weeding

Secondary weeding involves the selective removal or treatment of weeds, whilst allowing regenerating or planted native plants to increase in size, abundance and percentage cover.

Secondary weeding should be undertaken at intervals of not more than four weeks following the completion of primary weeding and continue throughout the plant establishment period in reconstruction areas (i.e. WR zone 1b and RC zone 2b) and as an ongoing task in assisted bush regeneration areas (i.e. WR zone 1a and RC zone 2a).

All herbaceous weeds should be managed to be at very-low percentage cover levels, (as a minimum 5% cover), or better. Particularly problematic herbaceous weeds with wind-blown seeds should be prevented from seeding at all times throughout the site.

4.3.3 Maintenance weeding

It can be expected that the remnant and revegetated areas in each VMP zone will always require a certain level of maintenance weeding, as weed seeds and vegetative propagules make their way on site from the soil stored seedbank, via water, wind and bird droppings. However, it can be expected that the amount of weeding required will decrease once the regenerating native plants grow, recover and become more resistant to disturbance and weed colonisation.

Maintenance weeding shall extend for a minimum of three years following the completion of the Plant Establishment / Defects Liability Period (refer Section 4.5.3) or until such time as a minimum 80% survival rate for all plantings and a maximum five percent (5%) weed cover for each VMP management zone.

4.4 Soil amelioration

Generally soil amelioration should not be with stripping, stockpiling, amelioration, and reinstatement of topsoil (A horizon) and B horizon sub-soil the responsibility of the Civil Contractor (refer Table 4-1).

In areas not subject to construction disturbance it is anticipated that existing soils will be suitable for revegetation following weed control without the need for amelioration.

Where construction activities have disturbed site soils (e.g. compaction, loss of topsoil) the following shall apply:

- All debris, stones and left over building materials (arising from the works) are to be removed from site.
- Stones exceeding 25 mm, clods of earth exceeding 50 mm, and weeds, rubbish or other deleterious material brought to the surface during excavation or cultivation, must be removed.
- Supply and cultivate/spread 50mm layer of organic compost within 50mm layer of topsoil.
- Organic compost to be pH neutral; low in phosphorus suitable for planting Australian natives; free from clods of soil, rock, rubbish, and other non-organic matter.

4.5 Mulching

The higher elevated parts of WR zone 1b and RC zone 2b are to be mulched with a minimum 75mm layer of woodchip/leaf mulch to assist with weed suppression, improve soil water conservation and soil erosion control.

Trees removed from within Oakdale South have been chipped and stockpiled for use in landscaping and bush regeneration works. However, the bush regeneration contractor must ensure that mulch is free of deleterious and extraneous matter such as soil, weeds, sticks and stones.

Mulch is to be placed to the required depth, clear of plant stems, and raked to an even surface flush with the surrounding finished levels. Spread mulch so that after settling it is:

- Smooth and evenly graded between design surface levels;
- Flush with adjacent finished levels;
- Of the required depths (75 mm depth); and
- Sloped towards the base of plant stems, but not in contact with the stem.

4.6 Planting program

4.6.1 Plant procurement

The contractor is responsible for procurement of provenance seed / other propagative materials, and growing on the plant species as per the Planting Schedule (provided in Appendix B). Plant stock is to be purchased at least four months prior to the anticipated delivery.

Plants that are not: true to species; vigorous and healthy; with a well-developed root system; free from disease / pests; and are not without scars or dead wood; shall be rejected at delivery.

Planting shall be undertaken immediately after acceptance of plant delivery. If this is not possible: appropriate storage to keep the plants in good condition on the site, adequately protected from frost, wind, sun and vermin, and secured from vandals; shall be facilitated.

4.6.2 Planting procedure

Planting shall generally entail the following:

- Dig hole sufficient for root ball of plant. The removal from the container and the positioning of the plant is to be done with minimum disturbance to the roots.
- Slow-release native plant fertiliser (low phosphorous formulated native plant fertiliser tablet/granules) and water saving crystals shall be placed into the planting hole.
- After planting, the soil shall be replaced and carefully firmed, leaving a slight depression around each plant to allow for water collection. Soil is to be replaced in the hole so that the base of the stem is level with the soil surface, not set below the soil, or sitting above.
- All plants should be watered-in thoroughly after planting to settle any air pockets around the root ball of the plant and to give the plant a good initial supply of water.

4.6.3 Practical completion

It is anticipated that Practical Completion can be achieved within six months from commencement of the bush regeneration/restoration works in each VMP zone. During this time planting establishment is to be achieved through watering, weeding, pest/disease control, replacing dead plant material and repairing/replacing erosion control matting/mulch. All plants should be watered thoroughly on at least 4 to 6 occasions, during this period.

Failure to maintain each VMP management zone in a stable and healthy condition may result in the Superintendent arranging for the maintenance work to be carried out by others at the expense of the Contractor.

Practical Completion shall require a minimum 80 per cent survival rate of each species planted and a maximum 5 per cent weed cover for each VMP management zone.

4.6.4 Planting establishment /defects liability

The Plant Establishment / Defects Liability Period shall be in force for 18 months after Practical Completion of each stage of the works or until the site is stable, whichever is the longer period.

Any defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or of any other cause, shall be removed and replaced at the contractor's expense by work or materials of the required standard.

4.7 Performance measures

Performance targets are necessary to objectively measure the progress and the achievement of the VMP objectives. The following targets apply:

1. All environmental and scheduled weeds are to be continuously suppressed and, if possible, eradicated from the site using recognised appropriate bush regeneration methods in accordance with best practice.
2. Weed control and revegetation works are to be carried out by a qualified bushland regeneration contractor for a period of 5 years.
3. Regeneration/restoration of 3.9 ha of RFEF vegetation community (inclusive of the realigned watercourse and dam) in VMP management zone 1 and 0.9 ha of RFEF vegetation community in VMP management zone 2, with a minimum 80% cover of native species achieved.
4. Weed control targets should be a maximum of 10% cover at the end of year 1 progressing to less than 5% or less at the end of year 5.

4.8 Compliance certification

Site audits, monitoring and reporting on the progress and achievement of the VMP performance targets shall be undertaken by an independent VMP specialist as nominated by Goodman as per AECOM specifications (November 2016). In general, reporting and compliance certificates shall be issued for the following items:

- Completion of primary weed control works;
- Completion of secondary weed control works;
- Inspection of plant materials delivered to site prior to commencement of planting works;
- Completion of revegetation planting works (Practical Completion);
- Completion of revegetation planting works (Practical Completion);
- Plant Establishment / Defects Liability Period; and
- Satisfactory achievement of revegetation/restoration works as per VMP performance targets (Section 4.7).

5. References

AECOM (2015) Oakdale South Industrial Development Watercourse Design. Report prepared for Goodman, 31 August 2015

AECOM (2016) Oakdale South Industrial Development Watercourse Design. Report prepared for Goodman, 23 September 2016

AECOM (2016) Oakdale South Industrial Development Watercourse Realignment – Specification. Prepared for Goodman, 8 November 2016

Cumberland Ecology (2016a) Oakdale South State Significant Development Application Biodiversity Assessment Report, prepared for Goodman Property Services (Aust.) Pty Ltd, 18 August 2016

Cumberland Ecology (2016b) Oakdale South State Significant Development Application Biodiversity Offsetting Strategy (BOS), prepared for Goodman Property Services (Aust.) Pty Ltd, 18 August 2016

Ecohort (2015) Vegetation Management Plan for the Oakdale South Development at Horsley Park. Prepared by Ecohort Pty Ltd for Goodman, 31 August 2015.

Ecohort (2016) Vegetation Management Plan for the Oakdale South Development at Horsley Park. Prepared by Ecohort Pty Ltd for Goodman, 11 December 2016.

Ecohort (2017) Vegetation Management Plan for the Oakdale South Development at Horsley Park. Prepared by Ecohort Pty Ltd for Goodman, 13 January 2017.

Hawkesbury River County Council (2017) Biosecurity Priority Weeds Local Plan October 2017

Office of Environment and Environment (OEH) (2011) Conservation Management Notes - Managing bushland and wildlife habitat. Office of Environment and Heritage, Department of Premier and Cabinet NSW. ISBN 978 1 74293 316 0 OEH 2011/0659

Appendix A. Weed Species

Table A. Weed species known to occur in VMP management zones

Species / Common names	Management measures
Shrubs	
<i>Cestrum parqui</i> Green cestrum	Schedule 2: Regional Priority Weed Regional Priority Weed Objective – ASSET PROTECTION: - Land managers mitigate the risk of the plant being introduced to land used for grazing of livestock. - Land managers prevent spread from their land where feasible. - The plant or parts of the plant are not traded, carried, grown or released into the environment. - The plant should be fully and continuously suppressed and destroyed on grazing land - Implement quarantine and/or hygiene protocols Schedule 3: Local Priority Weed - Land managers have mitigated the risk of the plant being introduced to land used for grazing of livestock - The plant should be fully suppressed and destroyed on grazing land.
<i>Dovyalis caffra</i> Kei apple	Schedule 2: Regional Priority Weed Regional Priority Weed Objective – ERADICATION The plant is eradicated from the land and the land is kept free of the plant. - Destruction of all infestations where feasible. - Manage in accordance with New Weed Incursion Plan. - Detailed surveillance and mapping to locate all infestations - Local Control Authority is notified if the plant is found on the land. - The plant or parts of the plant are not traded, carried, grown or released into the environment.
<i>Lantana camara</i> Lantana	Schedule 1: State Priority Weed State Priority Weed Objective – ASSET PROTECTION (Whole of State): Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell. Regional Strategic Response: Identify priority assets for targeted management.
<i>Lycium ferocissimum</i> African boxthorn	Schedule 1: State Priority Weed State Priority Weed Objective – ASSET PROTECTION (Whole of State): Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell.

Species / Common names	Management measures
	Regional Strategic Response: Identify priority assets for targeted management.
<i>Olea europaea</i> subsp. <i>cuspidata</i> African olive	Schedule 2: Regional Priority Weed Regional Priority Weeds Objective – CONTAINMENT: Oakdale south lies within the region classified as the core infestation area, the following applies: • The plant or parts of the plant are not traded, carried, grown or released into the environment. • Implement quarantine and/or hygiene protocols. • Surveillance and mapping to locate all infested properties. • Monitor change in current distribution to ensure containment of spread. • Land managers prevent spread from their land where feasible. • Land managers reduce the impact on priority assets. • Identify priority assets for targeted management
<i>Rubus fruticosus</i> agg Blackberry	Schedule 1: State Priority Weed State Priority Weed Objective – ASSET PROTECTION (Whole of State): Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell. Regional Strategic Response: Identify priority assets for targeted management.
<i>Ulex europaeus</i> Gorse	Schedule 1: State Priority Weed State Priority Weed Objective – ASSET PROTECTION (Whole of State): Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell. Schedule 2: Regional Priority Weed Regional Priority Weeds Objective – CONTAINMENT: • Land managers prevent spread from their land where feasible • Destruction of all infestations, aiming at local eradication where feasible. • Detailed surveillance and mapping to locate all infestations. • Implement quarantine and/or hygiene protocols. • Monitor progress towards eradication
Aquatic and semi-aquatic	
<i>Alternanthera philoxeroides</i> Alligator weed – Weed of National Significance	Schedule 1: State Priority Weeds State Priority Weed Objective – CONTAINMENT: Mandatory Measure (Division 8, Clause 33, Biosecurity Regulation 2017): A person must not move, import into the State or sell.

Species / Common names	Management measures
	Schedule 2: Regional Priority Weed Regional Priority Weeds Objective – CONTAINMENT: Oakdale south lies within the region classified as the core infestation area, the following applies: - Prevent spread from their land where feasible. - Mitigate the risk of the plant being introduced to their land. - Reduce the impact on priority assets. - Implement quarantine and/or hygiene protocols. - Manage in accordance with the Priorities for the control of Alligator Weed in the Sydney Region.
<i>Cyperus difformis</i> Dirty Dora	Other
<i>Cyperus eragrostis</i> Umbrella sedge	Other
<i>Juncus acutus</i> Spiny rush	Other
Vines/scramblers	
<i>Anredera cordifolia</i> Madeira vine	Schedule 1: State Priority Weed State Priority Weed Objective – ASSET PROTECTION (Whole of State): Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell. Regional Strategic Response: Identify priority assets for targeted management.
<i>Araujia sericifera</i> Moth vine	Other
<i>Asparagus aethiopicus</i> ground asparagus † <i>A. africanus</i> climbing asparagus <i>A. asparagoides</i> bridal creeper † <i>A. africanus</i> <i>A. plumosus</i> climbing asparagus fern	Schedule 1: State Priority Weed State Priority Weed Objective – ASSET PROTECTION (Whole of State): Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell. Regional Strategic Response: Identify priority assets for targeted management. † <i>A. africanus</i> Destruction of all infestations where feasible. - Manage in accordance with New Weed Incursion Plan. - Detailed surveillance and mapping to locate all infestations
<i>Asparagus virgatus</i> Asparagus fern	Schedule 3: Local Priority Weed The plant or parts of the plant have not been traded, carried, grown or released into the environment.

Species / Common names	Management measures
	Surveillance and mapping to locate all infested properties and maintain currency of exclusion zone and objectives.
<i>Modiola caroliniana</i> Creeper mallow	Other
Grasses	
<i>Axonopus fissifolius</i> Carpet grass	Other
<i>Briza subaristata</i> hilean quaking grass	Other
<i>Bromus catharticus</i> Prairie grass	Other
<i>Ehrharta erecta</i> Panic veldtgrass	Other
<i>Lolium perenne</i> Ryegrass	Other
<i>Paspalum dilatatum</i> Paspalum	Other
<i>Pennisetum clandestinum</i> Kikuyu	Other
<i>Sporobolus africanus</i> Parramatta grass	Other
Herbs	
<i>Anagallis arvensis</i> Scarlet pimpernel	Other
<i>Brassica fruticulosa</i> Twiggy turnip	Other
<i>Cirsium vulgare</i> Spear thistle	Other
<i>Hypochaeris radicata</i> Catsear	Other
<i>Senecio madagascariensis</i> Fireweed	Schedule 1: State Priority Weed State Priority Weed Objective – ASSET PROTECTION (Whole of State): Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell. Regional Strategic Response: Identify priority assets for targeted management.
<i>Sida rhombifolia</i> Paddy's Lucerne	Other

Species / Common names	Management measures
<i>Solanum americanum</i> American black nightshade	Other
<i>Solanum linnaeanum</i> Apple of Sodom	Other
<i>Sonchus oleraceus</i> Common sowthistle	Other
<i>Tagetes minuta</i> Stinking roger	Other
<i>Taraxacum officinale</i> Dandelion	Other
<i>Trifolium repens</i> White clover	Other

OTHER WEEDS

If a weed is not listed in Schedule 1,2 or 3 it is not considered to warrant the priority attention and resources of the County Council. However, it may still be deemed a biosecurity risk by an Authorised Officer and control, education or enforcement action may be taken if the process described in this policy for determining priority is followed.

REPORTING NOTIFIABLE WEEDS

A notifiable weed is a weed which lists a notification requirement in the guidelines for its management under Schedules 1, 2 and 3. All notifiable weeds within HRCC's jurisdiction must be reported in the following manner:

Phone: (02) 4574 9600

In-Person: directly to a HRCC Authorised Officer, or by visiting HRCC Office, 6 Walker St, South Windsor.

Email: council@hrcc.nsw.gov.au

Post: PO Box 6021, South Windsor DC, NSW, 2756

Appendix B. Planting Schedule

B1. Watercourse realignment (WR) planting schedule

Zone	Location Type	Species	Density (m ²)	Plant qty	% mix
PM1	PERMANENT POOLS (177m ²)	Bolboschoenus caldwellii	3	133	25
		Eleocharis gracilis	3	133	25
		Carex appressa	3	133	25
		Juncus usitatus	3	133	25
		Subtotal plants		531	100
PM2	LOW FLOW CHANNEL BASE (1033m ²)	Bolboschoenus caldwellii	4	1,033	25
		Eleocharis gracilis	4	1,033	25
		Carex appressa	3	775	25
		Juncus usitatus	3	775	25
		Subtotal plants		3,616	100
PM3	LOW FLOW CHANNEL BATTER EDGES (1424m ²)	Carex appressa	3	854	20
		Entolasia marginata	4	1,139	20
		Imperata cylindrica	4	1,139	20
		Juncus usitatus	3	854	20
		Lomandra longifolia	3	854	20
		Subtotal plants		4,842	100
PM4	LOW BENCHES (641m ²)				
	Trees	Melaleuca linariifolia	0.04	8	30
		Melaleuca styphelioides	0.04	20	70
				28	100
	Ephemeral species	Carex appressa	3	385	20
		Entolasia marginata	4	513	20
		Imperata cylindrica	4	513	20
		Juncus usitatus	3	385	20
		Lomandra longifolia	3	385	20
				2,179	100
	Subtotal plants			2,207	
PM5	BATTERS SUBJECT TO MATTING (2171m ²)				
	Trees	Casuarina glauca	0.11	239	100
				239	100
	Smaller shrubs	Acacia falcata	0.25	8	2
		Acacia floribunda	0.25	16	3
		Breynia oblongifolia	0.25	27	5
		Bursaria spinosa	0.25	27	5
		Clerodendrum tomentosum	0.25	27	5
		Daviesia genistifolia	0.25	54	10
		Dillwynia sieberi	0.25	54	10
		Dodonea viscosa spp. cuneata	0.25	54	10
		Goodenia ovata	0.25	27	5
		Hardenbergia violacea	0.25	27	5

Zone	Location Type	Species	Density (m ²)	Plant qty	% mix
		Indigophora australis	0.25	54	10
		Notelaea longifolia	0.25	27	5
		Ozothamnus diosmifolium	0.25	54	10
		Pultenea microphylla	0.25	54	10
		Rubus parviflorus	0.25	27	5
				539	100
	Ephemeral species	Carex appressa	3	651	10
		Danthonia spp	4	868	10
		Dianella spp	4	868	10
		Entolasia marginata	4	868	10
		Imperata cylindrica	4	868	10
		Juncus usitatus	3	651	10
		Lomandra longifolia	3	1,303	20
		Microlaeana stipoides	4	868	10
		Poa labillardieri	3	651	10
				7,599	100
	Broadleaf herbs, grasses and sedges	Centella asiatica	0.25	543	as available
		Commelina cyanea	0.25		
		Dichondra repens	0.25		
		Oplismenus spp.	0.25		
		Einadia spp.	0.25		
				543	
	Subtotal plants			8,920	
PM6	BATTERS SUBJECT TO MULCHING (5,310m²)				
	Canopy and subcanopy trees / large shrubs	Acacia decurrens	0.11	29	5
		Acacia parramattensis	0.11	12	5
		Angophora floribunda	0.11	48	20
		Eucalyptus amplifolia	0.11	24	10
		Eucalyptus moluccana	0.11	48	20
		Eucalyptus tereticornis	0.11	96	40
				256	100
	Smaller shrubs	Acacia falcata	0.25	66	5
		Acacia floribunda	0.25	66	5
		Breynia oblongifolia	0.25	66	5
		Bursaria spinosa	0.25	66	5
		Clerodendrum tomentosum	0.25	27	2
		Daviesia genistifolia	0.25	133	10
		Dillwynia sieberi	0.25	133	10
		Dodonea viscosa spp. cuneata	0.25	133	10
		Goodenia ovata	0.25	66	5
		Hardenbergia violacea	0.25	40	3
		Indigophora australis	0.25	133	10
		Notelaea longifolia	0.25	66	5

Zone	Location Type	Species	Density (m ²)	Plant qty	% mix
		Ozothamnus diosmifolium	0.25	133	10
		Pultenea microphylla	0.25	133	10
		Rubus parviflorus	0.25	66	5
	Broadleaf herbs, grasses and sedges			1,328	100
		Aristida ramosa or vagans	4	1,062	5
		Bothriochloa decipiens	4	425	2
		Capillipedium parviflorum	4	637	3
		Chloris truncata/ventricosa	4	1,062	5
		Danthonia spp	4	2,124	10
		Dianella spp	4	1,062	5
		Dicanthium sericeum	4	637	3
		Dichelachne micrantha	4	1,062	5
		Elymus scaber	4	425	2
		Eragrostis leptostachyos	4	1,062	5
		Eriochloa pseudoachritcha	4	1,062	5
		Eremophila debilis	4	1,062	5
		Entolasia marginata	4	1,062	5
		Imperata cylindrica	4	1,062	5
		Lomandra longifolia	3	797	5
		Microlaeana stipoides	4	2,124	10
		Poa labillardieri	3	797	5
		Sorghum leiocladum	4	1,062	5
		Themeda triandra	4	2,124	10
				20,709	100
	Herbs / vine / creepers	Arthropodium spp	0.25	1,328	as available
		Caesia spp	0.25		
		Centella asiatica	0.25		
		Clematis glycinoides	0.25		
		Commelina cyanea	0.25		
		Convolvulus erubescens	0.25		
		Dichondra repens	0.25		
		Einadia spp.	0.25		
		Geitonoplesium cynosum	0.25		
		Glycine tabacina	0.25		
		Hydrocotyle peduncularis	0.25		
		Mentha diemenica	0.25		
		Oplismenus spp.	0.25		
		Polymeria calycina	0.25		
		Pratia purpurascens	0.25		
		Ranunculus plebius	0.25		
		Rumex brownii	0.25		
		Scaveola albida	0.25		
		Solanum prinophyllum	0.25		
		Vittadinia spp	0.25		

Zone	Location Type	Species	Density (m ²)	Plant qty	% mix
		Wahlenbergia spp	0.25		
				1,328	
		Subtotal plants		23,621	
PM7	HIGH FLOW CHANNEL BASE / BATTER EDGES (679m ²)				
	Ephemeral species	Bolboschoenus caldwellii	4	679	25
		Eleocharis gracilis	4	679	25
		Carex appressa	3	509	25
		Juncus usitatus	3	509	25
	Subtotal plants			2,377	100
PM8	BIORETENTION BASIN ROCK LINED OUTLET SWALES (1948m ²)				
	Ephemeral species	Carex appressa	3	1,461	25
		Juncus usitatus	3	1,461	25
		Lomandra longifolia	3	1,461	25
	Grasses	Poa labillardieri	3	1,461	25
	Subtotal plants			5,844	100
PM9	TEMPORARY HAUL ROAD RESTORATION (1361m ²)				
	Trees	Casuarina glauca	0.11	42	70
		Melaleuca linariifolia	0.11	6	10
		Melaleuca styphelioides	0.11	12	20
				60	100
	Ephemeral species	Carex appressa	3	286	35
		Juncus usitatus	3	286	35
		Lomandra longifolia	3	286	30
				857	100
	Grasses and sedges	Aristida spp.	4	218	5
		Bothriochloa decipiens	4	218	5
		Chloris spp.	4	218	5
		Danthonia spp	4	435	10
		Dianella spp.	4	435	10
		Dicanthium sericeum	4	435	10
		Dichelachne micrantha	4	435	10
		Elymus scaber	4	218	5
		Eragrostis leptostachyos	4	218	5
		Entolasia marginata	4	218	5
		Imperata cylindrica	4	435	10
		Oplismenus spp.	4	218	5
		Poa labillardieri	3	162	5
		Themeda triandra	4	435	10
				4,298	100
	Subtotal plants			5,215	
SPM1	AREA = 23339 sqm				
	Trees	Acacia decurrens	0.11	128	5
		Acacia parramattensis	0.11	128	5
		Angophora floribunda	0.11	642	25

Zone	Location Type	Species	Density (m ²)	Plant qty	% mix
		Eucalyptus amplifolia	0.11	642	25
		Eucalyptus tereticornis	0.11	1,027	40
				2,567	100
	Shrubs	Acacia falcata	4	292	5
		Acacia floribunda	4	292	5
		Breynia oblongifolia	4	292	5
		Bursaria spinosa	4	292	5
		Clerodendrum tomentosum	4	117	2
		Daviesia genistifolia	4	583	10
		Dillwynia sieberi	4	583	10
		Dodonea viscosa spp. cuneata	4	583	10
		Goodenia ovata	4	292	5
		Hardenbergia violacea	4	175	3
		Indigophora australis	4	583	10
		Notelaea longifolia	4	292	5
		Ozothamnus diosmifolium	4	583	10
		Pultenea microphylla	4	583	10
		Rubus parviflorus	4	292	5
				5,835	100
	Grasses and sedges	Aristida ramosa or vagans	4	5,057	5
		Bothriochloa decipiens	4	2,023	2
		Capillipedium parviflorum	4	3,034	3
		Chloris truncata/ventricosa	4	5,057	5
		Danthonia spp	4	10,115	10
		Dianella spp	4	5,057	5
		Dicanthium sericeum	4	3,034	3
		Dichelachne micrantha	4	5,057	5
		Elymus scaber	4	2,023	2
		Eragrostis leptostachyos	4	5,057	5
		Eriochloa pseudoachritcha	4	5,057	5
		Eremophila debilis	4	5,057	5
		Entolasia marginata	4	5,057	5
		Imperata cylindrica	4	5,057	5
		Lomandra longifolia	4	5,057	5
		Microlaeana stipoides	4	10,115	10
		Poa labillardieri	4	5,057	5
		Sorghum leiocladum	4	5,057	5
		Themeda triandra	4	10,115	10
				101,148	100
		Subtotal plants		109,550	

TOTAL PLANTS WR ZONE 1

166,721

B2. Ropes Creek (RC) planting schedule

Zone	Species	density/m ²	% mix	Qty
RC Zone 2b (7,550m²)				
Trees / large shrubs	Acacia decurrens	0.0625	5	24
	Acacia parramattensis	0.0625	5	24
	Eucalyptus amplifolia	0.0625	20	94
	Eucalyptus eugeniodes	0.0625	20	94
	Eucalyptus moluccana	0.0625	20	94
	Eucalyptus tereticornis	0.0625	20	94
	Melaleuca stypheloidies	0.0625	10	94
			100	519
Smaller shrubs	Breynia oblongifolia	0.25	10	189
	Bursaria spinosa	0.25	10	189
	Clerodendrum tomentosum	0.25	10	189
	Daviesia genistifolia	0.25	10	189
	Dillwynia sieberi	0.25	10	189
	Dodonea viscosa spp. cuneata	0.25	10	189
	Goodenia ovata	0.25	10	189
	Indigophora australis	0.25	10	189
	Ozothamnus diosmifolium	0.25	10	189
	Pultenea microphylla	0.25	10	189
			100	1,888
Grasses / sedges	Aristida ramosa or vagans	4	3	906
	Austrodanthonia sp.	4	5	1510
	Carex appressa	4	5	1510
	Chloris truncata/ventricosa	4	5	1510
	Cymbopogon refractus	4	5	1510
	Dicanthium sericeum	4	5	1510
	Dichelachne micrantha	4	5	1510
	Eriochloa pseudoachritcha	4	2	604
	Eremophila debilis	4	5	1510
	Imperata cylindrica	4	20	6040
	Lomandra longifolia	3	10	3020
	Poa labillardieri	3	10	2265
	Themeda triandra	4	20	6040
			100	29,445
Herbs, scramblers, vines	Arthropodium spp	0.25	as available	1,888
	Burchardia umbellata	0.25		
	Brunoniella australis	0.25		
	Caesia parviflora	0.25		
	Clematis glycinoides	0.25		
	Dichopogon fimbriatus	0.25		
	Etinadia spp.	0.25		
	Glycine spp.	0.25		
	Mentha diemenica	0.25		

Zone	Species	density/m ²	% mix	Qty
	Oplismenus spp.	0.25		
	Polymeria calycina	0.25		
	Scaveola albida	0.25		
	Solanum prinophyllum	0.25		
	Tricoryne elatior	0.25		
	Wahlenbergia spp	0.25		
				1,888
	Total plants RC Zone 2a			33,740
RC Zone 2b (1,450m²)				
Grasses / sedges	Dianella longifolia	4	20	1,160
	Echinopogon ovatus	4	10	580
	Juncus usitatus	4	10	580
	Imperata cylindrica	4	20	1,160
	Lomandra longifolia	3	20	870
	Entolasia marginata	4	10	580
	Microlaeana stipoides	4	10	580
			100	5,510
Herbs, scramblers, vines	Brunoniella australis	0.25	as available	363
	Clematis glycinoides	0.25		
	Dichondra repen	0.25		
	Einadia spp.	0.25		
	Glycine spp.	0.25		
	Parsonsia straminea	0.25		
				363
	Total plants RC Zone 2B			5,873
	TOTAL PLANTS RC ZONE 2			39,613



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