

**VEGETATION MANAGEMENT PLAN (VMP)**  
**FOR**  
**PART OF 26-61 (LOT 1 DP 349727) NIKKO ROAD,**  
**WARNERVALE NSW**



For:

**KINGSTON PROPERTY FUND PTY LTD C-/O**  
**THE PROPERTY OWNER**

February 2018

Final Report

**Enviro Ecology**  
PO Box 345, Ourimbah 2250

Revision	Details	Date	Amended By
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Signed:



Date: ..... 27<sup>th</sup> February 2018

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# 1. Introduction

Enviro Ecology has been commissioned by Kingston Property Fund Pty Ltd C-/O the property owner to prepare a Vegetation Management Plan (VMP) for part of No 26-61 (Lot 1 DP 349727) Nikko Road, Warnervale NSW within the Central Coast LGA. The extent of the VMP area is defined by the E3 area as detailed on Figure 1-2.

This VMP has been prepared to address the NSW Office of Water (NOW) requirements and to enhance native vegetation within the E3 Lands.

Development approval has been sought for a Residential Subdivision for seventy (70) residential lots (Figure 1-1). This VMP has been prepared to managed and enhance the vegetation within E3 corridor situated along the northern portion of the subject property (Figure 1-1).

The proposed development will require the construction of roads, residential allotments, landscaping and provision of services such as electricity, sewer and water.

## 1.1. Existing hydrological regime

Figure 1-4 below shows a single blue line (watercourse) located upon lands to the east of the subject property which is subject to consideration by the NSW Office of Water (NOW) and more specifically the Water Management Act 2000 and WM Regulation (2011). The proposed development is within 40m of a 1<sup>st</sup> order watercourse located upon adjoining lands. The proposal will not result in the direct or indirect removal of vegetation associated with the 1<sup>st</sup> order watercourse.

The proposed subdivision is partly located within the Porters Creek catchment floodplain, overland flow is currently captured by an overland flow path which contained within the (E3 LANDS) which then carries water in an easterly direction where it discharges into dam located adjacent to the eastern boundary of the subject property (Figure 2-1) .

The pre-European hydrological regime has been altered through the construction of a dam on the western side of the subject property within the E3 lands, partially filling of the land on the northern side of dam & the clearing of native vegetation within the E3 Lands (Figure 1-3). Historical land searches reveal that the subject property has been managed for agricultural/farming since 1948-present (Appendix D).

The 1954 aerial photograph (Photograph 5-1) shows a dam and associated clearing within the central area of the Disturbed Riparian vegetation. The 1975 & 1984 aerals (Appendix D) show a dam that was also present in the 1954 aerial amongst cleared land with scattered trees. The dam is still present however it was heavily silted at the time of the site inspection. It is important to note that no watercourses have been mapped as occuring within the subject property. The overland flow path has no defined bed or banks and the flows through the subject property have been exacerbated by concentration of water from Railway Road to the east and Nikko Road which is the captured by two 450 diameter stormwater pipes and discharged into the subject property (Photograph 3-1).

## 1.2. Aims and Objectives

The primary aim of this VMP is to provide a working document for re-vegetation of the watercourse via regeneration of native vegetation within the E3 zone “riparian area”. This VMP covers only the E3 zone as depicted on (Figure 1-4).

This VMP has been prepared in accordance with best practice guidelines including the NSW Office of Water Guidelines for riparian corridors to ensure the ongoing protection and restoration of the existing disturbed riparian vegetation (Figure 2-1) within the subject property. The VMP focuses on the enhancement of the E3 LAND (overland flow path) within the northern portion of the subject property (Figure 1-4).

The vegetation along the overland flow path is currently in poor condition (Table 2-1) due to past clearing of native vegetation and the establishment of weeds. The aim of this VMP is to enhance the Disturbed Riparian vegetation with native species characteristic of the pre-European vegetation Map unit 26 Narrabeen Alluvial Drainage Line Complex, to maintain habitat and movement corridors throughout the remainder of the site and to enhance the bushland landscape character.

More specifically, the objectives of this VMP pertaining to (E3 Zone) are to:

- Assess the vegetation management issues relating to the re-vegetation & regeneration areas;
- Specify appropriate measures for the re-vegetation and regeneration;
- Identify the appropriate timing of works including site preparation, planting and weed management, and provide a programme of works; and
- Identify and assign responsibilities for ongoing management actions.

## 1.3. Terminology

This report uses the following terminology:

- TSC Act abbreviates the *Threatened Species Conservation Act 1995*;
- EPBC Act abbreviates the *Environment Protection and Biodiversity Conservation Act 1999*;
- EP&A Act abbreviates the *Environmental Planning and Assessment Act 1979*;
- LGA abbreviates Local Government Area;
- VMP area is the area of land subject to management under the VMP
- Threatened species refers to those flora and fauna species listed as vulnerable, endangered or critically endangered under the TSC Act or EPBC Act
- EEC abbreviates Endangered Ecological Community;

## 1.1 Site Description

The planning and cadastral details of the subject site are provided in Table 1.1.

**Table 1-1 Site details**

<b>Location</b>	No 26-61 (Lot 1 DP 349727) Nikko Road, Warnervale NSW
<b>VMP area</b>	0.24ha
<b>Topographic Map</b>	Wyong 1:25000
<b>Local Government Area</b>	Central Coast
<b>Elevation</b>	11-15m AHD
<b>Slope</b>	The entire development area slopes in a north-easterly direction.
<b>Aspect</b>	North-south

## 1.2 Existing vegetation

The area of land subject to this VMP is the E3 land identified on Figure 1-2 which is mostly disturbed re-growth. A review of past aerial photographs has been undertaken and is apparent that the vegetation within the E3 lands was subject to past clearing and grazing (Figure 1-5).

Four vegetation communities were recorded from the subject property during a detailed flora and fauna investigation these being Map unit 28 Narrabeen Buttonderry Footslopes Forest and Map unit 30 Narrabeen Dooralong Spotted-Gum Ironbark Forest, Exotic Grassland with Scattered Trees & Disturbed Riparian Vegetation (Enviro Ecology 2017).

Full vegetation description of these communities has been provided in section 2.

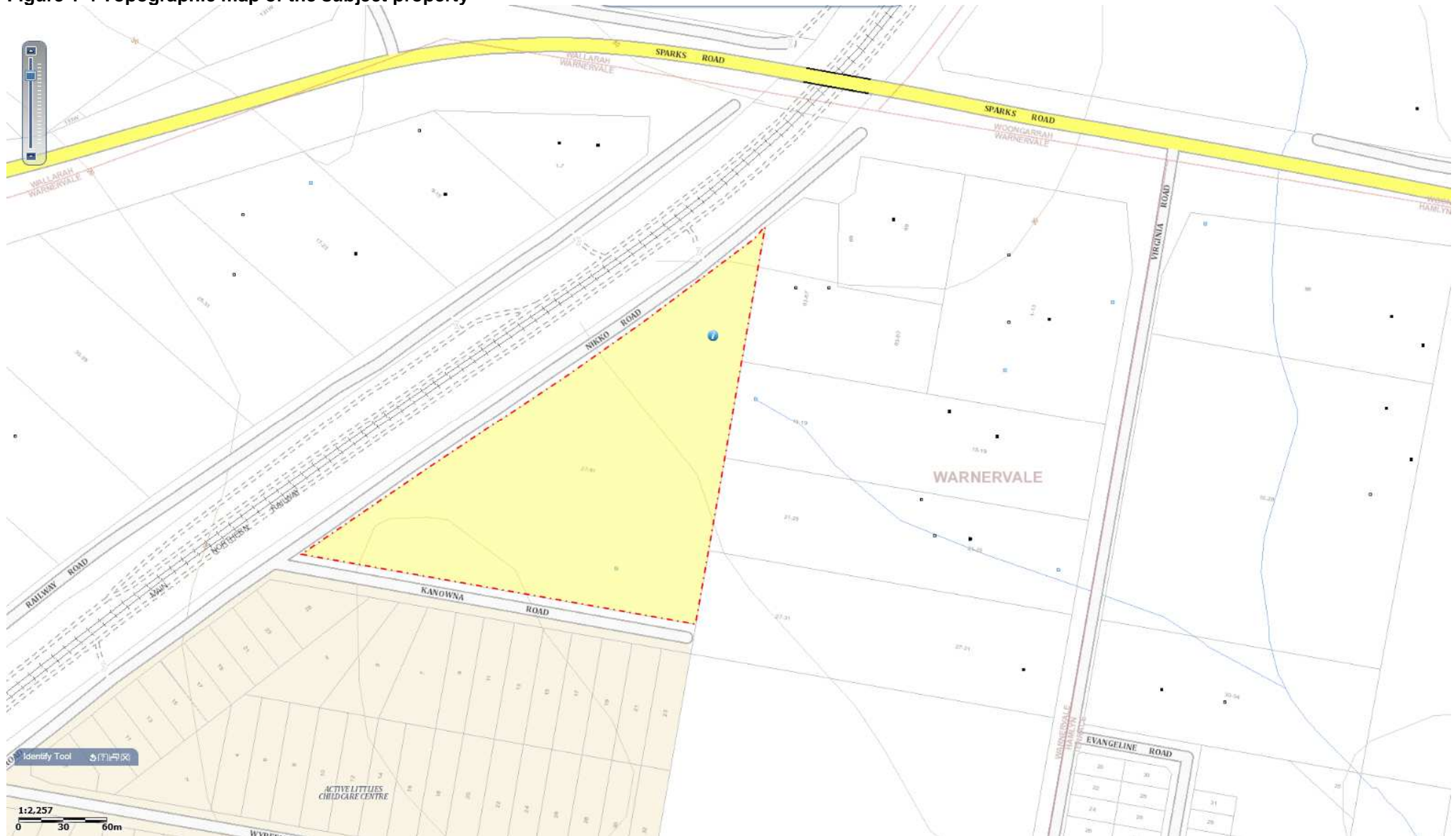
Figure 1-1 Subject property & VMP Area







Figure 1-4 Topographic map of the subject property



## 2. Methodology

This vegetation management plan was based on the results of a desktop review and recent site inspections on the 17<sup>th</sup> of May, 14<sup>th</sup>- 20<sup>th</sup> & 25<sup>th</sup> of June, 1<sup>st</sup>, 10<sup>th</sup> of July and on the 6<sup>th</sup> of August, 15<sup>th</sup>, 16<sup>th</sup> & 27<sup>th</sup> of September and on the 3<sup>rd</sup> & 13<sup>th</sup> of October 2017 and on the 16<sup>th</sup> of February 2018 by Mr John Whyte (Ecologist/Botanist) of Enviro Ecology.

### 2.1 Nomenclature

Names of plants used in this document follow Harden (Harden 1992; Harden 1993; Harden 2000; Harden 2002) with updates from PlantNet (Royal Botanic Gardens 2018). Scientific names are used in this report for species of plant. Scientific and common names of plants are listed in Tables 2-2 & Table 4-2.

### 2.2 Literature review

This assessment included a review of:

- Topographic maps
- Aerial photographs
- Vegetation Mapping of the area (Bell 2002) The natural vegetation of the Wyong Local Government Area, Central Coast, New South Wales. Wyong, Unpublished report to Wyong Shire Council, East Coast Flora Survey.
- Flora and Fauna Survey Report (*Enviro Ecology 2017*) Proposed Residential Subdivision No 26-61 (Lot 1 DP 349727) Nikko Road, Warnervale NSW
- NSW office of Water Guidelines for the preparation of vegetation management plans

### 2.3 Flora Survey

Inspections of the vegetation within the subject property were undertaken 17<sup>th</sup> of May, 14<sup>th</sup>- 20<sup>th</sup> & 25<sup>th</sup> of June, 1<sup>st</sup>, 10<sup>th</sup> of July and on the 6<sup>th</sup> of August, 15<sup>th</sup>, 16<sup>th</sup> & 27<sup>th</sup> of September and on the 3<sup>rd</sup> & 13<sup>th</sup> of October 2017. A recent site inspection was undertaken on the 16<sup>th</sup> of February 2018. The objectives of the site inspection were to:

- Identify flora species present or those that are likely to occur within the VMP area;
- Identified dominant species within native vegetation communities
- Weed species within the VMP area

This survey information has been used as a guide to the appropriate species composition for the re-vegetation of cleared areas E3 corridor.

- Activities specifically related to the preparation of this VMP included:
- Identification of weed species recorded from the VMP areas;
- Determination of appropriate re-vegetation and rehabilitation techniques for the re-vegetation area;
- Determination of appropriate weed control techniques for the re-vegetation & regeneration areas; and
- Preparation of a schedule of activities, outlining the responsibilities under this VMP and performance criteria.

## 2.4 Vegetation condition

The condition of vegetation communities is an important criterion to determine the conservation status of certain ecological communities. Vegetation in the subject was assigned to one of the following condition classes (refer Table 2-1).

**Table 2-1 Vegetation community condition classes**

Condition Class	Criteria
<b>Good</b>	Vegetation still retains the species complement and structural characteristics of the pre-European equivalent. Such vegetation has usually changed very little over time and displays resilience to weed invasion due to intact groundcover.
<b>Moderate</b>	Vegetation generally still retains its structural integrity, but has been disturbed and has lost some component of its original species complement. Weed invasion can be significant in such remnants
<b>Poor</b>	Vegetation that has lost most of its species and is significantly modified structurally. Often such areas now have a discontinuous canopy of the original tree cover and very few shrubs. Exotic species, such as introduced pasture grasses or weeds, replace much of the indigenous ground cover. Environmental weeds are often co dominant with the original indigenous species.

## 2.5 Vegetation communities

### 2.5.1 Map unit 28 Narrabeen Buttonderry Footslopes Forest

Map unit 28 Narrabeen Buttonderry Footslopes Forest (NBFF) community was found to occupy the entire study area. This community contained a similar floristic structure throughout. The vegetation condition of this community was found to be in moderate-good condition with only small area along the northern boundary containing understorey weed species.

#### Community Description

##### Canopy

Tree species commonly encountered were *Melaleuca nodosa* (Ball Honey-Myrtle), *Angophora costata* (Smooth-barked Apple), *Eucalyptus capitellata* (Brown Stringybark) with the occasional occurrence of *Corymbia maculata* (Spotted Gum), *Eucalyptus paniculata* (Grey Ironbark). The canopy ranged in height from approximately 8-18 m tall with a projected foliage cover of >15-35%.

##### Sub-Canopy

The sub-canopy was dominated by *Melaleuca nodosa* (Ball Honey-Myrtle) with the occasional occurrence of *Glochidion fernandi* (Cheese Tree), *Allocasuarina littoralis* (Black She-oak) & *Pittosporum undulatum* (Sweet Pittosporum) individual was also recorded. The sub-canopy was to a height of approximately 2-4m with a projected foliage cover of >5%.

##### Shrub understorey

Shrub species recorded were *Acacia longifolia*, *Banksia spinulosa/integrifolia*, & *Persoonia linearis/levis*. Shrubs were approximately 0.1-1.5 m tall with a projected foliage cover of >5%.

The ground layer was dominated by native groundcover species *Entolasia stricta*, *Microlaena stipoides* (Wallaby Grass), *Themeda australis* (Kangaroo Grass), *Imperata cylindrica* (Blady Grass), *Gahnia clarkei*, & *Dianella caerulea*. The ground layer along the northern boundary adjacent to cleared area was dominated by *Nephrolepis cordifolia* (Fish-bone Fern). *Gahnia sieberiana* was the dominant groundcover adjacent to an overland flow-path which passes through the subject property in a south-easterly direction.

The ground layer was to a height of 0.1-0.2m with a projected foliage cover of 50-70%.

### **Climbers**

Climbing species recorded were: *Parsonsia straminea* (Common Silkpod), *Cassytha pubescens* & *Hardenbergia Violaceae* (Native Violet).



**Photograph 2-1 Map unit 28 Narrabeen Buttonderry Footslopes Forest within the subject property**



**Photograph 2-2 Map unit 28 Narrabeen Buttonderry Footslopes Forest within the western portion of the subject property**

## 2.5.2 Map unit 30 Narrabeen Dooralong Spotted Gum-Ironbark Forest

The Narrabeen Dooralong Spotted Gum-Ironbark Forest (NDSGIF) community has been subject to past clearing of sub-canopy, shrub and ground vegetation. Despite past disturbance the NDSGIF community still retains native canopy dominance. This community was assessed as being in low-moderate condition (Table 2-1) at the time of the site inspections.

### Community Description

#### Canopy

Tree species commonly encountered were *Corymbia maculata* (Spotted Gum), *Eucalyptus paniculata* ssp. *paniculata* with the occasional occurrence of *Eucalyptus acmenoides* (White Mahogany). The canopy ranged in height from approximately 19-30m tall with a projected foliage cover of 15-45%.

#### Sub-Canopy

The sub-canopy was dominated by thickets of *Melaleuca nodosa* (Ball Honey-Myrtle) with the occasional occurrence of *Glochidion fernandi* (Cheese Tree) & *Pittosporum undulatum* (Sweet Pittosporum) being also recorded. The sub-canopy was to a height of approximately 2-4m with a projected foliage cover of >5%.

#### Shrub understorey

Shrub species recorded were *Lantana camara* (Lantana) & *Acacia longifolia*, Shrubs were approximately 0.1-1.5 m tall with a projected foliage cover of >5%.

#### Ground understorey

The ground layer was dominated predominately by exotic species however within intact areas dominated by *Melaleuca nodosa* the understorey was found to be in better condition.

Groundcover within the northern portion of this community was dominated by native groundcover species *Entolasia stricta*, *Microlaena stipoides* (Wallaby Grass), *Themeda australis* (Kangaroo Grass), *Imperata cylindrica* (Blady Grass), *Gahnia clarkei*, & *Dianella caerulea*.

The ground layer along the southern boundary adjacent to cleared area was dominated by *Nephrolepis cordifolia* (Fish-bone Fern), *Rubus fruticosus* (Blackberry), *Kikuyu* (*Pennisetum clandestinum*), *Paspalum dilatatum* (Paspalum), *Taraxacum officinale* (Dandelion) and *Plantago lanceolata*. The ground layer was to a height of 0.1-0.2m with a projected foliage cover of 50-70%.

#### Climbers

Climbing species recorded were: *Parsonsia straminea* (Common Silkpod), *Cassytha pubescens* & *Hardenbergia violaceae* (Native Violet).



**Photograph 2-3 Map unit 30 Narrabeen Dooralong Spotted Gum-Ironbark Forest**



**Photograph 2-4 Map unit 30 Narrabeen Dooralong Spotted Gum-Ironbark Forest**

### 2.5.3 Disturbed Riparian vegetation

The Disturbed Riparian vegetation community has been subject to past clearing of canopy, sub-canopy, shrub and ground vegetation. At the time of the site inspections this vegetation community was assessed as being in poor condition (Table 2-1).

#### Community Description

##### **Canopy**

Tree species were absent from this community.

##### **Sub-Canopy**

The sub-canopy was dominated by *Melaleuca sieberi*, *Glochidion fernandi* (Cheese Tree) and on the fringes of the Narrabeen Dooralong Spotted Gum-Ironbark Forest community *Melaleuca nodosa* (Ball Honey-Myrtle) was also recorded. The sub-canopy was to a height of approximately 4-9m with a projected foliage cover of >5-15%.

##### **Shrub understorey**

Shrub species frequently recorded were *Lantana camara* (Lantana), *Leptospermum polygalifolium* (Lemon-scented Tea-tree), *Ligustrum sinese* (Small-leaved Privet), *Cyathea australis* (Rough-tree Fern) & *Acacia longifolia*. Shrubs were approximately 1.5-3.5 m tall with a projected foliage cover of >5%.

##### **Ground understorey**

The ground layer along was dominated by *Rubus fruticosus* (Blackberry), *Ageratina adenophora* (Crofton Weed), *Lantana camara* (Lantana), *Verbena brasiliensis* (Veined Verbena), Kikuyu (*Pennisetum clandestinum*), *Paspalum urvillei* (Vasey Grass). The ground layer was to a height of 0.5-1.5m with a projected foliage cover of 50-85%.

##### **Climbers**

Climbing species recorded were: *Parsonsia straminea* (Common Silkpod), *Cassytha pubescens* & *Hardenbergia Violaceae* (Native Violet).



Photograph 2-5 Disturbed Riparian vegetation



**Photograph 2-6 Disturbed Riparian vegetation**



**Photograph 2-7 Disturbed Riparian vegetation**



**Photograph 2-8 Disturbed Riparian vegetation**



**Photograph 2-9 Disturbed Riparian vegetation**

Figure 2-1 Field verified vegetation communities identified from the subject property



## 3. Revegetation Management Issues

### 3.1 Hydrological environment

Threats to the hydrological environment such as soil disturbance and vegetation removal will not be significant. The hydrological environment within native bushland is unlikely to experience any significant change during or after the proposed works. At present two 450 diameter pipes (Photograph 3-1) direct water that is captured from the Rail Lands and Nikko Road and then discharges at the western boundary of the subject property (Figure 4-1). The water then flows in a north-easterly direction where it then flows into a large dam situated upon the adjoining property to the east of the subject property. The proposal will result in the creation of a detention basin (Figure 1-2) within the outer Vegetated Riparian Zone (VRZ) which will collect water from the development which will then overflow/discharge into the overland flow path located within the E3 Lands. Outlets from the detention basin are to be constructed in accordance with the NSW office of Water Guidelines for outlet structures.

**Photograph 3-1 Existing stormwater outlet off Nikko Road**



### 3.2 Soil erosion and sedimentation

Vegetation removal and re-vegetation works within the subject property will result in some minor and generally localised disturbance of soils. Erosion and sedimentation of soils from the proposed vegetation works into the adjacent bushland or the re-vegetation area is an undesirable result and should be mitigated to reduce impacts such as:

- Loss of top soil;
- Sedimentation of waterways, drainage lines; and
- Promotion of exotic weed and pests through dispersal, changes in habitat or germination of weed species

If an area of weed control or re-vegetation may cause sedimentation to occur, in particular immediately down slope of the drainage line or vegetation, then sediment control measures are to be installed Wyong Shire Council's requirements for erosion and sedimentation control. The measures will also follow best management practices in accordance with the (Department of Environment and Climate Change 2008) NSW Department of Housing and Landcom, (Landcom 2004), *Managing Urban Stormwater: Soils and Construction (Blue Book)* (NSW Department of Housing 1998). These measures will be maintained for as long as necessary after the completion of works to prevent sediment and dirty water entering the natural environment.

### 3.3 JUTE Biodegradable Erosion Control Mat

Jute biodegradable Erosion Control Matting (JBECM) is to be installed within revegetation areas (Appendix E). JBECM is to be installed within cleared areas to reduce competing weeds and the need to use damaging herbicide. JBECM geotextile weedmat allows air and water to pass unimpeded through its construction, the soil beneath it can breathe, promoting growth of desired plants while reducing evaporation and minimising watering needs. JBECM is to be utilised as it is 100% biodegradable. JBECM is to be installed two months prior to planting of tubestock.

### 3.4 Weeds

The main source of exotic weed is generated from the establishment of exotic species from weed propagules, garden refuse and green waste being dumped into adjacent bushland area as is the case with the current weeds within the bushland within the northern portion of the buffer (Figure 1-1). Past clearing of native vegetation and the establishment of pasture has resulted in simplified vegetation form with very little native species (Figure 1-1). There are large areas which are proposed to be re-vegetated (Figure 1-1) with native species (Table 4-3) which are currently dominated by exotic grasses e.g. Blackberry and Lantana and herbaceous weeds and exotic grasses which are recognized as part of a key threatening process to native bushland. The principal mechanisms for weeds establishing in an area include:

- Provision of weed seed/vegetative source e.g. Kikuyu;
- Physical disturbances to the soil via clearing of native vegetation;
- Increased soil moisture from shading and ponding of water; and
- Increased light at the margins of vegetation

### 3.5 Weed Management, suppression & control

All weeds need to be eradicated and controlled within areas of native vegetation within the subject property. During the recent site inspection detail targeted survey were undertaken to identify weeds across the VMP area (Figure 1-1) which are to be managed under the VMP.

Garden waste, weed propagules (seeds, tubers etc.) need to be periodically collected and disposed of at an approved waste transfer facility, and should not be stored or disposed of into any bushland areas.

Flora surveys conducted over VMP area identified 34 weed species, consisting of a variety of invasive, aggressive and herbaceous weeds (Table 4-2).

A variety of general weed removal techniques are to be used to suppress and control weeds within the revegetation area, including:

- cut-and-paint, stem scraping, stem injection, and frilling and chipping for woody weeds;
- hand removal and crowing for herbaceous weeds; and

Detailed weed removal techniques for the control of woody weeds, weeds with underground reproductive structures, small hand-pullable plants and vines and scramblers, are provided in Appendix B of this VMP.

### 3.6 Protective sediment Fencing

Sediment fencing (sedimentation fence) 600mm high is to be installed along the northern and eastern sides of the VMP area. The sediment fences will prevent sediment and weeds encroaching into the vegetated buffer and will also define an edge in which management can be undertaken. Sedimentation fences should be situated in accordance with guidance from the Vegetation Management Contractor/Ecologist. The protection fence is not to hinder the movement of wildlife throughout the site or harm fauna.

### 3.7 Restoration of Disturbed Areas

- Re-vegetate bare areas which are not regenerating within VMP area (Figure 1-2) with locally occurring native plants at the following planting densities and ratio (Table 3-1).
- Maintain in a weed-free condition for 3 years using low impact weed control methods (refer Appendices A & B); and
- Re-vegetation within remnant vegetation commensurate with natural species diversity, plant cover or density.

The fostering of natural processes for the promotion of vegetation regeneration within the bushland in preference to the introduction of plant material through planting regimes should be encouraged particularly within areas which are currently regenerating. However as the subject property has been subject to past clearing and garzing for many years the soils or vegetation has been significantly disturbed by exotic species or waste removal, suitable locally occurring native (endemic) bushland species are to be used to replace lost vegetation. Approximately 5532 endemic species have been selected as per Table 4-3 to be planted within the VMP Area.

**Table 3-1 Regeneration of native vegetation and/or supplementary planting ratios**

Plant Form	No of stems	Area (m <sup>2</sup> )	Revegetation Area (m <sup>2</sup> )	No of plant form	No of each species	Total to be planted	Comments
<b>Re-vegetation VMP AREA</b>							
<b>Trees</b>	1	50	2400	2	24	48	Species to be selected from Table 4-3
<b>Sub-canopy</b>	4	25	2400	3	128	384	Species to be selected from Table 4-3
<b>Shrubs</b>	1	8	2400	5	60	300	Species to be selected from Table 4-3
<b>Groundcovers</b>	2	1	2400	6	800	4800	Species to be selected from Table 4-3

## 4. Vegetation Management Plan

This chapter outlines the major activities to be undertaken as part of the VMP. They include the following:

- Impact Mitigation;
- Program of Works:
- Proposed Weeding Activities:
  - Primary Weeding;
  - Secondary Weeding or Follow-up Weeding;
  - Maintenance Weeding;
  - Planting;
  - Local provenance (plant material)
  - Soil Erosion and Drainage;
  - Re-vegetation-regeneration works;
  - Monitoring & auditing

This plan outlines the required vegetation management activities to be undertaken within the VMP Area “E3 Zone”. The property owner will be responsible for engaging contractors to ensure the requirements of this plan are executed to the satisfaction of the Central Coast Council.

The roles and responsibilities of staff undertaking rehabilitation works are identified and a schedule of activities provided for the first two years of implementation of the program.

The Re-vegetation works will be subject to this plan for the time frames outlined under section 4.2.

The *Program of Works* (Table 4-1) outlines the proposed works for the site.

## 4.1 Required Qualifications and Experience

All vegetation management works are to be undertaken by persons with minimum TAFE Bush Regeneration Certificate III qualification (previously called Certificate II) and supervised by a worker with TAFE Bush Regeneration Certificate IV qualification (previously called Certificate III or an Ecologist, with at least 5 years experience in Ecology of this area. See Australian Association of Bush Regenerators Web Site for a list of Bush Regeneration Companies – <http://www.aabr.org.au/>.

The engaged bush-contractor may also engage non-qualified personnel to assist with vegetation works provided that personnel are inducted into the VMP area. The bush contractor is to manage and supervise staff ensuring that threatened species & native vegetation is not impacted upon.

The techniques to be used by non-qualified personnel to remove weeds are to be undertaken in accordance with Appendix A- - (Weed Management Techniques). Non-qualified personnel may undertake revegetation works in accordance with Appendix C- (Revegetation Methods). All VMP works to be undertaken by non-qualified personnel are to be undertaken under the guidance & supervision of the qualified bush contractor

## 4.2 Impact Mitigation

The mitigation of potential adverse impacts of the proposed development will be implemented through the following procedures:

- Implementation of erosion and sediment control measures prior to the commencement of re-vegetation in areas where erosion is likely to impact on retained vegetation. This involves installation of filter fences down slope of re-vegetation-regeneration areas.
- Placement of plants within re-vegetation areas is to avoid planting against rough barked tree species and preferably in discontinuous clumps & spatially arranged to simulate the natural arrangement of plant communities.
- Removal of weeds and weed propagules in such a manner that they are not spread to other areas;
- Application of appropriate weed control / bush regeneration methods;
- Regeneration and enrichment planting (re-vegetation) of disturbed areas
- Retention of ground and shrub vegetation within the re-vegetation area for fauna refuge; and
- Use of locally occurring native (Endemic) species in all landscaping.
- Vehicles and other equipment to be used in weed works are to be received completely free of soil, seeds and plant material before entering the subject property to prevent the introduction of exotic plant species and pathogens. Equipment failing inspection should be sent away for cleaning.

### 4.3 Program of Works

The *Program of Works* (Table 4.1 below) is aimed at providing a framework for enacting relevant rehabilitation and re-vegetation, maintenance and monitoring and review programs. The implementation is the responsibility of the landholders in association with an ecologist. The re-vegetation works will take up to one year or longer to establish. The re-vegetation/re-generation works will continue for several years until the mass planting is sufficient to dominate exotic weed plants.

**Table 4-1 Proposed Vegetation Management Schedule of Activities**

Action	Responsibility	Performance Criteria	Timing
<b>Prior to commencement of works within Re-vegetation area</b>			
Native Plant Nursery to collect seed of parent plant material selecting only species from Table 4-3 which are dominant of vegetation description as per section 2-4.	Vegetation Management Contractor/Ecologist	Contacted Nursery prior to any works	Prior to commencement of any works
Collect baseline monitoring data (photos and quadrat)	Ecologist		Prior to commencement of any works
Install sediment fence along the western boundary of the vegetated buffer	Vegetation Management Contractor/Ecologist	Installation of sediment fence	Prior to commencement of any works
<b>Regeneration/Re-vegetation area Preparation</b>			
Signage is to be erected on protective fencing at the edge of the regeneration/revegetation area around VMP area in accordance with section 3.6 once protective fencing has been installed. Signs are to be spaced at sufficient intervals around the perimeter of the revegetation/regeneration area.	Vegetation Management Contractor/Ecologist	Signage erected on protective fencing once fence is installed.	Ongoing
Development activities to be excluded entirely from re-vegetation area. No plant or equipment will be parked within re-vegetation/regeneration area and no construction materials e.g. mulch or soil (or waste products from re-vegetation works) e.g. weeds removed are to be stockpiled in these areas.	Vegetation Management Contractor/Ecologist	Vehicles and plant excluded from surrounding vegetation for	Duration of development

Action	Responsibility	Performance Criteria	Timing
		duration of earthworks.	
Site Delineation – fence (1.8m tall metal chain wire fencing) to be constructed around Re-vegetation Areas and signage erected. Location of temporary stockpile outside the re-vegetation/ regeneration areas and remnant native vegetation is to be identified and marked. Signage to be erected ‘no go’ unless authorised on fence surrounding the regeneration/revegetation area.	Vegetation Management Contractor/Ecologist	Fence and signage erected.	Prior to commencement of development
<b>Weeding</b>			
Carry out primary weeding within the VMP AREA within the first year following vegetation clearing.	Vegetation Management Contractor/Ecologist	Main weed infestations and targeted or noxious weeds removed	Following site preparation
If pesticides are used, contractors must ensure compliance with the <i>Pesticides Act 1999</i> .	Vegetation Management Contractor/Ecologist	Pesticides used as per the Pesticide Act provisions	Ongoing
Ensure use of herbicides that are suitable for use in environmentally sensitive areas such as Round up Bioactive®.	Vegetation Management Contractor/Ecologist	Vegetation Management Contractor has appropriate qualifications for herbicide use; Roundup Bi-Active (or equivalent) is used.	Ongoing
Ensure compliance with <i>Bio-security Act 2015</i> ; i.e. organise removal from site of noxious weed propagules and biomass, as per specific action control categories for	Vegetation Management Contractor/Ecologist	Noxious weeds controlled as per	Ongoing

Action	Responsibility	Performance Criteria	Timing
each species.		Noxious Weeds Act provisions.	
Carry out secondary weeding.	Vegetation Management Contractor/Ecologist	Weed regrowth following primary weeding removed, secondary infestations removed.	Approximately 2 weeks following primary weeding, before planting and every 3-6 following secondary weeding
Weed biomass to be either composted on-site or disposed of at an approved waste management centre, as appropriate for each weed species.	Vegetation Management Contractor/Ecologist	Weed biomass disposed of correctly – not stockpiled on site.	Ongoing
<b>Planting</b>			
Only locally indigenous plant stock to be planted within re-vegetation areas as per Table 4-3.	Vegetation Management Contractor/Ecologist	Tubestock and cellstock comprise locally indigenous species. Evidence of provenance of plant stock.	Following secondary weeding
Installation of Jute biodegradable Erosion Control Matting (JBECM)	Vegetation Management Contractor/Ecologist		2 months prior to planting
Brush matting – Revegetation areas (VMP area) may be mulched utilising mulch generated from vegetation clearing works within the development area provided it has cured for at least 2 months and only within bare areas.	Vegetation Management Contractor/Ecologist	Mulch may be utilised in revegetation areas and to stabilise bare	After 2 months of being mulched.

Action	Responsibility	Performance Criteria	Timing
		areas to a depth of 100mm only. No mulch is to be utilised in regeneration areas.	
<b>Maintenance</b>			
Carry out maintenance weeding throughout re-vegetation & regeneration area	Vegetation Management Contractor/Ecologist	Weed cover maintained at less than 5% of vegetation cover. Regrowth following secondary weeding controlled. No new weed species or infestations.	Every three -six months for up to 3 years from date of final planting.
Carry out replacement of plant stock.	Vegetation Management Contractor/Ecologist	Minimum 80% original planted stock maintained No dead plant stock left in ground.	Every three months for a period of one year from date of final planting
On-going management of re-vegetation & regeneration area.	Vegetation Management Contractor/Ecologist	Weed levels in the Re-vegetation areas maintained at less than 5% of	Ongoing, as required

Action	Responsibility	Performance Criteria	Timing
		vegetation cover.	
<b>Monitoring (Regeneration/ Re-vegetation Works)</b>			
Take baseline monitoring photos and complete monitoring sheet (Appendix D).	Vegetation Management Contractor/Ecologist	The data sheet (Appendix D) must be photocopied and filled in after bush revegetation works have been carried out. All boxes must be filled in and the map must be marked with the relevant information on the data sheets and photos taken. Records are to be kept and the data sheets and photos are to be submitted to Councils Ecologist.	Once every six months to provide progress on revegetation works up to three years once VMP works commence.

## 4.4 Proposed Weeding Activities

The objectives of management actions are to protect natural vegetation (existing native vegetation within the areas subject to weed removal, re-vegetation & regeneration area. This will primarily involve the removal of exotic grasses and herbaceous weeds and the replanting of suitable native species within the regeneration/re-vegetation area (Table 4-2) and the ongoing maintenance of remnant vegetation and disturbed areas.

## 4.5 Primary Weeding

Primary weeding is the initial weeding. It is recommended that primary weeding should be carried out across the entire VMP area to remove the majority of dominant weeds within the re-vegetation areas. This involves removal of weeds through herbicide use and hand removal. It is important to note primary weeding usually initiates new growth of both weeds and native species. Primary weeding of the site may take up to 3 weeks to adequately control exotic pasture species.

## 4.6 Secondary or Follow-up Weeding

Secondary or follow-up weeding involves intensive weeding in areas that have already received primary work to remove weed re-growth or overlooked weeds. It is recommended that secondary weeding be conducted two weeks after primary weeding and the every 3-6 months after. Secondary weeding of the site may take up to 3 weeks or progressively over 12 months.

### 4.6.1 Maintenance Weeding

After primary and secondary weeding and natural regeneration of the bushland, the area should be able to resist most weeds. However, weeds will re-establish within the VMP area from bird, wind, water transport and other seed or propagules dispersal mechanisms within the VMP area. Maintenance weeding should be undertaken once or twice a year until such time as the resistance of the bushland to weeds increases, then only requiring hand-weeding every two to three years. Maintenance weeding of the site may take up to three weeks.

Regeneration of dominant natural plant species is expected to occur over a 2 year period provided ongoing management works are maintained. To allow regeneration to occur weed blooms need to be controlled within 2 years of commencing weed control works. Follow-up maintenance weeding is required every 3-6 months after for up to 3 years.

The use of herbicides is needed where hand removal of weeds is impractical. The use of Glyphosate based herbicides is recommended in accordance with the manufacturers labels.

The potential for destabilizing soils and causing erosion as a result of spraying vegetation with herbicide needs to be considered prior to commencement of weed control works.

Only operators with Chemcert or equivalent training must undertake the spraying of weeds. The operator must evaluate the success of each treatment after a set period of time according to the labelled effectiveness for each herbicide. Care must be taken when applying herbicides near water bodies due to the sensitivity of the waterways, and flora and fauna, to runoff containing these herbicides.

All herbicides must be applied according to the herbicide usage label and provisions of the Protection of the Environmental Operations Act (NSW).

Exotic species targeted for removal throughout the duration of the management plan are listed in (Table 4-2) below. These are exotic species that have been observed on site within the re-vegetation/regeneration areas. Generic management strategies enabling appropriate removal of these species are provided in Appendix B.

**Table 4-2 Exotic species recorded within the VMP area**

Scientific Name	Common Name
<i>Ageratina adenophora</i>	Crofton Weed
<i>Andropogon virginicus</i>	Whisky Grass
<i>Asparagus aethiopicus</i>	Asparagus Fern
<i>Bidens pilosa</i>	Cobbler's Pegs
<i>Briza maxima</i>	Quaking Grass
<i>Briza minor</i>	Shivery Grass
<i>Bryophyllum delagoense</i>	Mother of millions
<i>Chloris gayana</i>	Rhodes Grass
<i>Cinnamomum camphora</i>	Camphor Laurel
<i>Cirsium vulgare</i>	Spear Thistle
<i>Cyperus eragrostis</i>	Umbrella Sedge
<i>Ehrharta erecta</i>	Panic Veldtgrass
<i>Eichhornia crassipes</i>	Water Hyacinth
<i>Erythrina X sykesii</i>	Coral tree
<i>Hydrocotyle bonariensis</i>	
<i>Hypochaeris radicata</i>	Catsear
<i>Juncus cognatus</i>	
<i>Lantana camara</i>	Lantana
<i>Ligustrum lucidum</i>	Large-leaved Privet
<i>Ligustrum sinense</i>	Small-leaved Privet
<i>Lonicera japonica</i>	Japanese Honeysuckle
<i>Paspalum dilatatum</i>	Paspalum
<i>Pennisetum clandestinum</i>	Kikuyu Grass
<i>Richardia brasiliensis</i>	Mexican Clover
<i>Rubus fruticosus</i>	Blackberry complex
<i>Rumex crispus</i>	Curled Dock
<i>Senecio madagascariensis</i>	Fireweed
<i>Setaria gracilis</i>	Slender Pigeon Grass
<i>Sida rhombifolia</i>	Paddy's Lucerne
<i>Sonchus oleraceus</i>	Common Sowthistle
<i>Thunbergia alata</i>	Black-eyed Susan
<i>Verbena bonariensis</i>	Purpletop
<i>Verbena brasiliensis</i>	
<i>Verbena rigida</i>	Veined Verbena

The primary stages of the weeding phase of this plan are estimated to take approximately three weeks, while the secondary and ongoing maintenance stage for the restoration process should continue for at least two years in order to achieve effective control. Maintenance and regeneration should continue after 3 years on a needs basis.

Monitoring of the progress of weed removal, plant growth and natural regeneration should be undertaken on a six monthly basis with progress reports, including photographs, prepared and forwarded to Central Coast Council Development Planner Ecologist. In addition to the six-monthly reports, a final report certifying the completion of the works is to be submitted at the end of the three year period.

## 4.7 Planting

A review of the natural vegetation of the Wyong Local Government Area, Central Coast, New South Wales (Bell 2002) and extensive ground-truthing of vegetation within VMP area and the presence of remnant trees, scattered shrubs and groundcovers within the area subject to re-vegetation works. The vegetation to be reinstated within the re-vegetation-regeneration areas (VMP area) is to be Map unit 26 Narrabeen Alluvial Drainage Line Complex. Species to be planted will be in accordance with Table 4-3 below and are the dominant species across this community as per sections 2.5. The number of each species to be planted is detailed below.

**Table 4-3 Flora species proposed to be planted within the VMP Area**

Family	Scientific Name	Common Name	VMP Area	Total of each species
<b>Trees</b>				
Myrtaceae	<i>Eucalyptus robusta</i>	Swamp Mahogany	24	24
Myrtaceae	<i>Eucalyptus resinifera</i>	Red Mahogany	24	24
<b>Sub-canopy</b>				
Myrtaceae	<i>Melaleuca nodosa</i>	Ball Honey Myrtle	128	128
Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly Paperbark	128	128
Myrtaceae	<i>Melaleuca sieberi</i>		128	128
<b>Shrubs</b>				
Proteaceae	<i>Banksia robur</i>	Swamp Banksia	60	60
Myrtaceae	<i>Leptospermum grandifolium</i>	Mountain Tea-tree	60	60
Myrtaceae	<i>Leptospermum polygalifolium</i>	Lemon-scented Tea-tree	60	60
Euphorbiaceae	<i>Glochidion ferdinandi</i>	Cheese Tree	60	60
Myrtaceae	<i>Melaleuca thymifolia</i>		60	60
<b>Groundcovers</b>				
Cyperaceae	<i>Carex appressa</i>	Tall Spike Rush	800	800
Cyperaceae	<i>Gahnia clarkei</i>	Saw Sedge	800	800
Cyperaceae	<i>Lepyrodia scariosa</i>		800	800
Cyperaceae	<i>Gymnostachys anceps</i>	Settlers Flax	800	800
Cyperaceae	<i>Leptocarpus tenax</i>	Slender Twin Rush	800	800
Cyperaceae	<i>Schoenus brevifolius</i>	Zig Zag Bog Rush	800	800

## 4.8 Local provenance (Plant Material)

A native plant nursery is to be engaged to collect local provenance seed material from within the site and locality (5km) to be propagated for revegetation works. The re-vegetation works will take up to one year or longer to establish due to the lag phase in collecting plant material, propagation and growing plants. This should not prevent the commencement of other works as part of any stage.

## 4.9 Soil Erosion and Drainage

Erosion and sediment control measures are to be implemented on a needs basis to minimise adverse effects as a result of increased erosion and sediment loading. These include:

- Coordinated work practices aimed at minimising land disturbance;
- Identification of potential erosion areas;
- Installation and maintenance of flow, erosion, sediment and nutrient control structures particularly around re-vegetation/regenerations areas;
- Maintenance of sedimentation fencing surrounding re-vegetation (northern and southern boundaries of the VMP Area)
- Routine site inspections of any sediment control fences and/or structures
- The safe disposal of all waste products
- The minimisation of soil erosion will be achieved through soil stabilisation measures, sediment fencing, water control techniques and re-vegetation of cleared surfaces via brush matting and tubestock planting.

## 4.10 Impacts on Native flora

Where good quality or sensitive vegetation is present only hand removal or slashing methods will be employed to minimise adverse impacts on native species this is of particular relevance within area which contain low weed abundance.

### 4.10.1 Revegetation-regeneration Works

Re-vegetation works will be undertaken across the VMP Area (Figure 1-1) where weed control works result in the creation of bare areas. These works will be undertaken in accordance with Appendix B. Re-vegetation/regeneration works will concentrate on removal of all weed species (Table 4-2) and planting (Table 4-3) out the entire VMP area.

Mulching is an efficient method to impede the establishment of weed species, soil erosion, compaction and desiccation. Woodchip or other suitable mulch generate from clearing works may to be placed at a depth of 75-100mm covering any areas subject to re-vegetation works. Areas surrounding the stems/trunks of plants are to be kept free from mulch, thereby reducing the incidence of collar rot on retained or planted flora. Only mulch generated from area approved to be cleared which is clean of exotic material is to be used within re-vegetation areas.

### 4.10.2 Monitoring and auditing

The *Project Ecologist* is to monitor the success of the bush regeneration works, so that appropriate remedies can be pursued.

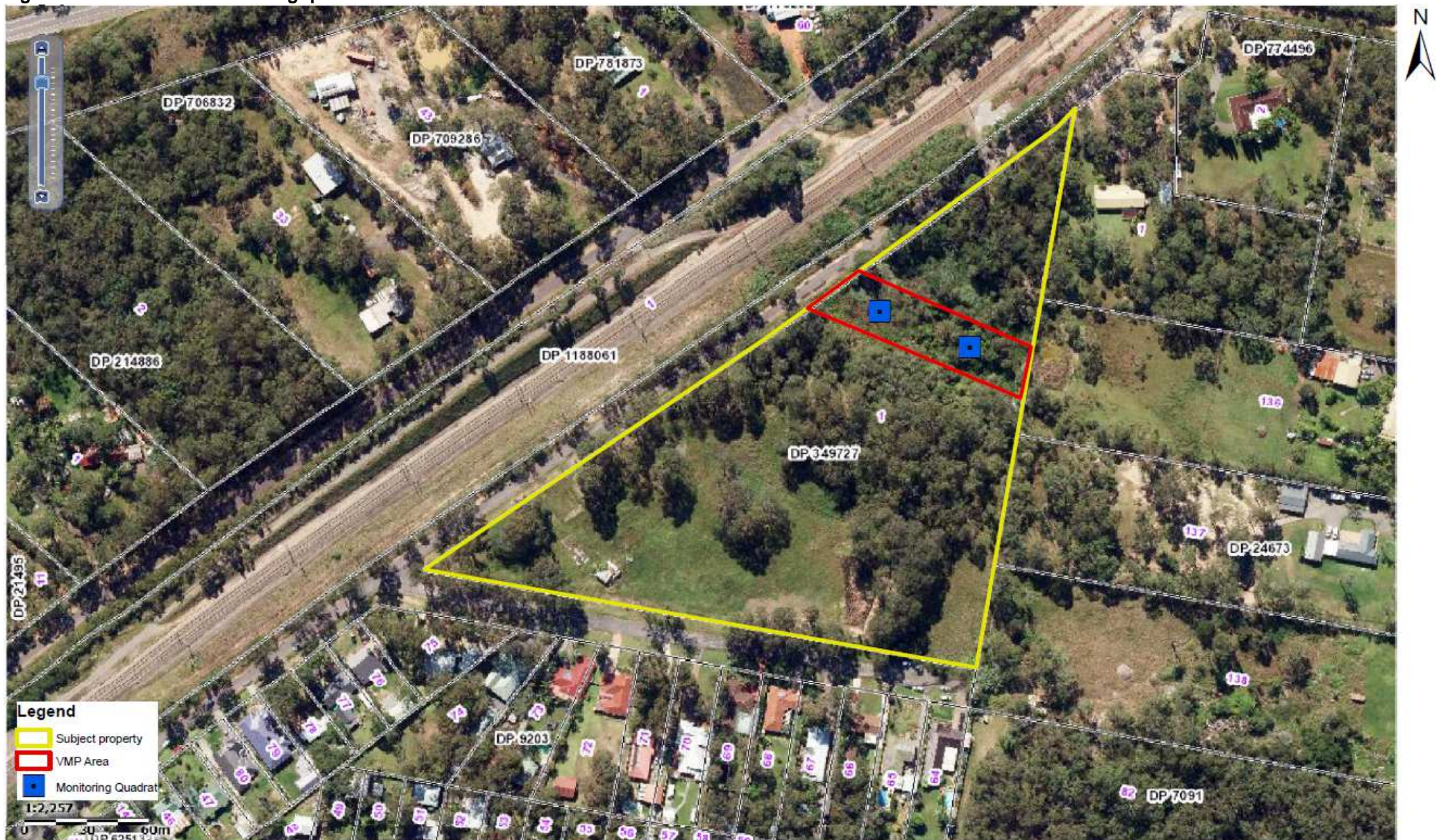
Monitoring activities will be undertaken during the bush regeneration works and will involve:

- Baseline data is to be collected prior to revegetation/regeneration works being undertaken. Photo points & quadrat monitoring plots are to be established throughout the revegetation/regeneration areas to monitor the success of VMP works. Monitoring of vegetation within the subject property should be undertaken on a 6 monthly basis for up to three years post vegetation clearance.
- 6-monthly updating of the photo points and quadrat monitoring data; and
- Compilation of six months *Monitoring Reports* to Central Coast Council's Development Planner Ecologist for up to 3 years.

**Table 4-4 Flora quadrat Monitoring Dates**

Inspection Number	Inspection Timing	Date inspection was undertaken
1	(6 Months) Year 1	
2	(12 Months) Year 1	
3	(18 Months) Year 2	
4	(24Months) Year 2	
5	(30 Months) Year 3	
6	(36 Months) Year 3	

Figure 4-1 Location of monitoring quadrats within the VMP area





## 5. References

- Bell, S. A. J. (2002). The natural vegetation of the Wyong Local Government Area, Central Coast, New South Wales. Wyong, Unpublished report to Wyong Shire Council, East Coast Flora Survey.
- Enviro Ecology (2017). Flora and Fauna Survey Report for a Proposed Residential Subdivision of No 26-61 (Lot 1 DP 349727) Nikko Road, Warnervale NSW
- Department of Environment and Climate Change (2008). Managing Urban Stormwater: soils and construction, Vol 2D: main road construction. South Sydney, Department of Environment and Climate Change NSW.
- Harden, G. (1992). Flora of New South Wales Volume 3. Kensington, University of New South Wales Press Ltd.
- Harden, G. (1993). Flora of New South Wales Volume 4. Kensington, University of New South Wales Press Ltd.
- Harden, G. (2000). Flora of New South Wales Volume 1 (Revised Edition). Kensington, University of New South Wales Press Ltd.
- Harden, G. (2002). Flora of New South Wales Volume 2 (Revised Edition). Kensington, University of New South Wales Press Ltd.
- Landcom (2004). Soils and construction: managing urban stormwater.
- National Trust of Australia (1999). Bush Regenerators' Handbook. NSW, National Trust of Australia.
- NSW Department of Housing (1998). Managing Urban Stormwater: Soils and Construction, NSW Department of Housing.
- Royal Botanic Gardens. (2018). "PlantNet - The Plant Information Network System of Botanic Gardens Trust (version 2.0)." from <http://plantnet.rbgsyd.nsw.gov.au/>.

## **Appendix A**

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### Weed Management Techniques

Noxious and environmental weeds are to be controlled in accordance with the following specifications and bush regeneration methods of Appendix B. The following weed management techniques; as recommended by the National Trust, NSW National Parks and Wildlife Service and Australian Association of Bush Regenerators; are to be used for all activities as specified under this Vegetation Management Plan.

### **Woody Weeds Removal Techniques:**

#### Cut and Paint (Woody weeds to 10 cm basal diameter)

Make a horizontal cut close to the ground using secateurs, loppers or a bush saw; and

Immediately apply herbicide to the exposed flat stump surface.

#### *Considerations:*

Cuts should be horizontal to prevent herbicide from running off the stump, sharp angle cuts are hazardous;

Herbicide must be applied immediately before the plant cells close (within 30 seconds) and translocation of herbicide ceases;

If plants re-sprout cut and paint the shoots after sufficient re-growth has occurred; and

Stem scraping can be more effective on some woody weeds.

See Figure 5-3 for further details

#### Stem Injection

At the base of the tree drill holes at a 45 degree angle into the sapwood;

Fill each hole with herbicide immediately; and

Repeat the process at 5 cm intervals around the tree.

#### Frilling or Chipping

At the base of the tree make a cut into the sapwood with a chisel or axe;

Fill each cut with herbicide immediately; and

Repeat the process at 5 cm intervals around the tree.

#### *Considerations:*

Plants should be actively growing and in good health;

Deciduous plants should be treated in spring and autumn when leaves are fully formed;

For multi-stemmed plants, inject or chip below the lowest branch or treat each stem individually; and

Herbicides must be injected immediately before plant cells close (within 30 seconds) and translocation of herbicide ceases.

### **Small Hand-Pullable Plants Removal Techniques:**

#### Hand Removal

Remove any seeds or fruits and carefully place into a bag;

Grasp stem at ground level, rock plant backwards and forwards to loosen roots and pull out; and

Tap the roots to dislodge any soil, replace disturbed soil and pat down.

*Considerations:*

Leave weeds so roots are not in contact with the soil e.g. hang in a tree, remove from site or leave on a rock.

See Figure 5-2 for further details

**Vines and Scramblers Removal Techniques:**

Hand Removal

Take hold of one runner and pull towards yourself;

Check points of resistance where fibrous roots grow from the nodes;

Cut roots with a knife or dig out with a trowel and continue to follow the runner;

The major root systems need to be removed manually or scrape/cut and painted with herbicide; and

Any reproductive parts need to be bagged.

See Figure 5-4 for further details

Stem Scraping

Scrape 15 to 30 cm of the stem with a knife to reach the layer below the bark/outer layer; and

Immediately apply herbicide along the length of the scrape.

*Considerations:*

A maximum of half the stem diameter should be scraped. Do not ringbark;

Larger stems should have two scrapes opposite each other; and

Vines can be left hanging in trees after treatment.

**Weeds with Underground Reproductive Structures Removal Techniques:**

See Figure 5-3 for further details

Hand Removal of Plants with a Taproot

Remove and bag seeds or fruits;

Push a narrow trowel or knife into the ground beside the tap root, carefully loosen the soil and repeat this step around the taproot;

Grasp the stem at ground level, rock plant backwards and forwards and gently pull removing the plant; and

Tap the roots to dislodge soil, replace disturbed soil and pat down.

See Figure 5-1 for further details

Crowning

Remove and bag stems with seed or fruit;

Grasp the leaves or stems together so the base of the plant is visible;

Insert the knife or lever at an angle close to the crown;

Cut through all the roots around the crown; and

Remove and bag the crown.

#### Herbicide Treatment – Stem Swiping

Remove any seed or fruit and bag; and

Using an herbicide applicator, swipe the stems/leaves.

#### *Considerations:*

Further digging may be required for plants with more than one tuber;

Some bulbs may have small bulbils attached or present in the soil around them which need to be removed;

It may be quicker and more effective to dig out the weed;

Protect native plants and seedlings; and

For bulb and corm species the most effective time to apply herbicide is after flowering and before fruit is set.

Exotic vegetation should be removed and stockpiled in a clear area away from adjoining bushland. This stockpile should be removed from the site at a convenient time. As part of the regular maintenance of the restored area any re-growth of the exotic plant species should be removed and disposed of appropriately.

#### *Use of Herbicides*

Herbicides are only to be used by trained personnel who hold a Chem Certificate. Herbicides should not be applied prior to rain occurring. This reduces the herbicides effectiveness as well as being transported in runoff to creek lines and waterways.



An advantage of herbicide use is the low time taken to spray weeds as compared to physically removing them, particularly for large infestations of weeds.

Enviro Ecology recommends that the use of herbicides should be considered when:


- There are small areas of dense weeds with few or no native plants to protect
- There are large areas of weeds
- The weeds are growing too rapidly for physical removal

The spraying of weeds must only be undertaken by experienced persons with Chemcert or equivalent qualifications. The success of each treatment must be evaluated by the operator after a set period of time and re-applied (if necessary) according to the labeled effectiveness for each herbicide. Care must be taken when applying herbicides near drainage lines to avoid excess use due to the sensitivity of the water bodies into which runoff will eventually flow.

Figure 5-1 Control of small hand-pullable plants

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Association  
of Bush  
Regenerators

Illustrations: V.Bear

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## Control of Small Hand-pullable Plants

**To Control:**

- Small soft weeds eg. fleabane, crofton weed, small grasses
- Seedlings of any weeds including privet, lantana, moth vine

### METHODS OF REMOVAL

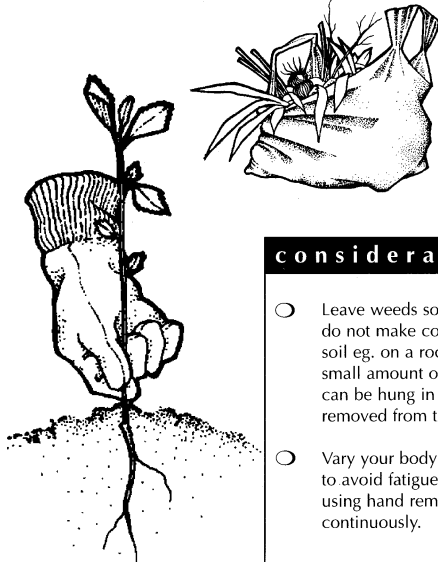
**1 HAND REMOVAL (Minimal Disturbance)**

**STEP 1** Gently remove any seeds or fruits and carefully place into a bag.

**STEP 2** Grasp stem at ground level.

**STEP 3** Rock plant backwards and forwards to loosen roots, and pull out gently.



**STEP 4** Carefully tap the roots to dislodge any soil. Replace disturbed soil and pat down.




### considerations

- Leave weeds so that roots do not make contact with soil eg. on a rock - a small amount of debris can be hung in a tree or removed from the site.
- Vary your body position to avoid fatigue when using hand removal continuously.

Figure 5-2 Control of weeds with underground reproductive structures

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of Bush  
Regenerators

Illustrations: V.Bear

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## Control of Weeds with Underground Reproductive Structures

**Examples: Weeds with**

- Tap roots - catsear, dandelion
- Rhizomes - asparagus fern, ginger plant
- Bulbs and corms - oxalis, onion weed, watsonia, freesias, montbretia
- Tubers - madiera vine, arrow head vine

### METHODS OF REMOVAL

**1 HAND REMOVAL OF PLANTS WITH A TAPROOT**  
Examples: Paddy's lucerne, dandelion

**STEP 1** Gently remove and bag seeds or fruit.

**STEP 2** Push a narrow trowel or knife into the ground next to the taproot. Carefully loosen soil. Repeat this step around the taproot.

**STEP 3** Grasp stem at ground level, rock plant backwards and forwards and pull gently.

**STEP 4** Gently tap the roots to dislodge soil. Replace disturbed soil and lightly pat down.

**2 CROWNING (Many grasses can be crowned)**  
Example: asparagus fern

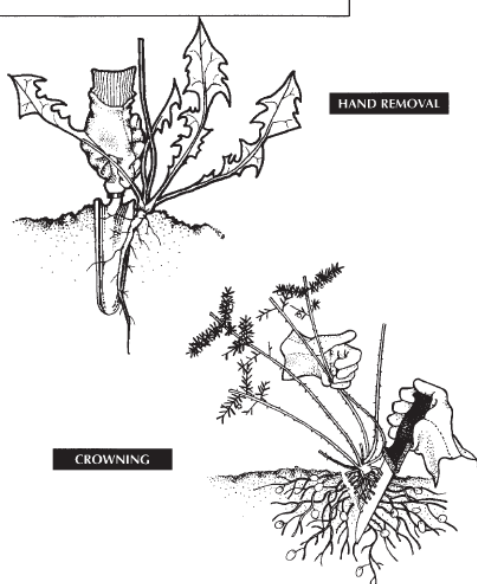
**STEP 1** Gently remove and bag stems with seed or fruit.

**STEP 2** Grasp the leaves or stems together so that the base of the plant is visible.

**STEP 3** Insert, at an angle, a knife or lever, close to the "crown".

**STEP 4** Cut through all the roots around the crown.


**STEP 5** Remove and bag the crown.




HAND REMOVAL

CROWNING


Figure 5-3 Control of woody weeds



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## Control of Woody Weeds

**Examples of woody weeds include:**

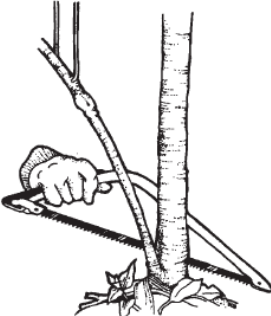
- lantana, bitou bush, cotoneaster, privet (cut and paint)
- camphor laurel, Mickey Mouse bush (ochna) and cassia/senna (stem scrape)

METHODS OF REMOVAL

**1 CUT AND PAINT**—Useful for small to medium sized woody weeds up to 10cm basal diameter

**STEP 1** Make a horizontal cut as close to the ground as possible with secateurs, loppers or a bush saw.


**STEP 2** Immediately apply herbicide to the exposed flat stump surface.



SAFETY CONSIDERATIONS

The following general precautions should be made when using herbicides:

- Read the label before opening the container and follow the instructions.
- Wear protective clothing as directed on the label.
- Wash hands after use and before eating or smoking.




considerations


- Cuts should be horizontal to prevent herbicide from running off the stump. Sharp angle cuts are hazardous.
- Herbicide must be applied immediately before the plant cells close and translocation of herbicide ceases.
- If plants resprout, cut and paint the shoots after sufficient regrowth has occurred.
- Stem scraping can be more effective on some woody weeds.

Illustrations: V.Bear


Figure 5-4 Control of vines & scramblers



NATIONAL TRUST

NSW NATIONAL PARKS AND WILDLIFE SERVICE

Australian Association of Bush Regenerators

BUSH REGENERATION INFORMATION SHEET

## Control of Vines and Scramblers

**Examples of vines include:**

- balloon vine, morning glory, honeysuckle, cape ivy, jasmine, madeira vine, blackberry

METHODS OF REMOVAL

**1 HAND REMOVAL**

**STEP 1** Take hold of one runner and gently pull it along the ground towards you.

**STEP 2** Check points of resistance where fibrous roots grow from the nodes. Cut roots with a knife or dig out with a trowel and continue to follow the runner.

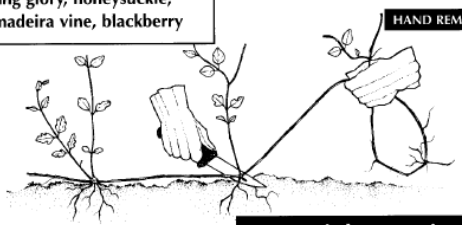
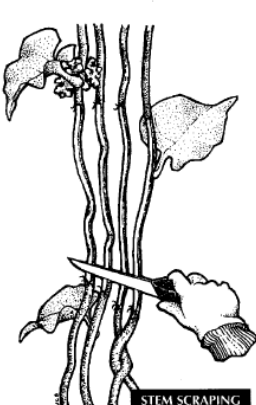
**STEP 3** The major root systems need to be removed manually or scrape/cut and painted with herbicide.

**STEP 4** Bag any reproductive parts.

**2 STEM SCRAPING**

**STEP 1** With a knife, scrape 15 to 30 cm of the stem to reach the layer below the bark/outer layer.

**STEP 2** Immediately apply herbicide along the length of the scrape.

considerations

- A maximum of half the stem diameter should be scraped. Do not ring bark.
- Larger stems (>1cm) should have two scrapes opposite each other.
- Aerial tubers on madeira vine should die with the plant when stem scraping is used. Those that fall from the plant in the scraping process need to be bagged.
- Vines can be left hanging in trees after treatment.

Illustrations: V.Bear

## **Appendix B**

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### Re-vegetation Methods

## **Weed Control**

Weed removal shall include any species likely to significantly invade bushland, prevent natural regeneration, or impede native seedling growth. Although priority shall be given to species listed as “Declared weeds” in the LGA, all weed species identified within the subject site are to be controlled in accordance with the appropriate herbicide label.

## **Weeding Techniques**

See Appendix A for detailed weed control techniques. Within the bush regeneration context weed control is described as the removal or control of weeds using hand removal and/or the application of selected herbicides. In specific circumstances, the use of machinery is used when the extent of the infestation is very large and machinery usage will not cause significant erosion or destabilisation. Weeding techniques should be appropriate to the weed type, growth form and to the existing site conditions.

Wherever possible, weed removal should be carried out prior to annual seed set. It is important to plan herbicidal control of targeted species according to a weeding calendar that recognises the weed's life form and seasonality (i.e. flowering, fruiting and seed set).

The techniques and methodologies used for bush regeneration shall conform to those identified in the National Trust Bush Regenerators Handbook (National Trust of Australia 1999) and currently taught through the NSW TAFE Bushland Regeneration Certificate Course.

## **Use of Herbicides**

Herbicides are only to be used by trained personnel who hold a Chem Certificate. The herbicide of choice for bush regeneration work is glyphosate (Roundup). Roundup Bi-active or equivalent shall be used within 5m adjacent to the drainage lines or in wet areas this of particular relevance for re-vegetation of the area proposed herewith this VMP.

Herbicide application shall be limited to the following techniques:

- Cut-stump and poison (cut and dab),
- Stem injection,
- Stem-scrape and poison,
- Basal bark painting,
- Selective spot-spraying.

## **Mulch and Cut Brush**

Any mulch imported onto the site shall be weed-free eucalyptus leaf mulch or woodchip. Mulch from Privet, Camphor laurel, Coral Tree, Poplar, Willow, aquatic or declared noxious weeds is not to be used. The Contractor shall ensure that any mulch used is properly composted before use.

Brush cut for erosion control and/or re-vegetation purposes shall be used only when cut branches are seed-laden. Branches shall be spread as quickly as possible to reduce seed loss during stockpiling. The collection of cut brush shall be limited to species occurring naturally in the bushland area.

### **Weed Debris and Rubbish**

Disposal of weed debris and other rubbish generated as a result of the work shall be the responsibility of the Contractor. Any burning must be carried out as advised by the Environment Protection Authority, NSW Fire Brigade or the Rural Fire Service.

### **Soil Erosion**

Where bush regeneration works have the potential to destabilise slopes or embankments, action such as the use of fibre matting and/or the placing of logs across the slope and fixing in place shall be employed to minimise the problem.

### **Reconstruction of Bushland (planting)**

All plant material used on-site re-vegetation works shall be grown from seed or cuttings collected from within the site or within a 5km locality.

Plant material may be supplied as tubestock, hikos or virocells depending on the species and planting conditions.

Planting methods are to conform to the Re-vegetation Specifications as described below.

### **Site Preparation**

Site preparation activities for all planting sites will include preliminary weed control, rubbish removal. It is expected that within any bare soil areas soil stabilisation (Brush matting), and (where applicable) soil erosion control measures installed.

### **Plant Material**

Plant material used to revegetate within the project area shall be sourced from the site and only from local bushland areas (within 2km). Contractors are responsible for obtaining all necessary permits and licenses.

All plants are to be provided in a healthy condition. They must have good root development and a sturdy shoot system. Plants with an elongated or yellowed shoot system shall not be accepted.

Planting shall be undertaken immediately after delivery. If this is not possible, the Contractor shall be required to provide appropriate storage to keep the plants in good condition on the site, adequately protected from frost, wind, sun, vermin, and secured from vandals.

### **Planting Guidelines**

#### Planting Densities and Niche species

The Contractor shall be responsible for planting according to this VMP. The Contractor shall be responsible for ensuring planting densities and appropriate niche species.

Only locally indigenous plants will be used. Niche preferences shall be considered in planting, with plants being placed in the correct position with regard to soil type, moisture, aspect and slope.

- Plantings should be at the densities as detailed in Table 3-1.

## **Planting Methods**

Planting holes shall be excavated to a depth of 150 mm and a diameter of 200 mm. Slow-release native plant fertiliser (low phosphorous formulated native plant fertiliser tablet/granules) shall be placed into the planting hole. In poorly structured soils, approximately 200 cubic centimetres of native plant soil mix is to be placed and incorporated into the planting hole with fertiliser and water storing granules.

Plants must be placed into moistened soil preferably by soaking 1-2 litres of water into each 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 are to be thoroughly watered before planting and again after planting. If the weather is hot, a third watering shall be carried out within two (2) days or a t-tape or drip irrigation system set up to water plants on a weekly basis.

## **Mulching**

After planting, exposed soils will be adequately protected by the re-spreading of stockpiled mulch to a maximum depth of 75-100 mm. A depth of approximately 75-100 mm and a diameter of 400 mm around each installed plant is recommended. No exotic plant material is to be used. The provenance of all mulch material must be from that which has been generated from site clearing.

Care should be taken to keep mulch material away from the stems of the newly planted tubestock.

## **Maintenance and Weed Control**

Tube stock must be suitably maintained (watering and weeding) are to be maintained over a 2 year period on the following basis:

- 1-3 months post planting – weekly watering and maintenance.
- 4-12 months post planting – monthly watering and maintenance.
- 13-24 months post planting – quarterly watering and maintenance.

Site maintenance shall consist of the following tasks:

1. Weeding throughout the planting area;
2. Watering tube stock;
3. Replacing lost plants (as required); and
4. Removing wind-blown or other rubbish from the planting area.

## **Appendix C**

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Monitoring Sheet for Vegetation  
Management Plan works for part of No 26-  
61 (Lot 1 DP 349727) Nikko Road,  
Warnervale NSW

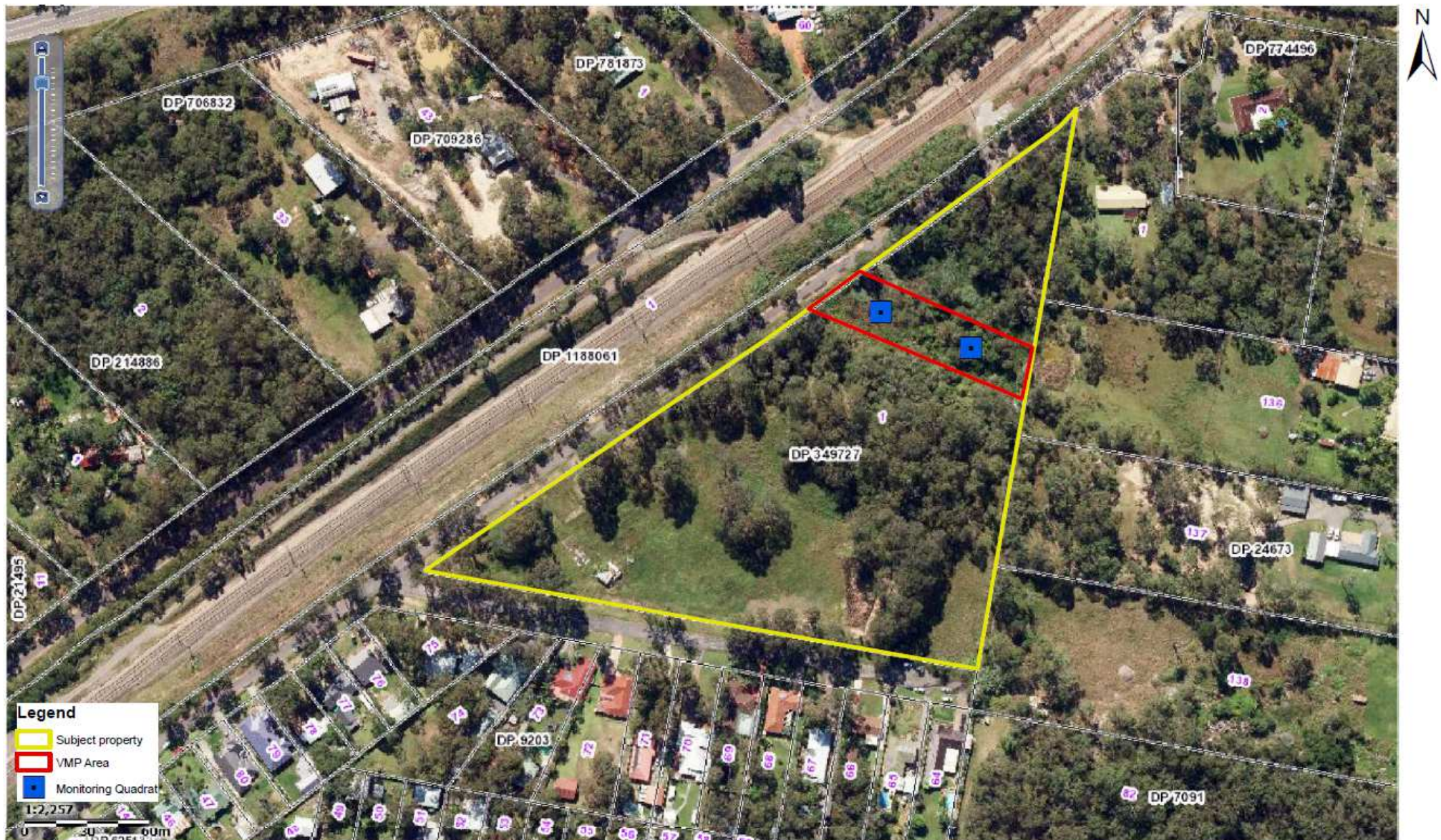
**Appendix C: Monitoring Sheet****Monitoring Sheet for Vegetation Management Plan****By Enviro Ecology****For No Vegetation Management Plan for part of No 26-61 (Lot 1 DP 349727) Nikko Road, Warnervale NSW****Ph: 0402592399****Tick report interval from date of Approval of VMP: ☐ 6 Months, ☐ 1 Year, ☐ 1.5 Years, ☐ 2 Years ☐ 2.5 Years ☐ 3 Years and there after on a yearly basis**

<b>General</b>	<b>Date:</b>	<b>Vegetation community(_____)</b>		
<b>Site Personnel</b>	Field Leader	Name:	Signature:	
	Other Field Persons			
	Contact No.			
<b>Effort</b>	Total Hours spent on site			
	Hours spent weeding			
	Hours spent planting			
	Hours spent other activities (specify)			
<b>Work Completed</b>	Include weed control methods used (e.g. hand weeding, spraying) & areas planted and weeded			
<b>Re-vegetation Success Rate</b>	<b>(%) of Ratio plantings established specified in VMP</b>	<b>Weed Cover (%):</b>	<b>Additional plants required (Species)</b>	<b>No of additional</b>
<b>Canopy</b>				
<b>Sub canopy</b>				
<b>Shrub</b>				
<b>Grasses &amp; Groundcovers</b>				
<b>Additional Comments:</b>				

<b>Materials Used</b>	Plants planted	<b>Species Planted</b>	<b>Quantity</b>	<b>Pot size</b>
	Source (nursery) of plants Source and type of mulch/chip and other materials			
<b>Animals seen during field work</b>	Fauna seen	<b>Species</b>	<b>No of individuals</b>	
	Pest species seen on site	Circle; Sparrows, Indians Mynas, Rabbits, Hare		
		Other;		
<b>Monitoring/Photos</b>	<b>Photos are to be taken from the established monitoring quadrats within VMP works area Yes/No</b>	<b>Photo Aspect</b>	<b>GPS Location of photo</b>	
	Photo Number:_____	Aspect:_____	Easting:_____	Northing:_____
	Photo Number:_____	Aspect:_____	Easting:_____	Northing:_____
	Photo Number:_____	Aspect:_____	Easting:_____	Northing:_____
	Photo Number:_____	Aspect:_____	Easting:_____	Northing:_____

# FURTHER NOTES

## MARK LOCATION OF WORKS COMPLETED ON MAP



## **Appendix D**

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### Historical Aerials

**Photograph 5-1 Aerial photograph March 1954**



**Photograph 5-2 Aerial photograph May 1975**



**Photograph 5-3 Aerial photograph September 1984**

