KHS Ecology & Bushfire

# Vegetation Management Plan

*for proposed ecotourism development at 51 Atkinson Street, Morts Estate, Lithgow*
*Lot 152/-/DP659519*

**Lithgow Local Government Area**

*August 2023*

**Prepared by:** KHS Ecology & Bushfire Pty Ltd
**Prepared for:** Property Owner, Mr Ben Harris
C/- Consulting and Environmental Services

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Vegetation Management Plan for proposed ecotourism development at 51 Atkinson Street, Morts Estate, Lithgow
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# 1 Introduction

## 1.1 Background

This Vegetation Management Plan (VMP) describes the vegetation management and ecological restoration actions for 51 Atkinson Street, Morts Estate Lithgow, in relation to the establishment of a proposed new 'Eco-tourist' development at the property. The proposal aims to provide accommodation and a nature-based experience for visitors to the Lithgow area, in conjunction with an environmental focus in the operational planning and management of the site.

The location of the subject land is shown in **Figure 1-1**. The development is being proposed by the property owner, Mr Ben Harris. The site plan has been prepared by Consulting and Environmental Services, as shown in **Figure 1-2**.

The property is situated at the edge of existing residential development in Morts Estate, Lithgow, between the State Mine Gully Road and State Mine Gully Creek and surrounded by the escarpment of the Newnes Plateau. The land has a disturbance history related to the State Mine and railway, however the site retains native forest trees and habitat values along the State Mine Gully Creek corridor and is surrounded by the forested slopes and escarpment landscape of the Newnes Plateau.

This VMP document is intended to be interpreted in conjunction with the 'Site Plan for Vegetation Management', prepared by Consulting and Environmental Services.

*Figure 1-1. Property location. (Source: NSW Planning Portal, accessed 31/1/2023)*

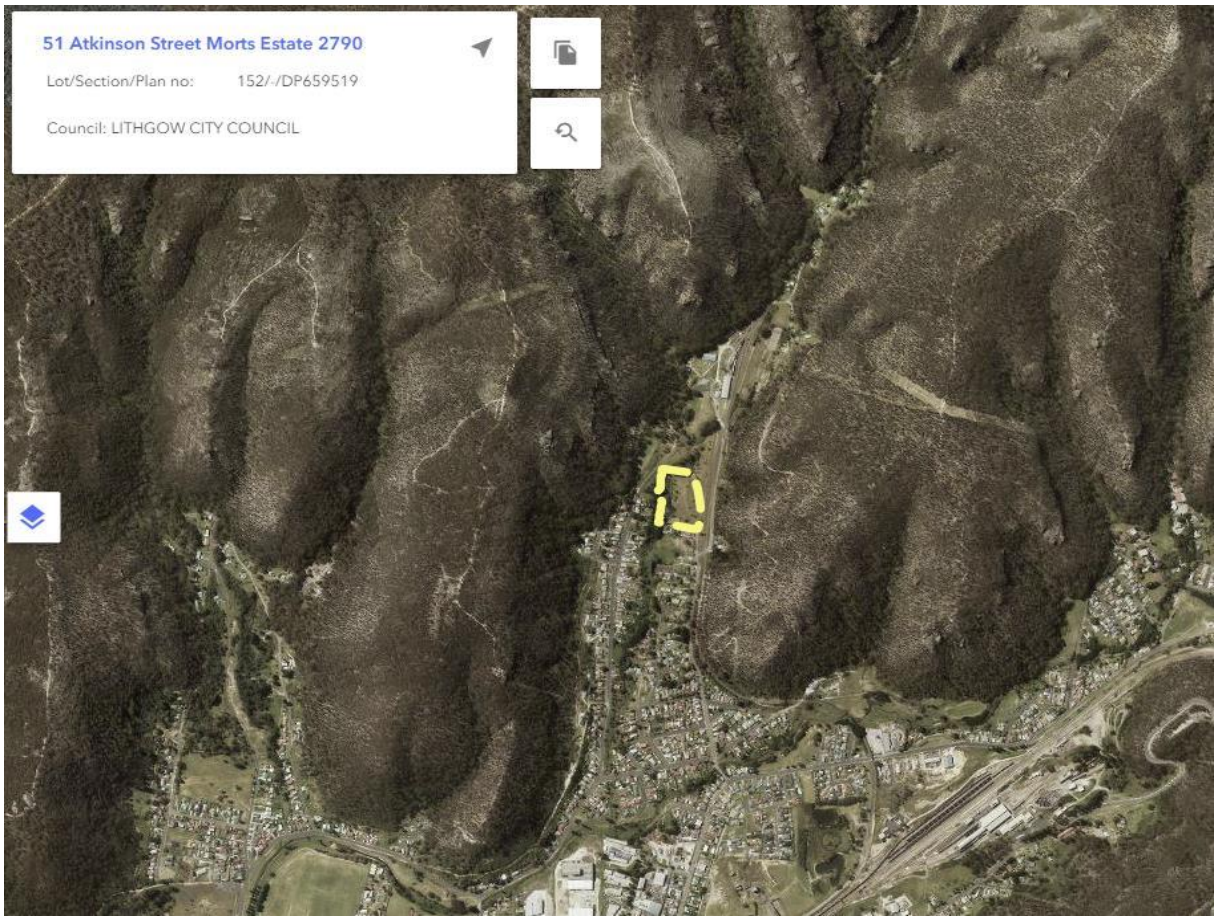
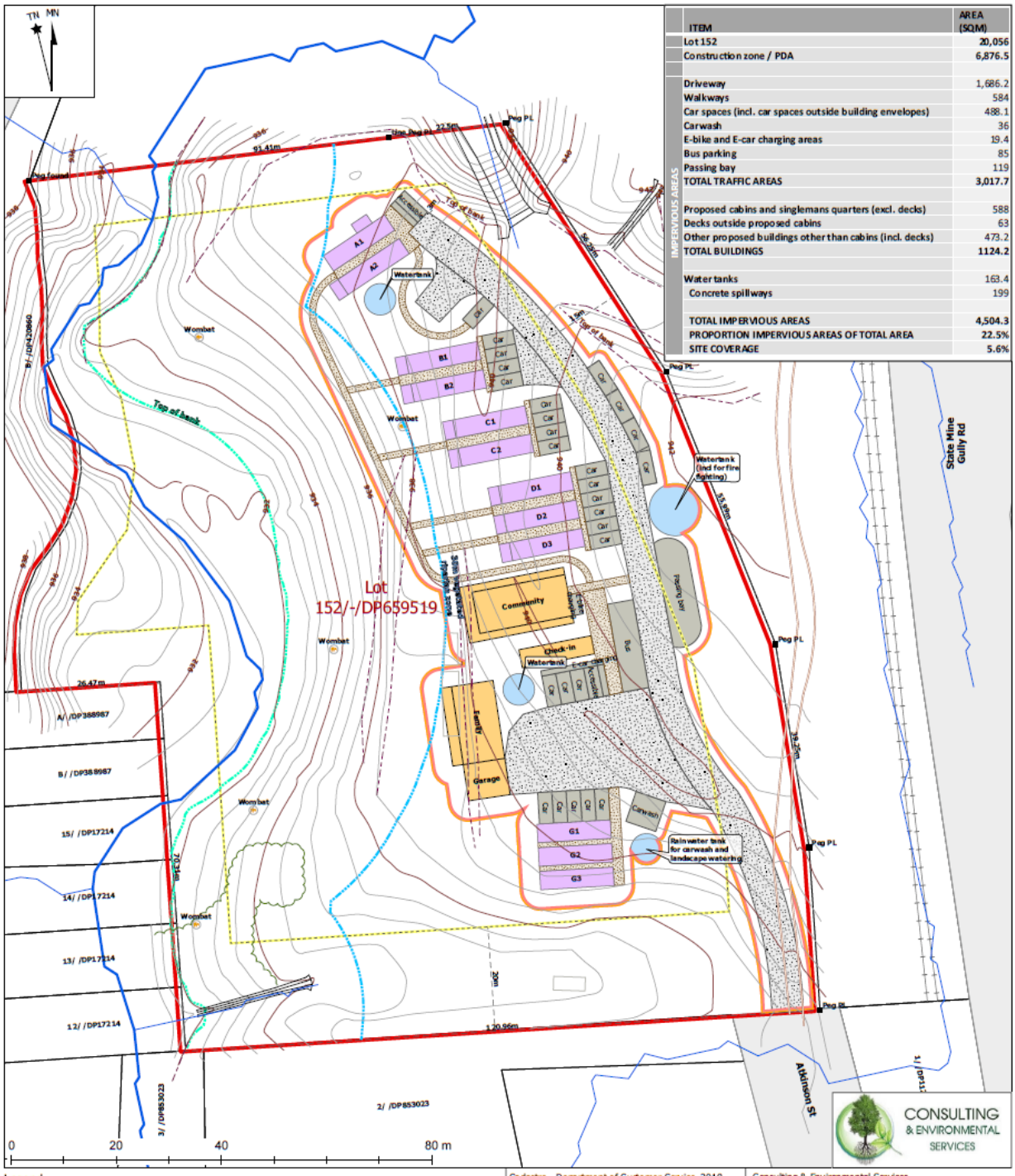


*Figure 1-2. Site plan prepared by Consulting & Environmental Services (Version 9, dated 9/03/2023).*



## 1.2 Information sources

The following information and data sources have used to inform the preparation of this VMP.

- Site plan prepared by Consulting & Environmental Services, Version 9, dated 9/03/2023.
- Three site assessments undertaken by KHS Ecology & Bushfire Pty Ltd ecologist, Dr Kate Hammill, on 21/02/2022, 21/3/2022 and 13/2/2023.
- Bushfire Assessment Report, prepared by KHS Ecology & Bushfire Pty Ltd, March 2023.
- Lithgow Local Environment Plan (LEP) 2014. (https://legislation.nsw.gov.au/view/html/inforce/current/epi-2014-0824).
- NSW Government Planning Portal (https://www.planningportal.nsw.gov.au/) and associated spatial data (www.maps.six.nsw.gov.au).
- Bionet Wildlife Atlas and Plant Community Type (VIS) databases and associated threatened species and ecological community profiles (www.bionet.nsw.gov.au accessed October 2022).
- Flora of NSW (Harden 1991-2002) and Flora NSW Online (www.plantnet.rbgsyd.nsw.gov.au).

## 1.3 The proposed development

The proposal is for an eco-tourist facility (also referred to as an 'ecotourism' development) at 51 Atkinson Street, Morts Estate, with the following components and features.

- The installation of twelve (49 sqm) prefabricated manufactured cabins for either a two- or one-bedroom occupancy.
- A site manager's cabin (two-person capacity).
- All cabin buildings are lightweight pre-constructed cabins. Roofs will be used for rainwater catchments, with energy efficiency supplemented with solar energy collection for hot water.
- A four-bedroom family residence with a garage for the owner / site manager.
- A check-in building for receiving of guests upon arrival.
- A community building with laundry, shared bathroom and kitchen facilities. The community building is designed for the purposes of a bushfire refuge and in case of an emergency situation.
- Construction of infrastructure for driveways, carparking, water supply (combined reticulated supply and tank supply), sewer and connections, and electrical services to the cabins, dwelling and other buildings.
- Implementation of vegetation management actions providing for habitat restoration along the creek corridor and adjoining recreational areas of the site to achieve the objectives for an eco-tourist facility, including protection of the natural environmental and providing a nature-based experience for visitors.

A view of the proposed development site and State Mine Creek corridor is shown in Photograph 1-1 and Photograph 1-2.

*Photograph 1-1. View of proposed development site, looking to the north into State Mine Gully. This area is proposed for the ecotourism accommodation buildings and associated infrastructure.*

*Photograph 1-2. View of the State Mine Creek corridor on the property, looking west, which is proposed to be managed as open space and wildlife corridor.*

## 1.4 Property identification and zoning

The property identification and relevant zoning under the Lithgow LEP 2015 is summarised below (refer to **Figure 1-3** to **Figure 1-6**).

- Council: LITHGOW CITY COUNCIL
- Address: 51 ATKINSON STREET MORTS ESTATE 2790
- Lot/Section/Plan no: 152/-/DP659519
- Land zoning: C3 – Environmental Management
- Bushfire Prone Land – Buffer
- Minimum lot size: 40 ha
- Flood Planning Area – along the riparian corridor
- LEP Terrestrial Biodiversity – not mapped

*Figure 1-3. Land zoning (Source: Planning Portal, accessed 31/1/2023)*

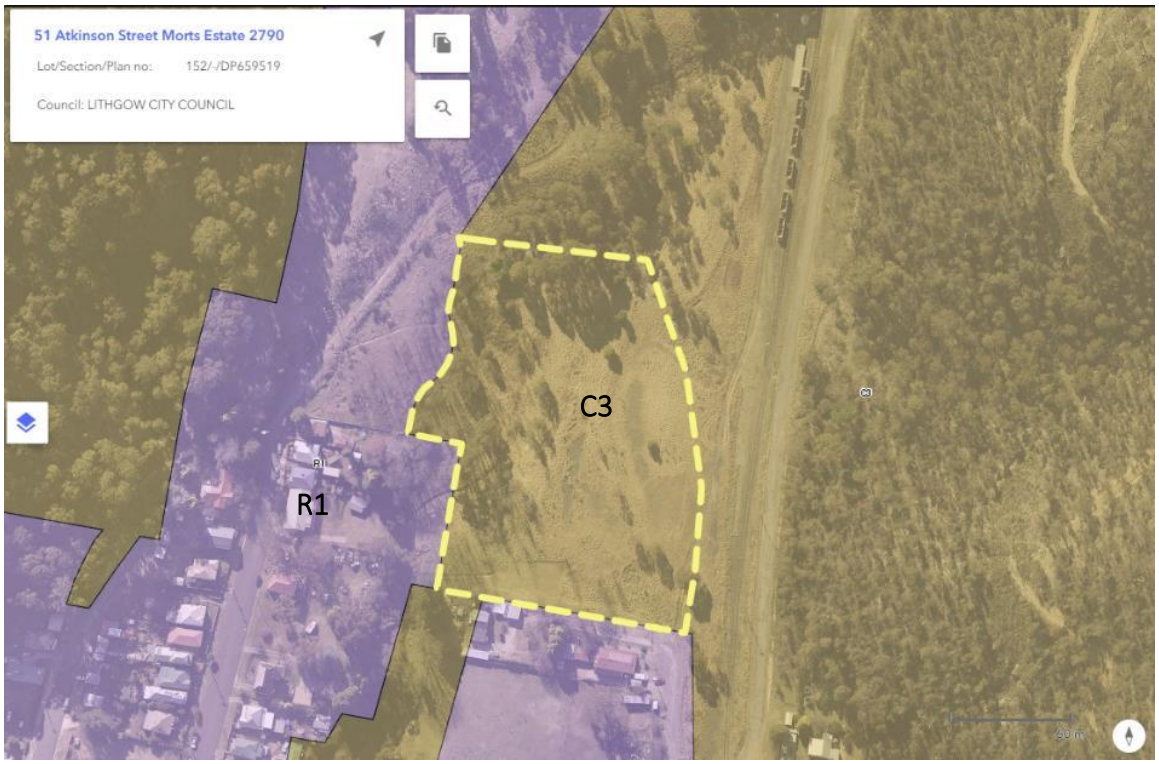


*Figure 1-4. Bush Fire Prone Land mapping (Source: Planning Portal, accessed 31/1/2023)*

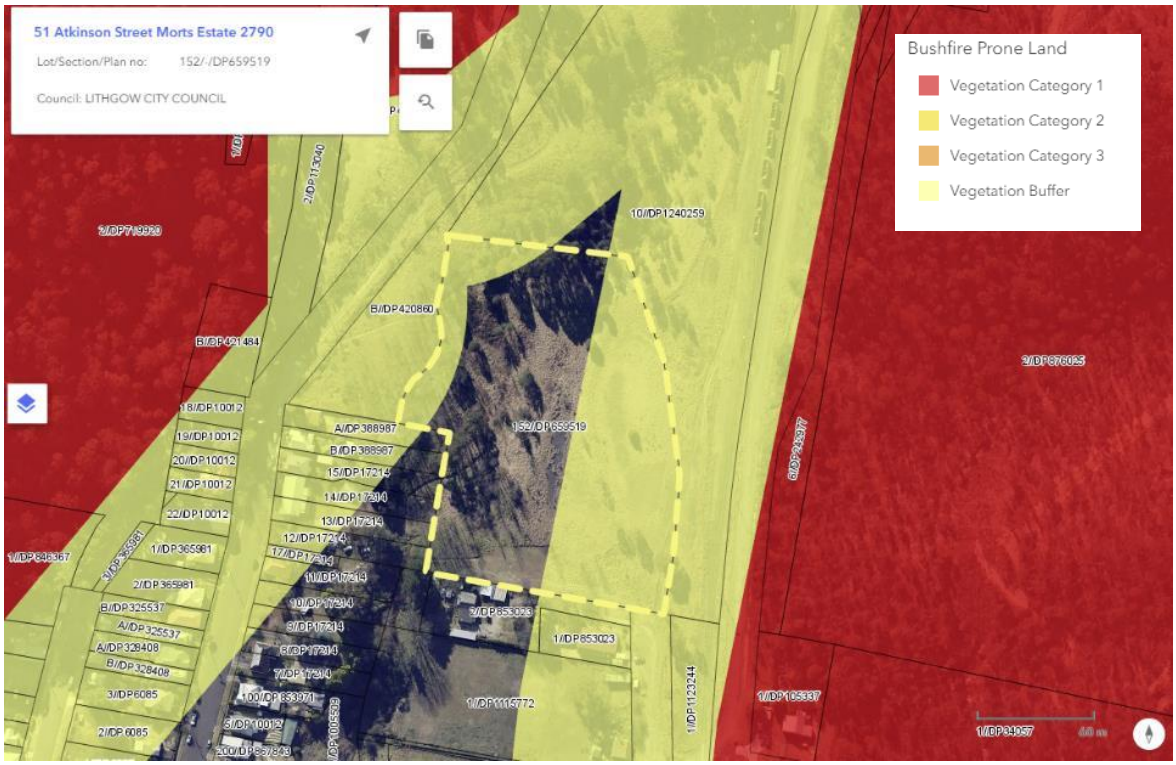



*Figure 1-5. Flood Planning Area (Source: Planning Portal, accessed 31/1/2023)*

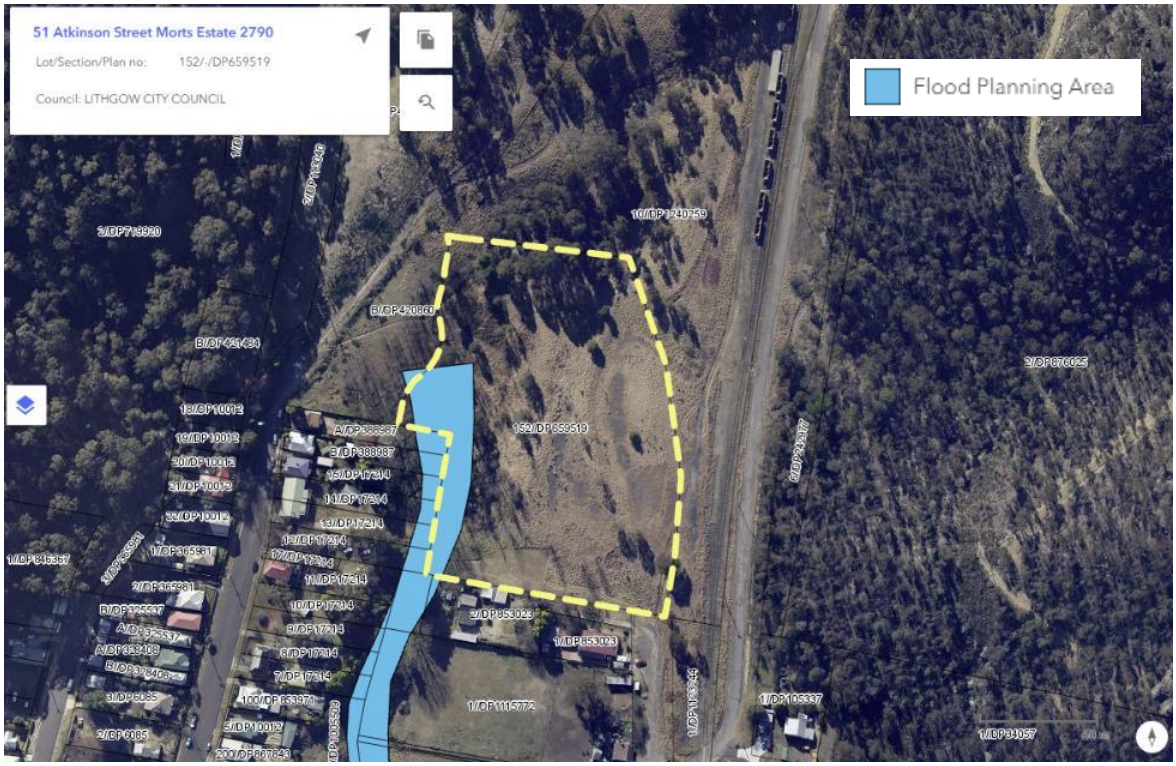
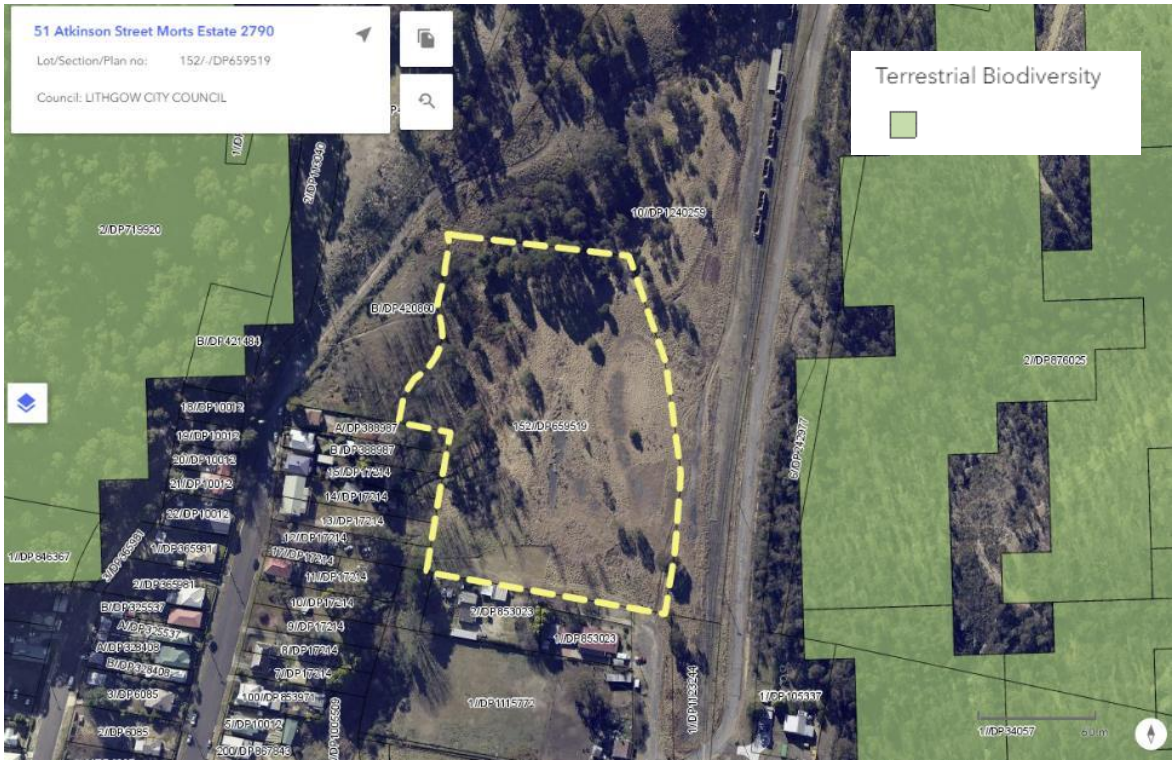


*Figure 1-6. Terrestrial Biodiversity (Source: Planning Portal, accessed 31/1/2023)*




## 1.5 Planning context and objectives

### *1.5.1 Eco-tourist objectives*

The proposal is for an Eco-tourist development (also referred to as 'ecotourism') which is a particular subcategory of tourist development with accommodation that provides a nature-based experiences for visitors in conjunction with an environmental focus in the operational planning and management of the site.

The objectives for Eco-tourist facilities are provided in clause 5.13 of the Lithgow LEP are as follows:

> *(a) to maintain the environmental and cultural values of land on which development for the purposes of eco-tourist facilities is carried out,*
>
> *(b) to provide for sensitively designed and managed eco-tourist facilities that have minimal impact on the environment both on and off-site.*

### *1.5.2 LEP zone objectives*

The property is zoned C3 – Environmental Management (**Figure 1-3**) and as such will need to address the LEP objectives for the zoning as set out in clause 2.1 of the Lithgow LEP.

- *To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.*
- *To provide for a limited range of development that does not have an adverse effect on those values.*
- *To facilitate the management of environmentally sensitive lands and riparian areas.*
- *To protect and conserve the vegetation and escarpment landscape surrounding Lithgow.*

- *To maintain or improve the water quality of receiving water catchments.*

### *1.5.3 Bushfire protection objectives*

The property is mapped as bush fire prone land (refer to **Figure 1-4**). Section 4.14 of the *Environmental Planning and Assessment Act 1979* requires developments on bush fire prone land to satisfy the NSW Rural Fire Service (RFS) document, *Planning for Bush Fire Protection 2019* (PBP). The proposal is a type of SFPP development, 'ecotourism', and is required to address the provisions of PBP, Chapter 6 *Special Fire Protection Purpose developments*. The specific objectives for SFPP developments, as stated in section 6.2 of PBP, are to:

- *minimise levels of radiant heat, localised smoke and ember attack through increased APZ, building design and siting;*
- *provide an appropriate operational environment for emergency service personnel during firefighting and emergency management;*
- *ensure the capacity of existing infrastructure (such as roads and utilities) can accommodate the increase in demand during emergencies as a result of the development; and*
- *ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.*

## 1.6 VMP objectives

This VMP aims to address the Eco-tourist objective and the C3 – Environmental Management in relation to

- *maintaining the environmental values of the land through native vegetation restoration and weed control,*
- *facilitating the management of environmentally sensitive lands and riparian areas and*
- *provide for the bushfire protection objectives of the facility through appropriate landscaping.*

The specific objectives of the VMP are to:

A. Protect and restore native vegetation on the site to enhance the habitat values for local wildlife.

B. Ensure the development does not adversely impact on surrounding land including the creek corridor and associated native vegetation.

C. To balance environmental management of the site with the protection of life and property from the threat of bushfire.

D. Manage and control weeds so that the land has a low weed burden for the life development.

## 1.7 Approach

This VMP describes the existing natural features of the site and outlines the proposed vegetation management zones and actions to achieve the Eco-tourist objectives in clause 5.13 of the Lithgow LEP and the C3 – Environmental Management objectives in clause 5.13 of the Lithgow LEP. The VMP aim is also to implement appropriate vegetation management to achieve bushfire protection for the facility.

The following steps have been undertaken in the preparation of the VMP.

- Site assessment for identification of existing vegetation and natural and constructed features.
- Identification of vegetation management zones and actions relevant to the site to achieve the objectives.
- Preparation of supporting technical information (in this report) to guide the implementation of management actions, species for planting, landscaping and fuel management for bushfire protection.

The VMP (this document) is intended to be interpreted in conjunction with a map-based 'Site Plan for Vegetation Management', prepared by Consulting and Environmental Services.

# 2 Existing environment

## 2.1 Site features

Key features of the land at 51 Atkinson Street relevant to the environmental management of the site include the following.

- The property is located on the valley floor of the State Mine Gully with surrounding slopes rising to the elevated sandstone plateau north of Lithgow. The property spans an elevation of 944m above sea level at the eastern boundary, to 934 m above sea level at State Mine Creek.
- The site is adjacent to the State Mine Creek, which flows to the south to Farmers Creek. Development areas are situated above the Flood Planning Area shown in Figure 1-5.
- Prior land use and disturbance is evident in the extensive areas of coal spoil fill which covers the majority of the site, and to within approximately 10-20 metres of State Mine Creek.
- The presence of coal spoil fill has limited the extent of native vegetation to small patches of remnant native groundcover and stands of forest eucalypts along the immediate creek banks only. These include: *Eucalyptus cypellocarpa* (Mountain Gum), *Eucalyptus radiata* (Narrow-leaved Peppermint), *Eucalyptus viminalis* (Ribbon Gum), and *Acacia* (wattle) which are representative of the original native vegetation of the sheltered valleys of the Lithgow area.
- The majority of the site is non-native vegetation with grassland areas dominated by *Eragrostis curvula* (African Lovegrass) and other herbaceous weeds. There are dense stands of exotic trees including Privet and *Robinia* and White Birch along the creek corridor, also with woody weeds including Blackberry and English Broom.
- The proposal aims to manage and restore remnant native forest habitat as a wildlife corridor along the creek alongside other areas of site to be managed as open grassland suitable for recreation and bushfire protection purposes.

## 2.2 Land use history

A review of previous land use has been undertaken by Consulting & Environmental Services has identified the previously use of the land on Lot 152 was for the purposes of the State Coal Mine, which ceased workings in June 1964. The previous and current land use on and surrounding the subject lot is summarised as follows.

- The site at 51 Atkinson Street (Lot 152) is an allotment formerly part of the State Coal Mine, now private land. The lot has landfill of coal mine rejects which will underly and be surface-rehabilitated by the proposed development.

- Land to the north and east is Lot 10 and part of the State Mine Heritage Park including the railway transport corridor that serviced the State Mine.
- Land to the south is residential, with access to the subject lot from Atkinson Street (a public road) via the south boundary.
- Land to the west includes the State Mine Creek and then Macauley Steet with residential homes, including areas of mine spoil dumping.

## 2.3 Existing vegetation

A list of plant species recorded during the site assessments is included in **Appendix A**. Different areas of the property support different types of vegetation, as described below. The vegetation along the creek corridor is currently regenerating from the 2019/2020 bushfires affecting the Lithgow area, as evidenced by the presence of eucalypt saplings and resprouting/regrowth on mature trees.

**Eastern portion of the site:** The majority of the site including the area proposed for the building components of the development has soil consisting of coal spoil fill (refer to Consulting & Environmental Services reports). The vegetation consists of non-native grasses dominated by *Eragrostis curvula* (African Lovegrass) and other weeds including *Conyza bonariensis* (Flaxleaf Fleabane) *and Verbena* spp. (Purple Top), also the significant weeds *Rubus fruiticosus* (Blackberry) and *Cytisus scoparius subsp. scoparius* (English Broom). This area lacks a natural soil profile and is non-native vegetation (**Photograph 2-1**).

*Photograph 2-1. The majority of the property is non-native grassland dominated by African Lovegrass.*

Creek corridor: The creek corridor supports remnant trees of the community type 'Western Blue Mountains Sheltered Shale Forest' (PCT 3227) with stands of eucalypts along with various exotic trees and weeds including blackberry and privet (Photograph 2-2). This eucalypts along the creek banks comprise the following species:

- *Eucalyptus cypellocarpa* (Mountain Gum),
- *Eucalyptus radiata* (Narrow-leaved Peppermint),
- *Eucalyptus viminalis* (Ribbon Gum),
- *Acacia* species,
- *Casuarina glauca* (River Oak) – likely planted.

There is very little native understorey present due to the coal spoil fill and dominance of weeds. Some species or native groundcover are present, including *Pteridium esculentum* (Bracken), *Austrostipa pubescens* (Tall Speargrass), *Coronidum scorpioides* (Button Everlasting) and *Microlaena stipoides* (Weeping Grass) (Photograph 2-3).

*Photograph 2-2.Stands of native Eucalyptus cypellocarpa (Monkey Gum) exist along the creek corridor amongst weeds trees of Robinia and Small-leaved Privet.*

*Photograph 2-3. Occasional native groundcover exists at the site, including species such as Coronidium scorpioides (Button Everlasting) (top) and Pteridium esculentum (Bracken) (bottom right) and eucalyptus regeneration (bottom left)*

*Photograph 2-4. Planted Casuarina glauca (River Oak) serve to stabilise the slope on the eastern side of the creek.*

## 2.4 Plant community type

The remnant native vegetation along the creek corridor is representative of the following Plant Community Type (PCT)[1] that would have been present more-extensively in this part of the landscape prior to mining and disturbance.

PCT 3227 Western Blue Mountains Sheltered Shale Forest

Site identification: PCT 3227 is identified on the site based on the location being on sheltered, valley floor and near a creek with remnant trees indicating a tall forest structure. The characteristic trees of *Eucalyptus cypellocarpa* are present, also with the sheltered forest species *Eucalyptus radiata*.

Description (DPE 2022a): A tall moist grassy sclerophyll open forest of loamy slopes on moderately high, cool ranges of eastern parts of the central tablelands. This PCT is known from talus slopes of Mount Airly south to Hassans Walls and Mount York, and slopes on rolling plateaus on Moorara Range, Bindook Highlands and at Maneveland. It occurs at elevations of 800-1100 metres asl, with means of 700-1100 mm rainfall and 5-17 frost days annually, on substrates including fine-grained sedimentary

[1] The PCT classification is the current standard classification of native vegetation communities in NSW and is published on BioNet (DPE 2023a). The method to identify the PCTs on the site is based on the following approach: (a) selection of a short-list of PCTs known to occur in the IBRA subregion; (b) compare the site characteristics with the published descriptions for the PCTs in relation to vegetation structure, dominant plant species in each stratum, landscape position and soil type/texture, (c) select the best-fit PCT to represent the native vegetation at the site, including any disturbed or degraded vegetation that has some characteristics of the PCT.

rocks (particularly Illawarra Coal Measures and Berry Siltstone) and Barrallier Ignimbrite. A tall to very tall canopy very frequently contains *Eucalyptus cypellocarpa*, commonly with *Eucalyptus blaxlandii*, with a sparse small tree layer of scattered occasional *Acacia falciformis* or *Acacia obliquinervia*. The shrub layer is sparse to patchy and very frequently includes Bursaria spinosa, commonly with sparse *Leucopogon lanceolatus* and occasionally *Podolobium ilicifolium* or *Persoonia linearis*. A mid-dense to sparse ground layer commonly includes *Poa sieberiana* at moderate to high cover, along with moist tableland ground layer species commonly including *Lomandra longifolia*, *Pteridium esculentum*, *Coronidium scorpioides*, *Dianella revoluta*, *Lomandra multiflora subsp. multiflora*, *Clematis aristata*, *Billardiera scandens*, *Desmodium varians, Microlaena stipoides, Lomandra filiformis, Gonocarpus tetragynus, Dichondra repens, Hydrocotyle laxiflora, Hypericum gramineum, Veronica plebeia* and *Oxalis perennans*. In deep gullies and on sheltered wet slopes this community may grade into PCT 3226, while at lower elevations in tributary gorges of the Coxs and Wollondilly it may be replaced by PCT 3481.

NSW Class / Formation (Keith 2004): Southern Escarpment Wet Sclerophyll Forests / Wet Sclerophyll Forests (Shrubby sub-formation).

Associated TEC: No associated TEC. The vegetation on the site is not part of a Threatened Ecological Community[2].

## 2.5 Weeds

The site has a number of significant weeds which are a priority for management and control (refer to plant list in Appendix A).

The weeds present on the site that are both Weeds of National Significance (WoNS) and NSW Priority weeds are:

- *Cytisus scoparius subsp. scoparius* (Scotch Broom), occurs on both the eastern open areas of the site and along the creek corridor.
- *Nassella trichotoma* (Serrated Tussock), occurs occasionally only on the disturbed open areas.
- *Rubus fruticosus* (Blackberry), occurs extensively over the site on on both the eastern open areas of the site and along the creek corridor.

The weeds present on the site that are NSW Priority weeds are:

- *Hypericum kouytchense* (Large-flowered St John's Wort ), occurs on the creek corridor.
- *Hypericum perforatum* (St. John's Wort ), , occurs in the disturbed open areas
- *Ligustrum sinense* (Small-leaved Privet), occurs in dense tree thickets along the creek corridor and adjacent slopes.
- *Robinia pseudoacacia* (Black Locust), occurs in dense stands of trees along the creek corridor and adjacent slopes.

Environmental weeds include non-native grasses such as *Anthoxanthum odoratum* (Sweet Vernal Grass) and *Eragrostis curvula* (African Lovegrass) and numerous herbaceous weeds. These environmental

[2] Threatened Ecological Community is a vegetation type that is listed under the *Biodiversity Conservation Act 2016* as Vulnerable, Endangered or Critically Endangered, due to being substantially reduced in extent and subject to ongoing threatened processes, typically clearing and habitat loss, and therefore at risk of further decline. TECs warrant special consideration for conservation management.

weeds occur in the disturbed open areas as well as nearer the creek and sloped areas. While not identified under legislation for control, these weeds are of management concern is that they can adversely affect site restoration by outcompeting native groundcover species, if not controlled.

It is noted that the property owner is already implementing weed control by slashing and herbicide treatment to reduce the weed load.

*Photograph 2-5. Robinia pseudoacacia (Black Locust) is present in dense stands along the creek corridor and adjacent slopes.*

*Photograph 2-6. Small-leaved Privet occurs in dense stands in southwest part of the site.*

*Photograph 2-7. Blackberry occurs in patches across the site and is currently being controlled by slashing.*

*Photograph 2-8. Blackberry occurs in patches across the site and is currently being controlled by slashing.*

*Photograph 2-9. Large-flowered St John's Wort (left) and Montbretia (right) occur on the creek corridor.*

*Photograph 2-10. The creek edges are dominated by Blackberry, Large-flowered St John's Wort, Montbretia, non-native grasses and trees of Silver Birch, Small-leaved Privet and Black Locust.*

## 2.6 Bushfire requirements

The bushfire protection requirement for ecotourism is that there be a suitable refuge building on site for the occupants to shelter in an emergency. This is required to have a maximum bushfire exposure of 10kW/m² radiant heat from, be constructed to BAL-12.5 standard, with vehicle access and located within 100m walking distance of accommodation buildings. In this case, it is proposed that a group of cabins be designated as the on site refuge.

The Bushfire Assessment Report by KHS Ecology & Bushfire Pty Ltd prepared in support of the proposal has identified the requirement for an Asset Protection Zone (APZ) around buildings.

Based on the bushfire assessment report, size of the APZ around the refuge cabins is required to be:

- 32 m on the east;
- 55 m on the north;
- 33 m on the southwest; and
- 14 m on the west.

There is also an APZ required around the private residential building as follows:

- 10 m on the east (relative to the Grassland hazard);
- 20 m on the north (relative to the remnant Forest, equivalent to Rainforest hazard);
- 33 m on the southwest (relative to exotic trees, equivalent to Rainforest hazard); and
- 9 m on the west (relative to exotic trees, equivalent to Rainforest hazard).

Vegetation management at the site is required to achieve the APZ low-fuel requirement within these areas around buildings, while also considering the environmental values of the land and eco-tourist objectives.

## 2.7 Biodiversity values

Biodiversity values of the land related to both mapped and unmapped values. These are outlined below.

### *2.7.1 Biodiversity Values Map*

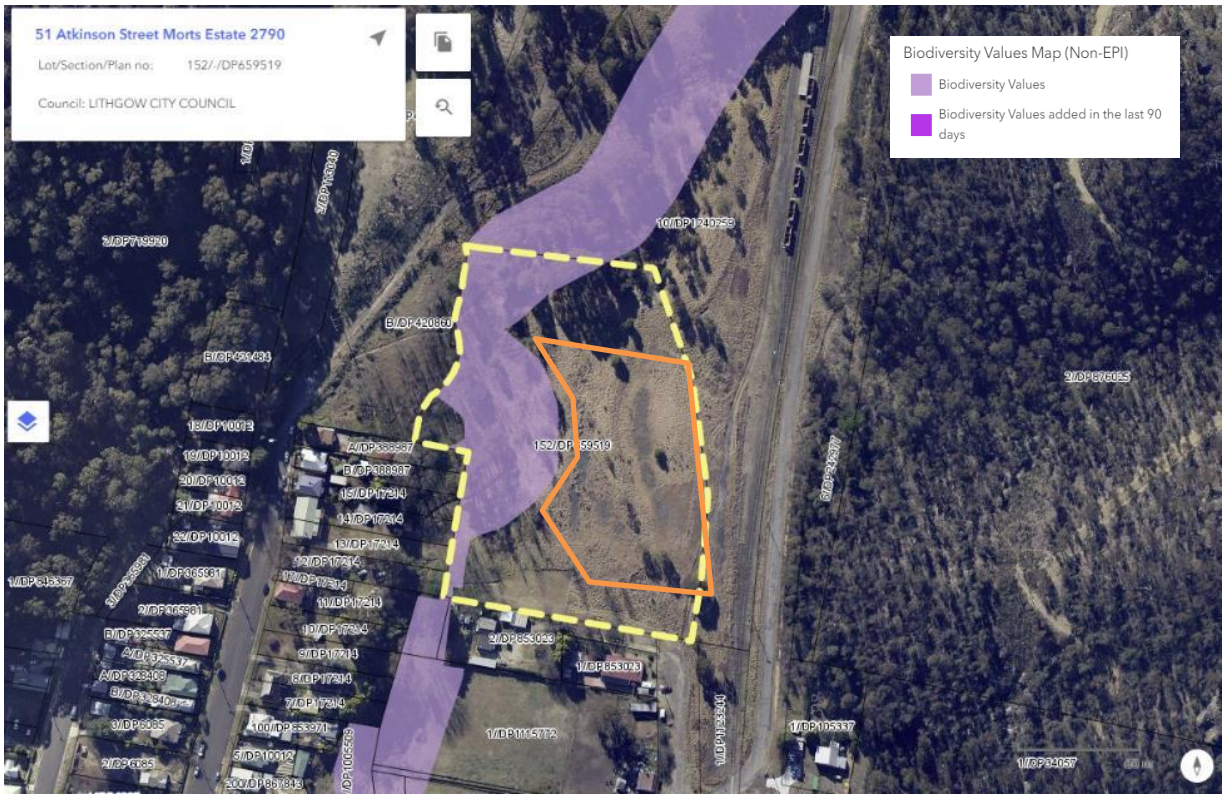
The State Mine Creek corridor is included on the Biodiversity Values Map (BV Map) (**Figure 2-1**)[3]. The BV mapped land (the purple area) covers a corridor of approximately 22.5 m from the centre of the creek line. The land has been including on the BV Map due to being protected riparian land, rather than for the native vegetation or habitat values on the ground in this location. The mapped land includes areas of coal mine spoil and exotic vegetation including Black Locust, Blackberry and Small-leaved privet.

The protection of native vegetation on the Biodiversity Values Map land at the property is addressed through the management zones and actions described in this VMP. There is no proposed building or other development on the BV Map land. The proposal seeks to restore native vegetation along the

[3] The Biodiversity Values Map is one of the thresholds for the Biodiversity Offset Scheme (BOS) under the NSW *Biodiversity Conservation Act 2016*. If a development or activity proposes to clear native vegetation on the BV Map, then the development is required to enter the BOS including possible payment of biodiversity credits to offset for the clearing.

creek corridor and on the BV Map by implementing weed control and revegetation. On this basis the project is not expected to be required to enter into the Biodiversity Offset Scheme.

*Figure 2-1. Biodiversity Values Map (Planning Portal, 31/1/2023) with the development area shown in orange outline.*




## 2.7.2 Habitat values

Habitat values on the property include the remnant stands of eucalypts trees, regenerating trees and the creek bed with associated water flows and aquatic habitat. The site is a natural wildlife corridor for kangaroos, wallabies and wombats among other fauna, which may be observed to be present and utilising the land resources and water source of the creek. The site has a history of significant disturbance with extensive coal mine spoil and engineered stormwater drainage, however is suitable for vegetation restoration in selected areas to improve the ecological values. Some stands of native forest trees of *Eucalyptus cypellocarpa* (Mountain Gum) and *Eucalyptus radiata* (Narrow-leaved Peppermint) are present, which are representative of the original natural forest in the area.

*Photograph 2-11. Eucalypt forest trees and open areas along the creek corridor provide habitat values for wildlife, connecting to the surrounding forested slopes and provide a water source and sheltered areas.*

# 3 Vegetation management zones and actions

Three vegetation management zones are identified for the ecotourism facility covering the entire property, namely

1. Construction and Landscaping Zone;

2. Asset Protection Zone (APZ);

3. Native Vegetation Restoration Zone.

A summary of the vegetation management zones including management principles, intended outcomes and site coverage is provided in **Table 3-1.**

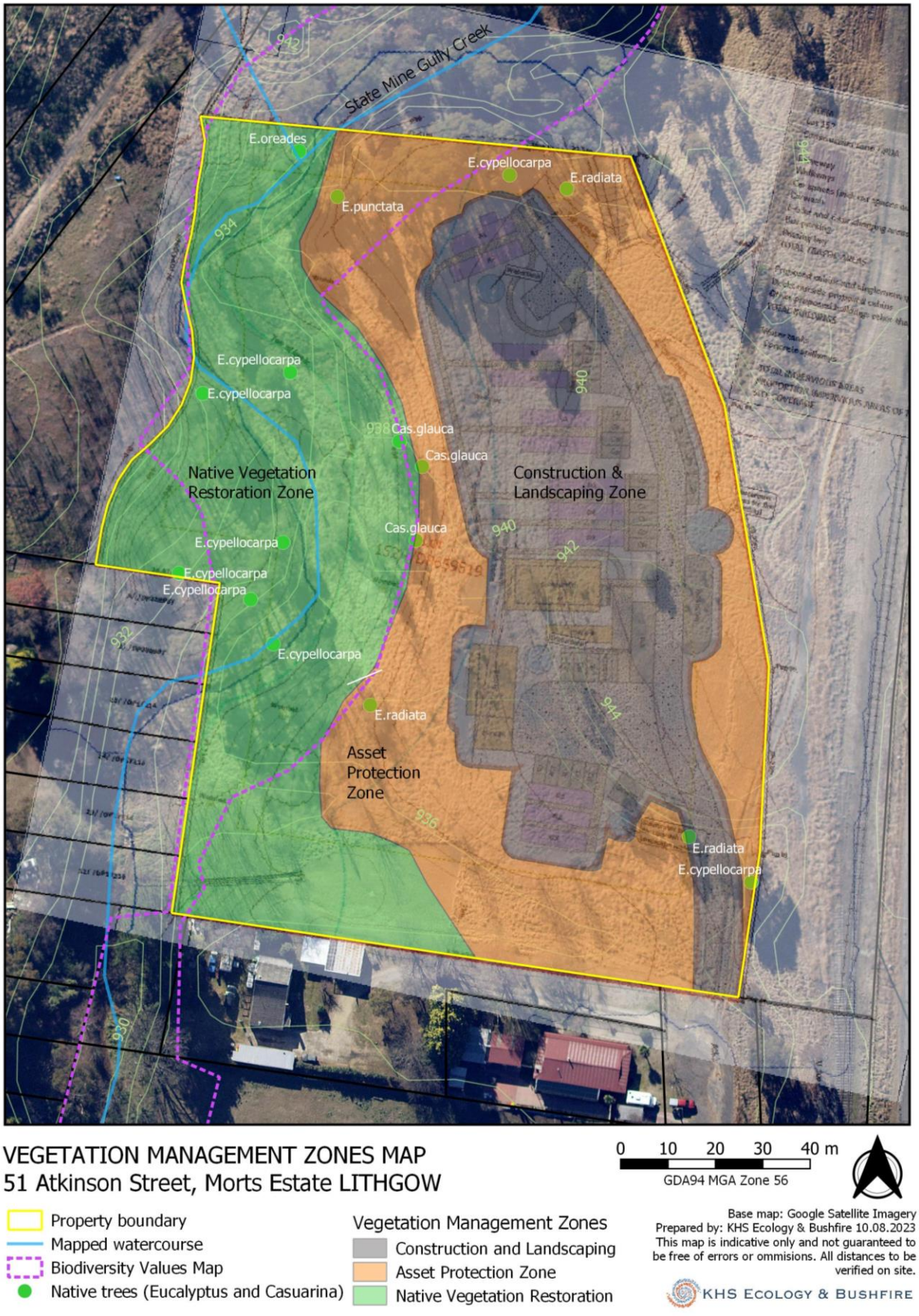
A map indicating the extent of each management zone in relation to the proposed development layout and buildings is provided in **Figure 3-1**. The exact extent of each zone is subject to the final approved building and infrastructure layout.

Description of the management zones with specific aims and actions for each zone is provided in the following sections.

*Table 3-1: Vegetation management zones, intended outcomes and site coverage.*

| Vegetation Management Zone | Description | Management principles | Intended outcome | Area (% site) |
|---|---|---|---|---|
| 1. Construction and Landscaping Zone | This zone comprises the area required for construction of buildings, driveways and services. | Contain all storm runoff, sediment and weeds during construction<br>Rehabilitate with landscaping, low-flammability gardens and/or lawn after construction | Soil is stabilised after-construction and areas of low-flammability landscaping/ gardens/ lawn are established around buildings | 6900m$^2$<br>(34% of site) |
| 2. Asset Protection Zone (APZ) | This zone comprises the area required to establish the APZ around buildings, as identified in the bushfire assessment report and associated site plans. | Vegetation managed to maintain low fuel standards consistent with and IPA<br>Existing native trees to be retained and gardens to ensure <15% tree cover (e.g. isolated trees and/or 'groves' of trees)<br>Ground layer vegetation to be managed to <10mm height<br>Surface fuels (leaf litter and sticks etc) raked / removed at least annually prior to the fire season. | APZs are established and maintained to Inner Protection Area standards, for the life of the development | 6260m$^2$<br>(31% of site) |
| 3. Native Vegetation Restoration Zone | Vegetation management in this zone aims to protect existing remnant eucalypt trees and restore native vegetation habitat along the creek corridor | All existing eucalypt trees and regenerating native vegetation to be retained<br>Weeds to be managed using best-practice environmentally-sensitive methods including bush regeneration techniques<br>Revegetation is implemented to enhance native vegetation cover, using appropriate locally-sourced native plantings | Native vegetation is restored along the creek corridor to improve habitat for wildlife<br>Fuel loads do not accumulate to excessive levels that increase the bushfire risk at the site and to neighbouring properties | 6880m$^2$<br>(34% of site) |

*Figure 3-1. Vegetation management zones map (indicative areas).*



## 3.1 Management zone 1 - Construction and Landscaping

This zone covers the area required for construction of buildings, driveways and services easements and surrounding landscaped areas. Landscaping and gardens will comprise non-flammable features (paths, gravel etc) and low-water-use, low-flammability plantings so as not to compromise bushfire protection. The landscaping is to be consistent with the requirements for an Inner Protection Area as described in *Planning for Bush Fire Protection 2019* (see Appendix E).

Aim:

To ensure the construction and development activities do not adversely impact on the surrounding land and environmental values of the site.

Vegetation management actions:

1. Demarcate the construction and landscaping zone with appropriate signage to indicate the limited of approved construction areas.
2. Install sediment fencing at the outer boundary of the zone to prevent sediment movement downslope during the works.
3. Monitor and control weeds prior to and after construction. Weeds of concern have been described in section 2 of this VMP. *Note: An additional, site-specific weed management plan may be required.*
4. Rehabilitate edges of the zone by:
    a. Installation of hard landscaping elements (e.g. low retaining walls) and/or biodegradable edging, such as coir logs, to contain soil and sediment.
    b. Revegetation to stabilise soil and rehabilitate disturbed areas, using the recommended species list in section 3.4 of this report. Planting material should be sourced from local seed stock, such as from Lithgow Community Society nursery.

## 3.2 Management zone 2 – Asset Protection Zone

This zone covers the area external to the construction and landscaping zone required to establish the proposed APZ as set out in the bushfire assessment report and associated plans.

The objectives for this zone are aligned to the requirements of *Planning for Bush Fire Protection* (see Appendix E) whilst also considering the environmental values of the land and Eco-tourist development objectives. The following principles are relevant for vegetation management within the areas identified for the APZs.

- Trees to be maintained at a canopy cover of <15%, with a crown separation of at least 2 to 5 m between canopies. Trees and shrubs are to be maintained to have no over-hanging branches over the roof, and a non-continuous canopy.
- Understorey vegetation, if present, shrubs to be thinned and maintained as sparse or absent, or planted in clumps well separated from trees.
- Ground-layer vegetation maintained as low-cut grass or lawn by mowing or slashing.
- Leaf litter, sticks and fallen timber removed to avoid accumulation of flammable surface fuels.
- Paving or gravel used for landscaping in the immediate curtilage of buildings, to provide defendable space and avoid providing a path for fire spread to buildings.

- Ornamental grasses, grass-like plants and other fine fuels are not to be used for landscaping near the house, as these contribute to the bushfire fuels.
- Non-flammable mulches (such as gravel) are recommended for landscaped areas near buildings. Woodchip mulch should be used only where necessary and to a very limited extent.

Aim:

Establish and maintain the necessary bushfire asset protection zones to achieve life and property protection as relevant to the location and 'Eco-tourist' use of the site.

Vegetation management actions:

5. Demarcate the APZ with appropriate signage to indicate all areas external to the zone are 'Environmental Protection Area' during construction.
6. Monitor and control weeds prior to and after construction and ongoing for the life of the development. Weeds of concern have been described in section 2 of this VMP. *Note: An additional, site-specific weed management plan may be required.*
7. Maintain all vegetation to be consistent with *Planning for Bush Fire Protection* APZ Inner Protection Area low fuel standards:
    - Removal of woody weeds.
    - Mowing/slashing of grassed areas to <10mm height
    - Removal of accumulated ground litter annually prior to the fire season, before the end of August.

## 3.3 Management Zone 3 – Native Vegetation Restoration

Vegetation management in this zone aims to protect and retain existing trees and restore native vegetation along the creek corridor which is consistent with the C3 – Environmental Management zone objectives under the LEP. Vegetation restoration on the site will also contribute to the objectives '*to protect and conserve the vegetation and escarpment landscape surrounding Lithgow'* and '*to maintain or improve the water quality of receiving water catchments*'.

It is important to note that the vegetation management along the creek corridor will need to be maintained to low fuel loads for mitigating bushfire risk to the site and neighbouring properties. This can be achieved through control of woody weeds and non-native grasses, in conjunction with native vegetation restoration, to reduce overall fuel loads.

Revegetation is best implemented by planting of 'groves' of trees, clumps of shrubs and high-density native groundcover. Over time, the intended outcome is to increase native vegetation cover and reduce weed dominance. Vegetation management methods is also recommended to maintain reduced overall bushfire hazard by maintaining vertical and horizontal separation of the vegetation layers, i.e. avoid planting shrubs beneath trees, trim lower branches of trees, remove fallen bark and litter beneath and between clumps of trees and shrubs.

Aim:

To restore native vegetation consistent with the C4 zone objectives to protect environmentally sensitive land, the riparian corridor, native vegetation and water quality.

Vegetation management actions:

8. Demarcate this zone as 'Environmental Protection Area' during construction with signage at the edge of the zone.
9. Retain all existing native trees and encourage natural regeneration of eucalypt seedlings and saplings within the zone.
10. Monitor and control weeds prior to and after construction and ongoing for the life of the development. Weeds of concern have been described in section 2 of this VMP. *Note: An additional, site-specific weed management plan may be required.*
11. Retain the natural soil profile by avoiding use of machinery in this zone.
12. Restore native vegetation across the zone, in conjunction with weed control works, by sequentially planting native shrubs and native groundcover, using suitable native species from local sources.

## 3.4 Recommended species for planting

A list of recommended species for planting is provided in Table 3-2, to guide the selection of plants for the landscaped and APZ areas and for revegetation in the Native Vegetation Restoration zone along the creek corridor.

The recommended plants for landscaping and APZ areas are low-flammability species, i.e. have leaves with lower oil content and/or broad leaves and/or non-flaky bark.

A wider selection of species is recommended for use in the rehabilitation planting in the Vegetation and habitat restoration zone.

Planting material should be sourced from local seed stock, such as from Lithgow Community Society nursery.

Practical steps for planning and implementing the planting works within the construction and landscaped zone are below.

- Place plant orders well in advance - at least twelve months before planting. This will allow nurseries to obtain the right seed and have plants grown to the right stage.
- Plant into moist soil and ensure weed control measures have been undertaken prior to planting.
- Plant into hessian mat/weed mat on steep slopes to assist retain soil and provide soil protection for moisture retention and to assist seedling establishment.
- Water immediately after planting to remove air pockets from the roots, to help overcome any transplant shock and to establish good root to soil contact.
- Monitor at regular intervals (e.g. every 3 months) to monitor the planting coverage and success / survivorship. This would include capturing photographs at photo points, keeping not of seedling loss and requirement for replacement planting.

Further detail on the specific areas for landscape plantings and revegetation can be provided in the detailed site plan and/or landscaping plan.

*Table 3-2: Planting species list for revegetation and landscaping.*

| Scientific name | Common name | Growth form | Planting location | Minimum number of plants |
|---|---|---|---|---|
| *Acacia melanoxylon* | Blackwood | Tree | Creek corridor | 20 |
| *Acacia rubida* | Red-stemmed wattle | Shrub | Creek corridor | 50 |
| *Acacia falciformis* | Broad-leaved hickory | Tree | Creek corridor | 20 |
| *Banksia cunninghamii* | Banksia | Shrub | Creek corridor | 20 |
| *Banksia marginata* | Silver banksia | Shrub | Creek corridor | 20 |
| *Callistemon citrinus* | Crimson bottlebrush | Shrub | Creek side | 50 |
| *Callistemon linearis* | Narrow-leaved bottlebrush | Shrub | Creek side | 50 |
| *Callistemon sieberi* | River bottlebrush | Shrub | Creek side | 50 |
| *Daviesia latifolia* | Hop Bitter-pea | Shrub | Creek corridor | 50 |
| ***Dianella caerulea*** | **Blue Flax-lily** | Groundcover | Landscaping APZ | 200 |
| ***Grevillea laurifolia*** | **Laurel-leaf Grevillea** | Groundcover | Landscaping APZ | 50 |
| *Hardenbergia violacea* | False Sarsaparilla | Groundcover | Landscaping APZ | 50 |
| *Indigofera australis* | Native Indigo | Shrub | Creek corridor | 50 |
| *Juncus continuus* | Rush | Groundcover | Creek side | 100 |
| *Leptospermum grandifolium* | Woolly teatree | Shrub | Creek corridor | 20 |
| ***Lomandra longifolia*** | **Spine-headed Mat-rush** | Groundcover | Creek side | 200 |
| ***Lomatia silaifolia*** | **Crinkle Bush** | Shrub | Creek corridor | 20 |
| *Olearia tomentosum* | Daisy bush | Shrub | Creek corridor | 20 |
| ***Patersonia sericea*** | **Silky Purple-Flag** | Groundcover | Landscaping APZ | 100 |
| *Persoonia chamaepitys* | Mountain Geebung | Groundcover | Landscaping APZ | 50 |
| ***Persoonia linearis*** | **Narrow-leaved Geebung** | Shrub | Creek corridor | 20 |
| ***Themeda australis*** | **Kangaroo Grass** | Groundcover | All areas | 200 |

## 3.5 Erosion control and soil stabilisation

Erosion control is required at the edges of all areas proposed for soil disturbance including the driveways and other infrastructure. Erosion control can be achieved by installing physical barriers and soil covering including hessian or similar material weed mat and coir logs. Placement of these soil erosion measures at an example site are shown below.

The performance target will be that no soil or sediment or other material has washed downslope or outside of the construction and landscaped zone, i.e. that the disturbance has been successfully contained.

*Figure 3-2. Example of hessian weed map placement (left) and Coir log placement(right) to stabilise soil for rehabilitation.*

## 3.6 Timeframe for implementation

A timeframe for the implementation of the vegetation management actions is set out in **Table 3-3**. The timing of works is provided to coincide with key stages of the development including prior to construction, during construction works, at issue of the Occupation Certificate and ongoing.

Sediment control measures will be established before and during the construction phase. Landscaping features including low stone walls and other measures will need to be established to provide soil erosion control over the life of the development.

Once established, APZ maintenance will be completed on an annual basis before the bushfire season, prior to the end of August.

Weed monitoring and control will be undertaken during construction in all zones to control existing weeds and detect and respond to new incursions.

After construction, weed monitoring and control is recommended to occur twice per year, once at the same time as APZ maintenance and once in early summer when weed growth may be at a peak and to remove weeds that are coming into flower to prevent seed set.

*Table 3-3: Timeframe and responsibility for management actions.*

| | | | Monthly, during construction (assumes 12 month construction period) | | | | | | | | | | | | Annually, post-construction | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Year1 | | | | | | | | | | | | Year 2 | Ongoing |
| | | | Month | | | | | | | | | | | | | |
| **Management Zone** | **Action** | **Before Construction** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | | |
| **1. Construction and Landscaping Zone** | 1. Demarcate the construction zone | | | | | | | | | | | | | | Complete | |
| | 2. Install sediment fencing | | | | | | | | | | | | | | Complete | |
| | 3. Monitor and control weeds | | | | | | | | | | | | | | Developer | Landowner |
| | 4. Rehabilitate edges of the zone after construction (erosion control and revegetation) | | | | | | | | | | | | | | Complete | |
| **2. Asset Protection Zone** | 5. Demarcate the APZ to indicate all areas external to the zone are 'Environmental Protection Area' | | | | | | | | | | | | | | Complete | |
| | 6. Monitor and control weeds in APZ | | | | | | | | | | | | | | Complete | |
| | 7. Maintain vegetation to be consistent with *Planning for Bush Fire Protection* Inner Protection Area low fuel standards | | | | | | | | | | | | | | Land Owner | Land Owner |
| **3. Native Vegetation Restoration Zone** | 8. Demarcate zone as 'Environmental Protection Area' during construction | | | | | | | | | | | | | | Complete | |
| | 9. Retain all native trees and encourage natural regeneration of eucalypt seedlings and saplings within the zone | | | | | | | | | | | | | | Land Owner | Land Owner |
| | 10. Monitor and control weeds | | | | | | | | | | | | | | Land Owner | Land Owner |
| | 11. Retain all native groundcover and top soil by avoiding or minimising use of machinery | | | | | | | | | | | | | | Complete | |
| | 12. Restore native vegetation across the zone, in conjunction with weed control works | | | | | | | | | | | | | | Land Owner | Land Owner |

Shaded cells indicate the recommended timing for implementation of the management action.

# 4 Performance targets

The performance targets for this VMP are set out in **Table 4-1** and provide a checklist to track site management actions and performing towards achieving the objectives. The performance targets are provided for each of the VMP objectives of this VMP.

*Note: Additional performance targets may be identified or required by Council as a condition of consent and/or as specified in a site-specific weed management plan.*

*Table 4-1: VMP objectives and performance targets.*

| VMP Objective | Performance Target | Achieved / Notes |
|---|---|---|
| A. Protect and restore native vegetation on the site to enhance the habitat values for local wildlife. | All batters and disturbed areas are planted out with a mix of the recommended species in **section 3.4** of this VMP, sourced from local seed stock.<br>The Vegetation and habitat restoration zone is managed for reduced weed cover and increased native vegetation cover.<br>Revegetation (planting out) of the Vegetation and habitat restoration zone is implemented with locally-sourced native seedlings.<br>A success rate of 80% survival of plantings is achieved, with replacement plantings if required. | |
| B. Ensure the development does not adversely impact on surrounding land including the creek corridor and associated native vegetation. | No construction disturbance occurs outside of the identified construction and landscaped zone.<br>There is no sediment run off outside of the identified Construction Zone. | |
| C. To balance environmental management of the site with the protection from the threat of bushfire. | Establish and maintain the necessary bushfire asset protection zones at the site to achieve life and property protection as relevant to the location and 'Eco-tourist' use of the site.<br>Trees are retained at <15% cover across the APZ.<br>Native shrubs are <10% of cover across the APZ.<br>Groundcover vegetation in the construction, landscaping and APZ zones is maintained at <10mm height. | |
| D. Manage and control weeds so that the land has a low weed burden for the life development. | There is less than 50% cover of NSW Priority weeds (*Biosecurity Act 2015* weeds) across the Vegetation and habitat restoration zone at commencement of construction.<br>There is less than 20% cover of NSW Priority weeds across the Vegetation and habitat restoration zone at occupation certificate.<br>There is 5% cover of NSW Priority weeds across the Vegetation and habitat restoration zone at year 5 of the project. | |

# 5 Links to other plans and legislation

Local development in NSW is assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This requires consideration of a number of related acts and policies. The relevant legislation and plans and how these have been/will be address by the proposal and actions in this VMP are summarised below.

### Biodiversity Conservation Act 2016 (BC Act) and the Regulations

The BC Act requires development proposals to identify biodiversity values including any threatened species, populations or communities likely to occur on site or be impacted. This assessment has not identified any threatened flora species requiring protection under the BC Act (see Appendix A). The management zones and actions outlined in this VMP are designed to avoid impacts to native vegetation and restore habitat for native fauna.

### Biosecurity Act 2015

The Act deals landowner's responsibility to identify and control weeds listed under the Act. This VMP addresses the monitoring and control of weeds on the site, in conjunction with native vegetation restoration.

### Fisheries Management Act 1994 (FM Act)

Aquatic biodiversity, including any species or ecological communities listed under the FM Act will not be affected by the proposal.

### Rural Fires Act 1997 (RF Act) and Regulations

As the proposal is on bushfire prone land, the development will be required to establish an APZ. The VMP addresses actions for sensitive management of the APZ and retention of selected trees, groves of trees, and shrubs and groundcover to achieve the requirement for the APZ while also avoiding complete clearing and retaining some vegetation that will be managed in a sensitive manner without unnecessary clearing.

### Lithgow LEP and DCP

This VMP seeks to address the objectives of the LEP for 'Eco-tourist' development and the objective for C3-Environmental Management zoned land in relation to management of environmentally sensitive land and riparian protected areas. This VMP is consistent with the principles in DCP clause 8.2.4. Eco-Tourist Facilities.

# 6 References

Fairley A (2004) *Seldom Seen: Rare Plants of Greater Sydney*, Reed New Holland, Australia.

Keith D A (2004) *Ocean Shores to Desert Dunes: The native vegetation of New South Wales and the ACT*, Department of Environment and Conservation (NSW), Hurstville NSW.

DPE (2023a) *BioNet Vegetation Classification and Plant Community Type profiles*, NSW Department of Planning and Environment (retrieved from https://www.environment.nsw.gov.au/research/Visclassification.htm , accessed October 2022).

NPWS (2003), The Bioregions of New South Wales their biodiversity, conservation and history. Published by the National Parks and Wildlife Service (NSW), Hurstville.

DPIE (2021b) *BioNet Vegetation Classification and Plant Community Type profiles*, Office of Environment and Heritage, NSW, accessed https://www.environment.nsw.gov.au/research/Visclassification.htm , August-September 2021

RFS (2019) *Planning for Bush Fire Protection*, published by the NSW Rural Fire Service, Sydney, November 2019 (https://www.rfs.nsw.gov.au/plan-and-prepare/building-in-a-bush-fire-area/planning-for-bush-fire-protection).

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# 7 Appendix A – Site flora species list

*Table 7-1: Plant species recorded during the site assessments.*

| Growth form | Scientific Name | Common Name | Status* | Location on site |
|---|---|---|---|---|
| NATIVE SPECIES | | | | |
| Tree | *Acacia decurrens* | Black Wattle | Native | Creek corridor |
| Tree | *Acacia melanoxylon* | Blackwood | Native | Creek corridor |
| Tree | *Casuarina glauca* | Swamp Oak | Native | Slopes east side of creek – likely planted |
| Tree | *Eucalyptus cypellocarpa* | Monkey Gum | Native | Creek corridor |
| Tree | *Eucalyptus radiata* | Narrow-leaved Peppermint | Native | Creek corridor |
| Tree | *Eucalyptus viminalis* | Ribbon Gum | Native | Creek corridor |
| Grass/ Grass-like | *Austrostipa pubescens* | Tall spear grass | Native | Slopes east side of creek |
| Grass/ Grass-like | *Cynodon dactylon* | Common Couch | Native | Slopes east side of creek |
| Grass/ Grass-like | *Microlaena stipoides* | Weeping Grass | Native | Slopes east side of creek |
| Forb | *Geranium homeanum* | Native Geranium | Native | Slopes east side of creek |
| Forb | *Helichrysum scorpioides* | Button Everlasting | Native | Slopes east side of creek |
| Fern | *Blechnum nudum* | Fishbone Water Fern | Native | Creek corridor |
| Fern | *Pteridium esculentum* | Bracken | Native | Slopes east side of creek |
| WEEDS | | | | |
| Non-native grass | *Anthoxanthum odoratum* | Sweet Vernal Grass | | Disturbed open areas |
| Non-native grass | *Arrhenatherum elatius* | Oatgrass | | Slopes east side of creek |
| Non-native tree | *Betula pendula* | European White Birch | Ornamental | Southern part of site - planted |
| Non-native grass | *Eragrostis curvula* | African Lovegrass | | Disturbed open areas |
| Non-native shrub | *Cytisus scoparius subsp.* | Scotch Broom | WoNS & NSW Priority | Disturbed open areas |

| Growth form | Scientific Name | Common Name | Status* | Location on site |
|---|---|---|---|---|
| | *scoparius* | | | |
| Non-native forb | *Centaurium erythraea* | Common Centaury | | All areas |
| Non-native forb | *Conyza bonariensis* | Flaxleaf Fleabane | | All areas |
| Non-native forb | *Crocosmia crocosmiiflora* | Montbretia | | Creek corridor |
| Non-native grass | *Festuca arundinacea* | Fescue | | Slopes east side of creek |
| Non-native forb | *Gamochaeta pensylvanica* | Cudweed | | Disturbed open areas |
| Non-native shrub | *Hypericum kouytchense* | Large-flowered St John's Wort | NSW Priority | Creek corridor |
| Non-native forb | *Hypericum perforatum* | St. John's Wort | NSW Priority | Disturbed open areas |
| Non-native forb | *Hypochaeris radicata* | Catsear | | Disturbed open areas |
| Non-native shrub | *Ligustrum sinense* | Small-leaved Privet | NSW Priority | Creek corridor |
| Non-native grass | *Nassella trichotoma* | Serrated Tussock | WoNS | Disturbed open areas |
| Non-native tree | *Robinia pseudoacacia* | Black Locust | NSW Priority | Creek corridor |
| Non-native shrub | *Rubus fruticosus* | Blackberry | WoNS & NSW Priority | Slopes east side of creek |
| Non-native forb | *Rumex acetosella* | Sheep Sorrel | | Disturbed open areas |
| Non-native forb | *Verbena spp.* | Verbena | | Disturbed open areas |

* Plant species status identified as follows on PlantNet (https://plantnet.rbgsyd.nsw.gov.au/ ) and NSW WeedWise (https://weeds.dpi.nsw.gov.au/ ).

Native – a plant species that is native to NSW.

'NSW Priority' – weeds which have a biosecurity duty under the *Biosecurity Act 2015*.

'Weeds of National Significance' (WONS) – weeds identified under the National Weeds Strategy and regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts.

# 8 Appendix B – Asset Protection Zone requirements

The following vegetation management guidelines are contained in Appendix 4 of *Planning for Bush Fire Protection 2019*, the legislated document prepared by the NSW Rural Fire Service, which outlines the vegetation management guidelines for APZs. The full document is accessible at https://www.rfs.nsw.gov.au/plan-and-prepare/building-in-a-bush-fire-area/planning-for-bush-fire-protection).

Bush fire risk can be reduced by implementing vegetation management actions to reduce vegetation and fuel levels in and around buildings to provide separation with the unmanaged vegetation, which is the 'bushfire hazard'. This is done by designing and managing landscaping within a defined Asset Protection Zone (APZ) around buildings and/or the property. Careful attention should be paid to species selection, their location relative to their flammability, minimising continuity of vegetation (horizontally and vertically), and ongoing maintenance to remove flammable fuels (leaf litter, twigs and debris).

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance of the APZ should be undertaken regularly, particularly in advance of the bush fire season.

The following standards are recommended to be met within an APZ.

## 8.1 Asset Protection Zones

An APZ is a fuel-reduced area surrounding a building or structure. It is located between the building or structure and the bush fire hazard. For a complete guide to APZs and landscaping, download the NSW RFS document Standards for Asset Protection Zones at the NSW RFS Website www.rfs.nsw.gov.au.

An APZ provides: a buffer zone between a bush fire hazard and an asset; an area of reduced bush fire fuel that allows for suppression of fire; an area from which backburning or hazard reduction can be conducted; and an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Bush fire fuels should be minimised within an APZ. This is so that the vegetation within the zone does not provide a path for the spread of fire to the building, either from the ground level or through the tree canopy.

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the building;
- damage to the building asset from intense radiant heat; and
- ember attack.

The methodology for calculating the required APZ distance is contained within Appendix 1. The width of the APZ required will depend upon the development type and bush fire threat and is typically define in a bushfire assessment report, prepared by an accredited bushfire consultant.

In forest vegetation, the APZ can be made up of an Inner Protection Area (IPA) and an Outer Protection Area (OPA).

## 8.2 Inner Protection Area

The Inner Protection Area (IPA) is the area closest to the building and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and act as a defendable space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

In practical terms the IPA is typically the curtilage around the building, consisting of a mown lawn and well-maintained gardens.

When establishing and maintaining an IPA the following requirements apply:

Tree canopy cover should be less than 15% at maturity; trees at maturity should not touch or overhang the building; lower limbs should be removed up to a height of 2m above the ground; tree canopies should be separated by 2 to 5m; and preference should be given to smooth barked and evergreen trees.

Shrub cover is maintained to create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided; shrubs should not be located under trees; shrubs should not form more than 10% ground cover; and clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass and other groundcover should be kept mown (as a guide grass should be kept to no more than 100mm in height); and leaves and vegetation debris should be removed.

## 8.3 Outer Protection Area

An Outer Protection Area (OPA) is located between the IPA and the unmanaged vegetation which is the bushfire hazard. It is an area where there is maintenance of the understorey and some separation in the canopy. The reduction of fuel in this area aims to decrease the intensity of an approaching fire and restricts the potential for fire spread from crowns; reducing the level of direct flame, radiant heat and ember attack on the IPA. Because of the nature of an OPA, they are only applicable in forest vegetation.

When establishing and maintaining an OPA the following requirements apply:

Trees canopy cover should be less than 30%; and canopies should be separated by 2 to 5m.

Shrubs should not form a continuous canopy; and shrubs should form no more than 20% of ground cover.

Grass should be kept mown to a height of less than 100mm and leaf and other debris should be removed. Other groundcover can be used such as prostrate native plants, forbs or herbaceous species.

*Figure 8-1. Schematic diagram of the appearance of an APZ (Source: Appendix 4 of Planning for Bush Fire Protection 2019).*