

Clarence City Council

Bushfire Management Plan

**Roches Beach Coastal Reserve
and Nowra Bushland Reserve
Roches Beach**

Revised
January 2017
Clarence City Council

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PROJECT TEAM

Rob Whittle

- Clarence City Council - Fire and Bushland Vegetation
Management Works Officer

Pat Marshall

- Clarence City Council – Fire and Bushland Vegetation
Management Coordinator

Gregg Jack

- Clarence City Council – Systems Asset Officer

1. Introduction

This Bushfire Management Plan (BMP) is the second revision and expansion of the BMP for Roches Beach Coastal Reserve and Nowra Bushland Reserve (formerly Kirra Road Bushland Reserve) prepared by AVK Environmental Management and Renaissance Forestry in 2005, and will operate for a period of 5 years after which another review is recommended.

It should be noted that this BMP is not an operations plan and does not deal directly with “response” to bushfires. Operational procedures are dealt with in various documents prepared by the Tasmania Fire Service (TFS) and other emergency services.

1.1 Aim

The aim of this BMP is to provide a framework for bushfire management that meets Clarence City Council’s land management objectives for the site, as set out in Council’s *Bushfire Management Strategy for Council Owned and Controlled Land*, *Bushfire Management Strategy - Best Management Practice Guidelines* and Strategic Plan.

It must be noted that it will not be possible to prevent bushfires occurring in the reserves. Unless these fires are suppressed quickly, there is a risk that large destructive fires may develop. Depending on weather conditions, such fires may burn a substantial portion of the bushland in and adjoining the reserves causing damage to assets and environmental values, and even loss of life. This BMP aims to lessen these risks by minimising the risk of fires starting in the reserves, and minimising the risk of injury or damage to assets in and surrounding the reserves.

This plan also provides for the use of fire as a management tool to:

- Target area for maximum risk reduction
- reduce bushfire hazard to protect assets from bushfires
- maintain the long-term viability of the native vegetation in the reserves
- Assist in the removal of weeds and the regeneration of degraded bushland.

1.2 Location and Description

The area covered by this BMP includes the Roches Beach Coastal Reserve of approximately 6^{ha} and the Nowra Bushland Reserve of approximately 16.3^{ha} (see figure 1). The Roches Beach Coastal Reserve is a narrow coastal strip between private property on the eastern side of Kirra Road and Fredrick Henry Bay. Nowra Bushland Reserve is situated on the southern slopes of Single Hill on the western side of Kirra Road (see figure 1). The highest point in the reserves is approximately 130m above sea level. Both reserves have multiple entry points (see figure 6).

Sections of both reserves have been mapped as a bushfire-prone area under the *Clarence Interim Planning Scheme 2015*. Any future developments within or adjacent may require a Bushfire Risk Assessment and a Bushfire Hazard Management Plan.

Figure 1 – Location of the Reserves



1.2.1 Geology and Soils

The coastal reserve consists of a very narrow, low foredune in the south and low dolerite cliffs and steep slopes to the north. Soils are thin podzolics, prone to tunnel erosion in gullies. The higher Nowra Bushland Reserve is on Jurassic dolerite. Soils here are brown clays of medium to high plasticity that are subject to cracking in dry periods.

1.2.2 Vegetation

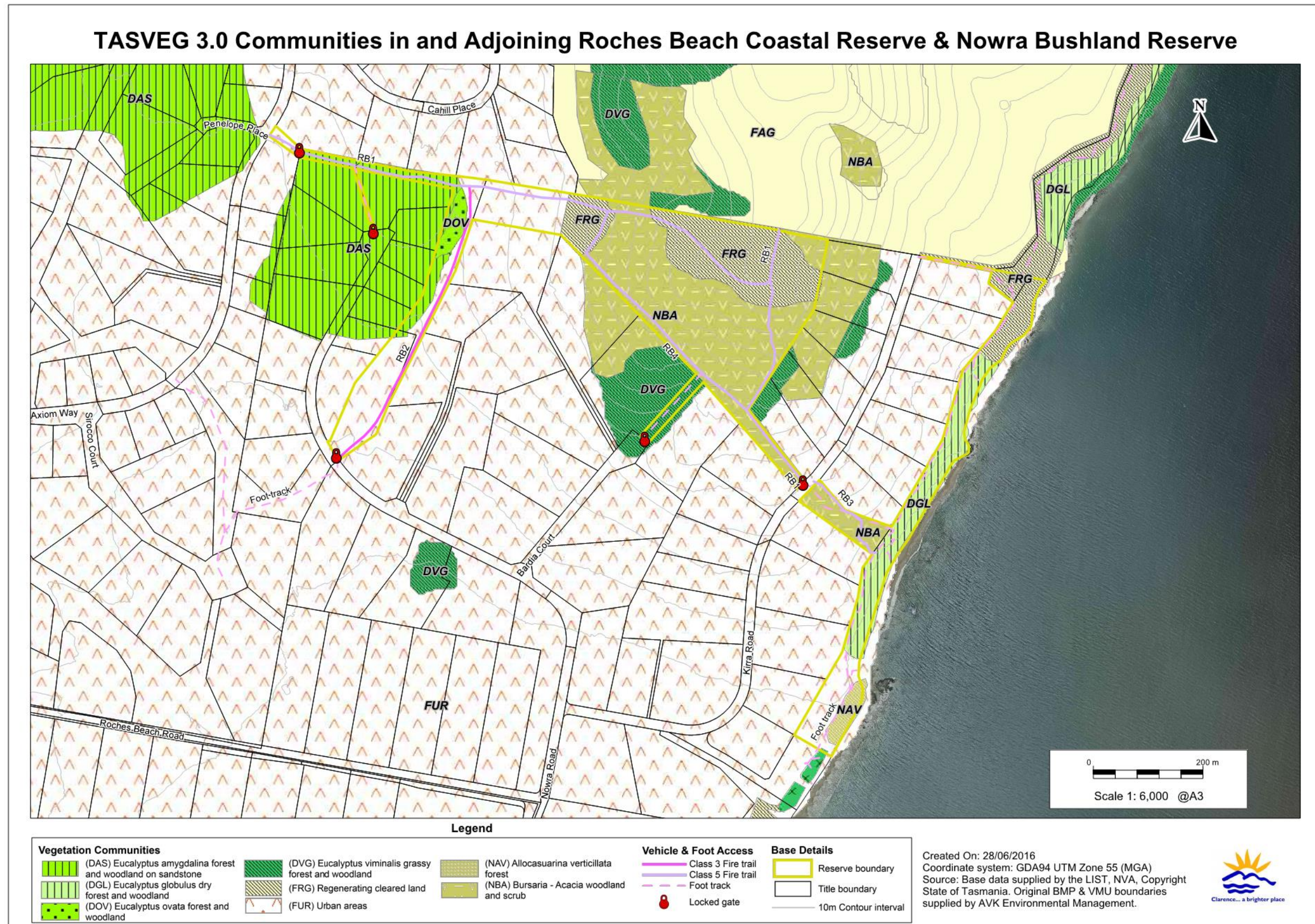
The major vegetation communities in the reserves are shown in figure 2. Vegetation types and community boundaries within the reserves are based on TASVEG 3.0 mapping, checked and modified where required following a survey of the reserves. Vegetation community boundaries outside the reserves have not been checked for accuracy but are shown to give an indication of the surrounding vegetation. Both reserves contain areas of managed grassland that is periodically slashed as well as former areas of pasture that are slowly returning to native bushland. The main native vegetation communities in the reserves are *Eucalyptus globulus* dry forest and woodland (DGL) in the coastal reserve and *Bursaria-Acacia* woodland and scrub (NBA) in Nowra Bushland Reserve. There are also small areas of *Allocasuarina verticillata* forest (NAV) in the coastal reserve, *Eucalyptus amygdalina* forest and woodland on sandstone (DAS), *Eucalyptus viminalis* grassy forest and woodland (DVG) and *Eucalyptus ovata* forest and woodland (DOV) in Nowra Bushland Reserve.

Eucalyptus amygdalina forest and woodland on sandstone (DAS), *Eucalyptus globulus* dry forest and woodland (DGL) and *Eucalyptus ovata* forest and woodland (DOV) are listed as threatened native vegetation communities under the *Nature Conservation Act 2002*.

1.2.3 Reserve Usage

The Roaches Beach Coastal Reserve contains a popular walking track through to Seven Mile Beach; Nowra Bushland Reserve has a highly frequented informal mountain bike track. Both reserves are used for activities such as; walking, bike riding, dog exercising and jogging.

Figure 2 – Vegetation Types in the Reserves



1.3 Bushfire Management Objectives

Bushfire management within the Roches Beach Coastal Reserve and Nowra Bushland Reserve will meet the following broad management objectives:

1. Protection of life, assets and adjoining property from bushfire.
2. Minimise the risk of fires starting and spreading in the reserve.
3. Protection and enhancement of the ecological and visual values provided by the reserve.
4. Protection of infrastructure and cultural heritage values within the reserve.
5. Recovery, maintenance and enhancement of vegetation communities and fauna habitat within the reserve.
6. Minimisation of soil loss resulting from bushfire, or bushfire management activities.

The actions recommended to attain each of these objectives are listed in section 5.1.

1.4 Reserve Management Responsibilities

Management of the reserves is the responsibility of the Clarence City Council. Clarence City Council has a responsibility under the *Fire Service Act (1979)* to take all reasonable precautions to prevent any fire lit on their property from spreading onto neighbouring property. This BMP will help to fulfil that “duty of care”. The TFS is responsible for suppressing bushfires within the reserves.

2. Bushfire Risks

Extreme bushfire conditions can occur in southern Tasmania when dry winters and springs are followed by summers where fuels are very dry. Under these conditions, fires can be expected to move quickly under the influence of strong, dry, north-westerly winds, and then move more or less at right angles on a broad front when the subsequent south-westerly wind change arrives. Fires that start under these conditions can reach a very high intensity, even in areas with relatively low fuel loads, and are very difficult to control until the weather conditions abate.

2.1 Fire History and Causes

The bushfire history of both reserves is shown on figure 3.

The planned burn history of both reserves is shown on figure 4.

2.1.1 Bushfires

Approximately 14^{ha} of Nowra Bushland Reserve was impacted by the 1967 black Tuesday bushfires.

In February 2013, 0.3^{ha} of Nowra Bushland Reserve was impacted by a bushfire ignited by the mower being used to reduce the fuel load on the adjacent private property catching on fire. This fire burnt in total approximately 17^{ha} into the adjacent Single Hill, suppression was achieved via helicopters water bombing.

In December 1999 the northern end of Roches Beach Coastal Reserve was impacted by a small vegetation fire approximately 1.3^{ha}. The cause was determined as unknown.

During the five year period of the previous BMP the TFS attended only one incident within both reserves – the February 2013 bushfire in Nowra Bushland Reserve.

2.1.2 Planned Burning

No planned burning for asset protection or ecological purposes was scheduled for the duration of the previous BMP. The only documented planned burn occurred within Nowra Bushland Reserve in vegetation management unit (VMU) 4 (see figure 7) during 1997.

The previous regime excluding fire in both reserves will continue for the five year duration of this BMP, and should be revised at the next BMP review. This review should analyse the requirement of a planned burning regime in the NBA and FRG communities (see figure 2) within Nowra Bushland Reserve to encourage native grass species recruitment. Section 2.4.2, 3.2 and 4.3.2 outlines serrated tussock (*Nassella trichotoma*) restraints that need to be factored in at time of review.

It also must be noted that fuel reduction burning in grasslands has little effect, as grass fuels can be replenished within a year post burn.

Broadscale planned burning is to be excluded from future BMPs within Roches Beach Coastal Reserve to mitigate coastal erosion. If required, patch or pile burning should only be utilised by those who satisfy the training requirements in section 4.3.3. Any patch or pile burning is solely at the discretion of Councils Fire and Bushland Management Co-ordinator, and no heaping of vegetation to be burned shall occur prior to consultation.

Figure 3 – Reserve Bushfire History

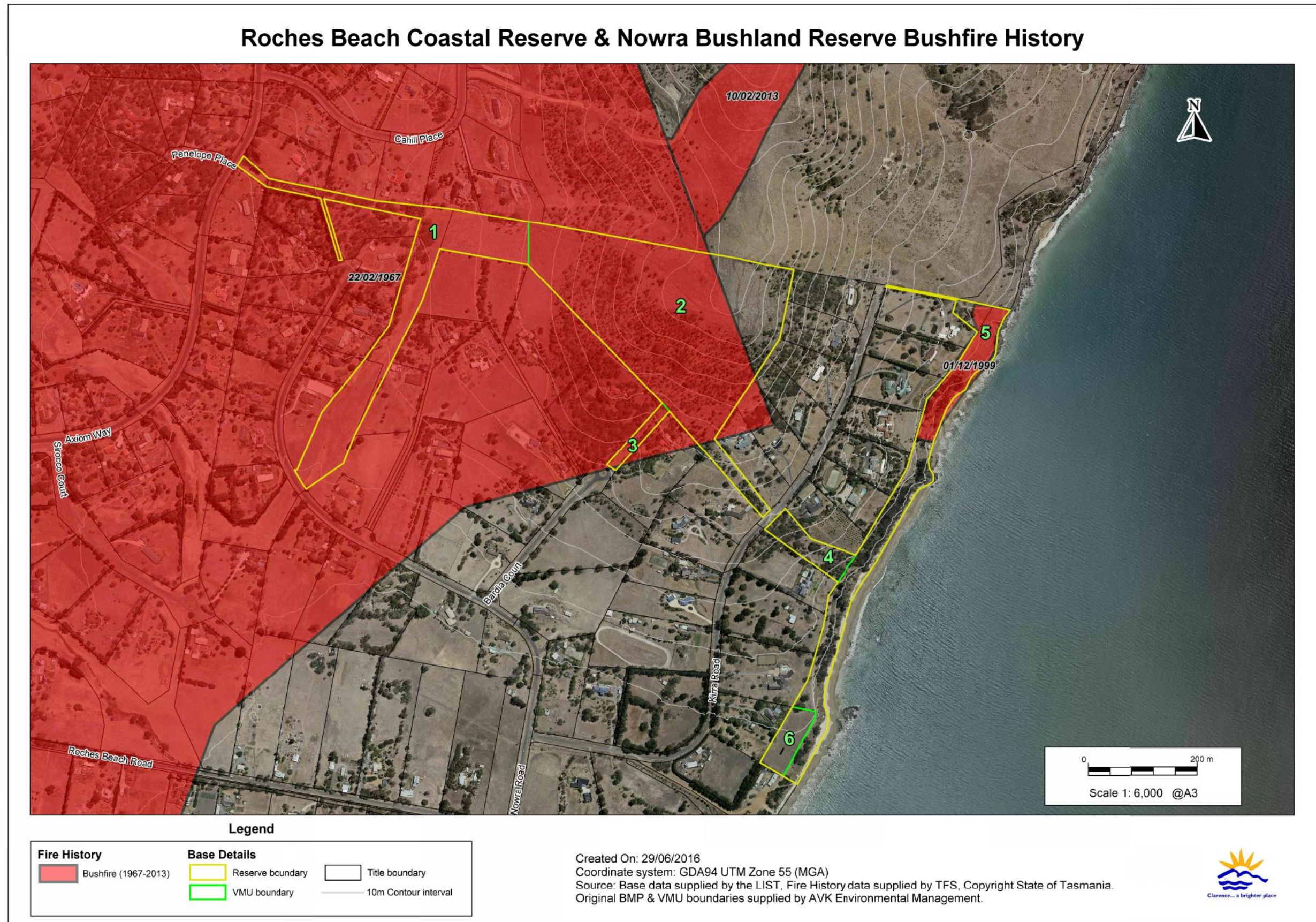
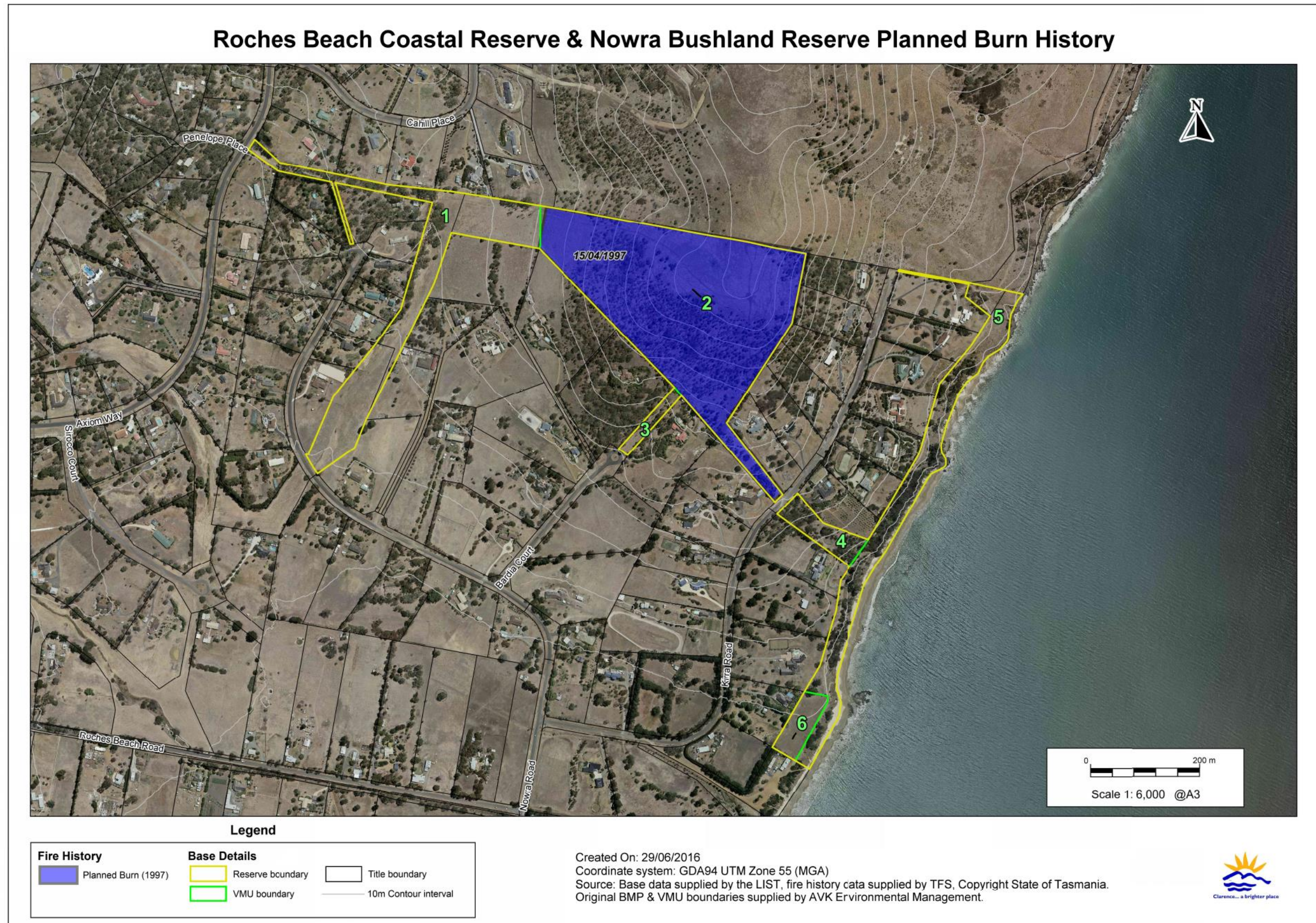


Figure 4 – Reserve Planned Burn History



2.2 Fuel Types and Hazard Levels

The higher the intensity of a bushfire the greater its destructiveness and the more difficult it is to control. As the intensity of a bushfire increases it becomes progressively more difficult to contain and suppress the bushfire. Very high intensity ($> 4000 \text{ kW/m}$ heat output at the fire front) fires with flame heights greater than 10m are generally uncontrollable (NSW Rural Fire Service, 1997). Although grass fires rarely attain a very high intensity, they can move much faster than forest fires, thereby making them difficult to contain.

Bushfire intensity is a function of the heat content of the fuel, the quantity (load) of fuel, and the rate of spread of the bushfire. The heat content of vegetation fuels is roughly constant, and rate of spread is largely a function of slope and weather conditions (wind speed and relative humidity). It has been found that the quantity and distribution of fine fuels are the main factor influencing bushfire behaviour. Larger fuels burn during a bushfire but do not contribute significantly to the spread of a bushfire (NSW Rural Fire Service, 1997).

Fine fuels consist of dead plant matter less than 6mm in diameter and live plant matter less than 2mm in diameter (including grasses, bracken, leaves, bark, and twigs and branches) (Marsden-Smedley, 2009). Fine fuel load (measured in tonnes per hectare) has therefore been used as a convenient measure of the underlying bushfire hazard in areas dominated by woody vegetation. The fine fuel load at any given time is a balance between the rate of fuel build-up, and factors that remove fuel, such as litter decomposition and fire. In the absence of bushfire, fuel loads in forests and woodlands with a shrubby or heathy understorey build up to a quasi-equilibrium state where the rate of fuel production equals the rate of decomposition. The maximum levels vary for different vegetation types and also for the same vegetation types in different locations (Conroy, 1988). The time taken to reach equilibrium fuel loads also varies, ranging from about 2 years in some native grasslands to about 20 to 40 years in dry eucalypt forests (Marsden-Smedley, 2009).

However, it has been found that the fuel structure is possibly more important than the total fine fuel load in determining bushfire behaviour (Marsden-Smedley, 2009). Fuel in forests, woodlands and shrublands can be categorised into four layers with differing effects on bushfire behaviour (Hines et al., 2010). These layers are:

- **Surface fine fuel;** leaves, bark, small twigs and other fine fuel lying on the ground. These fuels provide the horizontal continuity that allows a bushfire to spread.
- **Near surface fine fuel;** grasses, low shrubs, bracken etc. up to about 0.5m above the ground surface. Fuels in this layer will burn when the surface fuel layer burns and will increase bushfire intensity.
- **Elevated fuels;** larger shrubs and small saplings with most of the fuel closer to the top of this layer and a clear gap between them and the surface fuels. These interact with the two lower fuel layers to further increase bushfire intensity. They also contribute to the vertical continuity of fuel that allows fire to 'climb' into the tree canopy.

- **Bark fuels;** flammable bark on trees, saplings and large bushes from ground level to the canopy. Loose fibrous bark on stringy-bark eucalypts, and candle bark on some gums can generate large amounts of burning embers which can start spot fires ahead of the main fire front.

Canopy fuels are not usually included in fuel hazard assessments in forests and woodlands, but are included in shrubland and heath fuel types where they are equivalent to elevated fuels. If there is sufficient fuel in the lower fuel layers to start the canopy fuel burning (called a crown fire) bushfire intensity can increase considerably. Crown fires in forests are generally considered uncontrollable (Luke and McArthur, 1986).

The main fuel factor that influences the rate of spread of a bushfire is the quantity of near surface fuel whereas total fine fuel load is the main factor influencing bushfire intensity (Gould et al 2007).

In grasslands and grassy woodlands the degree of curing (dryness) of the fuel is considered at least as important as the actual fuel load (Cheney and Sullivan, 2008). Grass goes through an annual cycle with new growth in spring drying out over summer. The bushfire hazard in grassland areas is greatest when the grass is fully cured which usually occurs during the period from December to April depending on seasonal breaks and significant summer rainfall events. However, grasslands that are not grazed or slashed over winter can burn in spring if cured grass from the previous growing season is still present.

Unlike bushland dominated by woody plants, grasslands can accumulate fuel very rapidly, and therefore burning is not a very effective method of hazard reduction. As grass fuel decomposes faster than eucalypt leaves and twigs, and is more likely to be eaten by herbivores, fuel loads in grasslands and grassy woodlands can fluctuate from year to year (Cheney and Sullivan, 2008).

Fuel loads can be roughly categorised in terms of the potential threat they pose as follows:

Low - < 5 tonnes per hectare

Moderate - 5 to 15 tonnes per hectare

High - >15 tonnes per hectare.

The characteristics of each fuel type in the reserves are given in table 1. The TASVEG 3.0 codes of the vegetation types in figure 2 corresponding to each fuel type are listed under the fuel type.

Table 1 – Characteristics of the different fuel types in the reserves

FUEL TYPE	FUEL HAZARD CHARACTERISTICS	BUSHFIRE BEHAVIOUR AND CONTROL
Shrubby forest / woodland DAS	Canopy, bark, elevated, near surface and surface fuels all present. Relatively sparse, partly managed shrub layer on adjoining private properties. Near surface fuels a mixture of grasses and heathy shrubs. Leaf and bark fall around trees contributes to a gradual build up of fuel, particularly around the base of trees. Generally moderate overall fuel loads, but high where there is dense shrub growth. Grass component of the fuel load can build up fuel rapidly after a bushfire.	Can burn with moderate to high intensity depending on the degree of fuel accumulation. Significant ember attack on structures downwind of the bushfire and spotting across containment lines can be expected. Capable of carrying a bushfire at any time of year if there is sufficient amount of litter on the ground. Tree cover can sustain a crown fire, except where fuel loads in the understory are managed. Eucalypts, particularly old hollow trees and those with rough bark, will be a source of burning embers which can carry a bushfire over nearby fire control lines (roads, fuel breaks) and threaten nearby buildings. Fuel reduction burning is effective in removing accumulated litter, elevated fuels and the bark fuels largely responsible for spotting, but grass and bracken fuels can be replenished within a year or two after fire.
Grassy forest / woodland DGL DOV DVG	Canopy, near surface and surface fuel all present, bark fuels only present on roughed barked trees and shrubs. Moderate fuel loads, grass cover has some dense aggregates up to 1.5m. Leaf and bark fall around trees contributes to a gradual build up of fuel, particularly around the base of trees. Grass component of the fuel load can build up fuel rapidly after a fire.	Can burn with moderate to high intensity depending on the degree of fuel build-up. Significant ember attack on structures and spotting across containment lines can be expected. Capable of carrying a bushfire at any time of year if there is a sufficient amount of litter on the ground, and/or cured grass. Some areas capable of sustaining crown fire, however some aggregates of eucalypts with managed land beneath or adjacent make crown fire difficult to establish/sustain. Eucalypts with rough bark, old hollows, or dead standing will be a source of burning embers which can carry a bushfire over nearby fire control lines (roads, fuel breaks) and threaten nearby buildings. Fuel reduction burning is effective in removing accumulated litter and the bark fuels largely responsible for spotting, but grass fuels can be replenished within a year after a burn.
Shrubland NBA NAV	Surface and near surface fuels present in the form of sheoak leaves/duff layer with grasses up to 1m. Some elevated and bark fuels present. Dominant fuel layer is grass component which can build up fuel rapidly after fire or wet winters and springs.	Where shrub canopies touch, the fuel can sustain a running crown fire of high intensity on days of extreme bushfire weather that would be difficult to control. Dense thickets are difficult to access. Significant ember attack on nearby structures and spotting across containment lines can be expected. NAV is difficult to burn at low intensity in cool weather due to low surface and near surface fuel loads.

FUEL TYPE	FUEL HAZARD CHARACTERISTICS	BUSHFIRE BEHAVIOUR AND CONTROL
Unmanaged grassland FRG	Native and introduced grasses, scattered shrubs and saplings, near surface and surface fuels dominate with some elevated fuels. Potential for dense elevated fuels to about 1 m high following wet winters and springs. Flammability dependant on degree of curing of the grass. Grass fuels can be replenished within a year after fire.	Can generate rapidly moving, moderate intensity fires in late summer and early autumn. Fires can occur at other times of the year if the cured standing crop from the previous year's growth persists. Likely to be relatively little spotting so fires can usually be stopped at roads and fuel breaks, however, fires may be uncontrollable in extreme conditions.
Managed vegetation	Surface, near surface and some bark fuel present. Generally low to moderate overall fuel loads. Grass and shrubs generally less than 200 mm in height due to periodic slashing. Scattered trees contribute to a gradual build up of fuel, particularly around the base of trees.	Will burn with low intensity unless there has been a lot of fuel accumulation or the near surface fuels have not been slashed for periods. Capable of carrying a bushfire at any time of year if there is a sufficient amount of litter on the ground, and/or cured grass. Tree cover is generally too sparse and fuel loads too low to sustain a crown fire. Fires in this fuel type are unlikely to spot over control lines and will be relatively easy to control.

Low to moderate fuel loadings in both reserves averaging 5-7^t/ha. Near surface and elevated fuels in the form of grasses and shrubs are by far the major components of fuel loading in both reserves. Bushfires in these fuel types could be difficult to control, and most planned burns in this fuel type will be of moderate intensity.

2.3 Bushfire Threat and Risk to Persons

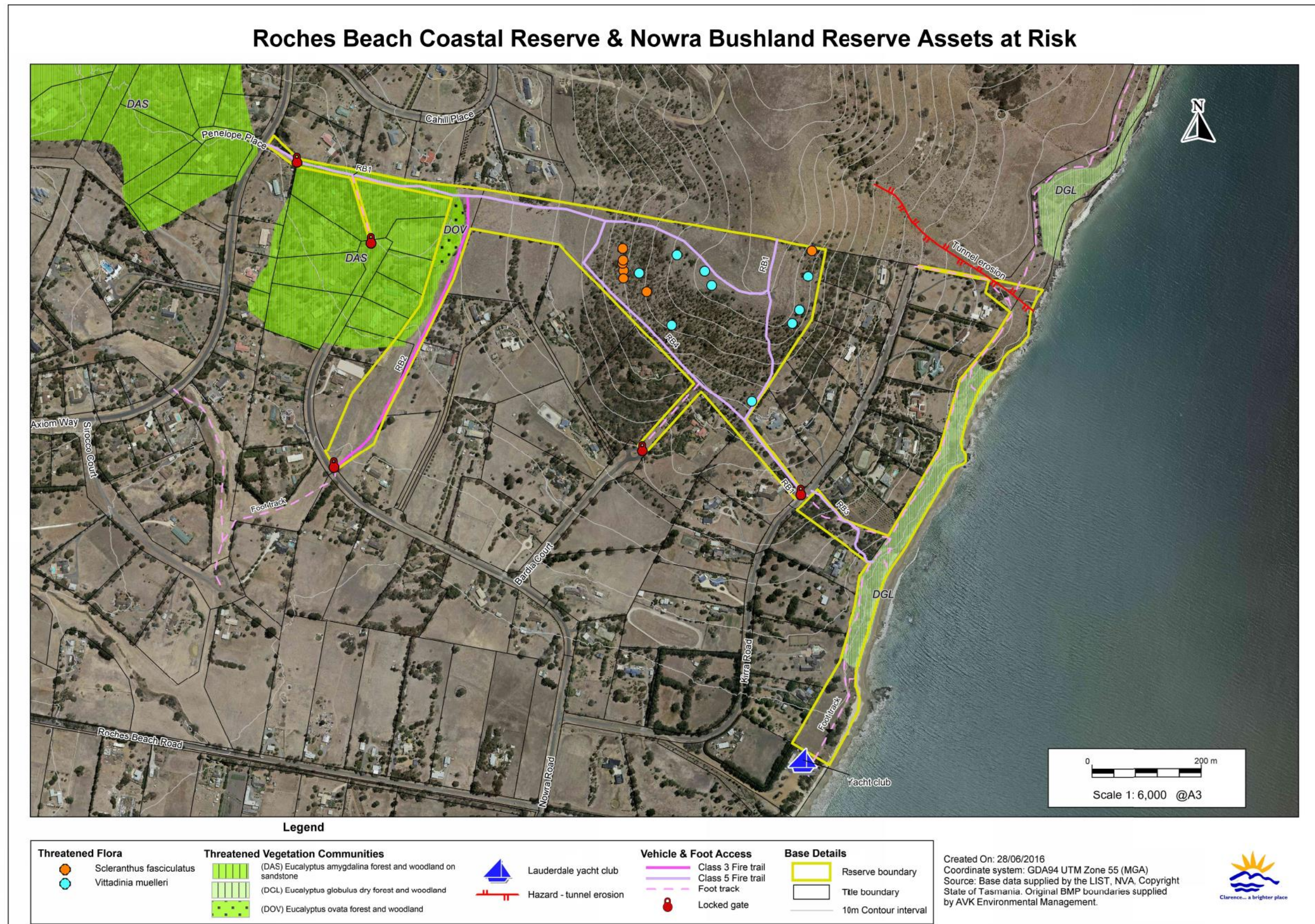
The Roches Beach Coastal Reserve is narrow and isolated. Fires in this reserve are likely to be the result of local ignitions and limited in extent. The Nowra Bushland Reserve adjoins an extensive area of farmland and bushland on Single Hill and is likely to be affected by any major fires in this area. Fires entering the reserve from the north would be burning downslope which would limit their intensity. Fires starting on the western and southern aspects of the reserve are expected to travel at moderate to high intensity upslope through the reserve, running into the adjacent Single Hill. As the reserves are relatively narrow and it is easy to reach cleared areas, either on the beach or on adjoining private property, the risk to persons in the reserves is considered to be low.

2.4 Assets at Risk from Bushfire

Assets potentially at risk from bushfire include; dwellings, infrastructure, and other items (such as ornamental and regeneration plantings) which would cost money to replace; as well as items of scenic, cultural and natural heritage value which could be damaged or destroyed by fire, or bushfire suppression activities. Each landowner has an obligation to reduce a bushfire hazard where it is a threat to neighbouring properties. However, even with extensive hazard reduction, the risk of high intensity bushfires occurring in the reserves cannot be eliminated.

Therefore consideration must be given to protection measures that will reduce the risk of bushfire damage to assets in and surrounding the reserves. Assets within and surrounding the reserves that are considered at risk from bushfires are shown in figure 5.

Figure 5 - Assets at risk from bushfire



2.4.1 Bushfire Risk to Natural Heritage Assets

The conservation value of plant communities in the reserves is given in table 2. Two plant species of conservation value is known to occur within Nowra Bushland Reserve; spreading knawel (*Scleranthus fasciculatus*) and a large population of narrow leaf New Holland daisy (*Vittadinia muelleri*). These are listed in table 3 along with their response to bushfire. The *Natural Values Atlas* identifies no flora of conservation value within Roaches Beach Coastal Reserve.

The *Natural Values Atlas* identifies no recent verified records of fauna species of conservation significance occurring within the reserve. It does identify potential habitat present within the reserve for the following species:

Greg goshawk (*Accipiter novaehollandiae*), chaostola skipper (*Antipoda chaostola*), chevron looper moth (*Amelora acontistica*), wedge-tailed eagle (*Aquila audax*), tunbridge looper moth (*Chrysolarentia decisaria*), spotted-tail quoll (*Dasyurus maculatus*), white-bellied sea-eagle (*Haliaeetus leucogaster*), swift parrot (*Lathamus discolor*), green and gold frog (*Litoria raniformis*), forty-spotted paradalote (*Paradalotus quadragintus*), eastern barred bandicoot (*Perameles gunnii*), Australian grayling (*Prototroctes marena*), tussock skink (*Pseudemoia pagenstecheri*), Tasmanian devil (*Sarcophilus harrisii*) and masked owl (*Tyto novaehollandiae*).

Multiple wedge-tailed eagles (*Aquila audax*) have been observed regularly above the adjacent Single Hill. Although no suitable habitat is within the reserve for this species, the adjacent Meehan Ranges provides suitable easterly facing mature *Eucalypt* tracts for nesting territory in addition to known nest sites. The habitat requirements and preferred bushfire management of this species is given in table 4

Table 2 – Conservation value of native plant communities

TASVEG 3.0 CODE	EQUIVALENT FLORISTIC COMMUNITY¹	Conservation Status²
DAS	DRY-hAM-sand Grassy <i>E. amygdalina</i> forest	THREATENED NATIVE COMMUNITY
DGL	DRY-gGLOB Grassy <i>E. globulus</i> forest	THREATENED NATIVE COMMUNITY
DOV	DRY-gOV Grassy <i>E. ovata</i> forest	THREATENED NATIVE COMMUNITY
DVG	DRY-gVIM Grassy <i>E. viminalis</i> woodland	Not threatened
NBA	None described	Not threatened
NAV	DRY-in VERT Inland <i>A. verticillata</i> low forest	Not threatened

1. Forest Practices Authority (2005)

2. Nature Conservation Act 2002

Table 3 - Plant species of conservation value and preferred bushfire management

SPECIES	CONSERVATION STATUS¹	OCCURRENCE	RESPONSE TO BUSHFIRE AND MANAGEMENT	ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC Act) STATUS
<i>Scleranthus fasciculatus</i> Spreading knawel	VULNERABLE	Scattered plants recorded in Nowra Bushland Reserve.	May survive cool burn, likely to regenerate from seed following a bushfire.	Not threatened
<i>Vittadinia muelleri</i> Narrow leaf New Holland daisy	RARE	A large population recorded in Nowra Bushland Reserve.	Regenerates from seed following bushfires.	Not threatened

1. Tasmanian Threatened Species Protection Act 1995

Table 4 - Fauna of conservation value and preferred bushfire management

SPECIES	CONSERVATION STATUS ¹	HABITAT AND PREFERRED BUSHFIRE MANAGEMENT	ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC Act) STATUS
<i>Aquila audax</i> wedge-tailed eagle	ENDANGERED	<p>Nesting habitat includes the following elements: patches of mature (including old-growth) forest, or forest with mature/old-growth elements, normally greater than 10^{ha} in area; nest trees usually tall (25-75m), large and robust mature eucalypts, generally taller than the canopy; nests are often constructed in the tallest and largest tree at a site, and usually located within the canopy even when the nest tree is taller; nests typically occur on the lee (sheltered) aspect of the site (or where hills shelter an otherwise exposed site), with the nest situated below the ridge level for protection from prevailing winds.</p> <p>Disturbance (visible or audible) to a nesting eagle can result in the death of eggs or chicks, through exposure to cold, heat or predation while adults are absent - including:</p> <ul style="list-style-type: none"> - people or loud machinery too near the nest during the breeding season ('too near' can be many hundreds of metres if in direct line of sight of the nest); - residential development near nesting habitat; and - investigating nests during the breeding season. <p>Removal of nest trees or surrounding vegetation (the same nest may be used intermittently over decades). (Threatened Species Link, 2016)</p> <p>No planned burning within reserves during breeding season (August-January).</p>	ENDANGERED

1 - Tasmanian Threatened Species Protection Act 1995

The fire sensitivity and flammability ratings of the vegetation types in the reserves according to Pyrke and Marsden-Smedley (2005), is given in table 5.

Table 5 – Fire attributes of the native vegetation

TASVEG 3.0 CODE	FIRE SENSITIVITY	FLAMMABILITY
DAS	Low	High
DGL	Low	High
DOV	Low	High
DVG	Low	High
NAV	Low	Moderate
NBA	Low	High

Flammability classification of Tasmanian vegetation (Pyrke & Marsden-Smedley, 2005)

FLAMMABILITY	CRITERIA FOR FLAMMABILITY
Very high	Will burn readily throughout the year even under mild weather conditions, except after recent rain (i.e. less than 2-7 days ago).
High	Will burn readily when fuels are dry enough but will be too moist to burn for lengthy periods, particularly in winter. Fuels will be dry enough to burn on most days from late spring to early autumn.
Moderate	Extended periods without rain (i.e. two weeks at least) and/or moderate or stronger winds are required for these communities to burn.
Low	These communities will burn only after extended drought (i.e. four weeks without rain) and/or under severe fire weather conditions (i.e. forest fire danger index > 40).

Note: recently burnt stands of low or moderate flammability classes may have a higher flammability rating.

Fire sensitivity classification of Tasmanian vegetation (Pyrke & Marsden-Smedley, 2005)

FIRE SENSITIVITY	ECOLOGICAL IMPACT OF BUSHFIRE	MANAGEMENT RECOMMENDATIONS
Extreme	Any bushfire will cause either irreversible or very long-term (> 500 years) damage.	Suppress all bushfire. Highest priority for bushfire suppression.
Very high	A single bushfire will cause significant change to the community for 50-100 years and will increase the probability of subsequent fires changing the community permanently.	Suppress all bushfire. High priority for bushfire suppression.
High	A bushfire-adapted community requiring at least 30 years between fires to maintain the defining species. Bushfire intervals greater than 80 years are required to reach mature stand structure.	Suppress all bushfire, but give higher priority to stands burnt less than 80 years ago.
Moderate	A bushfire-adapted community requiring at least 15 years between fires to maintain the defining species.	Suppress fires in stands burnt less than 20 years ago.
Low	Highly bushfire-adapted or non-native vegetation. A single bushfire will generally not affect biodiversity, although repeated short intervals (i.e. < 10 years) may cause long-term changes.	Suppression usually not an ecological priority except in specific situations (e.g. a recently burnt stand of a threatened species).

The low fire sensitivity of the native vegetation in the reserves indicates that it is highly fire adapted and a single fire will generally not adversely affect biodiversity, though repeated fires at intervals of less than 10 years may cause long-term changes in floristics and vegetation structure (Pyrke & Marsden-Smedley 2005). The moderate to high flammability rating of the native bushland in the reserves in Pyrke & Marsden-Smedley (2005) indicates that the bushland in the reserves will burn readily when fuels are dry but may be too moist to burn for long periods during winter. Fuels will generally be dry enough to burn on most days from late spring to early autumn.

2.4.2 Bushfire and Habitat Management

The main bushfire risk to natural heritage assets in the reserves is from fire regimes that are outside the thresholds within which a particular plant community, or habitat for flora and fauna species, has viability in the long-term. Fire regimes within the thresholds of a particular plant community will help maintain its long-term viability, whereas fire regimes outside the thresholds are likely to lead to progressive changes in the structure and floristics of the plant community, and loss of habitat for the fauna favouring that plant community.

High intensity bushfires that burn the whole of the reserve can damage or destroy valuable fauna habitat including:

- Tree hollows used as nests and dens by many birds and arboreal mammals.
- Mature, senescing or dead trees that can be important invertebrate, bird and reptile habitat, and take a long time to replace.
- Understorey species that provide nest and shelter sites as well as a food source for many bird and mammal species.
- Fallen logs, bark and leaf litter that provide shelter and a food source for invertebrates, frogs, reptiles, birds and mammals.

Species may be lost from the reserves if they cannot recolonise from nearby areas, or survive in unburnt patches.

Bushfires often stimulate the spread of environmental and other weeds. However, some weed species provide significant protection and food sources for fauna (for example, gorse and blackberry) and removal of these species should be carefully managed to ensure they are progressively replaced by equivalent native species habitat.

The bushfire management requirements of the different plant communities/habitats in the reserves are given in table 6. These plant communities have been grouped together according to their bushfire management requirements. Although most areas of native bushland benefit from periodic planned burns, they are not recommended for the reserves for the duration of this BMP. The Roches Beach Coastal Reserve is narrow and located on steep slopes. It has areas of weeds that are likely to spread if adjoining areas of native vegetation are burnt, and removal of ground cover could cause erosion problems. These are considered to outweigh the benefits of burning.

In the Nowra Bushland Reserve, burning could be used to create the inter tussock spaces required by the two plant species of conservation value in the reserve if there is excessive grass growth. Currently, the grass cover is relatively sparse and there is ample bare ground for the two plant species of conservation value. Serrated tussock (*Nassella trichotoma*) is also present in the reserve. As burning would encourage this weed it is recommended that the reserve not be burnt until it has been controlled in the area. See section 4.3.2 regarding a flupropanate herbicide regime to reduce serrated tussock communities in Nowra Bushland Reserve.

Table 6 - Bushfire management requirements of the plant communities in the reserves

TASVEG 3.0 MAPPING UNITS	BUSHFIRE IMPACTS AND BUSHFIRE MANAGEMENT AIMS
Heathy dry sclerophyll forests and woodlands	
DAS - <i>Eucalyptus amygdalina</i> forest and woodland on sandstone	<p>Bushfire controls the establishment of a dense shrubby understorey which would reduce light penetration to the ground layer. This can help maintain a diversity of heathy shrubs and herbs.</p> <p>Frequent fires can encourage a dense bracken layer that can suppress other ground layer species.</p> <p>Bushfire provides an opportunity for fire dependent species to germinate.</p> <p>Optimal bushfire interval for maintaining these communities is 15-25 years.</p> <p>Exclude bushfire from representative areas to provide controls for monitoring the effects of bushfire.</p>
Grassy dry sclerophyll forests and woodlands	
<p>DGL - <i>Eucalyptus globulus</i> dry forest and woodland</p> <p>DOV - <i>Eucalyptus ovata</i> forest and woodland</p> <p>DVG - <i>Eucalyptus viminalis</i> grassy forest and woodland</p>	<p>Infrequently burnt sites develop a dense shrubby understorey. Kangaroo grass (<i>Themeda triandra</i>) can die out after an extended absence of bushfire, or other method of biomass reduction (Lunt & Morgan, 1998).</p> <p>Frequent fires (< 5 years) can inhibit tree regeneration and eliminate the shrubby component</p> <p>Sites overlying dolerite and other more fertile soils have markedly more rapid rates of regeneration than low fertility soils derived from mudstone and sandstone.</p> <p>Overfrequent burning regimes in the past within much of the forest overlying mudstones around Hobart has contributed to loss of topsoil and erosion.</p> <p>Extended absence from bushfire can result in build up of fuel causing hot and damaging burns.</p> <p>A temporal and spatial mosaic-burning pattern would assist with tempering the effects of a devastating bushfire.</p> <p>Optimal bushfire frequency is 5-20 years on fertile sites.</p> <p>Exclude bushfire from representative areas to provide controls for monitoring the effects of bushfire. Exclude bushfire from most areas on mudstone, which due to low fertility have low biomass growth rates and are drought stressed.</p>

TASVEG 3.0 MAPPING UNITS	BUSHFIRE IMPACTS AND BUSHFIRE MANAGEMENT AIMS
Non eucalypt forests/woodlands	
NBA – <i>Bursaria</i> / <i>Acacia</i> woodland and shrub	<p>This community is typically derived from eucalypt woodland. It is a degradation phase often associated with extended periods of moderate to high intensity grazing.</p> <p>Fire regimes will influence the nature of regeneration. Important to allow for a period of absence from bushfire where eucalypts can re-establish if desired.</p> <p>Optimal bushfire frequency is 5-20 years.</p> <p>Exclude bushfire from representative areas to provide controls for monitoring the effects of bushfire.</p>
NAV – <i>Allocasuarina verticillata</i> Forest	<p>Extended absence of fires leads to a closed canopy and a dense litter layer that has a low density and diversity of ground layer species, although it may be important for invertebrate species.</p> <p>Frequent low intensity fires benefit <i>Allocasuarina verticillata</i> over the adjacent eucalypt dominated communities (Kirkpatrick 1985).</p> <p>Tendency to exclude bushfire for visual impact reasons in foreshore environments risks the long-term loss of regenerative age classes and the ultimate decline of this community in favour of grassland. Alternate methods of facilitating natural regeneration through localised clearance may be a more suitable method.</p> <p>Exclude bushfire for the duration of the plan from foreshore reserves.</p> <p>Preferred bushfire interval in inland reserves is between 15-25 years.</p>

2.4.3 Bushfire Risk to Built and Cultural Assets

During the BMP review process Aboriginal Heritage Tasmania (AHT) completed a requested search of the Aboriginal Heritage Register (AHR) regarding the area inside the BMP boundary. This search identified two known locations of shell middens or artefact scatter within Roches Beach Coastal Reserve. Proposed management strategies to preserve these sites are mentioned in Table 7 under “Other Bushfire Risks”.

Most of the assets likely to be at risk from bushfire are in the Roches Beach Coastal Reserve and include the Lauderdale Yacht Club building and infrastructure such as timber bridges and steeples, hand rails, picnic tables and fencing. Assets at risk from bushfire in the Nowra Bushland Reserve are limited to perimeter fencing. For minor infrastructure assets, it is generally considered more costly to provide bushfire protection than to replace the asset if damaged in a bushfire.

Dwellings on properties adjoining the reserves are far enough from the reserve boundaries to provide adequate defensible spaces within allotments to current TFS standards; most adjoining lots are well managed.

The degree of fire danger at any particular time is a combination of fine fuel quantity, slope, and the prevailing weather conditions. The actual risk of a bushfire causing damage to an asset is a function of the degree of danger, the probability of a bushfire igniting, and any measures taken to prevent the bushfire causing damage.

The four major modes of attack by bushfires that can cause damage to assets are:

1. wind-blown burning debris
2. radiant heat which can ignite flammable materials ahead of the fire front and shatter glass
3. flame contact
4. Strong winds generated or intensified by the bushfire.

The potential for damage to buildings in the path of large fires burning out of the reserves will depend largely on:

- whether the bushfire will approach upslope or downslope
- the quantity and distribution of fuel surrounding the building
- whether they are defended during the bushfire
- their design
- if the building was constructed to Australian Standard 3959-2009, *Construction of Buildings in Bushfire-prone Areas*
- How well they have been maintained.

The Australian Standard for Construction of buildings in bushfire-prone areas (AS:3959 – 2009) uses a Fire Danger Index (FDI) of 50 to determine the Bushfire Attack Level (BAL) for buildings that need to comply with the standard. An FDI of 50 is the boundary between Very High and Severe Fire Danger Rating.

There is insufficient data available to assess the likelihood of a high intensity bushfire starting in the reserves; however there is sufficient fine fuel within the unmanaged portion of Nowra Bushland Reserve to sustain a high intensity bushfire on days of extreme fire danger. The narrow width of the Roches Beach Coastal Reserve means there is insufficient fire run to develop high intensity bushfires. The bushfire risk to the built and cultural heritage assets within and surrounding the reserves has been assessed using a procedure adapted from the National Emergency Risk Assessment Guidelines (NEMC, 2010). The assessment process is explained in section 5.4 of *Clarence City Council Bushfire Management Strategy for Council Owned and Controlled Land*, and the results and proposed management strategies are shown in table 7.

Note that the assessment in table 7 only considers the risk from fires starting in, or passing through the reserves. Some assets may face a greater bushfire risk from nearby bushfire hazards that are not under the control of Clarence City Council. Other assets, such as Aboriginal heritage sites, may not be directly damaged by bushfire but may be damaged by bushfire management and bushfire suppression activities, such as constructing fire control lines. If present, these risks are noted under “other risks” in table 7.

NOTE: It was not possible to inspect assets on properties adjoining the reserves. The risk assessment therefore makes the following assumptions about these assets:

- Landowners/residents have established and are maintaining a defensible space to current TFS specifications around vulnerable assets, either wholly within the lot, or up to the boundary with the reserves where there is insufficient space within the lot. Where this is not the case the asset may face a much higher bushfire risk than indicated in the risk assessment.
- All dwellings adjoining the reserve are well maintained to resist attack by wind-blown burning embers. Where this is not the case the asset may face a much higher bushfire risk than indicated in the risk assessment.

The management strategies recommended in table 7 will reduce the existing bushfire risk to built and cultural assets but in most cases will not eliminate it. Active protection of an asset during a bushfire can greatly reduce the bushfire risk. Assets at medium and high risk of damage from bushfire should be protected during planned burns in the reserves.

Table 7 - Bushfire risk assessment for built and cultural assets

<p>RISK CATEGORIES</p> <p>LOW – asset of low value or considered to have a low risk of damage from bushfires in the reserve due to its construction, location, or protection measures already in place.</p> <p>MODERATE – asset is vulnerable to damage by bushfires and could face attack by a moderate to high intensity bushfire, but has features that will reduce the intensity of the fire attack, or provide some protection from fires. Further bushfire protection measures are required.</p> <p>HIGH – asset is of high value, is vulnerable to damage by bushfires and could face attack by a high intensity bushfire with few, if any, features that would reduce the intensity of fire attack. Further bushfire protection measures are required.</p>										
ASSET AT RISK	RISK ANALYSIS (See section 5.4 of the Bushfire Management Strategy)								OTHER BUSHFIRE RISKS	PROPOSED MANAGEMENT STRATEGIES
	A	B	C	D	E ¹	F	G	Level of Risk		
Dwellings adjoining Nowra Bushland Reserve on the western side of Kirra Road.	4	1	3	2	0.2	2	6	57.6 Low		Advise residents of the need to maintain an adequate defendable space around their dwelling. No defendable space required in the reserve.
Dwellings adjoining Nowra Bushland Reserve at the northern end of Bardia Court.	4	1	3	2	0.2	2	6	57.6 Low		Advise residents of the need to maintain an adequate defendable space around their dwelling. Maintain approximately 6m wide fuel break along boundary fence for access.
Dwellings adjoining Nowra Bushland Reserve along Cahill Place.	2	2	3	2	0.2	2	6	57.6 Low		Advise residents of the need to maintain an adequate defendable space around their dwelling. Maintain existing area of slashed grassland within the reserve.
Dwellings adjoining Roches Beach Coastal Reserve on the eastern side of Kirra Road.	2	3	1	2	0.2	2	6	28.8 Low		Advise residents of the need to maintain an adequate defendable space around their dwelling. Maintain a 5m wide outer zone along the reserve boundary on the northern side of the dwelling on 15 Kirra Road.
Lauderdale Yacht Club	2	2	1	2	0.2	2	4	12.8 Low		Maintain existing mown area on the northern side of the yacht club.

ASSET AT RISK	RISK ANALYSIS (See section 5.4 of the Bushfire Management Strategy)								OTHER BUSHFIRE RISKS	PROPOSED MANAGEMENT STRATEGIES
	A	B	C	D	E ¹	F	G	Level of Risk		
Dwellings adjoining Nowra Bushland Reserve along Nowra Road.	2	1	2	2	0.2	2	6	19.2 Low		Advise residents of the need to maintain an adequate defendable space around their dwelling. Maintain existing area of slashed grassland in the reserve.
Aboriginal heritage sites									May be damaged by vehicle movements during bushfire management or suppression, and establishment of fire control lines.	Ensure that the TFS is aware that the reserve has known sites and their importance. Only use existing trails and tracks for fire control lines, or use wet lines.

1 – Note that the risk analysis score in column E only indicates that there is enough space to provide a defendable space between bushland in the reserve and an adjoining asset. It does not indicate that a defendable space has been established on the adjoining property, or if established is being adequately managed.

3. Bushfire Management Issues

3.1 Existing Bushfire Management

3.1.1 Implementation of the Previous Bushfire Management Plan

As part of this revision of the BMP for the reserves, a review of the implementation of the recommendations of the previous BMP was carried out.

The review found that of 16 recommendations, 7 have been implemented successfully, 3 have not been implemented because they have not been required (i.e. they are actions in response to other incidents) and 2 have not been implemented.

The 2 recommendations that have not been implemented are a familiarisation tours for the TFS and establishing vegetation monitoring. The full findings of the review are in Appendix A.

3.1.2 Planned Burning

The previous BMP recommended no planned burning during its five year period. This regime is to continue for this BMP for reasons stated in section 2.4.2.

3.1.3 Vehicle Access Routes and Foot Tracks

There are five vehicle access points into Nowra Bushland Reserve, controlled by locked bollards or chains (see figure 6). Unauthorised use of fire trails by trails bikes and 4WD vehicles is rare.

There are two vehicle access points into Roaches Beach Coastal Reserve, one unrestricted from Lauderdale Yacht Club (although this only provides access for approximately 125m), the second through 17 Kirra Road which is an unformed track on Council land with limited turning, referenced as RB3 (figure 6 and table 8).

Each fire trail has been assigned a usage class in table 8 and its current condition assessed against the standard for their assigned usage class in MP 1 in the *Clarence City Council Bushfire Management Strategy – Best Management Practice Guidelines*. The section of fire trail through Nowra Bushland Reserve that crosses steep slopes on dolerite derived soils has not been surfaced, and will be very slippery after rain. Similarly, the access from Nowra Road is low lying and may become boggy when wet.

An additional fire trail RB4 has been implemented during the 2016 review. RB4 will also function as a 6m wide fuel break as specified in table 7 and section 3.1.5.

Foot tracks in Roches Bay Coastal Reserve are regularly maintained and are in good condition. There are no formalised foot tracks in the Nowra Bushland Reserve.

Figure 6 – Vehicle and Foot Access

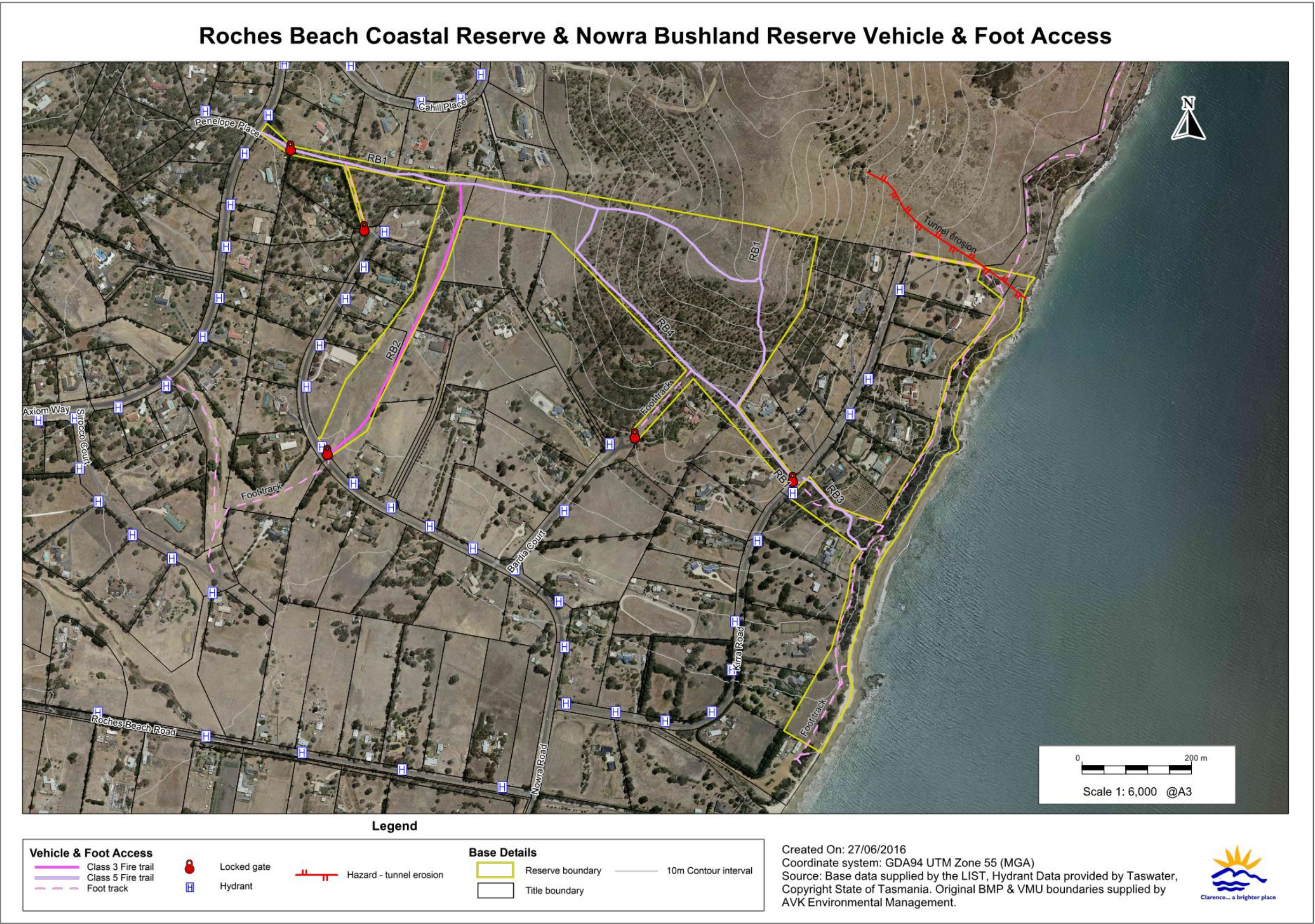


Table 8 - Condition and maintenance of fire trails in the reserves

Assigned usage class (see Management Procedure (MP) 1): Class 1 – all 2WD and 4WD vehicles Class 3 – all weather 4WD, light and heavy 4WD vehicles (category 3, 4 & 5 tankers) Class 5 – dry weather and/or high clearance 4WD, light 4WD (category 5 tankers), also includes trails with sharp bends and dead end trails with small turning areas.	Maintenance priority: High priority - major through routes and fire control lines Medium priority - important access and escape routes and minor fire control lines Low priority - minor access routes and boundaries of vegetation management units.
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The trail usage class describes the suitability of the fire trail if properly maintained, not necessarily its condition at the time of inspection.

***MP refers to Management Procedures in Clarence City Council Bushfire Management Strategy – Best Management Practice Guidelines**

FIRE TRAIL ID	USAGE CLASS	STRATEGIC FIRE TRAIL UNDER HOBART FIRE PROTECTION PLAN ¹	MAINTENANCE PRIORITY	LOCATION AND CONDITION AT MARCH 2016	ACTION REQUIRED	MANAGEMENT CONSTRAINT
RB1	5	NO	Medium	Runs from the Axiom Way entrance through Nowra Bushland Reserve to the Kirra Road entrance. Unsurfaced trail in reasonable condition. Steeper sections likely to be slippery when wet. Trail meets most class 5 specifications.	Inspection and maintenance as specified in MP2.	NONE
RB2	3	NO	Medium	Runs from the Nowra Road entrance through Nowra Bushland Reserve to RB1. Trail is in good condition but has sections that may become boggy when wet. Trail meets most class 3 specifications.	Inspection and maintenance as specified in MP2.	NONE

FIRE TRAIL ID	USAGE CLASS	STRATEGIC FIRE TRAIL UNDER HOBART FIRE PROTECTION PLAN ¹	MAINTENANCE PRIORITY	LOCATION AND CONDITION AT MARCH 2016	ACTION REQUIRED	MANAGEMENT CONSTRAINT
RB3	5	NO	Medium	<p>Runs from Kirra Road to the coastal walking track in Roches Beach Coastal Reserve.</p> <p>Unformed access route, limited turning area at the bottom of the hill. Dry weather use only.</p> <p>Trail meets class 5 specifications except for encroaching vegetation.</p>	<p>Clear encroaching vegetation to class 5 standards.</p> <p>Inspection and maintenance as specified in MP2.</p>	NONE
RB4	5	NO	Medium	<p>Starts at southwestern corner of 26 Kirra Road at RB1. Trail is unformed in sections running west along northern boundary of properties along Bardia Court, following shrubland boundary. Trail finishes at RB1 on northern side of reserve.</p> <p>Trail meets class 5 specifications except for encroaching vegetation.</p> <p>Section of trail also forms 6m fuel break se section 3.1.5</p>	<p>Undergrowth needs to be cleared to 6m width.</p> <p>Inspection and maintenance as specified in MP2.</p>	NONE

1 - Strategic fire trails have been identified in the Hobart Fire Protection Plan. Strategic fire trails will be signposted.

3.1.4 Water Supply

There are no water sources within the reserves. Water for firefighting and bushfire management has to be obtained from fire hydrants along nearby roads (see figure 6). This is considered adequate for fire fighting and bushfire management within the reserves.

3.1.5 Fuel Breaks and Defendable Spaces

A fuel break (sometimes called a “firebreak”) is a strip of cleared, or partly cleared, bushland constructed and maintained to slow, or stop, the progress of a bushfire to assist in its control. They are not the same as defendable spaces which are maintained around vulnerable assets to protect them from bushfires. Fuel breaks in grassland can be effective in stopping fires if cleared down to mineral earth, but where trees and shrubs are present wind-blown burning embers will usually carry a bushfire across a fuel break. Therefore, in bushland with shrubs and trees the only benefit of a fuel break is to provide access for firefighters and a boundary for backburning operations. Currently there are no standards or guidelines for fuel breaks in Tasmania. The low lying, western portion of the Nowra Bushland Reserve is regularly slashed and functions partly as a fuel break and partly as an outer zone to TFS specification for an outer zone.

A defendable space is an area of managed vegetation around an asset likely to be at risk from bushfire that protects it from direct flame contact and intense radiant heat, as well providing an area where fire fighters can defend the asset. The TFS document *Bushfire Survival Plan 2015-2016* recommends that a defendable space includes two 'zones':

- An inner zone (formerly Bushfire Protection Zone or BPZ) where flammable materials are minimised.
- An outer zone (formerly Fuel Modified Zone or FMZ) where a low level of flammable material is permitted.

In the inner zone, flammable materials on, under and around your home should be moved away from the house.

In the inner zone:

- Include non-flammable areas such as paths, driveways, and mowed lawns.
- Use non-flammable mulch; do not use woodchips or bark.
- Locate any dams, orchards, vegetable gardens and any effluent disposal areas on the fire-prone side of the home.
- Use radiation shields and windbreaks such as stone or metal fences and hedges using low-flammability plants.
- Remove fire hazards such as wood piles, rubbish heaps and stored fuels.
- Replace all highly-flammable plants with low-flammability plants.
- Prune lower branches on trees and remove flammable shrubs from under and between trees.

- Rake up bark and leaves and keep roofs and gutters clear of flammable debris.

The TFS notes it is not necessary to remove all vegetation from the inner zone. Individual trees rarely cause houses to burn in bushfires.

Trees can screen a building from windblown embers while protecting it from radiant heat. Smooth barked trees are less likely to catch fire than those with rough bark. No tree should be able to fall on the building.

In the outer zone, small-sized natural fuels (such as leaf litter, bark, sticks, tussocks and some shrubs) should be removed and larger fuels (trees and shrubs) should be cut back to reduce the intensity of an approaching bushfire.

Natural fuels, both on the ground and between the ground and any larger trees, should be reduced by selective removal of vegetation, both horizontally and vertically, followed by ongoing maintenance.

In the outer zone:

- Retain established trees to trap embers and reduce wind speeds.
- Selectively remove small trees and shrubs to create clumps (rather than a continuous wall of trees) separated by open areas.
- Remove the vegetation between the ground and the bottom of the tree canopy, to a height of at least two metres.
- Minimise fine fuels at ground level, such as grasses and leaf litter.

The existence and adequacy of defensible spaces on individual lots adjoining the reserves was not surveyed as part of this BMP. Nevertheless, it must be stressed that establishment and maintenance of defensible spaces around residences bordering the reserves are essential for bushfire protection. Clarence City Council and individual landowners need to co-operate to provide and maintain adequate bushfire protection.

Currently an approximately 3m wide fuel break is maintained along part of the southern boundary of Nowra Bushland Reserve (see figure 7). This is to be re-established and upgraded to 6m to allow the instalment of an additional fire trail RB4 (see figure 6 and table 8). Additional outer zones which are recommended in both reserves (see table 7, table 9 and figure 7). These outer zones should provide adequate protection for adjoining properties, provided that the portion of these properties between the dwelling and the reserves are maintained as an inner zone.

3.1.6 Bushfire Detection and Suppression

Both reserves are visible from surrounding properties and roads, and it is likely that any fires would be promptly reported. Fires in Roches Beach Coastal Reserve are most likely to start in the reserve itself but Nowra Bushland Reserve adjoins an extensive area of bushland and pasture on Single Hill and is likely to be affected by major bushfires in this area.

The reserves are relatively small with multiple access points and sections of both reserves are regularly slashed. It should be noted that vehicle access could be difficult when trails are wet. During the 2013 bushfire in Nowra Bushland Reserve, helicopters were utilised to water bomb the fire in an attempt to control and rapidly suppress the fire. The utilisation of helicopters was extremely successful; however on a day with multiple fires burning across the state, future fires starting or running through the reserve may not have resources allocated as in 2013, and can burn through the whole reserve and into adjacent private property.

3.2 Weeds

A detailed weed survey was not undertaken as part of the review of the previous BMP, merely observations from field work.

Environmental weeds occur throughout both reserves and are a key management issue affecting their natural values. While much primary weed control work has been undertaken by Councils Fire and Bushland Management and various Council contractors and the Lauderdale Coastcare Group to manage infestations of African boxthorn (*Lycium ferocissimum*) and serrated tussock (*Nassella trichotoma*), follow-up maintenance activities will be required for many years.

Several weed species found in the reserves are classified as declared weeds under the Tasmanian *Weed Management Act 1999* and/or Weeds of National Significance (WONS). Where possible these weeds will be targeted as a priority to prevent their further spread.

Boneseed (*Chrysanthemoides monilifera*), African boxthorn (*Lycium ferocissimum*) and serrated tussock (*Nassella trichotoma*) are present declared weeds and WONS.

Horehound (*Marrubium vulgare*) is a well-established declared weed in Nowra Bushland Reserve that is not listed as a WONS.

Other environmental weeds present within the reserves are cotoneaster (*Cotoneaster* sp.), radiata pine (*Pinus radiata*), briar rose (*Rosa rubiginosa*) and periwinkle (*Vinca major*).

Serrated tussock (*Nassella trichotoma*) forms extensive patches in open grassland areas and also creeps into the margins of shrubland areas within the Nowra Bushland Reserve. Serrated tussock is capable of rapidly colonising bare ground and can be spread by inappropriate bushfire management techniques or poor machinery hygiene, as well as by inappropriate grazing. Bushfire management therefore needs to take into account the presence of serrated tussock.

See section 4.3.2 on the implementation of a fluproponate herbicide regime to reduce serrated tussock communities.

Near the Kirra Road entrance there are a number of sticky wattle (*Acacia howittii*) which appears to be spreading. This is not native to Tasmania and is likely to be a garden escape with potential to establish across Nowra Bushland Reserve.

3.3 Stakeholder and Community Concerns

At the commencement of the project Clarence City Council sent a letter to all landowners adjoining the reserves and to other stakeholder groups informing them that the BMP was being revised and inviting them to have input into the revised plans for the reserves by sending in a written submission, attending a community “walk and talk” in the reserve, or by contacting the reviewer directly. The community “walk and talk” was held in the reserves on the 7th November 2015 and was attended by two community members and one Council representative. In addition four written comments were received.

The community concerns about bushfire management in the reserves expressed during the walk and talk and written comments are summarised in Appendix B along with the reviewer’s response.

4. Plan Implementation

To ensure that the recommendations in this plan are fully implemented, Clarence City Council will ensure that TFS brigades likely to attend bushfires within the park are familiar with the plan, and its contents are issued to the TFS.

4.1 Bushfire Risk Reduction Strategy

The overall bushfire risk reduction strategy recommended for the reserves can be summarised as follows:

- Reduce ignitions through prosecution of arsonists, and prompt reporting of fires.
- Maintain access points and hazard reduced areas to enable the TFS to rapidly contain fires that start in the reserves and ensure the TFS are familiar with the location and condition of fire trails in the reserves.
- Maintain defendable spaces in the reserves to complement defendable spaces on adjoining properties.
- Encourage neighbouring residents to maintain defendable spaces around their homes.

4.2 Community Education, Awareness and Involvement

To ensure successful implementation of this BMP it will be necessary to inform key sectors of the community about bushfire management issues within the reserves. This should include surrounding residents and those with special interests in the reserves, or whose activities can affect assets within the reserves. The community education process is detailed in section 5.7 of *Clarence City Council Bushfire Management Strategy for Council Owned and Controlled Land*. This was not implemented during the previous BMP, and has a heavy influence in the effectiveness of this BMP.

In particular, adjoining residents should be advised that dumping garden waste and other rubbish in reserves increases the bushfire hazard and makes firefighting along the bushland/urban interface more difficult and dangerous for fire fighters. It also contributes to the spread of weeds. Residents should also be advised that they are not authorised to remove vegetation in a Council reserve, even if it is recommended in the BMP. If residents have any concerns about the bushfire hazard in the reserves near their home, they are encouraged to contact Council's Fire and Bushland Vegetation Management Co-ordinator.

4.3 Planned Burning

The native plant communities in the reserves are considered dependent on bushfire to maintain their structure and floristics in the long term. Periodic burning will help to maintain diversity in the understorey, and allow bushfire dependent species to germinate and establish. However, there is a need to minimise damage to important habitat elements (such as dead trees, old logs and stumps) during these burns, and to ensure adequate retention of unburnt patches of each forest type to act as refugia for recolonisation of burnt areas.

Section 2.1.2 explains withholding fire from both reserves for the duration of this BMP, in addition section 2.4.2 discuss utilising this period to establish a management regime for serrated tussock (*Nassella trichotoma*).

4.3.1 Vegetation Management Units (VMU)

The planned burning program in this plan is based on the division of the dry forest, shrubland and grassland habitats into a mosaic of vegetation management units (VMU) (see figure 7). VMUs can be burnt at a frequency, season and intensity that is optimal for the plant communities within each unit or excluded from fire if the vegetation does not require burning or the VMU is being managed by other means. The bushfire management requirements of the vegetation communities within the reserves are given in table 6.

The previous BMP divided the reserves into seven VMUs covering each of the two reserves respectively. This revised BMP has removed VMU 7 as this area is now managed vegetation. The reviewed BMP now incorporates six VMUs, which will provide the most appropriate methods required currently for managing bushfire hazard whilst promoting biodiversity and controlling serrated tussock communities until the next revision in 2021.

4.3.2 Planned Fire Regimes

The approach adopted in this BMP is to withhold planned burning for a 5 year period to allow the implementation of a fluproponate herbicide regime to reduce serrated tussock populations in Nowra Bushland Reserve. This program should incorporate additional plantings of native grass species to assist in achieving the best desirable outcome. For this regime to be successful an annual maintenance program needs to be adopted which includes targeted glyphosate spot-spraying and manual removal of outlier plants. Fluproponate should not be used as an annual treatment as it may lead to herbicide resistance in serrated tussock populations (McLaren and Grech 2010).

At present, the use of planned fire is not considered necessary for management of the vegetation in Roches Beach Coastal Reserve.

This BMP covers a 5-year period, after which another review is recommended. At this time the need for broad area burning should be reassessed for Nowra Bushland Reserve, particularly if serrated tussock in the area has been brought under control. Bushfire management recommendations for VMUs within the reserves are given in table 9.

Figure 7 – Vegetation Management Units in the Reserves

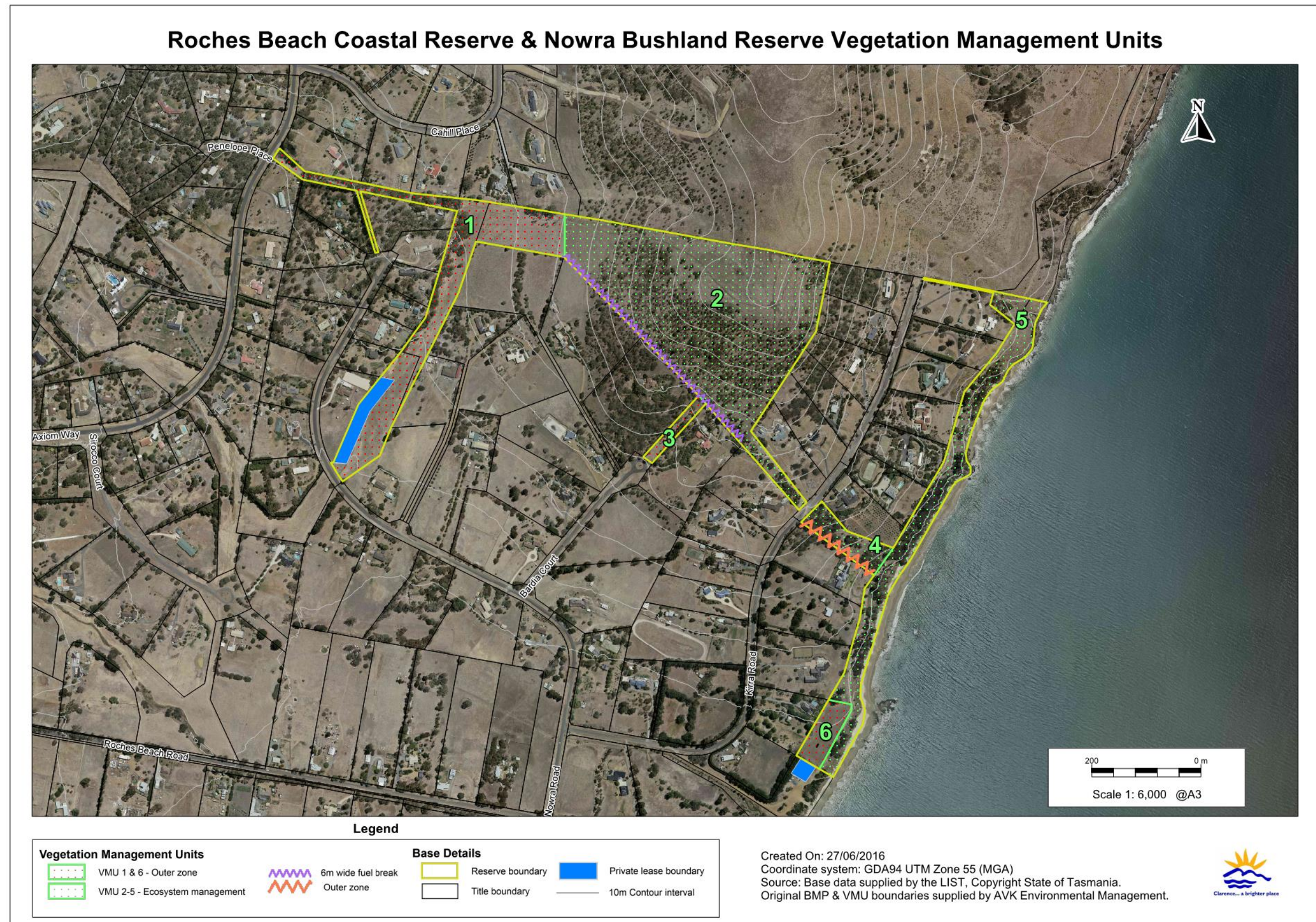


Table 9 – Bushfire management in the reserves

VMU ¹	AREA (ha)	BUSHFIRE MANAGEMENT OBJECTIVES and PRESCRIPTIONS	NOTES and PRECAUTIONS ^{2, 3, 4}	LAST BURNT	NEXT BURN
DOV / Managed Vegetation 1	3.8	OBJECTIVE: Maintain as managed grasslands to protect adjoining dwellings with aggregates of retained vegetation managed as an outer zone. PRESCRIPTION: Slash annually; remove any branches below 2m on retained vegetation.	Consult DPIPWE Threatened Species Section before operations which may impact DOV ² community.	1967	No burning this BMP
2 NBA FRG	11.3	OBJECTIVES: Maintain as grassland and shrubland. Reduce the extent and density of weeds, particularly serrated tussock. PRESCRIPTION: No burning for the duration of this plan.	Contains the vulnerable and rare plant species <i>Scleranthus fasciculatus</i> ³ and <i>Vittadinia muelleri</i> ³ . Obtain a permit from DPIPWE Threatened Species Section prior to operation which may impact. Avoid fire in areas containing serrated tussock (<i>Nassella trichotoma</i>) ⁴ .	1997 complete 2013 Partial	No burning this BMP
3 DVG	0.3	OBJECTIVE: Maintain as an outer zone PRESCRIPTION: See specifications for outer zones in MP 5 in the Best Management Practices Guidelines.	Annually slash/mow.	1967	No burning this BMP
4 NBA	0.7	OBJECTIVES: Maintain the structure and floristics of the vegetation community. Reduce the extent and density of weeds. PRESCRIPTION: Councils Fire and Bushland Management to annually brushcut selected areas.		Not known	No burning this BMP
5 DGL NAV	4.7	OBJECTIVES: Maintain the structure and floristics of the vegetation communities. Reduce the extent and density of weeds. PRESCRIPTION: Brushcut grassy verges of walking track during fire season.	Consult DPIPWE Threatened Species Section before operations which may impact DGL ² community.	1999 (part)	No burning this BMP

VMU ¹	AREA (ha)	BUSHFIRE MANAGEMENT OBJECTIVES and PRESCRIPTIONS	NOTES and PRECAUTIONS ^{2, 3, 4}	LAST BURNT	NEXT BURN
Managed Vegetation ⁶	0.6	<p>OBJECTIVE:</p> <p>Maintain as an outer zone to protect adjoining dwellings.</p> <p>PRESCRIPTION:</p> <p>See specifications for outer zones in MP 5 in the Best Management Practices Guidelines.</p>		Not known	No burning this BMP

¹ TASVEG 3.0 codes of vegetation types in the unit.

² *Nature Conservation Act 2002*

³ *Tasmanian Threatened Species Protection Act 1995*

⁴ *Tasmanian Weed Management Act 1999*

4.3.3 Preparation and Supervision

Future planned burning within the reserves should be inspected some months before the proposed burn to check that the scheduling and burning prescriptions are still appropriate and to determine whether weeds are present that require treatment before burning. Where treatment of weeds is required, it should be carried out at least 3 months in advance of the burn to allow treated weeds to desiccate. Disturbance of the treated infestations (by mechanical means, slashing or burning) within this period may reduce the herbicide's effectiveness, and regeneration from rootstock is likely to occur.

Successful implementation of planned burns in future BMPs requires trained personnel and special equipment. Each planned burn recommended future BMPs must have a burn plan prepared by someone who has completed the Forestry Tasmania "Develop Prescribed Burning Plans" course or equivalent. All persons engaged in planned burning or firefighting in the reserve must have completed the Forestry Tasmania "Forest Fire Fighting" course or equivalent.

If the planned burning is contracted out, the contractor must be able to meet the required training accreditation in the previous paragraph, as well as provide evidence of experience in carrying out broadscale low intensity fuel reduction burns.

4.4 Bushland Management

Bushfire can provide the disturbance that many introduced species need to spread to new areas, as well as to expand existing populations. Other bushfire management activities, such as construction and maintenance of fire trails, and bulldozing of fuel breaks during bushfire suppression, can also provide opportunities for weeds to colonise native bushland. Fire can also be used as a tool to manage weed infestations. Some species are best controlled by herbicide application to regrowth following a bushfire. Other species can sometimes be controlled by the application of a fire regime that stimulates germination of seed but kills the regrowth before it has been able to flower.

Planned burning can assist a weed control program, and it is recommended that weed control activities be integrated with planned burning where it is necessary to dispose of a large weed biomass and stimulate regeneration of native species. MP 8 in *Clarence City Council Bushfire Management Strategy - Best Management Practice Guidelines* includes guidelines for integrating weed management with management burning, and for minimising the risk of weed invasion following bushfires. These guidelines should ensure that fires in the reserves do not worsen existing weed problems, or cause weeds to spread.

It should be noted that bush regeneration plantings in previously cleared areas might increase the bushfire hazard. Any proposals for bush regeneration in the reserves should be considered in the context of this BMP to ensure that they do not compromise bushfire protection measures proposed in this plan. In general, plantings are not allowed:

- on inner zones and outer zones established around assets at risk
- on fuel breaks
- Within 2m of the edge of fire trails.

5. Bushfire Management Recommendations

The management actions recommended to meet the objectives of the plan in section 1.3 have been summarised and classified using the following criteria:

- URGENT** - Actions required to reduce a very high risk to life or property.
- ESSENTIAL** - Actions required to improve safety, or inadequate bushfire protection measures in high risk areas.
- Actions that are essential for control & suppression of bushfires, and/or conservation of threatened species.
- RECOMMENDED** - Actions required to improve inadequate bushfire protection measures in moderate risk areas.
- Actions required to ensure on-going effective bushfire management, or conservation of biodiversity.
- ROUTINE** - Maintenance of bushfire control resources and protection measures.

Urgent actions need to be undertaken as soon as possible.

Where applicable the desirable timing of other actions has been coded as follows:

- A - Inspect and maintain annually, or as specified in the relevant MP
- A/S - Timing as specified in the bushfire management plan
- 1, 2, etc - Carry out action within the time period specified (years)
- 1A, 2A etc - Construct within the next 1, 2 etc years and then inspect and maintain annually, or as specified in the relevant MP.

Management actions have been linked to generic MP's in *Clarence City Council Bushfire Management Strategy – Best Management Practice Guidelines*. Performance indicators have also been provided for each management action. These should be used to determine if the specific objectives of this BMP have been achieved. They should be monitored when the plan is revised every 5 years. Where performance targets are not being achieved, a review of the relevant portion of the plan should be undertaken.

5.1 Management Action Summary

RECOMMENDED ACTION	OBJECTIVE (section 1.3)	PRIORITY	RESPONSIBILITY	PERFORMANCE INDICATORS
1) Develop a community education program, including an information sheet, as outlined in section 5.7 of the Bushfire Management Strategy, to inform the community of bushfire management issues in the reserves and to ask them to report any smoke, or suspicious activity, on days of total fire bans to the police.	1, 2	REC - 1	Clarence City Council Fire and Bushland Management Tasmania Fire Service	Educational material distributed to adjoining residents, reserve users and other interest groups. Reduction in the incidence of illegal fires on and around the reserve.
2) Implement the bushfire protection measures in section 2.4 for protection of assets in and around the reserves.	1, 4	E	Clarence City Council Fire and Bushland Management Private landowners	Bushfire protection measures for adjoining dwellings implemented and maintained. No assets lost to fires originating in, or moving through, the reserves.
3) Implement the recovery procedures in MP 12 following bushfires.	1, 5, 6	E	Clarence City Council Fire and Bushland Management Tasmania Fire Service	Post-fire recovery carried out after bushfires. No users of the reserves injured by fires or the effects of fires.
4) Ensure fire trails shown on figure 6 are inspected and, where specified in table 8, are maintained in a trafficable condition at all times according to MP 2.	3, 4	ROU - A	Clarence City Council Fire and Bushland Management	Vehicle access routes inspected as required in MP 2, and maintained in a trafficable condition for Council and TFS appliances.
5) Inspect gates regularly to ensure that locks are in place and functioning. Ensure that the local TFS brigade and other emergency services have keys to the gates on trails giving access to the reserves.	2	ROU - A	Clarence City Council Fire and Bushland Management	No unauthorised use of fire trails in the reserves. Security lock system implemented, keys distributed to TFS brigades and other emergency services.

RECOMMENDED ACTION	OBJECTIVE (section 1.3)	PRIORITY	RESPONSIBILITY	PERFORMANCE INDICATORS
6) Conduct a familiarisation tour upon request from local TFS brigades.	1, 2, 4	ROU	Clarence City Council Fire and Bushland Management Tasmania Fire Service	Local TFS brigades familiar with bushfire management assets in the reserve.
7) Ensure follow-up weeding is carried out after bushfires.	3, 5	REC – A/S	Clarence City Council	Post fire weed control carried out in any weed infested VMUs burnt during this plan. Minimal coppicing or regrowth of weeds from treated rootstock. No increase in WONS, declared and environmental weeds within reserves.
8) Consult with the DPIPWE Threatened Species Section when carrying out bushfire management activities that may affect populations of flora or fauna of conservation significance.	3	E	Clarence City Council Fire and Bushland Management DPIPWE Threatened Species Section	All required permits obtained before commencement of management activities likely to affect species of conservation significance.
9) Avoid burning the whole of any population of a threatened or rare plant species in a single fire.	3	E	Clarence City Council Fire and Bushland Management Tasmania Fire Service	No decline in populations of flora or fauna of conservation significance due to bushfire.
10) Carry out vegetation monitoring as detailed in section 5.10 of the Bushfire Management Strategy including the recovery of any populations of rare or vulnerable flora and fauna burnt by bushfires.	3, 5	E	Clarence City Council Fire and Bushland Management DPIPWE Threatened Species Section	Vegetation monitoring plots set up and surveyed. Data on the population size and extent of flora of conservation significance recorded annually.

RECOMMENDED ACTION	OBJECTIVE (section 1.3)	PRIORITY	RESPONSIBILITY	PERFORMANCE INDICATORS
11) Regularly revise burning schedules and prescriptions to ensure they incorporate the most recent information on the fire ecology of flora, fauna and plant communities of conservation value within the reserves.	3, 5	REC - A/S	Clarence City Council Fire and Bushland Management	BMP revised every 5 years.
12) Coordinate bushfire management, weed management and other management activities, such as bush regeneration, using the procedure in MP 9.	3, 5	REC - A	Clarence City Council Fire and Bushland Management	Meetings held as recommended in MP9 and the outcomes recorded.
13) Record bushfire management activities and bushfires using the procedures in MPs 10 and 11.	3, 4, 5	REC - A/S	Clarence City Council Fire and Bushland Management	Records maintained of all bushfire management activities.
14) Re-establish and upgrade existing 3m wide fuel break to 6m fuel break/class 5 fire trail (RB4) along southern boundary of VMU 2.	1, 2, 3, 5	E - 1	Clarence City Council Fire and Bushland Management	6m fuel break established.
15) Implement fluproponate herbicide regime to reduce serrated tussock populations within Nowra Bushland Reserve.	3, 5	REC - 1A	Clarence City Council	Reduction in serrated tussock populations within Nowra Bushland Reserve.

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Appendix A

Implementation of the previous BMP

The following codes have been used in assessing implementation of the previous Bushfire Management Plan for Roches Beach Coastal Reserve and Nowra Bushland Reserve:

IS – Implemented successfully

PI – Partly implemented

NI – Not implemented

NA – Not applicable (to be implemented at a later time, or dependent on another incident or action).

RECOMMENDED ACTION	CODE	COMMENT
1) Develop a community education program, including an information sheet, as outlined in section 5.7 of the Bushfire Management Strategy, to inform the community of bushfire management issues in the reserves and to ask them to report any smoke, or suspicious activity, on days of total fire bans to the police.	PI	A formalised community education program has not been designed. Public exhibition of Councils <i>Bushfire Management Strategy for Council Owned and Controlled Land, Bushfire Management Strategy Best Management Practice Guidelines</i> and the previous BMP for the reserves has taken place. Various TFS community bushfire preparation events have been attended and represented by Councils Fire and Bushland Management throughout municipality.
2) Implement the bushfire protection measures in section 2.4 for protection of assets in and around the reserves.	PI	The bushfire protection measures in section 2.4 of the previous plan have been largely implemented. The 3m fuel break adjacent to the dwellings adjoining the Nowra Bushland Reserve along Cahill Place needs to be re-established.
3) Erect appropriate signs on tracks and roads to warn reserve users of planned burns.	NA	No planned burning occurred throughout previous BMP in either reserve.
4) Implement the recovery procedures in MP 12 following planned burns and bushfires.	IS	Recovery measures successfully implemented post 2013 bushfire in Nowra Bushland Reserve.
5) Ensure fire trails shown on figure 5 are inspected and, where specified in table 8, are maintained in a trafficable condition at all times according to MP 2 and fire trail signs are in place and legible.	PI	All fire trails maintained and regularly inspected. Fire trail signage has not been installed.
6) Inspect gates regularly to ensure that locks are in place and functioning. Ensure that the local TFS brigade and other emergency services have keys to the gates on trails giving access to the reserves.	IS	All entry points inspected regularly. Nowra Road, Axiom Way and Bardia Court access now have locked Council gates restricting access.

RECOMMENDED ACTION	CODE	COMMENT
7) Conduct a familiarisation tour of the reserve for local TFS brigades prior to the start of the fire permit period each year.	NI	Familiarisation tour not undertaken with TFS. Familiarisation tour will be undertaken at request of TFS.
8) Carry out planned burning according to the schedule in table 9 using the procedure in MP 7.	NA	No planned burning prescribed during previous BMP.
9) Treat any weeds in areas to be burnt under this bushfire management plan according to MP 8. Ensure follow-up weeding is carried out after planned burns and bushfires.	IS	No planned burning prescribed during previous BMP. Follow up weed management implemented post 2013 bushfire in Nowra Bushland Reserve.
10) Consult with the DPIPWE Threatened Species Section when carrying out bushfire management activities that may affect populations of threatened flora or fauna.	NA	No bushfire management activities effecting populations of threatened flora or fauna occurred during previous BMP.
11) Avoid burning the whole of any population of a threatened or rare plant species in a single fire.	IS	Known locations of <i>Scleranthus fasciculatus</i> and <i>Vittadinia muelleri</i> unburnt during 2013 bushfire.
12) Carry out vegetation monitoring as detailed in section 5.10 of the Bushfire Management Strategy including the recovery of any populations of threatened or rare flora and fauna burnt by bushfires or planned burns.	NI	No formal vegetation monitoring to date has been established in either reserve. Regular site inspections have been undertaken by Councils Fire and Bushland Management targeting vegetation health and weed locations.
13) Regularly revise burning schedules and prescriptions to ensure they incorporate the most recent information on the fire ecology of flora, fauna and plant communities of conservation value in the reserves.	IS	Regimes and prescriptions have been analysed throughout life of previous BMP. During 2016 review process all VMUs regimes and prescriptions have been evaluated to suit best outcomes for asset protection and ecological burning.
14) Coordinate bushfire management, weed management and other management activities, such as bush regeneration, using the procedure in MP 9.	PI	Coordination of activities has been undertaken. Meetings as recommended in MP9 not carried out.

RECOMMENDED ACTION	CODE	COMMENT
15) Ensure all personnel engaged in planned burning activities in the reserves have the appropriate level of training and equipment as outlined in the bushfire management strategy, and the minimum equipment listed in MP 7.	IS	Extensive training has been delivered to Council Fire and Bushland Crew during term of previous BMP. Ongoing training will be recommended on a needs basis.
16) Record bushfire management activities and bushfires using the procedures in MPs 10 and 11.	IS	Since 2013 Council has developed an extensive GIS Fire Management context. All available historic fire management information has been input and updated annually.

Appendix B

**Summary of community concerns and comments
in the initial round of community consultation**

COMMUNITY CONCERNS and COMMENTS	COUNCILS COMMENT
Comment dead dry sheoak branches on side of coastal walking track in VMU 5 poses fire hazard.	Councils Fire and Bushland Management to investigate removal.
Boxthorn previously cut and rolled down bank to beach on adjacent coastal walking track in VMU 5 poses fire hazard.	Have discussed matter with parties involved and recommended future works to have better suited removal strategies in place.
Comment on lack of communication informing adjacent properties that pile of green waste would be burnt adjacent to sailing club.	Council unable to comment as not responsible undertaking operation. Councils Fire and Bushland Management has procedures in place for neighbour/community notifications prior to any planned burning. Council will further investigate.
Concern over trees on private property posing fire hazard.	Council's Bushfire Management Strategy only applies to Council managed land. Advised resident to contact Council Chambers in which relevant Council staff can determine if abatement notice can be issued to resident.
Concern regarding fire risk to abundant undergrowth and ground fuels in VMU 2	Fuel reduction burning in grasslands has little effect as grass fuels can be replenished within one year post burn. Council's Fire and Bushland Management will re-establish fuel break along southern boundary of VMU 2. Recommend residents to maintain properties to TFS specifications for defendable spaces as outlined in document <i>TFS Bushfire Survival Plan 2015-2016</i> to compliment fuel break on Council land.
Question if any planned burns are scheduled for 2016 within Nowra Bushland Reserve?	Council has no planned burning scheduled within Nowra Bushland Reserve during 2016-2021. Vegetation will be managed in the respective annual maintenance program by Councils Fire and Bushland Management. The 3m fuel break on the southern side of VMU 2 will be re-established during the revised BMP to 6m.
Comment on lack of fire reduction work within Nowra Bushland Reserve.	Council has no planned burning scheduled within Nowra Bushland Reserve during 2016-2021. Vegetation will be managed in the respective annual maintenance program by Councils Fire and Bushland Management. The 3m fuel break on the southern side of VMU 2 will be re-established during the revised BMP to 6m.
Comment on challenges managing serrated tussock on private land, when adjacent Nowra Bushland Reserve has established infestations.	This is not a direct fire management issue. However serrated tussock is capable of rapidly colonising bare ground created from fire. Recommend Council establish management program for serrated tussock within Nowra Bushland Reserve as outlined in section 4.3.2.