

BILGOLA NEWPORT ESCARPMENT BUSHFIRE MANAGEMENT PLAN



Report prepared for:
Pittwater Council
(Project No. 203-001)

July 2008

Document Tracking

Item	Detail	Signature
Project Name	Bilgola Newport Escarpment Bushfire Management Plan	
Project Number	203-001	
Prepared by	AP	
Prepared by	NK	
Approved by	SH	
Status	Final	
Version Number	4	
File location	G:\Groups\Current_Projects\Councils\Pittwater\Bilgola Newport Escarpment BMP\Reports	
Date	15 July 2008	

Acknowledgements

This document has been prepared by and is copyright of Eco Logical Australia Pty Ltd. Eco Logical Australia wishes to thank the following people for their input into the project:

Pittwater Council: Mark Beharrell, Chris Wright, Karin Nippard

Rural Fire Service: George Sheppard

Aboriginal Heritage: Phil Hunt

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This report is based upon best practise management and ecological principles. Concerns have been raised that sufficient resources may not be available to implement this plan in its entirety.

Contents

GLOSSARY OF TERMS	1
1 INTRODUCTION	2
1.1 MANAGEMENT PLAN OBJECTIVES	2
1.2 REPORT STRUCTURE	3
2 LEGISLATION AND POLICY	4
3 BUSHFIRE HAZARD ASSESSMENT	5
3.1 RISK ASSESSMENT	5
4 FIRE MANAGEMENT AND HAZARD REDUCTION.....	6
4.1 FIRE HISTORY	6
4.2 FIRE MANAGEMENT ZONES AND CONSTRAINTS.....	6
4.2.1 <i>Constraints to Fire Management</i>	6
4.3 HAZARD REDUCTION.....	7
4.3.1 <i>Environmental Assessment of Scheduled Works</i>	7
4.3.2 <i>Manual Methods</i>	7
4.4 PRESCRIBED BURNING	8
4.5 EMERGENCY HAZARD REDUCTION.....	8
4.6 FIRE TRAILS, TRACKS AND PUBLIC ROAD ACCESS.....	9
4.7 MANAGEMENT RESPONSIBILITIES	9
5 CONCLUSIONS, RECOMMENDATIONS AND IMPLEMENTATION	10
5.1 FIRE MANAGEMENT AND HAZARD REDUCTION.....	10
5.2 COMMUNITY SAFETY	10
5.3 PERFORMANCE MEASURES.....	11
5.3.1 <i>Monitoring Fire Regimes and Changes to Biodiversity</i>	11
5.3.2 <i>Implementation schedule</i>	11
6 REFERENCES	13
7 APPENDIX 1 – SUPPLEMENTARY INFORMATION	14

Glossary of Terms

APZ	An Asset Protection Zone (APZ) is an area around a development offering protection to reduce the bush fire hazard. It can consist of an Inner Protection Area (IPA) and an Outer Protection Area (OPA). Hazard reduction techniques can include slashing, raking, bush regeneration and burning.
Biodiversity fire regime thresholds	These thresholds are a range of appropriate fire frequency intervals, intensities and seasons to sustain the ecology of each vegetation community. Where fire regimes are outside the threshold, significant declines in species populations can be expected, particularly if the fire regime prevails over greater than 50% of the community area.
Ecosystem	An interactive system between living organisms (plants and animals) and their non living surroundings.
Fine fuels	Bark, grass, leaves and twigs less than six millimetres in diameter.
Fire regime	The history of fire in a particular area, including the frequency, intensity and season of burning.
Fuel	Any material capable of being ignited and sustaining fire. Such as grass, live vegetation, leaf litter and bark. Generally measured in tonnes per hectare of dry weight.
Hazard reduction	Works designed to attain planned resource management objectives, primarily the reduction of fire threat. Activities include: <ul style="list-style-type: none"> • Manual and mechanical thinning of vegetation (NOT broad scale clearing) • Controlled burning of a predetermined area, carried out under specified weather and environmental conditions
LMZ	Land Management Zones (LMZ) are broader areas of the landscape, which do not satisfy the criteria for Strategic Fire Management Zones (SFMZ) or Asset Protection Zones (APZ). Fire in these areas should be managed to meet conservation objectives for species, habitats, populations and cultural heritage values.
SFAZ	Strategic Fire Advantage Zones (SFAZ) are usually adjacent to, and compliment, Asset Protection Zones (APZ). They are managed to protect community assets and ecological sustainability.
Wildfire	An unplanned fire.

1 Introduction

Eco Logical Australia was contracted by Pittwater Council in November 2007 to prepare a Bushfire Management Plan for Bilgola Newport Escarpment. The broad aim of this exercise was to develop a plan (in consultation with Council and the NSW Rural Fire Service) that can be used to guide the management of bushfire (both planned and unplanned events) in combination with the ecological considerations of the site, on both public and private lands. Recommendations from the report will then be fed into the updated Warringah Pittwater Bush Fire Risk Management Plan currently being prepared by the Warringah Pittwater Bush Fire Management Committee.

The Bilgola Newport Escarpment includes 50 hectares of land that extends across the suburbs of Bilgola and Newport. It is comprised of land owned by Pittwater Council, Roads and Traffic Authority, Department of Lands, Sydney Water, Energy Australia and Private land owners. The land owned by Pittwater Council consists of five reserves including: Hewitt, Attunga, Kanimbla, Crown of Newport and Hamilton.

The reserves have a high conservation value, containing valuable habitat for a range of threatened and non-threatened native species and communities. Recreational activities such as bushwalking form the primary use within the reserves. There has also been aboriginal heritage artefacts recorded in the area.

1.1 Management Plan Objectives

- To provide recommendations for:
 - Bushfire management zones
 - Suitable options for fuel management
 - Strategies to protect persons and property within, or immediately adjacent to the reserve
- Creation of:
 - A plan that is acceptable to and can be implemented by Council and the NSW Rural Fire Service (RFS)
 - A strategy to enable the effective planning of Hazard Reduction (HR) with regard to:
 - Endangered ecological communities
 - Endangered populations
 - Threatened, locally or regionally significant species
 - Aboriginal sites and culturally significant features known to exist within the reserve
 - Geotechnical hazard and slopes
 - Assets and infrastructure on and off the study site

1.2 Report Structure

The Bushfire Management Plan for Bilgola Newport Escarpment is comprised of two separate documents. First and foremost an A0 sized poster showing a series of relevant maps and tables. Secondly, this report, which is intended as a supporting document to the poster. It identifies and provides further information on the background to the project, major issues affecting the site and plan, and some specific details to compliment the poster where required.

2 Legislation and Policy

Fire management activities on the site are constrained by numerous Acts, plans and guidelines. The most relevant documents are listed below:

- Local Government Act 1993 & Crown Lands Act 1989
- Rural Fires Act 1997
- Warringah Pittwater Bush Fire Risk Management Plan
- Planning for Bush Fire Protection 2006
- National Parks and Wildlife Act 1974
- Environment Protection & Biodiversity Conservation Act 1999
- Environmental Planning and Assessment Act 1979
- Threatened Species Conservation Act 1995
- State Environmental Planning Policy 19 (SEPP 19) – Bushland in Urban Areas
- Bushfire Environmental Assessment Code for NSW 2006
- State Environmental Planning Policy No 26-Littoral Rainforests
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Pittwater LEP 1993*
- Pittwater Council Geotechnical Risk Management Plan 2008

3 Bushfire Hazard Assessment

A bushfire hazard assessment for the site has been undertaken based upon an analysis of the slope and vegetation (see poster). The assessment provides an indication of the varying levels of bushfire hazard affecting the site as well as a relative indication of Asset Protection Zone (APZ) requirements.

The assessment is derived (spatially) through a classification of the slope and the vegetation formations (according to Keith, 2004) found on the site. These two classifications are then amalgamated to produce a final classification of which a hazard rating is applied. The hazard rating is applied which reflects likely bushfire behaviour. Generally, steep slopes combined with areas of high fuel vegetation (i.e. forests) lead to classification of the highest bushfire hazard. The bushfire hazard assessment is shown on the poster.

Although the rainforest and heath vegetation formations have relatively low fuel loads, the majority of the site was on extreme slopes over 18 degrees, thus resulting in a generally moderate-high hazard rating. The two areas of forest formation vegetation have an extreme hazard rating.

3.1 Risk Assessment

Most of the site is rainforest vegetation and whilst there is a risk of bushfire within this vegetation, it is generally considered unlikely and further that a large extreme bushfire event is particularly unlikely. In addition to this, there are a number of other factors that lessen the risks from bushfire, including:

- The aspect (generally east and south facing) and location, leading to predominately moist coastal winds limiting the ability of a bushfire event to build and develop
- Non-rainforest vegetation (heath and forest) that is more likely to be capable of supporting bushfire is:
 - Restricted in extent, therefore limiting potential for fire spread and run
 - Often comprised of mesic elements (i.e. would burn less intense and inhibit fire development)

Whilst the hazard rating is high, a risk assessment builds on hazards and considers if a fire is likely to occur and cause damage to neighbouring assets. In this context, the risk is considered to be relatively low, given aspect, limited areas of potential 'fire run', the dominance of rainforest vegetation and generally mesic understorey.

4 Fire Management and Hazard Reduction

4.1 Fire History

There have been no wildfire events recorded in the study area. Indeed, the prevalence of rainforest vegetation is considered a natural factor limiting the occurrence and potential spread of any wildfire event.

Recent hazard reduction burning history was supplied by Pittwater Council and verified and mapped in the field. There has been one recent hazard reduction burn within the study area carried out in 2004.

Field validation of fire history was undertaken and no further evidence of the recent occurrence of fire was found.

4.2 Fire Management Zones and Constraints

Fire management zones have been developed in consultation with council and NSW RFS and are shown on the BMP poster (ELA 2008). These were developed based on the hazards within the study area, the risks from fire to neighbours as well as constraints and risks to the site from fire management. The type and objectives of the zones include:

- Asset Protection Zones (APZ) – for the protection of human life and property
- Strategic Fire Advantage Zones (SFAZ) – to reduce fire intensity across larger areas and complement APZs
- Land Management Zones (LMZ)– to conserve biodiversity and protect cultural and historic heritage

4.2.1 Constraints to Fire Management

The constraints limiting the application of fire management actions includes:

- steep slopes often greater than 18 degrees;
- a geotechnical hazard rating of 'H1' being almost certain, likely or possible to experience a land slip in the near future;
- rainforest vegetation
- vegetation dominated by Endangered Ecological Communities (EEC);
- limited options for the creation of control lines; and
- Adequacy of existing access arrangements.

In addition to the above, the reserve is surrounded by existing residential development that has predominately been constructed outside the guidelines specified by Planning for Bushfire Protection (RFS, 2001 and RFS, 2006a). As an alternative to Planning for Bushfire Protection guidelines, smaller more realistic APZs are recommended. Generally, a 20m APZ (15m for Short Heath) is recommended where the vegetation is downslope from the asset. Where the vegetation is upslope from the asset a 10m APZ is recommended. APZ widths may be adjusted where natural features provide logical boundaries

Given the constraints and the presence and nature of existing development, traditional passive mitigation measures (such as APZs) are not a practical option for the majority of residences surrounding the reserves. For example, APZs are generally not permitted within EEC or rainforest vegetation, on slopes >18° or in a landslip

prone area. Alternatively, greater emphasis needs to be given to active mitigation measures. To this end a classification of risk to the bushfire hazard interface has been incorporated on the BMP poster such that active measures can target higher risk areas. Recommended active mitigation measures include:

- Recognition of above situation and adequate emergency wildfire management planning from NSW Rural Fire Service and NSW Fire Brigades
- Appropriate hazard reduction programs across relevant section of the reserves according to this plan, and
- Educational and community involvement programs aimed at raising community awareness and preparedness for prevention, preparation and emergency planning for bushfire events

4.3 Hazard Reduction

Hazard reduction is an important tool for the protection of life and assets. Due to the constrained nature of the site, only manual methods of hazard reduction using hand held tools have been proposed. Hazard reduction should be undertaken regularly in all proposed APZs following the guidelines set out below in section 4.3.2.

4.3.1 Environmental Assessment of Scheduled Works

Under the *State Environmental Planning Policy No 26-Littoral Rainforests*, any work to be carried out in Littoral Rainforest Vegetation will be triggered as 'designated development' and will therefore require an Environmental Impact Statement (EIS) rather than an REF. All other works proposed within the fire management plan will be assessed for environmental and heritage impacts at the HR planning stage. This will be conducted either under the EP&A Act through an REF, or under the Bush Fire Environmental Assessment Code.

4.3.2 Manual Methods

Existing vegetation in the asset protection zones should be kept sparse at all times along the following lines (based on (DEC 2005, RFS 2006a, RFS 2006b, RFS 2006c)):

General

- Removal of noxious weeds from ground, shrub and canopy layers should be conducted pre, during and post hazard reduction.
- Materials such as piles of wood, household rubbish, composted garden clippings and other combustible materials should be removed from backyards.
- Only hand held machinery and hand tools such as clippers, rakes and shovels may be used.
- Care should be taken at all times to consider the geotechnical hazard of the site. Avoid removal of fuel that may destabilise surrounding debris, particularly around large sandstone outcrops. No roots should be removed.
- All cut material should be mulched and spread along the ground to prevent weeds and reduce soil erosion.

Canopy

- 75% of original canopy cover must be retained.
- No tree should be removed on slopes over 18 degrees or from any Endangered Ecological Community.
- Trim branches where the tree canopy overhangs or is within 5 metres of buildings.

- Trim branches where they extend underneath buildings, particularly decking.
- Remove lower branches and thin secondary branches to a height of two meters.
- All branch removal should adhere to the pruning standards listed below.

Groundcover

- 90% ground cover must be maintained to prevent soil erosion.
- Retain all low native ground covers.
- Large build-ups of litter such as leaves, twigs (less than 6 mm in diameter) and bark should be removed from the surface regularly during the fire season, however, no soil should be left exposed.
- Lawns and native grasses need to be kept short (10cm) and green when possible.

Shrub Layer

- Retain clumps or islands of shrubs rather than continuous shrub layers.
- Remove all shrubs within 2m of any building.
- Do not remove shrubs where removal would leave the ground cover exposed.

Pruning Standards

RFS '*Standards for Asset Protection Zones*' (RFS 2006c) advises pruning must be conducted in accordance with the following standards:

- Use sharp tools. These will enable clean cuts and will minimise damage to the tree.
- Decide which branches are to be removed before commencing work. Ensure that you maintain a balanced, natural distribution of foliage and branches.
- Remove only what is necessary.
- Cut branches just beyond bark ridges, leaving a small scar.
- Remove smaller branches and deadwood first.

4.4 Prescribed Burning

Prescribed burns for the study area are proposed for ecological biodiversity purposes rather than specifically hazard reduction purposes. Given that most of the vegetation is rainforest (along with other constraints to the site) little prescribed burning is proposed. The majority of heath vegetation on site is over its burn threshold and an ecological burn regime should be implemented where possible. In particular, small ecological burns (3 within the next 5 years) are proposed by Council for the heath vegetation within LMZ 9.

4.5 Emergency Hazard Reduction

Emergency bush fire hazard reduction works are permitted on any land under s.100C(2) of the Rural Fires Act 1997. Emergency works do not require approval under the Environmental Planning and Assessment Act 1979 (EP&A Act) or the Bush Fire Environmental Assessment Code (RFS 2006b). These activities, however, should be assessed at the time of conduct to determine likely rehabilitation requirements. This is particularly important for issues such as soil erosion where rehabilitation delays may significantly increase impacts.

4.6 Fire Trails, Tracks and Public Road Access

The existing trail network within the reserves and the public road system outside the reserves does not provide sufficient access, in line with PBP (RFS 2006a) and best practice management. In order to satisfy such requirements trails would need to be implemented between the reserves and residential houses. However, due to ecological and topographical constraints, retrospective implementation of fire trails is not considered to be practical in this case. As such, active mitigation measures take on greater importance (as outlined in section 4.2).

It is recommended that the existing walking trails be maintained for both management and recreational purposes.

Fire truck access is limited within the study area. Attunga, Hillside and Hillslope Roads are very narrow with parked cars common on both sides of the road. Fire truck access along these roads is severely restricted. Hillside Road in particular, is a 400m dead end road with only a 10.5 meter turning circle. These conditions also restrict evacuation by residents.

4.7 Management Responsibilities

Overall management of the reserves is the responsibility of Pittwater Council. Within the reserves however there are assets owned by Sydney Water and Energy Australia, and in these cases it is the responsibility of the owner to ensure that their assets are afforded an adequate level of protection (in collaboration with Council and in keeping with the management framework of this plan). The NSW Rural Fire Service is responsible for fire suppression efforts in the reserves and for mapping of any fires that occur. In addition to this the Rural Fire Service generally takes the lead in any prescribed burns.

This plan has divided the study area into a number of different management zones. Zones that cover private property are the responsibility of the land holder. Given the nature of past planning decisions (i.e. general lack of setbacks and defensible space between dwellings and vegetation) and the environmentally sensitive nature of the study area, a suite of management measures will be required to reduce bushfire risk. This includes a considerable component of property management and maintenance on private landholdings adjacent to the reserves. Adjacent landholders cannot rely solely on reserve management practices to adequately reduce risk – adequate maintenance and management practices on their own properties will need to be implemented. This includes maintaining their buildings appropriately and managing components of their yards as APZs. The RFS and Council are well placed to advise and assist (where applicable) private landholders to ensure a sufficient level of management is maintained.

5 Conclusions, Recommendations and Implementation

The majority of the study area is highly constrained due to the presence of a number of factors including Endangered Ecological Communities, steep slopes (>18°), Aboriginal sites, Endangered Flora and Fauna, and a high geotechnical hazard. As such, the implementation of hazard reduction measures on the reserves is severely limited. In particular, the majority of the site is constrained by a high geotechnical hazard rating associated with the steep slopes, and Rainforest vegetation. Most hazard reduction activities on steep slopes are restricted according to the *Bushfire Environmental Assessment Code for NSW 2006*. In addition, any work to be carried out in Littoral Rainforest Vegetation will be triggered as 'designated development' and will therefore require an Environmental Impact Statement (EIS). Lastly, given the geotechnical hazard known at the site, any works planned will need to meet the requirements of Pittwater Geotechnical Risk Management Plan 2008 (i.e. to demonstrate how the works will not contribute to geotechnical instability such as through removal of ground cover vegetation and root stock).

The outcome of the highly constrained nature of the reserves and nature of existing development, is that traditional passive mitigation measures on-reserve (such as APZs) are not considered practical or appropriate. Alternatively, greater emphasis needs to be given to active mitigation measures and off-reserve property management. Recommended active mitigation measures include:

1. Recognition of above situation and adequate emergency wildfire management planning from NSW Rural Fire Service and NSW Fire Brigades
2. Appropriate hazard reduction programs across relevant section of the reserves according to this plan, and
3. Educational and community involvement programs aimed at raising community awareness and preparedness for prevention, preparation (property management) and emergency planning for bushfire events

5.1 Fire Management and Hazard Reduction

Implement appropriate hazard reduction programs across relevant sections of the reserves according to this plan, including:

- Manual Hazard Reduction around existing residences as in section 4.3.1 above;
- Prescribed burning of LMZ 9 as in section 4.3.2 above; and,
- Continued maintenance of existing walking trails for both management and recreational purposes.

5.2 Community Safety

Adoption of a 'fireWise' program run by the Warringah Pittwater Bush Fire Management Committee is recommended to raise community awareness and preparedness for prevention, preparation and emergency planning for bushfire events.

Residents should be guided in how they can reduce the bushfire risk to their property:

- Removal of combustible material particularly litter in gutters, woodpiles or other materials near the building;
- Removing excess amounts of fuel from garden areas (including organic mulch);
- Ensuring garden plantings do not overhang any buildings, tree canopies are discontinuous and shrubs are not positioned within 2m of the building; and
- Review the level of construction according to AS3959, *Construction of buildings within bushfire prone areas* (SA 1999)

Planning for Bushfire Protection (RFS 2006a) prescribes construction standards for all new houses within 100m of bushfire prone vegetation. Due to the age of many of the dwellings (i.e. constructed prior to implementation of RFS 2006a) they do not meet current bushfire construction standards and are thus more likely to be impacted by the factors of bushfire attack (smoke, embers, radiant heat and direct flame contact) if a bushfire event was to occur. Suggestions could be made to residents about how they could enhance the fire safety of their houses based on level 3 construction standards under Standards Australia (SA 1999). It should also be conveyed to them that any new additions to their houses would have to comply with these standards due to the planning legislation of section 79BA under the EP&A Act.

5.3 Performance measures

This plan should be reviewed annually and updated every five years.

APZs should be monitored by RFS on an annual basis to assess if the guidelines in section 4.2.3 are being met by both council and private landholders.

5.3.1 Monitoring Fire Regimes and Changes to Biodiversity

Fire records should be updated as fire incidents occur.

Alteration to fire threshold status resultant from fire occurrences should be assessed annually and at the beginning of HR planning, to determine potential management requirements.

This assessment should involve a comparison of required and actual vegetation community and threatened species thresholds and would require:

- Updated fire records
- Determination of fire age
- Consideration of required threshold in accordance with BEAC
- Assessment of current threshold status

5.3.2 Implementation schedule

The following table outlines the proposed schedule for implementation.

Action	Year	Responsibility
Issue statement to residents regarding maintenance of APZs on their property	2008	Pittwater Council
Walking trail maintenance	2008 & yearly	
Implementation of hazard reduction for APZs on		

Action	Year	Responsibility
council land		
Update this plan	2013 & every five years	
Implementation of hazard reduction for APZs on Sydney Water land	2008	Sydney Water
Prescribed burn for first section of LMZ 9	2008	Pittwater Council and RFS
Prescribed burn for second section of LMZ 9	2010	
Prescribed burn for final section of LMZ 9	2012	
Ecological burning of heath vegetation as applicable with fire thresholds	As applicable	
Monitoring of APZ and hazard mitigation measures on private land	2009 & yearly	RFS
Consider the findings from this report when updating the Warringah Pittwater Bush Fire Risk Management Plan	2008	Warringah Pittwater Bush Fire Management Committee
Adopt a program to educate the local community on prevention, preparation and emergency planning for bushfire events	2009	

6 References

Department of Environment and Conservation (DEC) (2005), *fire management manual*.

Eco Logical Australia (ELA) (2008), Bilgola Newport Escarpment Bushfire Management Poster. Unpublished poster.

Keith, D. (2004), *Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT*, Department of Environment and Conservation NSW, Sydney

NSW Rural Fire Service (RFS) (2006a), *Planning for Bush Fire Protection. A guide for Councils, Planners, Fire Authorities and Developers*. NSW Rural Fire Service, Rosehill.

NSW Rural Fire Service (RFS) (2006b), *Bush Fire Environment Assessment Code for Asset Protection and Strategic Fire advantage Zones*. Rural Fire Service.

NSW Rural Fire Service (RFS) (2006c), *Standards for Asset Protection Zones*. Available at: http://www.rfs.nsw.gov.au/file_system/attachments/State/Attachment_20060130_7DE0A145.pdf

Standards Australia (SA) (1999), "AS 3959, Construction of buildings in bushfire prone areas".

Warringah Pittwater Bush Fire Management Committee (WPBFMC) (2000), *Bush Fire Risk Management Plan*. Unpublished Report.

7 Appendix 1 – Supplementary Information

The following tables are also displayed on the BMP poster (ELA 2008)

Contact Information		
Agency	Position / Location	Phone
NSW Fire Brigades	Avalon	9918 3938
	Mona Vale	9999 1677
Rural Fire Service	24 Hours	8741 5555
	Warringah/Pittwater Rural Fire District	9450 3000
Sydney Water	24 hour Service & Emergency Contact	13 20 90
SES	Emergency	000
	Warringah/Pittwater SES	9486 3399
Police	Emergency	000
	Northern Beaches Local Area Command	9971 3306
Ambulance	Emergency	000
	Bookings	131 233
Hospital	Mona Vale	9998 0333
Council	Pittwater Council	9970 1111

Fire Season Information	
Wildfires	<ul style="list-style-type: none"> The statutory wildfire season occurs between 1st October and 31st March. This may be extended if weather conditions lead to increased fire danger outside of this period.
Prescribed Burning	<ul style="list-style-type: none"> Prescribed burning in this area is normally undertaken in Spring through to Autumn.

Threatened Fauna Fire Ecology*	
Species	Fire Ecology
<i>Pteropus poliocephalus</i> Grey-headed Flying Fox (Vulnerable)	<ul style="list-style-type: none"> Avoid fire in the near vicinity of roost within known/potential habitat where possible, especially during the breeding season (March – October). Maintain a mosaic of age classes within known/potential foraging habitat. Avoid slashing, tittering or tree removal within known habitat.
<i>Ninox strenua</i> Powerful Owl (Vulnerable)	<ul style="list-style-type: none"> Apply low-intensity, mosaic pattern fuel reduction regimes. Avoid fires in woodland and forests and, protect potential habitat trees from fire damage. Large home range suggests the species will be minimally impacted by inappropriate regimes affecting small areas, but the survival of this species relies on the survival of its prey which are primarily smaller, arboreal species that are more sensitive to inappropriate fire regimes. Frequent fires can reduce prey numbers and frequent low intensity burns can reduce prey habitat quality.
<i>Phascolarctos cinereus</i> Koala (Vulnerable)	<ul style="list-style-type: none"> Historical records only. For prescribed burns: avoid medium to high intensity fires in areas of known colonies or low open forests with known forage tree species.
<i>Pandion haliaetus</i> Osprey (Vulnerable)	<ul style="list-style-type: none"> Protect nest tree sites, especially during breeding season (July-September). No slashing, trittering or tree removal of (or around) known nesting sites.

Threatened Fauna Fire Ecology*	
Species	Fire Ecology
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat (Vulnerable)	<ul style="list-style-type: none"> • Avoid fire in the near vicinity of roost within known/potential habitat where possible, especially during the breeding season (Spring and Summer). • Maintain a mosaic of age classes within known/potential foraging habitat. • Avoid damaging roost caves/structures.
<i>Ninox connivens</i> Barking Owl (Vulnerable)	<ul style="list-style-type: none"> • Protection of known nesting sites required in late winter spring breeding season. • Avoid med-high intensity fire during nesting season and over large areas that reduce forage habitat.
<i>Burhinus grallarius</i> Bush Stone-curlew (Endangered)	<ul style="list-style-type: none"> • Slashing in winter, but no trittering or tree removal • No burning from 1 August to 31 March, and no more than once every 2 years. • Retain logs on ground
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat (Vulnerable)	<ul style="list-style-type: none"> • No slashing, trittering or tree removal.
<i>Cercartetus nanus</i> Eastern Pygmy-possum (Vulnerable)	<ul style="list-style-type: none"> • Avoid large scale fires and aim to provide a mosaic of age classes across the landscape. • No slashing, trittering or tree removal.
<i>Calyptorhynchus lathamii</i> Glossy Black-Cockatoo (Vulnerable)	<ul style="list-style-type: none"> • Feeds exclusively on Allocasuarina and Casuarina sp., so maintain diversity of age structure of these species. • Avoid med-high intensity fire with a recurrent frequency of <15 years. • Avoid large scale fires that reduce forage habitat.
<i>Pseudophryne australis</i> Red-crowned Toadlet (Vulnerable)	<ul style="list-style-type: none"> • Likely to be adversely affected by frequent burning through loss of litter layer and death during fire and trail maintenance activities. • Habitat preference indicates that the populations will survive less frequent fires. • Avoid burning known breeding locations with interval of less than 8-10 years.
<i>Xanthomyza Phrygia</i> Regent Honeyeater (Endangered)	<ul style="list-style-type: none"> • Avoid winter fires in <i>E. robusta</i> Forest and large scale fires in <i>B. ericifolia</i> heathland during flowering period. Unlikely to be affected by fire in other seasons.
<i>Dasyurus maculates</i> Spotted-tailed Quoll (Vulnerable)	<ul style="list-style-type: none"> • In known locations avoid high intensity fires over large area. • Autumn burns are preferred timing to avoid breeding season. • During mop-up avoid felling potential den trees.
<i>Petaurus norfolcensis</i> Squirrel Glider (endangered ecological population in Pittwater) (Vulnerable)	<ul style="list-style-type: none"> • Found in dry forests and woodlands with tree hollows and winter flowering trees. • Low intensity fires. • Avoid felling trees with hollows in known locations.
<i>Ptilinopus superbus</i> Superb Fruit-Dove (Vulnerable)	<ul style="list-style-type: none"> • Found in Rainforest or Rainforest margins. • Avoid burning in known locations during breeding. • Unlikely to be affected by low intensity fires due to habitat preference.
<p>*All species within 3km of study area Reference: Warringah Pittwater Bush Fire Management Committee. 2000, DEC, Threatened Species Website.</p>	

Threatened Flora Fire Ecology*	
Name	Fire Ecology
<i>Syzygium paniculatum</i> Magenta Lilly Pilly (Vulnerable)	<ul style="list-style-type: none"> • Avoid Fire. • Avoid the use of rainforest margins as control lines for prescribed burns and suppression activities. • Found in sheltered gullies, closed forest and rainforest.
<i>Genoplesium baueri</i> Bauer's Midge Orchid (Vulnerable)	<ul style="list-style-type: none"> • Grows in sparse sclerophyll forest and moss gardens over sandstone. • Fire ecology is unknown.
<i>Eucalyptus nicholii</i> Narrow-leaved Black Peppermint (Vulnerable)	<ul style="list-style-type: none"> • Not native to this area. Planted trees only. • No fire more than once every 10 years. • No slashing, trittering or tree removal.
<i>Chamaesyce psammogeton</i> Sand Spurge (Endangered)	<ul style="list-style-type: none"> • Found on foredunes and exposed sites on headlands. • Exclude fire from known locations.
<p>*All species within 3km of the study area Reference: RFS 2006b DEC, Threatened Species Website.</p>	

Aboriginal Cultural Heritage	
Type	Site Management Guidelines
<p>Grinding Grooves</p> <p>(A groove in a rock surface resulting from manufacture of stone tools such as ground edge axes and spears, may also include rounded depressions resulting from grinding of seeds and grains)</p>	<ul style="list-style-type: none"> • Avoid sandstone outcrops (overhangs and flat/level areas over about 1m in size). • Avoid the use of machinery directly on sandstone. • If burning, loose leaf litter must be carefully removed from rock platforms and from under overhangs. • If burning, rake loose leaf litter away from vegetation in the vicinity of the site if smoke is likely to impact upon rock paintings. • No use of chemicals or other retardants within 20 metres of art sites. If windy the distance is to be extended to 50 metres. • Vegetation which is screening the site must not be damaged. • There must be no slashing/trittering of vegetation, no tree removal, and no use of earthmoving equipment such as bulldozers.
<p>Reference: RFS 2006b and, Personal communication, Phil Hunt, Archaeologist, Aboriginal Heritage Office</p>	

Endangered Ecological Communities Fire Ecology	
Community	Fire Ecology
Pittwater Spotted Gum Forest Community	<ul style="list-style-type: none"> • Long-term exclusion of fire may reduce understorey species diversity and recruitment of tree species. • Fire thresholds likely to be within general community threshold for open forest. • Minimum fire interval of 15 years should apply to reduce sapling mortality. • Avoid burning more than 30% of any patch at one time and avoid burning 100% of patches within 10 years. • Medium intensity prescribed burns should be implemented to maximise recruitment of flora species.
Littoral Rainforest	<ul style="list-style-type: none"> • No fire • No slashing, trittering or tree removal
Reference: RFS 2006b, Warringah Pittwater Bush Fire Management Committee. 2000	

Vegetation Communities Present On-site	
Vegetation Formation	Vegetation Communities within Formation
Short and Tall Heath	<ul style="list-style-type: none"> • Coastal Clay Heath • Coastal Sandstone Heath
Forest	<ul style="list-style-type: none"> • Pittwater Spotted Gum Forest (EEC) • Shale Forest • Coastal Shale Forest
Rainforest	<ul style="list-style-type: none"> • Littoral Rainforest - Sandstone (EEC) • Littoral Rainforest - Shale (EEC) • Cabbage Tree Palm Forest

Vegetation Communities and Biodiversity Thresholds		
Regime	Vegetation Community	Biodiversity Thresholds
A	Short And Tall Heath	<ul style="list-style-type: none"> • Avoid successive fires at intervals of < 8 years. • Avoid fire exclusion for a period of > 30 years.
A	(Eucalypt) Dry Sclerophyll Forest	<ul style="list-style-type: none"> • Avoid successive fires at intervals of < 8 years. • Avoid fire exclusion for a period of > 30 years.
B	Rainforest	Fire should be avoided.
Reference: DEC 2002		

<i>Suppression Strategies</i>		
In the event of a fire breaking out in or near the reserves, the following actions should be carried out by the Rural Fire Service depending on the current and forecast Fire Danger Rating (FDR)*.		
Current FDR*	Forecast FDR*	Action
Low – Mod	Low – Mod	<ul style="list-style-type: none"> • As far as possible, undertake indirect, parallel or direct attack along existing control lines. • Identify and survey backup control lines.
Low – Mod	= > High	<ul style="list-style-type: none"> • Undertake indirect, parallel or direct attack to minimise the time taken to contain the fire. • Construct new control lines if necessary to minimise the time to contain the fire. • Identify and survey backup control lines.
High	All	<ul style="list-style-type: none"> • Undertake indirect attack along existing or newly constructed control lines. • Secure and deepen control lines along the next predicted downwind side of the fire. • Identify and survey backup control lines.
All	All	<ul style="list-style-type: none"> • Ensure there is sufficient time to secure control lines before the fire gets to them. • If there is insufficient time to secure control lines, fall back to the next potential control line. • As far as possible, implement threatened species and cultural heritage management guidelines.
<p>*Fire Danger Ratings (FDR) are determined daily for NSW Fire Areas by the Bureau of Meteorology (BOM) and can be found on the RFS web page: http://www.rfs.nsw.gov.au/dsp_more_info_latest.cfm?CON_ID=1854</p>		

Fire Management Zones			
Asset Protection Zones	The objective of APZs is the protection of human life and property. This will have precedence over guidelines for the management of biodiversity.		
	Zone Name	Action	Responsibility
	All Asset Protection Zones	<ul style="list-style-type: none"> Generally, a 20m APZ (15m for Short Heath) is recommended where the vegetation is downslope from the asset. Where the vegetation is upslope from the asset a 10m APZ is recommended. APZ widths may be adjusted where natural features provide logical boundaries. APZs start at the edge of the building line and extend towards the hazard. Where an adequate APZ is not/cannot be provided for (due to constraints such as EEC or rainforest vegetation, threatened species or cultural heritage features, slopes >18° or geotechnical hazard) then additional measures may need to be implemented by the landholder. Pruning of trees permissible. 75% of original canopy cover must be retained. On slopes less than 18 degrees, tree removal is permitted provided the root structure is undisturbed. On slopes over 18 degrees, at least 90% ground cover must be maintained. Use handheld tools and machinery only. No slashing, ploughing, grading, dozing or tree removal. Implement the threatened species management strategies specified in the Operational Guidelines table as required. See supporting document 'Bilgola Newport Escarpment Bushfire Management Plan' (ELA 2008) for detailed actions. 	Private land owner
Strategic Fire Advantage Zones	The objective of SFAZs is to reduce fire intensity across larger areas and complement APZs where these do not provide adequate protection. Adherence to guidelines for biodiversity will take precedence where practical.		
	Zone Name	Action	Responsibility
	SFAZ 1 SFAZ 3 SFAZ 4	<ul style="list-style-type: none"> Manual clearing of fuel loads e.g. dead shrubs and other litter. Long term weed suppression 	Pittwater Council
	SFAZ 2	<ul style="list-style-type: none"> Maintain Power line easement. Manual clearing of fuel loads e.g. dead shrubs and other litter. 	Pittwater Council & Energy Australia
	All Strategic Fire Advantage Zones	<ul style="list-style-type: none"> Implement the threatened species management strategies specified in the Operational Guidelines table as required. Use handheld tools and machinery only. No slashing, ploughing, grading, dozing or tree removal. On slopes over 18 degrees, at least 90% ground cover must be maintained. 	Pittwater Council
Land Management Zones	The objective of LMZs is to conserve biodiversity and protect cultural and historic heritage. Manage fire consistent with fire thresholds.		
	Zone Name	Action	Responsibility
	LMZ 1 LMZ 6	<ul style="list-style-type: none"> Maintain fire regime specific to Tall Heath vegetation communities detailed in the Vegetation Communities and Biodiversity Thresholds table. Remove weeds and dead shrubs. 	Pittwater Council
	LMZ 2	<ul style="list-style-type: none"> Implement the cultural and historic heritage management strategies specified in the Operational Guidelines table as required. Maintain Power line easement. Maintain Trails. Avoid Fire. 	Pittwater Council & Energy Australia
	LMZ 3	<ul style="list-style-type: none"> Maintain Power line easement while retaining shrub cover to avoid erosion. Avoid Fire. 	Pittwater Council & Energy Australia
	LMZ 4 LMZ 5	<ul style="list-style-type: none"> Avoid Fire. 	Pittwater Council
	LMZ 7	<ul style="list-style-type: none"> Maintain Power line easement. 	Pittwater Council & Energy Australia
	LMZ 8	<ul style="list-style-type: none"> Maintain Trails. 	Pittwater Council
	LMZ 9	<ul style="list-style-type: none"> Ecological mosaic burns. Three separate sections over the next 5 years. 	Pittwater Council, RFS
	All Land Management Zones	<ul style="list-style-type: none"> Implement the threatened species management strategies specified in the Operational Guidelines table as required. Use handheld tools and machinery only. No slashing, ploughing, grading, dozing or tree removal. On slopes over 18 degrees, at least 75% ground cover must be maintained. 	Pittwater Council
<p>Note: Given the lack of available APZs and the highly constrained nature of the site, active mitigation/suppression will take on more importance (rather than passive) particularly for interfaces with higher risk classes.</p> <p>A hazard reduction certificate or approval by Council is required before any vegetation removal or pruning more than 10% of any tree is undertaken.</p>			