

DEE WHY ESCARPMENT FIRE REGIME MANAGEMENT PLAN



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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.

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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.
FEZ	Fire Exclusion Zones (FEZ) are areas that contain fire intolerant species. Fires in these areas should be avoided and quick fire suppression should occur in the case of fire.
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
Inter-fire period	The period of time between successive burns.
IPA	Inner Protection Areas (IPA) are parts of an Asset Protection Zone (APZ). They are designed to eliminate the threat of fire radiation to the development, and use techniques such as slashing, shrub clearing, and construction of barriers or hazard reduction burning to reduce fuel loads.

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.
Minimum Fire Threshold	The minimum fire frequency permitted before a decline in biodiversity is expected.
Maximum Fire Threshold	The maximum fire frequency permitted before a decline in biodiversity is expected.
OPA	Outer Protection Areas (OPA) are parts of an Asset Protection Zone (APZ). They are designed to reduce the speed and intensity of an approaching bush fire. Techniques such as hazard reduction burning or selective shrub clearing are used to reduce fuel load.
Prescribed burning	A controlled burn to a predetermined area, carried out under specified weather and environmental conditions, designed to achieve planned resource management objectives.
Quick succession	Events occurring within five years of each other.
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.
Treatment Area	Area of land subject to removal or reduction of fuel by manual or mechanical means, or by prescribed burning.
Wildfire	An unplanned fire.

Executive Summary

Dee Why Escarpment covers approximately 3.1 hectares and is located in Sydney's Northern Beaches district, within the suburbs of North Curl Curl and Dee Why. The reserve supports educational and recreational activities, with surrounding land uses including residential dwellings. No threatened species or endangered ecological communities have been identified within the Escarpment.

The existing fire trail system within the Escarpment does not meet current best practice. However, due to ecological constraints, the low nature of the threat and past planning decisions, retrospective implementation of fire trails is not considered to be practical. Therefore, it is proposed that access to the Escarpment for bushfire planning and management be obtained via residential allotments and reserve access points.

The Management Plan for the Escarpment has been prepared using a landscape approach which also considers the fire history of nearby headlands. The Plan divides the Escarpment into management zones which include Asset Protection Zones (APZ) and Land Management Zones (LMZ). Existing tracks, natural features and cleared areas have been used for fire management boundaries where available, with proposed management zones covering both Council owned/managed and privately owned land.

The Plan contains a Prescribed Operations Schedule that specifies treatments, timing and other characteristics. It includes burning a small area within the middle of the Escarpment in 2006 and a larger area further to the south in 2010. Additional management actions include weed control and hand removal of fuels within areas of build up.

1 Introduction

Eco Logical Australia was contracted by Warringah Council in March 2005 to prepare a 10 year Fire Management Plan from 2006 to 2016 for Dee Why Escarpment.

1.1 Reserve Outline

Dee Why Escarpment is located in Sydney's Northern Beaches district, within the suburbs of North Curl Curl and Dee Why. Located between North Curl Curl and Dee Why beach the Escarpment covers approximately 3.1 hectares, most of which supports native vegetation. See Figure 1 for site location.

The headland heath vegetation found within the Escarpment is of regional significance and represents distinct local adaptations in many plant species to the exposed escarpment site. The area supports a number of significant flora species as well as habitat for threatened and non-threatened flora and fauna species.

Educational and recreational activities such as bushwalking form the primary uses within the Escarpment.

Surrounding land use includes residential dwellings, the Tasman Sea is located immediately to the east.

The Escarpment consists of land owned by Warringah Council and by the Department of Lands, under the trustee management of Council.

1.2 Management Plan Objectives

- To provide recommendations for:
 - New fire management zones
 - Suitable alternatives for fuel management
 - Strategies to protect the existing infrastructure located within the Escarpment
 - Strategies to protect persons and property within, or immediately adjacent to the Escarpment
- Creation of:
 - Comprehensive fire history for the reserve
 - A plan that is acceptable to and can be implemented by Council and the NSW Rural Fire Service (RFS)
 - An ecologically based strategy for fuel management, incorporating the requirement for:
 - Mosaic burn patterns
 - Fire regimes in line with vegetation community thresholds, endangered ecological communities and identified threatened species, as well as locally or regionally significant species

- A strategy to enable the effective planning of Hazard Reduction (HR) burns 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
 - Assets and infrastructure

1.3 Report Structure

The Fire Management Plan for Dee Why Escarpment comprises two separate documents:

- 1) This report
- 2) An A0 sized poster showing a series of relevant maps and tables

This report identifies the fire management framework, fire related issues and risks within the Escarpment, and provides an operational schedule and performance measures. It is intended that this written report be used in conjunction with the "Dee Why Escarpment Fire Regime Management Poster" (Appendix 7, ELA 2006).

1.4 Assumptions

Vegetation fuel loads and structure were derived from Vegetation Mapping by P & J Smith (2003). Whilst limited opportunistic on-ground validation of vegetation communities was undertaken, it was assumed that this mapping was generally accurate.

Figure 1 Site Location



2 Legislative and Planning Instruments

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

The majority of the legislation and planning instruments listed below impact HR planning requirements. Further information regarding this process may be seen in the 'Warringah Local Government Area Hazard Reduction Guidelines' (Appendix 6).

2.1 Management Plan for Coastal Headland Vegetation in the Warringah Council Local Government Area

This plan (Stricker & Adam 1999) divides the reserve into a number of management units, outlining vegetation composition and recommending management actions including:

- Burning regimes
- Pre and post burn monitoring
- Weed control
- Storm water management

2.2 Crown Lands Act 1989 & Local Government Act 1993

The Escarpment consists of land owned by Warringah Council and the Department of Lands, under the care, control and management (CCM) of Council. Management of the land owned by Council must align with the Local Government Act, whilst land under the CCM of Council must address both the Crown Land and the Local Government Acts.

This Plan of Management will meet the requirements of the Local Government Act 1993, with regards to:

- Defining objectives and performance targets
- Stating the means by which objectives and performance targets will be met
- Stating the means by which performance will be measured
- Observing the requirements of any threat abatement plans and recovery plans made under the Threatened Species Conservation Act

Plans of management for areas owned by the Department of Lands require consideration of the Crown Lands Act 1989. This includes the requirement that the following principles be followed:

- Environmental protection principles are observed in relation to the management and administration of Crown land
- Natural resources of Crown land (including water, soil, flora, fauna and scenic quality) are conserved wherever possible
- Where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity

- Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles

2.3 Management Strategy for Weed Control and Fire Management Access Zones¹

This document, created in 1996, sets out aims and objectives for the management of fire and weeds within the Warringah Council Local Government Area (LGA).

Fire management objectives include:

- Ensuring that fire management access zones are of dimensions that can be maintained in the long term
- Ensuring that methods of construction and maintenance of fire management access zones are environmentally sensitive
- Carrying out of community education in conjunction with Fire Control, and of fire hazard reduction techniques
- Co-ordinating with Fire Control on the fire hazard reduction issues

These objectives have been considered during the creation of this plan.

2.4 Rural Fires Act 1997

The objectives of the Rural Fires Act (RF Act) 1997 are to provide for:

- The prevention, mitigation and suppression of fires
- Coordination and prevention of bushfire fighting
- Protection of people and property from fires
- Protection of the environment

The RF Act requires the creation of a Bush Fire Co-ordinating Committee and a Bush Fire Risk Management Plan (outlined below).

Obligations are imposed on Council and other land management agencies to:

- Protect life and property
- Prevent fire from leaving land vested in or under its control
- Implement the provisions of Bush Fire Management Plans

2.5 Warringah Pittwater Bush Fire Risk Management Plan

Required under Section 52 of the RF Act, the Warringah Pittwater Bush Fire Risk Management Plan outlines the importance of bush fire management zones to assist in reducing bush fire risk and damage to assets. The plan also emphasises fire management priorities. Where areas are faced with an extreme bush fire risk, it will be given the highest management priority and allocation of resources.

¹ Council has acknowledged that this document is outdated and that changes are required to bring it up to current standards.

The plans are required to consider threatened species conservation and may restrict or prohibit the use of fire and other fire hazard reduction activities. This is particularly relevant for threatened species habitat.

The responsibility to implement asset protection is placed on the owners of the land that is subject to the bush fire threat. It is also Council's responsibility to ensure that the owners or occupiers of private property have taken the required steps to reduce bush fire hazards on their land. This can be enforced by the RFS through section 66 of the RF Act.

Council is responsible for environmental assessment of land prior to commencing any fire management activities (on Council owned or managed land). This is achieved through issuing a Bush Fire Hazard Reduction Certificate, obtained under the Environmental Planning and Assessment Act 1979 (EP&A Act), or through the Bush Fire Environment Assessment Code (2006).

The Escarpment is zoned as an LMZ Environmental (under WPBFMC 2000) and as such the existing Bush Fire Environment Assessment Code (RFS 2006) does not apply.

2.6 Bush Fire Environment Assessment Code

This code provides a stream-lined environmental assessment process for use in determining applications for Bush Fire Hazard Reduction Certificates and provides standards for the conduct of HR works for areas zoned under the Bush Fire Risk Management Plan (WPBFMC 2000).

The code consists of and refers to standards and guidelines that relate to the conduct and planning of managed hazard reduction activities.

Requirements for the code are specified under Section 100J of the RF Act, including land restrictions and exclusions for environmentally sensitive areas (Sections 2 and 3, BFEAC 2006).

The land covered by the Escarpment is zoned as Land Management Zone (LMZ) under the Bush Fire Risk Management Plan (WPBFMC 2000). The Escarpment is not considered to be restricted or excluded land; as such the existing Bush Fire Environment Assessment Code (RFS 2006) does apply to this reserve.

2.7 Planning for Bush Fire Protection 2001

Planning for Bush Fire Protection (PBP), prepared by the Rural Fire Service and Planning NSW is the key bush fire planning document for the state. The document identifies requirements and strategies for new developments to help protect them from bush fire hazards. It details the location and depth of asset protection zones, fire trails and perimeter roads, water supply and building standards in bush fire risk areas.

2.8 National Parks and Wildlife Act 1974

Aboriginal and cultural heritage sites are protected under this Act, as well as threatened flora, fauna and endangered ecological plant communities. The

Department of Environment and Conservation (DEC) are named as the responsible authority under the act, which extends to the protection of items outside the reserve system.

2.9 Environment Protection & Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) stipulates that approval from the Commonwealth Environment Minister is required if a development is likely to have a significant impact on matters considered to be of National Environmental Significance.

The Atlas of NSW Wildlife (DEC 2004) was utilised to identify known threatened flora within 5km and threatened fauna within 10km of the Escarpment.

2.10 Environmental Planning and Assessment Act 1979 (EP&A Act)

The NSW EP&A Act is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals and activities.

2.11 Threatened Species Conservation Act 1995

The NSW *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development or an activity (such as mechanical hazard reduction) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

Threatened flora within 5km and threatened fauna within 10km of the Escarpment have been identified (see Appendix 2) and the fire ecology requirements of those species considered.

2.12 Noxious Weed Act 1993

This Act requires Council to control noxious weeds and destroy notifiable weeds within areas under its control; and ensure that private landholders do the same.

Some of the weeds identified within this plan are considered noxious and as such require removal under this Act.

2.13 Rivers and Foreshores Improvement Act 1948

The NSW *Rivers and Foreshores Improvement Act 1948* (RFI Act) aims to provide effective controls on activities that could harm sensitive waterway and foreshore environments. The Act has provisions that require a permit for excavations, fill and other works within 40m of the top of the bank for rivers, estuaries and lakes as it is recognised that they can have significant detrimental environmental impacts on habitat, water quality, flooding and erosion. This Act exempts 'local authorities' from the need to obtain a permit.

A Part 3a permit would be required under the RFI Act for works listed above. The RFI Act is soon to be repealed and replaced by the *Water Management Act, 2002* but the provisions under this act are likely to be similar to the RFI Act. A notable exception, however, is that 'local authorities' will no longer be exempt from the need to obtain a permit.

2.14 State Environmental Planning Policy 19 (SEPP 19) – Bushland in Urban Areas

SEPP 19 is designed to protect bushland in public open space zones and reserves, as part of preservation for natural heritage, or for recreational, educational and scientific purposes. It ensures that bushland preservation is given a high priority when local environmental plans for urban development are prepared. Under SEPP 19 'bushland' means land on which there is vegetation that is either a remainder of the natural vegetation of the land or, if altered, is still representative of the structure and floristic integrity of the natural vegetation.

This reserve is zoned as public open space. As such future Hazard Reduction work must address this legislation.

3 Bush Fire Risk

3.1 Bush Fire History

Fire history mapping including both Wildfire and Hazard Reduction burning was supplied by Warringah Council, the Department of Environment and Conservation and the NSW Rural Fire Service. Fire history data for these agencies ranged in date from 1952 to 2005.

Additional written fire history data was obtained from the NSW Fire Brigade (FB) consisting of records for Hazard Reduction burning over the last 5 years and unplanned vegetation fires for the past 10 years. Additional fire history information was obtained from Stricker and Adam (1999).

Fire history mapping prior to 2000 was often not undertaken or consisted of approximate desktop estimates. As such past fire history data may be incomplete.

Field validation of fire history data was conducted in order to increase data reliability. A component of the field validation included an analysis of time since last fire through an assessment of growth characteristics of *Banksia ericifolia* (in accordance with Jenkins *et al* 2005 and Lamont, 1985). Using this methodology it was determined to be approximately 22 years since the last fire across the bulk of the Escarpment (See Appendix 5 for methodology limitations). This estimate coincides with the occurrence of a wildfire at the site in the 1980s (pers. comm. T Auld, 7/09/05).

Two fires within the Dee Why Escarpment boundaries have been mapped, occurring in 1991 and 2003, covering 15 % of the Escarpment area. Small spot fires mapped outside the Escarpment were not included in the analysis.

See "Dee Why Escarpment Fire Regime Management Poster" (Appendix 7, ELA 2006) for a map of recorded fire history, including approximate *Banksia ericifolia* locations.

3.2 Fuel Load Assessment

An assessment of fuel loads has been undertaken in the ArcView GIS, using a program add-on to predict fuel loads, based on vegetation type and time since last fire. This software, prepared for NPWS, uses fuel accumulation curves for structural vegetation types (after Conroy, 1994) to provide an estimate of fuel loads across the study area.

This information has been used to assist in the identification of priority areas for hazard reduction burns. As new fires occur and vegetation regenerates, fuel loads and therefore hazard reduction priorities will vary over time.

Fuel modelling has been based on fire history data from 1952 to the 2005 fire season and Warringah Vegetation Mapping (P & J Smith 2003) (See Figure 2).

High levels of weed infestation currently occur within the Escarpment, these weeds have the potential to alter fuel loads and fire response. Weed presence has been

mapped and considered within the proposed works schedule (see Section 4.4 and Figure 4). Predicted fuel loads for the Escarpment are shown in Figure 3.

3.2.1 Limitations

The following is an overview of the limitations of the fuel model:

- The model is based on topography, vegetation mapping and fire history. Any inaccuracies or gaps in base data will persist throughout the fuel model
- Current fire history records do not include any indication of fire intensity. The model assumes a starting fuel load of 0 tonnes per hectares. After any fire this is unlikely and in the case of a cool burn, much of the available fuel may remain
- Fire history records before the mid 1980s were not systematically recorded
- Years of drought and very poor ridge-top soil conditions may result in a much slower rate of vegetation growth and fuel accumulation
- Areas of cleared or highly disturbed vegetation were excluded from the fuel load assessment
- In some areas manual Hazard Reduction (HR) works have not been mapped. This has resulted in higher fuel load predictions than that which is actually on the ground.

3.2.2 Algorithms

The following vegetation fuel classes are used:

- 1 = grass (not included in model at this stage)
- 2 = shrub / heathland
- 3 = woodland
- 4 = open forest
- 5 = rainforest (not included in model)
- 0 = cleared, disturbed, not vegetated, swamp, reedland, saltmarsh (not included in model)

The following fuel accumulation algorithms are used:

$$\text{Shrubland: } F = 40 - (e^{-0.01169 * T} * 36.6345)$$

$$\text{Woodland: } F = 22.3 - (e^{-0.1634 * T} * 16.878)$$

$$\text{Forests: } F = 23 - (e^{-0.112 * T} * 16.346)$$

Where:

F = Fuel Load in tonnes/hectare

T = Time since last fire (in years)

3.3 Assets at Risk from Fire

3.3.1 Built and Cultural Assets

Built assets within the Escarpment include seats, look-outs and timber boardwalks/stairs.

Identification of cultural assets including known European and Aboriginal Heritage sites has been undertaken using information from the Aboriginal Heritage Information Management System (AHIMS – May 2005), the Bush Fire Risk Management Plan (WPBFMC, 2000, Appendix D). AHIMS data has been provided in digital GIS format and is intended to flag known cultural heritage issues for consideration during HR planning.

No known items of aboriginal or European heritage were identified within the Escarpment.

3.3.2 Natural Heritage Assets

Information on natural heritage values has been sourced from the following:

- Atlas of NSW Wildlife (DEC 2004)
- Warringah Vegetation Mapping (P & J Smith 2003, supplied in digital format by Council)
- Warringah Natural Area Survey, Vegetation communities and Plant Species (P & J Smith 2003)
- Management plan for coastal headland vegetation in the Warringah Council area (Stricker & Adam 1999)

3.3.2.1 Vegetation Communities

No EPBC Act listed communities or any considered as Endangered Ecological Communities (EECs) under the TSC Act occur within the Escarpment, however Sandstone Headland Heath is a community of regional significance.

Table 1 contains a list of communities, their legal status in NSW, and their priority within Warringah LGA (P & J Smith 2003). See Figure 2 for vegetation communities, Appendix 1 for an explanation of vegetation priority and Section 4.6 for fire requirement information.

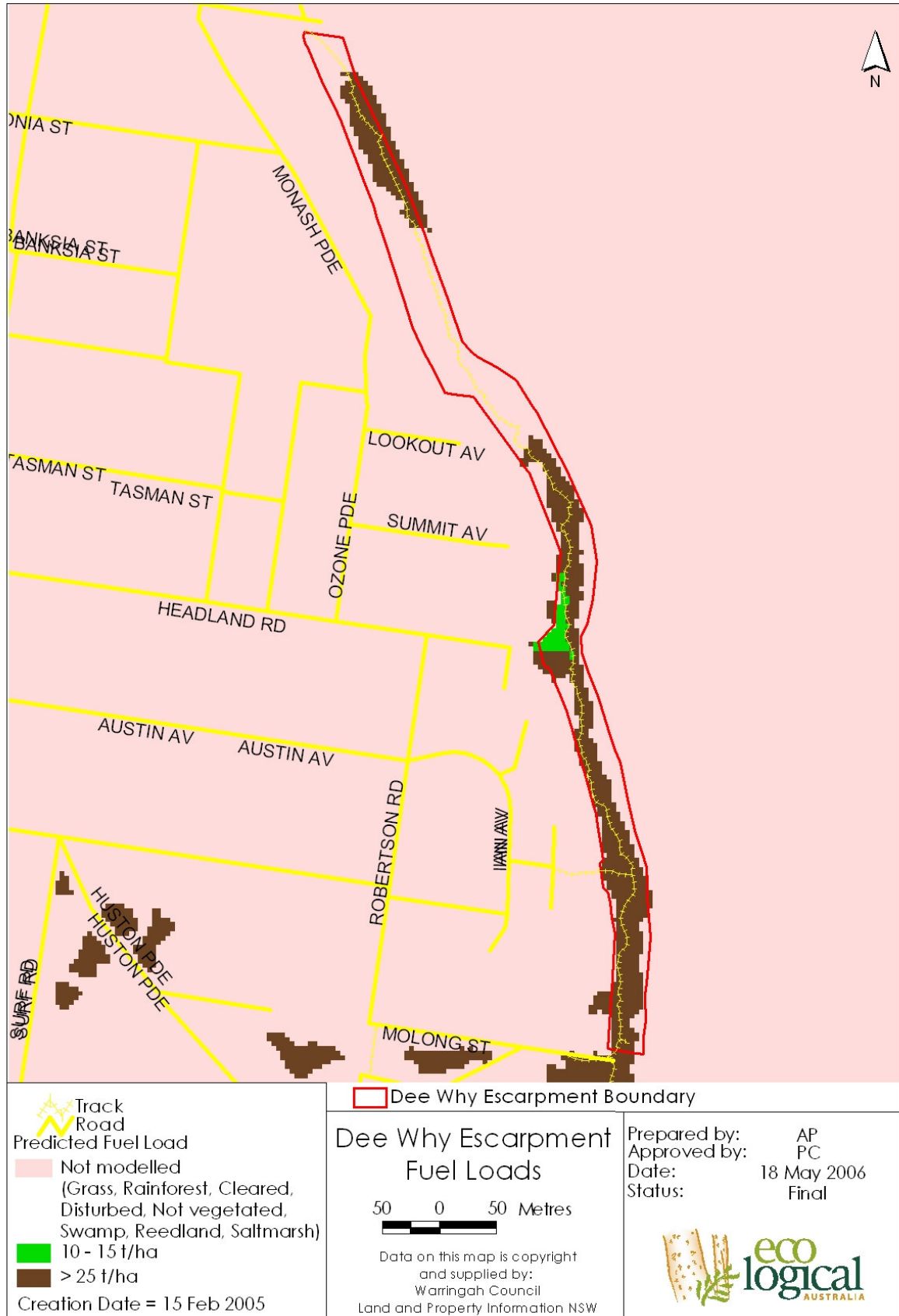
Table 1 Vegetation Communities of Dee Why Escarpment

Vegetation Community	Map Symbol	State Legislative Status (TSC Act 1995)	LGA Priority
Sandstone Headland Heath	HD	Not listed	1

Figure 2 Vegetation Communities



Figure 3 Predicted Fuel Loads



3.3.2.2 Managed Regeneration Areas

Regeneration works are currently being undertaken within a section of the Escarpment. Consideration should be given to the vulnerability of bush regeneration areas within the Escarpment at the HR planning stage as well as during wildfire response, where possible.

3.3.2.3 Threatened Flora and Fauna

A search of the Atlas of NSW Wildlife was conducted for:

- Threatened flora listed under the TSC Act 1995, and flora indicated by P & J Smith (2003) as being nationally, regionally or locally significant. Search area was within 5km of the Escarpment; and
- Threatened fauna listed under the TSC Act 1995, and fauna indicated by P & J Smith (2005) as being nationally, regionally or locally significant. Search area was within 10km of the Escarpment.

Species identified within the radius' above may be seen in Appendix 2 and includes:

- 38 threatened fauna species
- 39 national, regional or locally significant fauna species
- 3 threatened flora species
- 8 national, regional or locally significant flora species

No threatened species were identified within the Escarpment.

Fire requirements for threatened fauna identified within 10km of the escarpment were considered during creation of the operational schedule. These included requirements identified within relevant recovery plans for each species.

Protection of locally and regionally significant species is aimed at maintaining the structure and floristic integrity of the plant communities within which they occur.

Additional management requirements for all species identified (see Appendix 2) should be considered during HR planning including fire intensity, burn season, escape routes and internal burning boundaries to ensure protection of **breeding** areas and habitat.

Fire ecology requirements of threatened flora within 5km and threatened fauna within 10km of the Escarpment have been assessed and provided to Council within the Warringah Reserve Threatened Flora/Fauna Fire Ecology spreadsheets (ELA 2005a, ELA 2005b).

Additional information, including species habitat distribution/condition and population age (for flora species), is required to enable effective HR planning. As such field assessment at HR planning stage is advised.

To assist in future management, it is recommended that Council obtain mapping of:

- Potential refuge areas for amphibians, reptiles and mammals (considering the existence of barriers such as fences).

- Distribution and abundance of habitat features for which protective measures can be implemented, including:
 - Ephemeral areas
 - Hollow bearing trees/ significant stands

4 Fire Management Issues

4.1 Fire Management Boundaries

The reserve boundary used within this plan has been compiled from cadastral data.

Normally a fire management plan will only apply to the subject reserve. However in order to provide logical management and increased protection to adjacent assets, residential areas have been included within proposed APZ's.

4.2 Management Responsibilities

Fire management within the areas is co-ordinated on a landscape scale by the Warringah Pittwater Bush Fire Management Committee (BFMC). This committee is responsible for providing a coordinated, agreed approach to major issues in preparing plans for operations, and bush fire risk management within the district and is made up of Warringah Council, DEC and other key stakeholders.

Overall management of the Escarpment is the sole responsibility of Warringah Council. The NSW Fire Brigade is responsible for fire suppression efforts in the Escarpment and for mapping any fires that occur.

This plan has divided the Escarpment into a number of different management zones. Zones adjoining or including private properties may require landowner's cooperation. Council have no responsibility for land not under their management.

4.3 Fire Trails and Tracks

The existing trail system within the escarpment does not meet current best practice as specified in PBP and would entail installation of fire trails to do so. However due to ecological constraints, the low nature of the threat, as well as past planning decisions, retrospective implementation of fire trails is not considered to be practical in this case.

Access is to be managed by:

- APZ management to allow effective personnel access as required
- Use of residential allotments

Signage maps showing trails within the Escarpment are recommended.

Fire trail management should be undertaken in accordance with the Bush Fire Coordinating Committees' Policy (no. 1/03), Guidelines for the Classification of Fire Trails and Guidelines for Fire Trail Signage (BFCC 2003). Additionally a Fire Trail Register is maintained by the BFMC.

4.4 Introduced Species Management

Weed management

Weed management has been considered as a component of proposed fire management with the Escarpment.

Interactions between fire and weed species include:

- Increased fuel levels, with some weed species being particularly flammable (Eg. Pampas grass)
- Decreased likelihood of effective burn intensities, due to fire retardant species (Eg. Privet and mesic species)
- Potential for weed mortality by fire
- Encouraged proliferation of weeds, due to seed stimulation and ecological conditions post fire

Weed information was collected opportunistically as a component of field surveys (see Figure 4). Species lists are not considered comprehensive with weed recording focusing upon species which potentially have high impacts upon either ecological diversity, human health or fire impacts.

To ensure appropriate weed management, weed control should be considered during HR planning. This should include an assessment of:

- Removal of weed species over natives during creation of APZ areas
- Pre-fire weed preparation requirements. Factors to consider include weed type, species, moisture content and desired fire intensity

Management of weeds within APZ areas must incorporate ecological, stabilisation, and fire considerations.

Appropriate techniques are to be employed to prevent weed dispersal by mowers etc and the removal of dead vines from trees, as these features can act as wicks for fire to spread into canopy.

Feral fauna management

Fire may increase the impact of feral fauna species through a reduction in protective ground cover for prey species. As such control of feral species should be considered during HR planning works.

Control of rabbits should be considered with this species being observed during field surveys. Domestic cats were also observed within the Escarpment area, this may indicate the need for additional education and regulatory enforcement.

Figure 4 Recorded Weed Presence Within Dee Why Escarpment



Weed Management Explanation

- Weed mapping consisted of point and area records.
- Where area records align with APZ areas, weeds within APZ and within directly adjacent bushland have been recorded.
- Approximately 10m mapping accuracy.
- Comments on litter build up and site safety have been provided within some locations.
- *Melaleuca nodosa* is threatened in Warringah.
- Targeted weeds should include:
 - ◆ Pampas grass - due to its high flammability,
 - ◆ *Lantana* - creates high fuel loads (contributing to hotter bushfires); and
 - ◆ *Pittosporum undulatum* - an opportunistic species; high densities increase canopy density, contributing to crown fires.
 - ◆ Noxious species

Weed Point Reference	Weed Species	Comments
1	Asparagus fern	
2	n/a	Remove fuels. Dead <i>Banksia ericifolia</i> etc.
3	Asparagus fern, Mother of millions, Cobblers pegs, Capeweed	
4	n/a	Fuel piles existing
5	Asparagus fern, Blue morning glory, Mother of millions	Area part garden - reduce ground cover
6	Asthma weed, Farmers friends, Asparagus fern, Mother of millions, Cape ivy	
7	Coral tree, <i>Pittosporum undulatum</i>	
8	Blackberry, Cape ivy, Passionfruit (<i>Passiflora</i> sp), Crofton, Turkey rhubarb, Fishbone fern, Lantana	Remove fuel from near house. Will have to replace weeds with fire resistant natives to stabilise slope.
9	Asparagus fern, Cape weed, Lantana, Mother of millions	
10	Pennywort, Blue morning glory, Kikuyu, Asparagus fern	
11	Pennywort, Blue morning glory, Kikuyu, Asparagus fern	APZ in place - maintain
12	<i>Ehrharta erecta</i> , Lantana, Asparagus fern, Turkey rhubarb	
13	Japanese honey suckle, Senna species, Wandering Jew, Turkey rhubarb, <i>Pittosporum undulatum</i> , Lantana, Cotoneaster, Morning glory, Coral tree, Mother of millions, Fishbone fern, Wild watsonia	The APZ can be increased by removal of <i>Pittosporum undulatum</i> , lantana, Cotoneaster, Morning glory, Coral tree
14	Wild Watsonia, Blue morning glory, Coastal morning glory, Canna lily, Kikuyu	
15	Pennywort, <i>Pittosporum undulatum</i> , Turkey rhubarb	

Dee Why Escarpment
Weed Records

Prepared by: AP
Approved by: PC
Date: 9 September 2005
Status: Final

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4.5 Fire Management Zones

The Fire Management Zones used in this plan are based on those used in the Warringah Pittwater Bush Fire Risk Management Plan (WPBFMC 2000). The description, aims and prescription for these zones are described below.

4.5.1 Asset Protection Zones (APZ)

Description

- Area surrounding a development and managed to reduce bush fire hazard
- Often has inner protection area (IPA) and outer protection area (OPA)
- APZ widths and fuel reduction treatment will be determined by slope and existing nature of assets
- Reduction techniques will include:
 - raking and slashing
 - bush regeneration, involving initial weed removal and long term weed management. This method should be combined with hand removal of ground fuels and manual removal of shrub and middle storey layers
 - burning

Aims

- To protect human life and property
- To protect highly valued assets

Prescriptions

- To maintain reduced ground fuel loads and maintain understorey to less than 50cm in height, with discontinuous shrub and canopy layers, by:
 - removal/ suppression of weeds
 - thinning of regrowth
 - hand removal
 - raking and slashing
- A combination of prescriptions may be appropriate depending upon the slope and naturalness of the vegetation
- APZ areas may be burnt as appropriate dependant on management issues
- Trees should not over-hang buildings

4.5.2 Land Management Zone (LMZ)

Description

- Broader areas of the landscape, incorporating those areas not satisfying the criteria for inclusion in Strategic Fire Management Zones or Asset Protection zones
- Reduction techniques will include:
 - burning
 - weed control

Aims

- Protection of natural and cultural heritage values
- Maintenance of ecological processes

Prescription

- Fire management to meet conservation objectives for species, habitats, populations and cultural heritage values, including:
 - to control breaches in minimum fire thresholds and address maintenance of fire age (vegetation age) mosaic, including maximum fire thresholds
 - implementation of cultural heritage and threatened species management within areas where cultural heritage and threatened species sites are known or likely to occur

4.5.3 Strategic Fire Advantage Zones (SFAZ)

Description

- Usually adjacent to and complementing asset protection zones
- Managed to protect community assets and ecological sustainability
- Reduction techniques will include:
 - burning
 - manual fuel reduction techniques. Such as raking, slashing, hand removal of ground fuels and manual removal of shrub and canopy layers; Emphasis placed on weed species where appropriate. Focusing on weed species where appropriate
 - weed control

Aims

- To restrict fire movement into and out of reserves
- Reduce the speed and intensity of fire
- Reduce the potential for spot fire development

Prescription

- A general prescription for maximum fine fuel loading within a range of 8 – 18 tonnes per hectare
- To be managed consistently with the following applications:
 - to provide fuel reduced areas which enable the protection of assets by fire fighters when Asset Protection Zones are not in place
 - to complement Asset Protection Zones where insufficient protection is provided
 - to provide fuel reduced zones in areas of high ignition potential (eg along roads, rail lines, power lines etc) to slow the development of fires, reduce their spread, and provide for safe suppression
 - to provide strategically located fuel reduced areas to reduce the vulnerability of assets which are susceptible to fire
 - to attain a fire regime consistent with the requirements for the preservation of biodiversity within vegetation communities

4.5.4 Fire Exclusion Zones (FEZ)

Description

- Areas containing fire intolerant species and assets

Aims

- To exclude fires (both wildfires and hazard reduction burning) due to the presence of fire intolerant assets, including:
 - fire intolerant vegetation communities
 - riparian buffers
 - cultural/historic sites

Prescription

- Exclude fire and undertake rapid suppression of unplanned fires to maintain fire intolerant species and assets.

4.6 Biodiversity Fire Regime Thresholds

Biodiversity fire regime thresholds are intended to ensure there is no loss of biodiversity through senescence or insufficient recruitment as a result of fires being too frequent. Additionally, varying inter-fire periods across the landscape ensures greater heterogeneity of lifecycles and growth stages, enhancing habitat value.

Minimum and maximum inter-fire periods have been defined for vegetation communities known to occur within the Escarpment. These are shown in Table 3.

Revegetation areas within the Escarpment have not been included within this assessment process. Due to the potentially young age of these communities it is noted that prescribed biodiversity thresholds may have detrimental effects. These factors need to be considered during future HR planning conducted prior to burning.

An evaluation of fire history and biodiversity fire regime thresholds for mapped vegetation communities has been undertaken for the entire Escarpment. The current fire threshold status and resultant ecological fire requirements for vegetation within the Escarpment have been determined and may be seen in Figures 5 and 6 respectively. An explanation of these categories can be seen in Table 2.

The information above has been considered in determining the prescribed operation schedule (see Section 5).

Where the minimum inter-fire threshold has not been reached (i.e. it has not been burnt too frequently), an indication of the number of burns permitted within the life of the plan has been provided.

Fire should be excluded from areas where the minimum inter-fire threshold has been reached.

Where the minimum inter-fire threshold has been exceeded (that is, it has been burnt too frequently), strategies to facilitate recovery should be implemented. These may include:

- If wildfire occurs, the area burnt should be minimised through immediate response and rapid suppression
- Use of prescribed burning in surrounding areas to reduce the threat of wildfire whilst maintaining varying fire ages

When identifying if an area has breached, reached or not reached its minimum inter-fire threshold the precautionary approach was adopted. It was not possible, with the data available to identify whether a fire had occurred at the start or end of a calendar year. This is due to the fact that some fires are recorded by fire season, which actually occurs over 2 calendar years. Therefore, when calculating the minimum inter-fire threshold, areas on the fringe of the threshold were included. For example, if an area had a minimum threshold of >2 fires in <5 years, and was burnt in 1999, and 2004, we would identify this area as having reached its minimum threshold, even though the fires may have actually occurred 6 years apart (eg. January 1999 and December 2004). This precautionary approach means areas for future burning were not identified if they were on the verge of reaching their minimum threshold.

Where frequent fire is identified in a Recovery Plan as a threatening process, relevant pre-existing Threat Abatement Plans should be implemented.

Table 2 Ecological Threshold and Ecological Fire Requirement Explanation

Ecological Thresholds	Explanation	Ecological Fire Requirements
Threshold breached	This includes areas of vegetation where fire frequency has either been too infrequent, or too frequent for the maintenance of optimum biodiversity, as recommended within vegetation community fire thresholds.	<ul style="list-style-type: none"> • Actions for areas will depend upon whether the minimum threshold (i.e. burnt too frequently) or the maximum threshold (i.e. not burnt frequently enough) has been reached. <p><u>Minimum threshold breached:</u> Suppression priority. Exclude prescribed burning for a minimum of 10 years in forest, heathland / tall shrubland and woodland.</p> <p>For other community types prevent successive fires until community is within threshold.</p> <p><u>Maximum threshold breached:</u> Prescribed burning to be undertaken ensuring sufficient areas of old age class communities are left within the escarpment. Managed as for Prescribed Fire Management Zone (see Section 5.1).</p>
Threshold reached	This includes areas of vegetation where fire occurrence has reached the limit of identified vegetation community fire thresholds.	<p><u>Minimum threshold reached:</u> Prevent successive fires until community is within threshold.</p> <p><u>Maximum threshold reached:</u> Monitor vegetation community to determine age distribution. Prescribed burning may be undertaken, ensuring sufficient areas of old-age class communities are left within the escarpment. Managed as for Prescribed Fire Management Zone (see Section 5.1).</p>
Threshold not reached	This includes areas of vegetation where fire has occurred at a frequency within the identified vegetation community fire thresholds.	An indication of the number of fires permitted within the life of the plan before threshold is reached is provided.

Ecological Thresholds	Explanation	Ecological Fire Requirements <ul style="list-style-type: none"> Actions for areas will depend upon whether the minimum threshold (i.e. burnt too frequently) or the maximum threshold (i.e. not burnt frequently enough) has been reached.
Nearing maximum, no fire recorded	This includes areas of vegetation where a fire has not been recorded in the data provided. Area should be managed to ensure that a mosaic of fire ages within the area exist.	Prescribed burning to be undertaken, ensuring sufficient areas of old age class communities are left within the escarpment. Managed as for assigned fire management zone - see Section 5.1).
Threshold not reached (reached >10 years ago)	This includes areas of vegetation where a fire has occurred at a frequency within the identified vegetation fire thresholds, however the threshold was reached in the past (i.e. >10 years ago).	An indication of the number of fires permitted within the life of the plan before threshold is reached is provided.
Threshold not reached (breached >10 years ago)	This includes areas of vegetation where a fire has occurred at a frequency within the identified vegetation fire thresholds, however the threshold was breached in the past (i.e. >10 years ago).	An indication of the number of fires permitted within the life of the plan before threshold is reached is provided.
Not addressed	This includes water bodies and areas mapped as highly disturbed or cleared vegetation. These areas have no identified vegetation community fire thresholds.	Not applicable.

Figure 5 Vegetation Fire Threshold

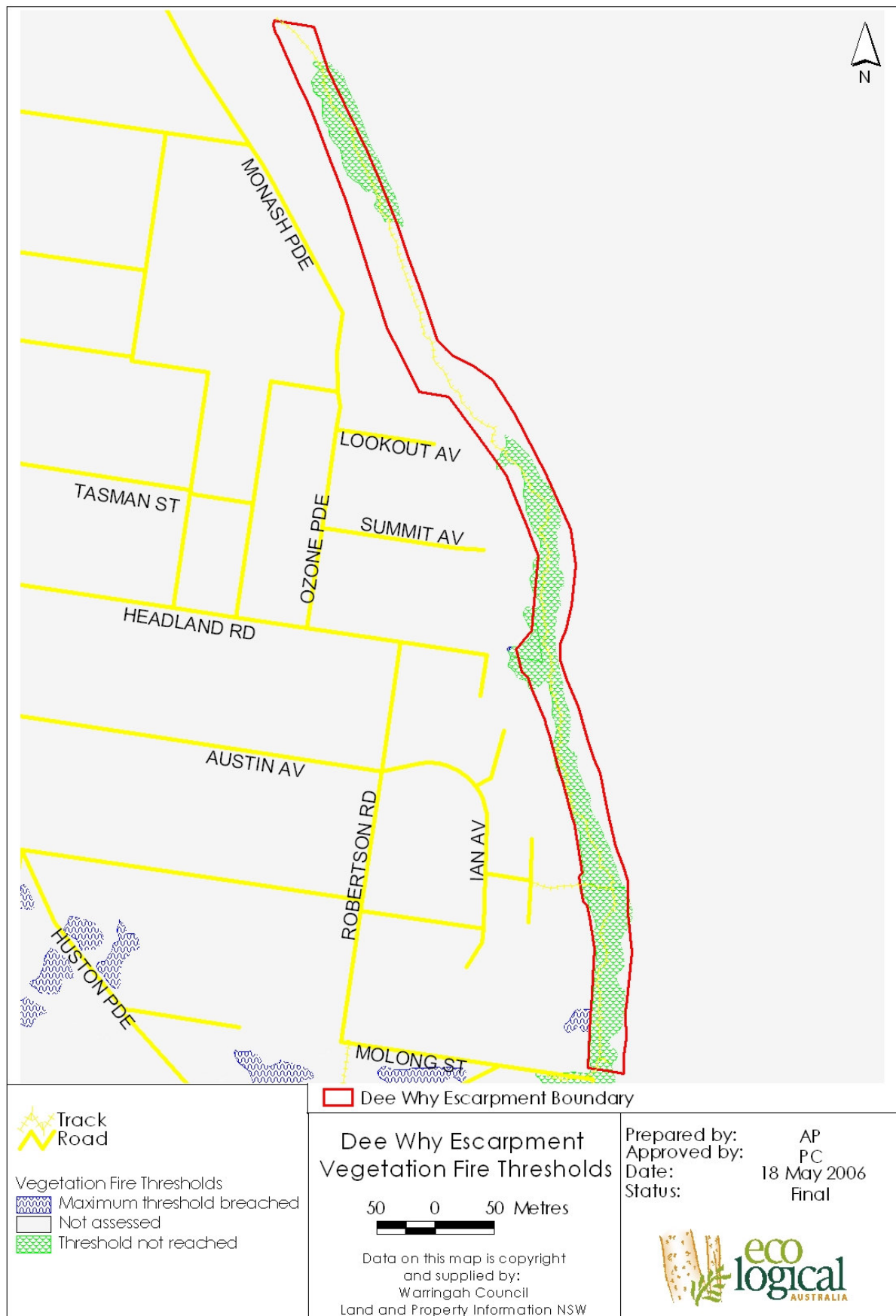


Figure 6 Ecological Fire Requirements

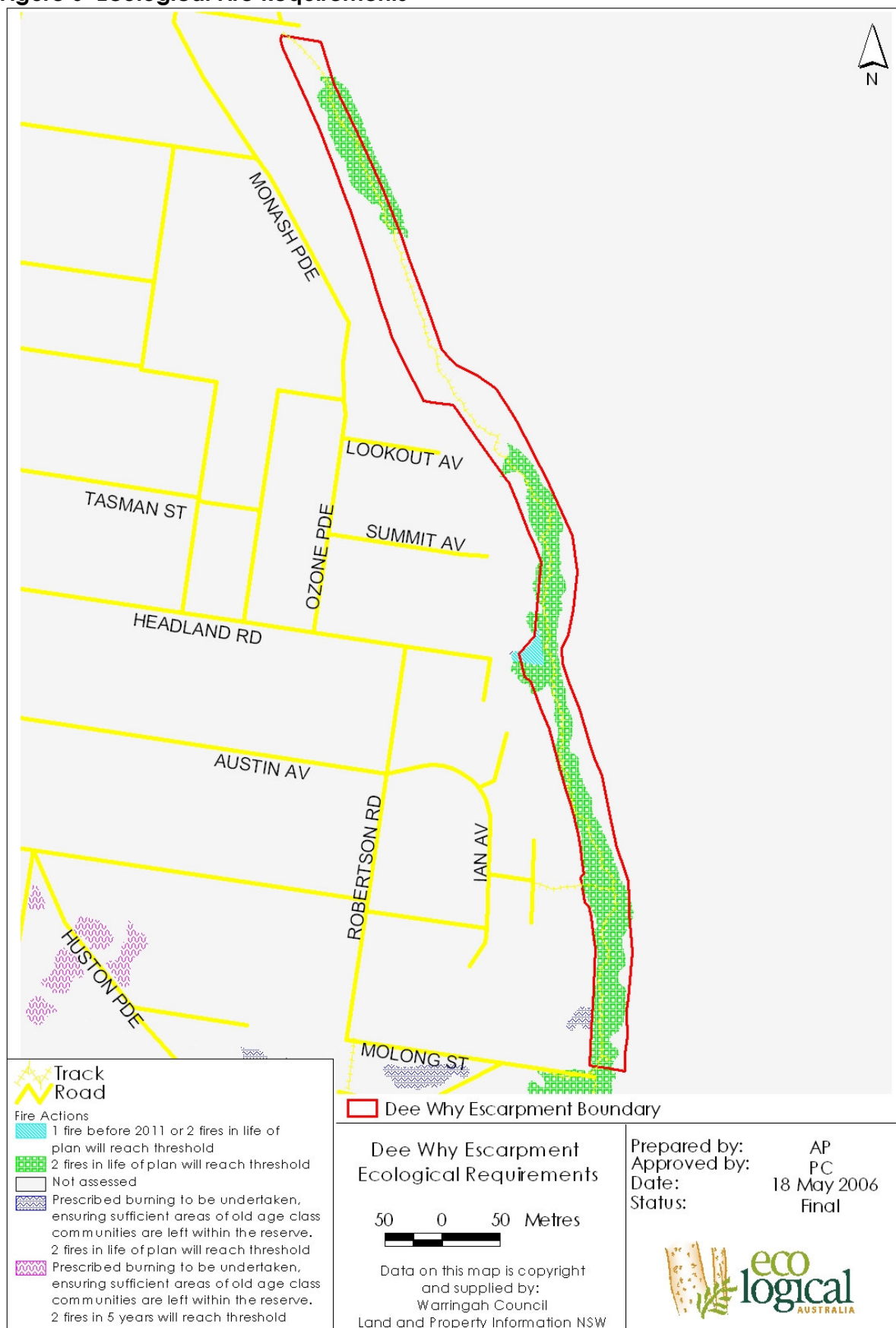


Table 3 Biodiversity Fire Regime Thresholds for Vegetation Communities identified within Dee Why Escarpment

Vegetation Community	Priority	Minimum Fire Interval	Maximum Fire Interval	Fire Restrictions	Reference
Sandstone Headland Heath	1	>2 in quick succession in 8 yr interval, 3 in quick succession each 15 to 30yrs interval	>30	-	WPBFMC, 2000

5 Operational schedule

The operational schedule is explained below and is made up of the:

- Prescribed Fire Management Zones
- Prescribed Works Schedule

This may be seen in:

- Figure 7 and 8
- Table 4
- The "Dee Why Escarpment Fire Regime Management Poster" (Appendix 7, ELA 2006)

5.1 Prescribed Fire Management Zones

The following fire management zones have been (see Figure 7, Section 4.5):

- Asset Protection Zones (APZ)
- Land Management Zones (LMZ)

Prescribed APZ widths may be seen in Table 4.

In order to minimise impacts and to allow for effective management, existing tracks, natural features and cleared areas have been used for fire management boundaries where available.

Zones cover both Council owned/managed and privately owned land. Cooperation of all landowners will be required for the successful implementation of this plan.

A landscape approach has been adopted for fire management within the Escarpment, providing a mosaic of fire ages between headlands. This approach provides for the retention of some areas of senescing communities and reduces the impacts of mosaic management on a micro scale.

5.2 Prescribed Works Schedule

The prescribed works schedule lists the actions required by Council to facilitate implementation of this Plan's objectives.

Prescribed burning within **LMZ's** has been proposed for selected areas where biodiversity fire regime thresholds are near to or have been exceeded (that is, if the vegetation has not been burnt for a long time and is in danger of senescing and losing biodiversity values). Assessed threshold explanation, status and proposed action status can be seen in the following:

- Sections 4.6
- Figure 5 and 6
- Table 2

Water quality within the Escarpment should be protected by the restriction of fire or through limiting fire intensity from within 20 metre of watercourses where possible.

Figure 7 Prescribed Fire Management Zones



Figure 8 Prescribed Works Schedule



Table 4 Prescribed Operation Schedule for Dee Why Escarpment

Name	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Land Tenure	APZ Widths
APZ 1	Burning, Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	Ongoing regeneration Approach & fuel reduction	2	2010	-	Warringah Council, Private land	5m minimum. Natural features, tracks may be used
APZ 2	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	Ongoing regeneration Approach & fuel reduction	-	Subject to Council's FMAZ program priorities♦	-	Department of Lands - CCM Warringah Council, Private land	5m APZ applied
LMZ 1	Burning	-	1	2006	-	Warringah Council	-
LMZ 2	Burning	Control weeds	2	2010	-	Warringah Council	-
LMZ 3	-	Control weeds	-	-	Lookout	Department of Lands - CCM Warringah Council	-
LMZ 4	-	Control weeds	-	-	Wooden boardwalk, park benches, timber steps	Department of Lands - CCM Warringah Council	-

* Year of burn may vary due to weather and environmental conditions and resource availability

♦ Fire Management Access Zone (FMAZ) priorities dependent on available funds

Note:

- No Aboriginal or cultural sites recorded
- No Threatened Species or Endangered Ecological Communities recorded in this reserve
- The following significant species were identified within the reserve:
 - *Correa alba*
 - *Melaleuca nodosa*
 - *Pelargonium australe*
 - *Rulingia hermanniifolia*

6 Performance measures

6.1 Environmental Assessment of Scheduled Works

All 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 (See Section 2.5). The "Warringah Local Government Area Hazard Reduction Guidelines" (Appendix 4) may be used to assist this process.

6.2 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 after 24/06/05 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 requires:

- Updated fire records
- Determination of fire age
- Consideration of required threshold
- Assessment of current threshold status

Assessment of vegetation community threshold status was undertaken in 2005 (see Section 4.6) and is included within:

- Figure 5 and 6
- The "Dee Why Escarpment Fire Regime Management Poster" (Appendix 7, ELA 2006)
- Digital data provided to Council

Pre and post burn monitoring of vegetation response would assist in appropriate management within these areas.

6.3 Fire Management Plan Review

The goal of this plan is to guide the management of fire within the Dee Why Escarpment for the next 10 years and to provide a sustainable balance between asset protection and ecosystem management.

Prescribed works schedule assessment

Assessment of the prescribed works schedule (Section 5.2) and the Warringah Reserve Threatened Flora/Fauna Fire Ecology spreadsheets (ELA 2005a, ELA 2005b) should be undertaken on an annual basis and during HR planning. This should include:

- Incorporation of additional developments in the management of native flora and fauna with respect to fire
- Alterations in fire thresholds (see Section 6.2)

Fire management plan evaluation

It is recommended that an evaluation of this plan be conducted at the end of 10 years. The evaluation should involve stakeholder (RFS and DEC) assessment and include:

Quantitative assessment:

- Minimum fire thresholds not exceeded
- Number of hectares burnt outside ecological threshold for HR and wildfires
- Maintenance of a mosaic of fire age (vegetation age)
- Maintenance of fuel free and fuel reduced APZ's
- All activities proposed within the Prescribed Work Schedule accepted by the NSW Rural Fire Service (RFS)

Qualitative assessment:

- Provision of effective and user friendly instructional guidelines to enable other planning processes. Including:
 - Proficient/successful HR planning
 - Prevention of fire damage to infrastructure
 - Prevention of fire damage to threatened, locally or regionally significant species, endangered populations or endangered ecological communities
 - Protection of aboriginal and culturally significant sites from fire damage
 - Visit current social attitudes to determine success of proposed management strategies
 - Evaluate feasibility and practicality of prescribed operational schedule

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Appendix 1 – Vegetation Priority Explanation

Priority 1	EEC (under <i>TSC Act 1995</i>), or represent potentially important habitat for threatened flora or fauna species (listed under <i>TSC Act 1995</i>). Particularly if the community is absent or poorly represented in Garigal and Ku-ring-gai Chase National Parks.
Priority 2	Important for conservation of biodiversity at the local level. Communities with a restricted distribution in the Warringah LGA and are absent or poorly represented in Garigal and Ku-ring-gai Chase National Parks. Stands of these communities warrant first priority if they support populations of threatened fauna or flora species.
Priority 3	Communities that are well represented in Garigal and Ku-ring-gai Chase National Parks and common in Warringah. Stands of these communities warrant first priority if they support populations of threatened fauna or flora species.

Source: P & J Smith 2003

Appendix 2 – Known Threatened Flora Within 5km and Threatened Fauna Within 10km of Dee Why Escarpment

Table 1 Known threatened flora within 5km of Dee Why Escarpment*

Scientific Name	Common Name
<i>Chamaesyce psammogeton</i>	
<i>Syzygium paniculatum</i>	
<i>Tetralthea glandulosa</i>	

* **Source:** DEC 2004

* No species identified within the Escarpment

Table 2 Known threatened fauna within 10km of Dee Why Escarpment*

Scientific Name	Common Name
<i>Botaurus poeciloptilus</i>	Australasian Bittern
<i>Calidris alba</i>	Sanderling
<i>Calidris tenuirostris</i>	Great Knot
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo
<i>Charadrius leschenaultii</i>	Greater Sand Plover
<i>Charadrius mongolus</i>	Lesser Sand Plover
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Diomedea exulans</i>	Wandering Albatross
<i>Esacus neglectus</i>	Beach Stone-curlew
<i>Gygis alba</i>	White Tern
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher
<i>Haematopus longirostris</i>	Pied Oystercatcher
<i>Heleioporus australiacus</i>	Giant Burrowing Frog
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)
<i>Ixobrychus flavicollis</i>	Black Bittern
<i>Lathamus discolor</i>	Swift Parrot
<i>Litoria aurea</i>	Green and Golden Bell Frog
<i>Macronectes giganteus</i>	Southern Giant-Petrel
<i>Macronectes halli</i>	Northern Giant-Petrel
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat
<i>Ninox strenua</i>	Powerful Owl
<i>Pandion haliaetus</i>	Osprey
<i>Phascolarctos cinereus</i>	Kodla
<i>Phoebastria fusca</i>	Sooty Albatross
<i>Pseudophryne australis</i>	Red-crowned Toadlet
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove
<i>Ptilinopus superbus</i>	Superb Fruit-Dove
<i>Puffinus assimilis</i>	Little Shearwater
<i>Puffinus carneipes</i>	Flesh-footed Shearwater
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat
<i>Sterna albifrons</i>	Little Tern
<i>Sterna fuscata</i>	Sooty Tern
<i>Thalassarche cauta</i>	Shy Albatross
<i>Thalassarche melanophris</i>	Black-browed Albatross
<i>Tyto novaehollandiae</i>	Masked Owl
<i>Varanus rosenbergi</i>	Rosenberg's Goanna

* **Source:** DEC 2004

* No species identified within the Escarpment

Appendix 3 – Known Significant Flora Within 5km and Significant Fauna Within 10km of Dee Why Escarpment

Table 1 Known significant flora within 5km of Dee Why Escarpment

Scientific Name	Common Name	Significance	Recorded Within Escarpment	Source
<i>Eucalyptus luehmanniana</i>	Yellow-top Ash	Nationally significant species		DEC 2004
<i>Gonocarpus salsoloides</i>		Nationally significant species		DEC 2004
<i>Hibbertia nitida</i>		Nationally significant species		DEC 2004
<i>Plantago hispida</i>		Threatened in northern Sydney		DEC 2004
<i>Rulingia hermanniifolia</i>	Wrinkled Kerrawang	Nationally significant species	X	DEC 2004, Stricker & Adam 1999
<i>Scaevola calendulacea</i>	Dune Fan-flower	Threatened in northern Sydney	X	DEC 2004, P & J Smith 1998 (cited in Stricker & Adam 1999)
<i>Pelargonium australe</i>	Native Storksbill	Significant in Sydney region	X	DEC 2004, Stricker & Adam 1999
<i>Eucalyptus scias</i>	Large-fruited Red Mahogany	Significant in Sydney region	X	DEC 2004, P & J Smith 1998 (cited in Stricker & Adam 1999)

Table 2 Known significant fauna within 10km of Dee Why Escarpment*

Scientific Name	Common Name	Significance
<i>Anous stolidus</i>	Common Noddy	Migratory
<i>Antechinus swainsonii</i>	Dusky Antechinus	Threatened in northern Sydney
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory
<i>Arenaria interpres</i>	Ruddy Turnstone	Migratory
<i>Calidris ruficollis</i>	Red-necked Stint	Migratory
<i>Charadrius bicinctus</i>	Double-banded Plover	Migratory
<i>Chlidonias leucopterus</i>	White-winged Black Tern	Migratory
<i>Diplodactylus vittatus</i>	Eastern Stone Gecko	Threatened in northern Sydney
<i>Egretta sacra</i>	Eastern Reef Egret	Migratory
<i>Furina diadema</i>	Red-naped Snake	Threatened in northern Sydney
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler	Migratory
<i>Heteroscelus incanus</i>	Wandering Tattler	Migratory
<i>Lialis burtonis</i>	Burton's Snake-lizard	Threatened in Warringah
<i>Limnodynastes dumerilii</i>	Bullfrog	Threatened in northern Sydney
<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog	Threatened in northern Sydney
<i>Limosa lapponica</i>	Bar-tailed Godwit	Migratory
<i>Monarcha melanopsis</i>	Black-faced Monarch	Migratory
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Migratory
<i>Numenius madagascariensis</i>	Eastern Curlew	Migratory
<i>Origma solitaria</i>	Rockwarbler	Biogeographically Significant
<i>Philomachus pugnax</i>	Ruff	Migratory
<i>Phyllurus platurus</i>	Broad-tailed Gecko	Biogeographically Significant
<i>Plegadis falcinellus</i>	Glossy Ibis	Migratory
<i>Pluvialis squatarola</i>	Grey Plover	Migratory
<i>Puffinus griseus</i>	Sooty Shearwater	Migratory
<i>Puffinus pacificus</i>	Wedge-tailed Shearwater	Migratory
<i>Puffinus tenuirostris</i>	Short-tailed Shearwater	Migratory
<i>Rattus lutreolus</i>	Swamp Rat	Threatened in northern Sydney
<i>Rhipidura rufifrons</i>	Rufous Fantail	Migratory
<i>Sericornis magnirostris</i>	Large-billed Scrubwren	Threatened in northern Sydney
<i>Stercorarius longicaudus</i>	Long-tailed Jaeger	Migratory
<i>Stercorarius parasiticus</i>	Arctic Jaeger	Migratory
<i>Stercorarius pomarinus</i>	Pomarine Jaeger	Migratory
<i>Sterna caspia</i>	Caspian Tern	Migratory
<i>Sterna hirundo</i>	Common Tern	Migratory
<i>Sterna paradisaea</i>	Arctic Tern	Migratory
<i>Tringa nebularia</i>	Common Greenshank	Migratory
<i>Tringa stagnatilis</i>	Marsh Sandpiper	Migratory

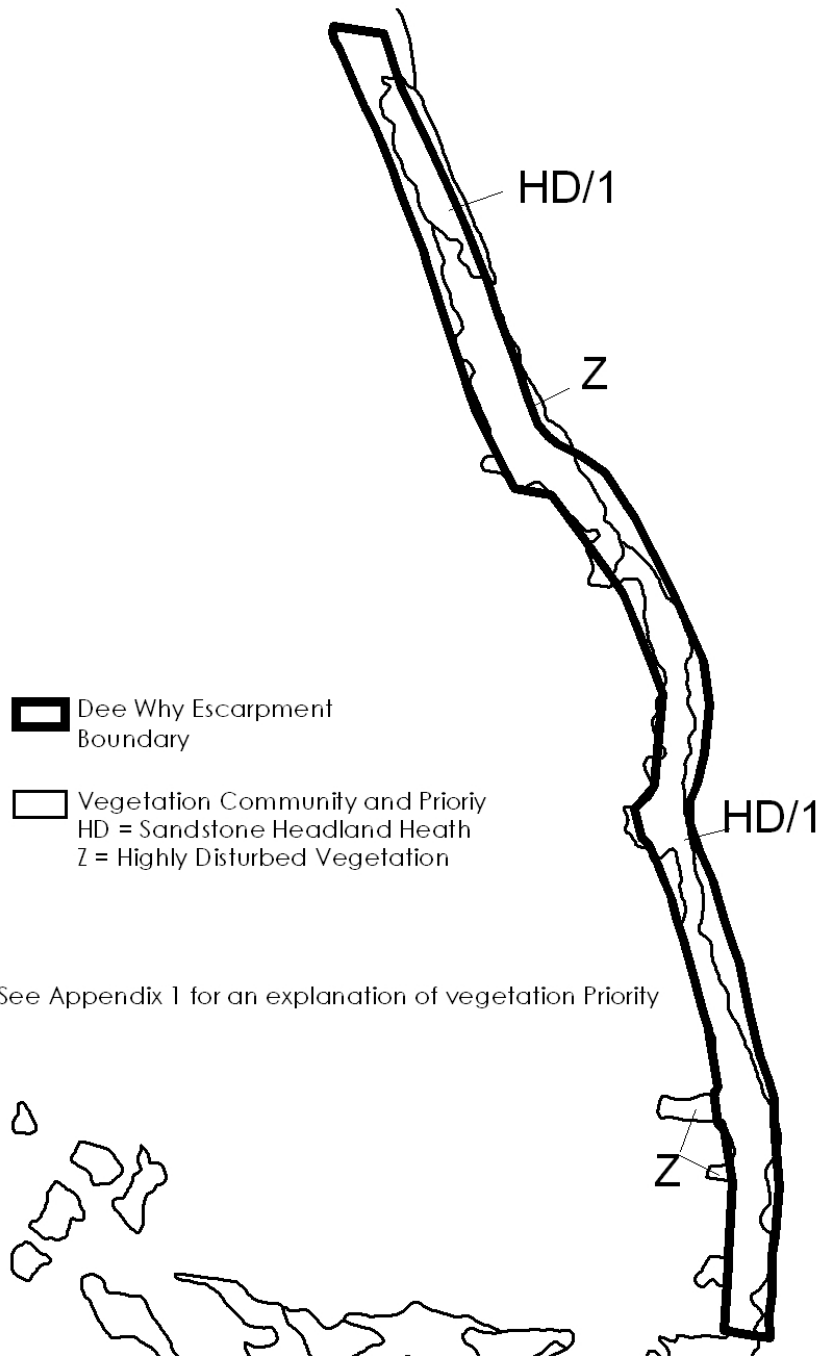
* **Source:** DEC 2004

* No species identified within the Escarpment

Appendix 4 – Warringah Local Government Area Hazard Reduction Guidelines

Appendix 5 – Fire Management Plan Methodology

Appendix 6 – Vegetation Community Overlay



Appendix 7 – Dee Why Escarpment Fire Regime Management Poster