

MANLY WARRINGAH WAR MEMORIAL PARK 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

Manly Warringah War Memorial Park is located in Sydney's Northern Beaches district, within the suburb of Allambie Heights. The park contains the largest fresh water lake (Manly Dam) in Sydney's metropolitan area and consists primarily of native bushland.

Covering an area of approximately 377 hectares, the park provides habitat for a number of flora and fauna species; including three threatened fauna and two threatened flora species. The park also contains Silvertop Ash-Brown Stringybark Forest (listed as Duffys Forest Endangered Ecological Community) as well as *Angophora crassifolia* a significant plant species.

Internal uses within the park include four formal picnic areas, Wakehurst Golf Course, Couvret Tennis Courts, the Warringah Aquatic Centre, and the adjacent sports fields. Surrounding land uses include low density urban development, independent and assisted care for senior citizens, primary schools, an industrial area and Garigal National Park.

In addition to ongoing maintenance of existing fire trails, creation of a new fire trail between Wakehurst Parkway and the top of Wakehurst Golf Course, is recommended, in order to provide adequate access to primarily fire break areas. It is further recommended that fire trails at Roosevelt Avenue (adjacent to the tennis courts) and behind Lutheran Homes be upgraded / maintained in accordance with the requirements for Planning for Bush Fire Protection (RFS 2001).

The Management Plan divides the park into management zones which include Asset Protection Zones (APZ), Fire Exclusion Zones (FEZ), Land Management Zones (LMZ) and Strategic Fire Advantage Zones (SFAZ). Existing tracks, natural features and cleared areas have been used for fire management boundaries where available, with proposed management zones covering both Council managed and privately owned land.

The Plan contains a Prescribed Operations Schedule that specifies treatments, timing and other characteristics. It prescribes numerous hazard reduction burns between 2006 and 2016, as well as fire exclusion / quick suppression, weed control and hand removal of fuels within areas of build up.

1 Introduction

Eco Logical Australia was contracted by the Warringah Council in March 2004 to prepare a 10 year Fire Regime Management Plan from 2006 to 2016 for Manly Warringah War Memorial Park.

1.1 Reserve Outline

Manly Warringah War Memorial Park (referred to as 'the Park') is located in Sydney's Northern Beaches district, within the suburb of Allambie Heights, in the Warringah Local Government Area (LGA). Covering an area of approximately 377 hectares, the park contains the largest fresh water lake (Manly Dam) in Sydney's metropolitan area and consists primarily of native bushland. See Figure 1 for site location.

The Park is Crown Land, reserved for public recreation and is managed by Warringah Council, zoned under 'existing Recreation' and 'Open space' under the Warringah Local Environmental Plan (LEP) 1985.

Internal uses within the park include the Warringah Aquatic Centre, the sports fields adjacent to the Aquatic Centre, four formal picnic areas, Wakehurst Golf Course and Couvret Tennis Courts (near Wakehurst Golf Course)

Surrounding land uses include low density urban development, independent and assisted care for senior citizens, primary schools, an industrial area and Garigal National Park.

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 park
 - Strategies to protect persons and property within, or immediately adjacent to the park
- Creation of:
 - Comprehensive fire history for the park
 - 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 park
 - Assets and infrastructure

1.3 Report Structure

The Fire Regime Management Plan for Manly Warringah War Memorial Park comprises two separate documents:

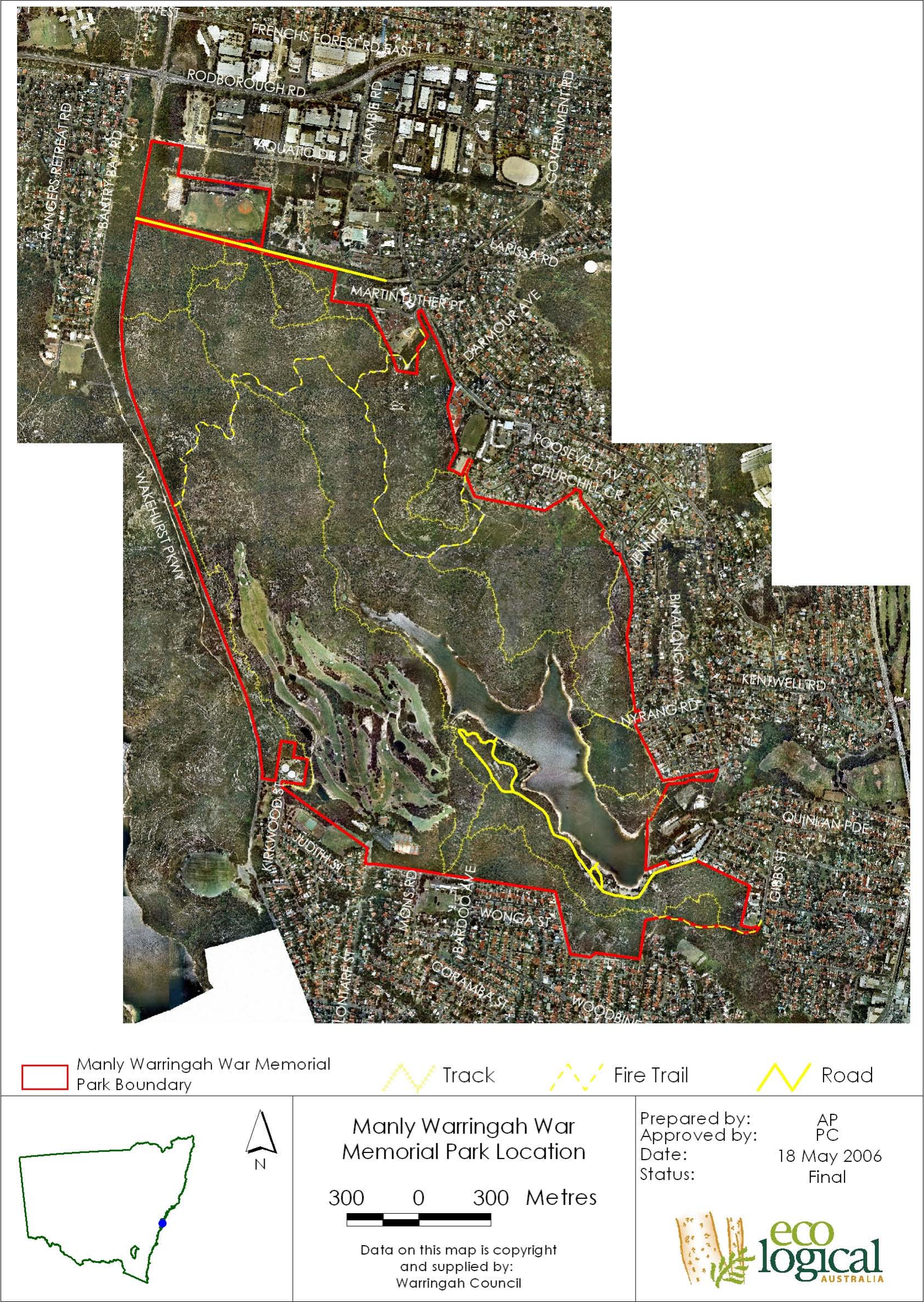
- 1) This report
- 2) An A0 sized poster showing a series of relevant maps and tables

This report identifies the fire management framework, fire related issues and risks within the park, and provides an operational schedule and performance measures. It is intended that this written report be used in conjunction with the "Manly Warringah War Memorial Park Fire Regime Management Poster" (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 4).

2.1 Crown Lands Act 1989 & Local Government Act 1993

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 1995

All plans of management for this park 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

2.2 Manly Warringah War Memorial Park Plan of Management

This plan was created July 1998 and provides a frame work for managing Manly Warringah War Memorial Park. Providing a back ground, management strategies and work schedules for the following issues:

- Vegetation management
- Feral and introduced animal control
- Water quality
- Aboriginal sites
- Education and research
- Visitor facilities
- Safety and standards

The plan refers to past fire history and the Bush Fire Control Plan as written by ES & S Consultants (1981).

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 bush fire 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 which 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 (RFS 2006).

Areas along the northern, eastern and southern boundaries of Manly Dam Warringah War Memorial Park are zoned as Asset Protection zones (APZ). The rest of the park is zoned as an environmental Land Management Zone (LMZ) (under WPBFMC 2000).

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 Manly Dam is mapped as Asset Protection Zone (APZ) and Environmental Land Management Zone (LMZ) under the Bush Fire Risk Management Plan (WPBFMC 2000). The existing Bush Fire Environment Assessment Code (RFS 2006) does apply to this park, with restrictions within areas of Freshwater Lagoon Swamp.

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 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.

2.10 Environmental Planning and Assessment Act 1979

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.

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.

The Atlas of NSW Wildlife (DEC 2004) was utilised to identify known threatened flora within 5km and threatened fauna within 10km of the park (see Appendix 2). Fire ecology requirements of recorded 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.

This plan has been prepared in conjunction with the Bushland Management Plan For Manly Warringah War Memorial Park (ELA 2005e). Management of noxious weeds observed within the park is required 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 bush 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 park 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 and the NSW Rural Fire Service. Field validation, completed in January 2005, was undertaken to increase the reliability of the data. Spatial accuracy for data was found to be low, particularly for older fires.

Additional fire history data was assessed, including:

- Digital data from the Department of Environment and Conservation (incorporated into fire mapping, post site validation)
- Written information derived from Nelson Consulting (1998), (incorporated into fire mapping, post site validation)
- Written data from the NSW Fire Brigade, consisting of records for Hazard Reduction burning over the last 5 years and unplanned vegetation fires for the past 10 years (provided to Council)

Fire history data from all sources ranged in date from 1952 to 2005.

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.

Fires recorded within Manly Warringah War Memorial Park boundaries occurred between 1971 and 2005. Small spot fires mapped outside the park were not included in the analysis.

An analysis of available mapped fire history data showed that 76% of Manly Warringah War Memorial Park has been burnt since 1952, with the major source of fire emanating from the adjacent Garigal National Park. The most recent fire events occurred in 2005.

See "Manly Warringah War Memorial Park Fire Regime Management Poster" (Appendix 8, ELA 2006) for a map of recorded fire history.

3.2 Adjacent areas

Manly Warringah War Memorial Park is located adjacent to Garigal National Park; there by increasing the fire threat to the park.

The Ku-ring-gai and Garigal National Parks Fire Management Plan (DEC 2005) has classified the areas surrounding the reserve and adjoining Community Land as Heritage Area Management (see NPWS 2005a for prescriptions). The plan states that prescribed burning schedules will be developed in consultation with relevant Bush Fire Management Committees, as such no burning has been proposed at this stage.

Further fire management planning within this area may be seen within the Garigal National Park Draft Fire Management Strategy (DEC 2005a).

3.3 Fuel Load Assessment

An assessment of fuel loads has been undertaken in ArcView GIS, using a program add-on to predict fuel loads, based on vegetation type and time since fire. This software, prepared for NPWS (Conroy 1994), uses fuel accumulation curves for structural vegetation types. The information was then analysed in relation to time since last fire 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 will vary.

Fuel modelling has been based on fire history data from 1952-1953 to 2004-2005 fire seasons and Warringah Vegetation Mapping (P & J Smith 2003) (See Figure 3).

It should also be noted that high levels of weed infestation currently exist within the park. The occurrence of these weeds has the potential to alter fuel loads and fire response.

3.3.1 Limitations

The following is a basic list of the limitations of the fuel model:

- The model is based on topography, vegetation mapping and fire history. Any inaccuracies or gaps in the data will be persistent 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
- Hazard reduction burns undertaken in 2005 – 2006 fire season were not included within fuel load assessments

3.3.2 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:

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

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

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

Where:

F = Fuel Load measured in tonnes/hectare

T = Time since last fire (in years)

3.4 Assets at Risk from Fire

3.4.1 Built and Cultural Assets

The park contains numerous built assets including, Couvret Tennis Courts, the Warringah Aquatic Centre, the sports fields adjacent to the Aquatic Centre, Wakehurst Golf Course, four formal picnic areas, a Council Park Office, storage sheds, and workshops. Protection of these assets have been included within zone management. The park also contains lower level assets such as walking and bike tracks, bridges, drains, fencing and signage. Consideration for the protection of such assets should be given prior to the conduct of HR burning.

Identification of cultural assets including known European and Aboriginal heritage sites have been identified from the Aboriginal Heritage Information Management System (AHIMS – DEC 2004a), Council data and the parks management plan (Nelson Consulting 1998). This information has been provided in digital GIS format and is intended to flag known cultural heritage issues for consideration during the HR planning process.

Manly Warringah War Memorial Park and Manly Dam are formally listed as heritage items, within the National Estate Database, with 11 items of Aboriginal cultural heritage occurring within the park.

3.4.2 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)
- Manly Warringah War Memorial Park Plan of Management (Nelson Consulting 1998)

3.4.2.1 Vegetation Communities

The park contains one vegetation type listed under the TSC Act as one Endangered Ecological Community (EEC) - Duffys Forest Ecological Community. No Nationally listed communities (under the EPBC Act) occur within the park.

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. A Transparent overlay of vegetation communities may also be seen in Appendix 7.

Duffys Forest vegetation within the northern section of the park, adjacent to Warringah Aquatic Centre is likely to cover a greater area due to regeneration works undertaken. Future revision of mapping within this area should be considered, providing follow up weed work is undertaken.

Table 1 Vegetation Communities of Manly Warringah War Memorial Park

Vegetation Community	State Legislative Status (TSC Act 1995)	LGA Priority
Bloodwood-Scribbly Gum Woodland	Not listed	3
Freshwater Lagoon Swamp	Not listed	1
Peppermint-Angophora Forest	Not listed	3
Sandstone Heath	Not listed	3
Sandstone Swamp	Not listed	2
Silvertop Ash-Brown Stringybark Forest	Duffys Forest vegetation community in the Sydney Basin Bioregion	1

Figure 2 Vegetation Communities

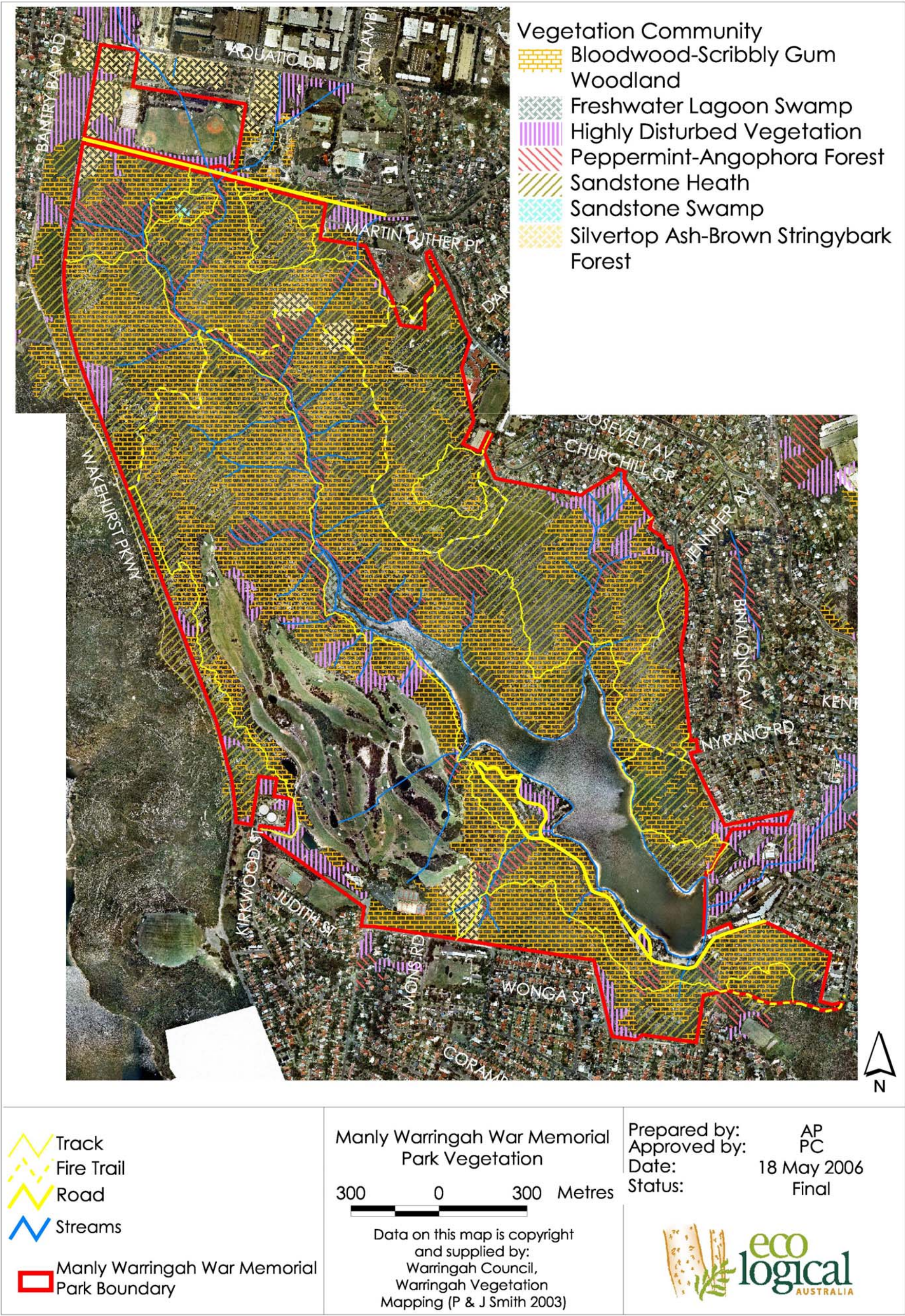
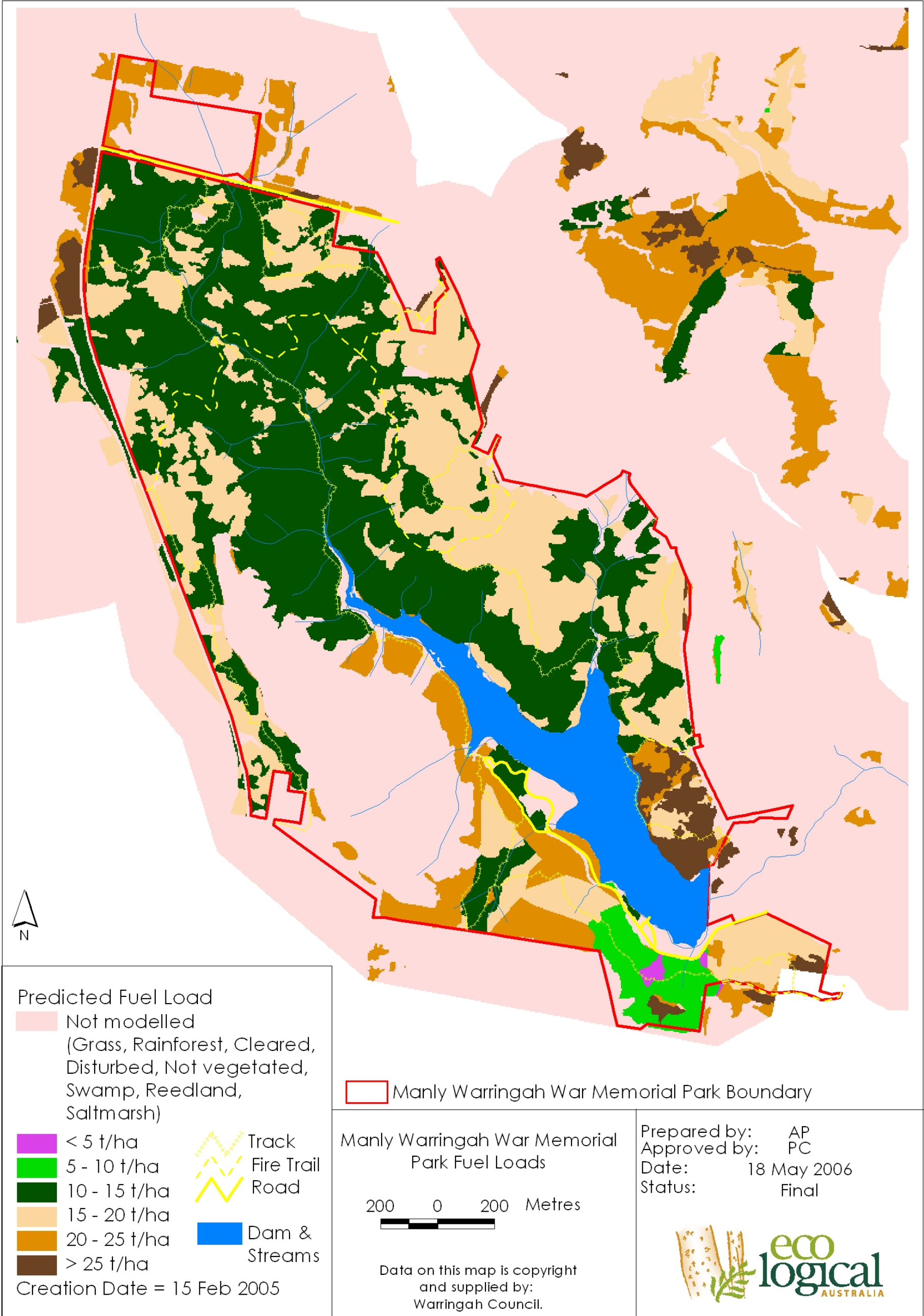


Figure 3 Predicted Fuel Loads



3.4.2.2 Managed Regeneration Areas

Consideration should be given to the vulnerability of bush regeneration areas within the park at HR planning stage as well as during wildfire response, where possible.

3.4.2.3 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 Park; 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 Park.

Species identified within the radius' above may be seen in Appendixes 2 - 3 and includes:

- 42 threatened fauna species
- 47 national, regional or locally significant fauna species
- 9 threatened flora species
- 24 national, regional or locally significant flora species

Threatened species identified within the park include the Rosenberg's Goanna, the Grey-headed Flying-fox, the Eastern Bent-wing Bat, *Microtis angusii* and an *unnamed Prostanthera* species. *Angophora crassifolia* a significant plant species was also recorded within the park.

Fire requirements for threatened species identified within the park 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 as well as threatened species identified as occurring outside the park 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 park 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 park boundary used within this plan has been compiled from both cadastral and park management boundaries (as proposed by Nelson Consulting (1998). Areas where the park management boundary is seen to deviate outside of the cadastral boundary have been included.

Normally, a fire management plan would only apply to the subject park. However due to the occurrence of special purpose developments such as primary schools and retirement villages and the desire to manage based on logical boundaries this plan includes some zone areas that are outside the Park.

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

This plan has divided the park into a number of different management zones. Zones adjoining or including private/commercial may require landowner's co-operation. Council have no responsibility for land not under their management.

The Warringah Aquatic Centre, retirement dwellings and schools adjacent to the park also require an active evacuation plan.

4.3 Fire Trails and Tracks

The following actions should be undertaken in order to ensure adequate access and egress to primarily fire break areas within the park:

- All existing official trails be maintained

- Creation of a new fire trail between Wakhurst Parkway and the top of Wakehurst Golf Course (see Figure 6 and 7, for approximate location).
- Maintenance/upgrade the following trails in accordance with the requirements for Planning for Bush Fire Protection (RFS 2001):
 - fire trail at Roosevelt Avenue adjacent to the tennis courts
 - fire trail behind Lutheran Homes

Slip rail gate locks on either side of the pipeline easement should be the same. This will require co-operation with Sydney Water.

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

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

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 the tree canopy.

Due to the parks adjacency to Garigal National Park, co-ordination between Council and DEC is recommended for effective weed control. This is in particularly important for the control of *Acacia saligna*.

This plan has been prepared in conjunction with the Bushland Management Plan

For Manly Warringah War Memorial Park (ELA 2005e).

The Bushland Management Plan (ELA 2005e) recommends that a small area trial burn along Wakehurst Parkway be conducted, within highly infested areas of *Acacia saligna*. This burn is not addressed within this plan. Exclusion of the trial burn from this plan should not be used as a reason for not undertaking the burn.

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.

The implementation of a co-ordinated fox and feral cat control program is recommended within Nelson Consulting (1998).

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 the 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

- APZ areas may be burnt as appropriate dependant on management issues

IPA:

- To maintain minimum ground fuel loads by raking and slashing to less than 40cm in height, with discontinuous shrub and canopy layers. Reduction techniques will include:
 - removal/ suppression of weeds
 - thinning of regrowth
 - hand removal
 - raking and slashing
 - Trees should not over-hang buildings

OPA:

- To maintain reduced ground fuel loads and maintain understorey to less than 50cm in height. Reduction techniques will include:
 - removal/ suppression of weeds
 - thinning of regrowth
 - hand removal
 - raking and slashing

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
 - weed control

Aims

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

Prescription

- Two SFAZ prescriptions have been used. These include:
 - **Low fuel SFAZ:** general prescription for maximum fine fuel loading within a range of 8 – 15 tonnes per hectare
 - **SFAZ:** 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 quick fire suppression 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 park. These are shown in Table 3.

Revegetation areas within the Park 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 park. This assessment did not include hazard reduction burns undertaken in 2005 – 2006 fire season.

The current fire threshold status and resultant ecological fire requirements for vegetation within the park have been determined and may be seen in Figures 4 and 5 respectively. An explanation of these categories can be seen in Table 2.

The information above has been considered in determining the 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 to reduce the threat of wildfire whilst maintaining varying fire ages.

When identifying if an area had 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 park. 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 park. 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 park. 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 4 Vegetation Fire Threshold

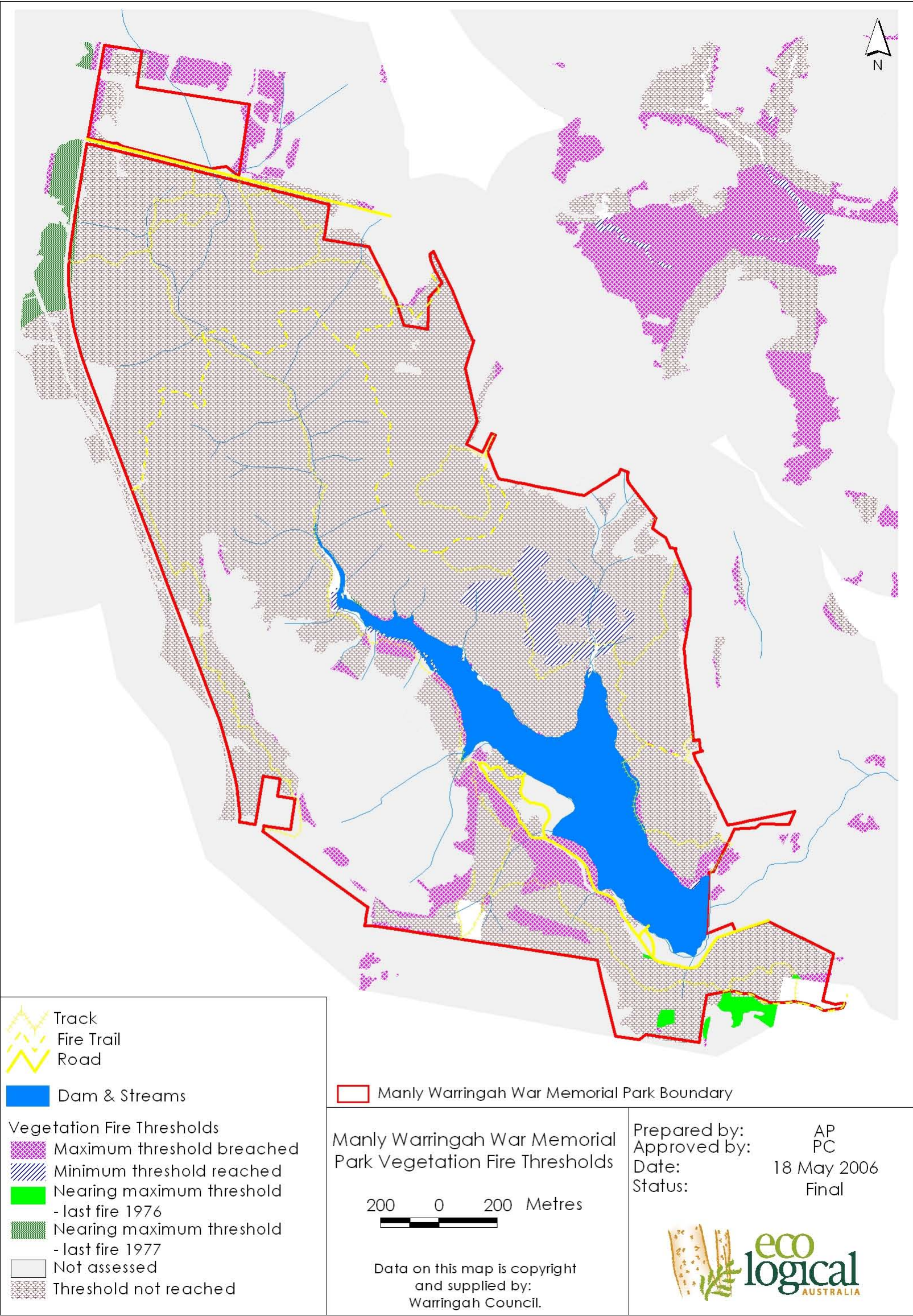


Figure 5 Ecological Fire Requirements

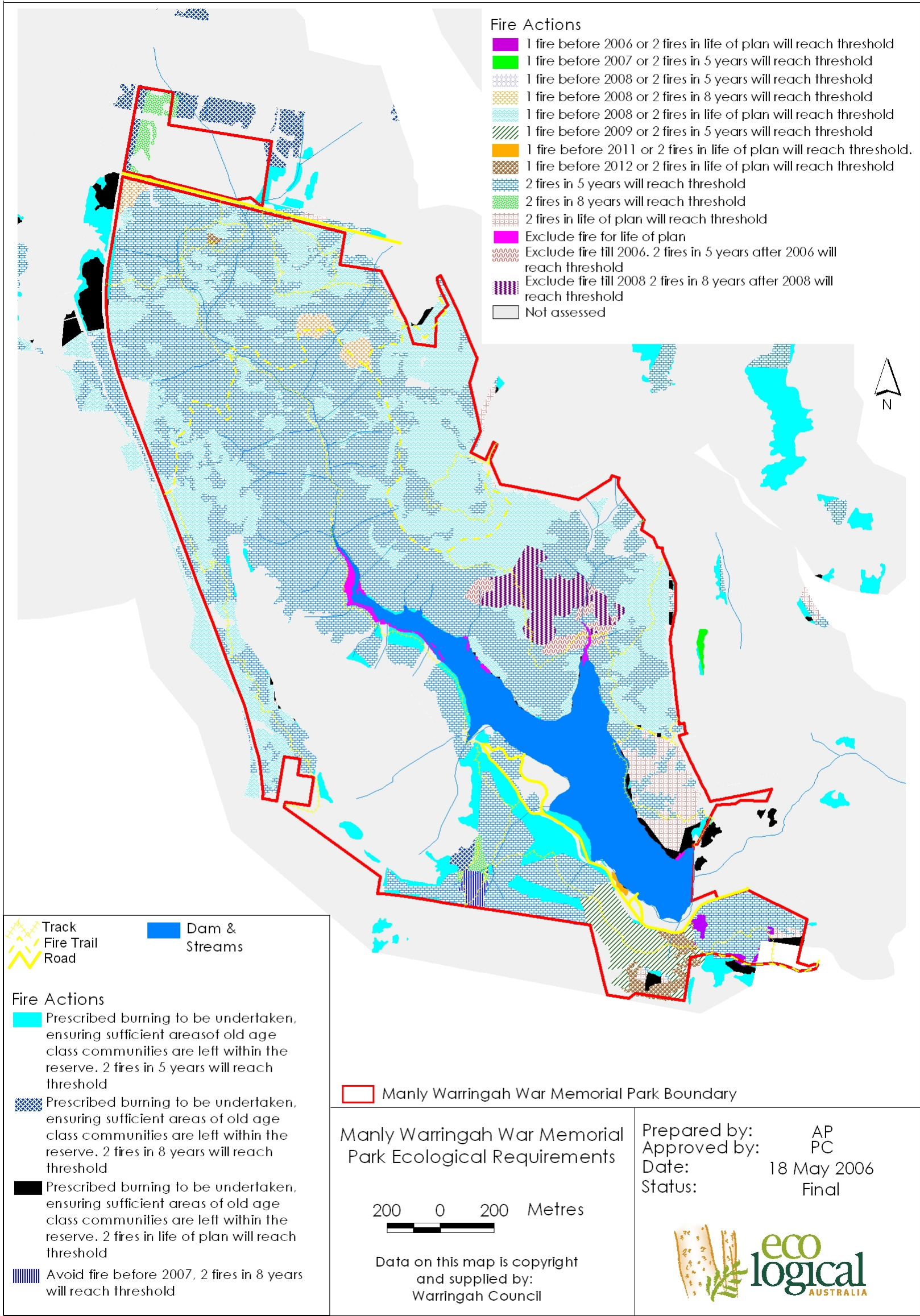


Table 3 Biodiversity Fire Regime Thresholds for Vegetation Communities identified within the Manly Warringah War Memorial Park

Vegetation Community	Priority	Minimum Fire Interval	Maximum Fire Interval	Fire Restrictions	Reference
Bloodwood-Scribbly Gum Woodland	3	> 2 successive fires in < 5yr intervals	>30	Decline predicted if successive fires occur which totally scorch or consume the tree canopy. Avoid successive fires of intensity sufficient to scorch or consume dominant tree crown	(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002), (WPBFMC 2000)
Freshwater Lagoon Swamp	1	No fires acceptable	No fires acceptable		
Peppermint-Angophora Forest	3	> 2 successive fires in < 5yr intervals	>30	Decline predicted if successive fires occur which totally scorch or consume the tree canopy. Avoid successive fires of intensity sufficient to scorch or consume dominant tree crown	(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002), (WPBFMC 2000)
Sandstone Heath	3	>2 in quick succession in 8 yr interval, 3 in quick succession each 15 to 30yrs interval	>30		(WPBFMC 2000)
Sandstone Swamp	2	Variable frequency, >2 in quick succession in 8 yr interval, 2 consecutive fires >15 yrs apart. No more than 2 consecutive fires where < 10 t/ha fuel consumed.	>30		(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002)
Silvertop Ash-Brown Stringybark Forest	1	> 2 successive fires in < 5yr intervals	>30		(WPBFMC 2000)

5 Operational Schedule

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

- Prescribed Fire Management Zones; and
- Prescribed Works Schedule.

This may be seen:

- Figure 6 and 7;
- Table 4
- The “Manly Warringah war Memorial Park Fire Regime Management Poster” (Appendix 8, ELA 2006).

5.1 Prescribed Fire Management Zones

The following fire management zones have been applied (see Figure 6, Section 4.5):

- Asset Protection Zones (APZ)
- Land Management Zones (LMZ)
- Strategic Fire Advantage Zones (SFAZ)
- Fire Exclusion Zones (FEZ)

Prescribed APZ widths may be seen in Table 4 (see Appendix 6 for detailed APZ maps).

SFAZ and LMZ have been divided up into fire management zones, to ensure the maintenance of mosaic fire age and required threshold regimes.

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.

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 has been proposed for selected areas for the management purposes including weed control, asset protection and 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).

In order to maintain SFAZ within prescribed fuel load limits whilst maintaining ecological integrity:

- Dominant vegetation types were identified within each SFAZ

- The maximum prescribed fuel load for each SFAZ was entered into the fuel accumulation model to provide a guide for required burn year
- The burn year was evaluated against identified ecological fire thresholds (see Section 4.6) and known threatened species fire intervals (see ELA 2005a and ELA 2005b)

Two types of SFAZ have been implemented based upon asset protection requirements. These include:

- **SFAZ** (with an 8-18 tonnes per hectare fuel prescription)
- **SFAZ – low fuel** (with an 8-15 tonnes per hectare fuel prescription)

These zones were designed to minimise impacts upon incompatible thresholds where possible. For areas identified as **SFAZ-low fuel**, adherence to prescribed fuel loads have been assigned priority over maintenance of ecological fire thresholds. Assessments should be conducted prior to burning any of these areas to determine if fuel levels have reached maximum tonnage prior to burning as proposed.

It is recommended that in 2012 Council, RFS and DEC consult regarding the need for additional management within the southern and western section of the park in order to assist with fire management for:

- The threat posed by major fires
- Protection of environmental assets (i.e. Freshwater Lagoon Swamp)
- Areas east of the golf course to support APZs within the vicinity and maintain SFAZ within fuel load prescriptions

Water quality within the park should be protected by restricting, or limiting the intensity, of fire from within 20m of watercourses where possible.

Figure 6 Prescribed Fire Management Zones

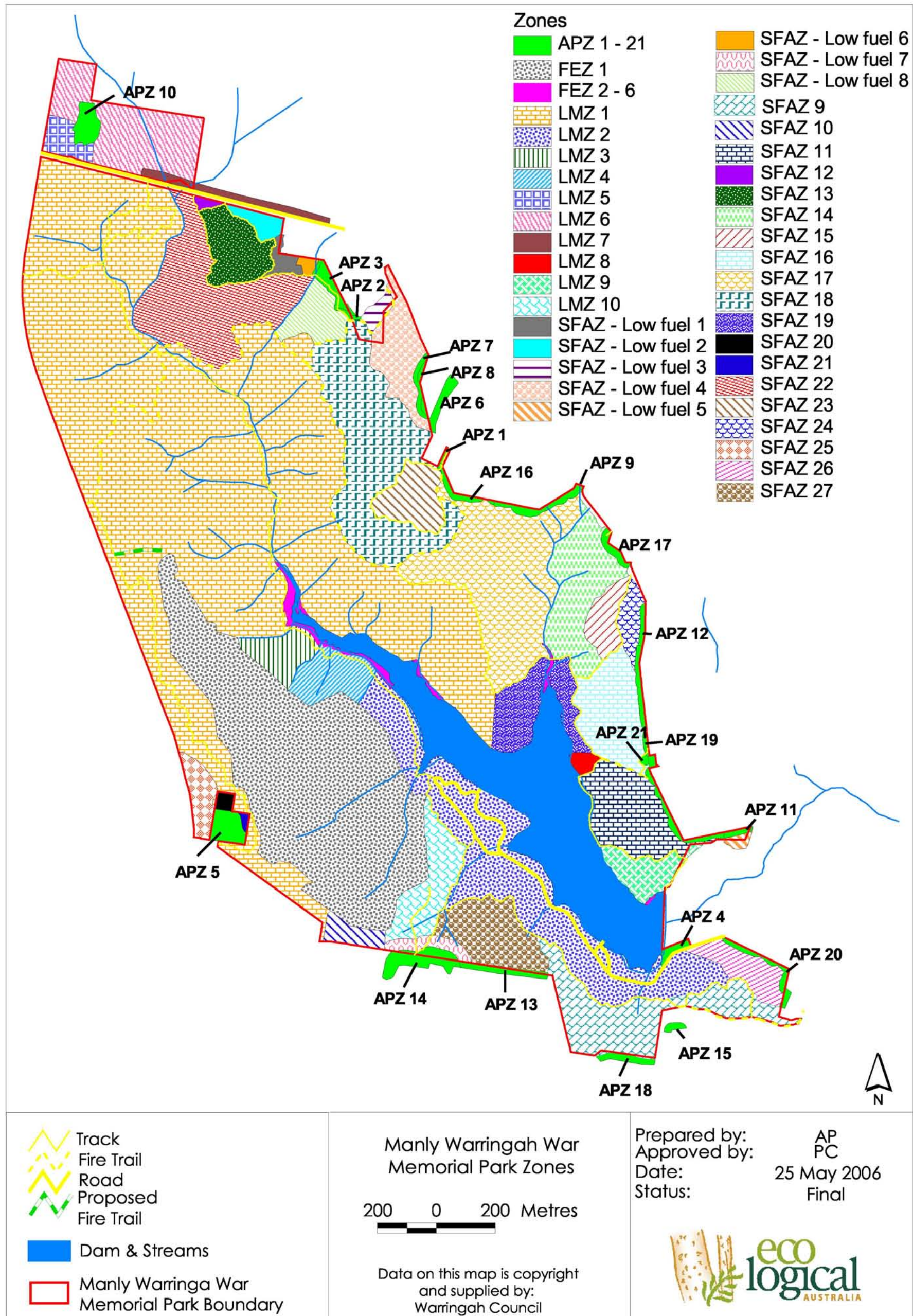


Figure 7 Prescribed Works Schedule

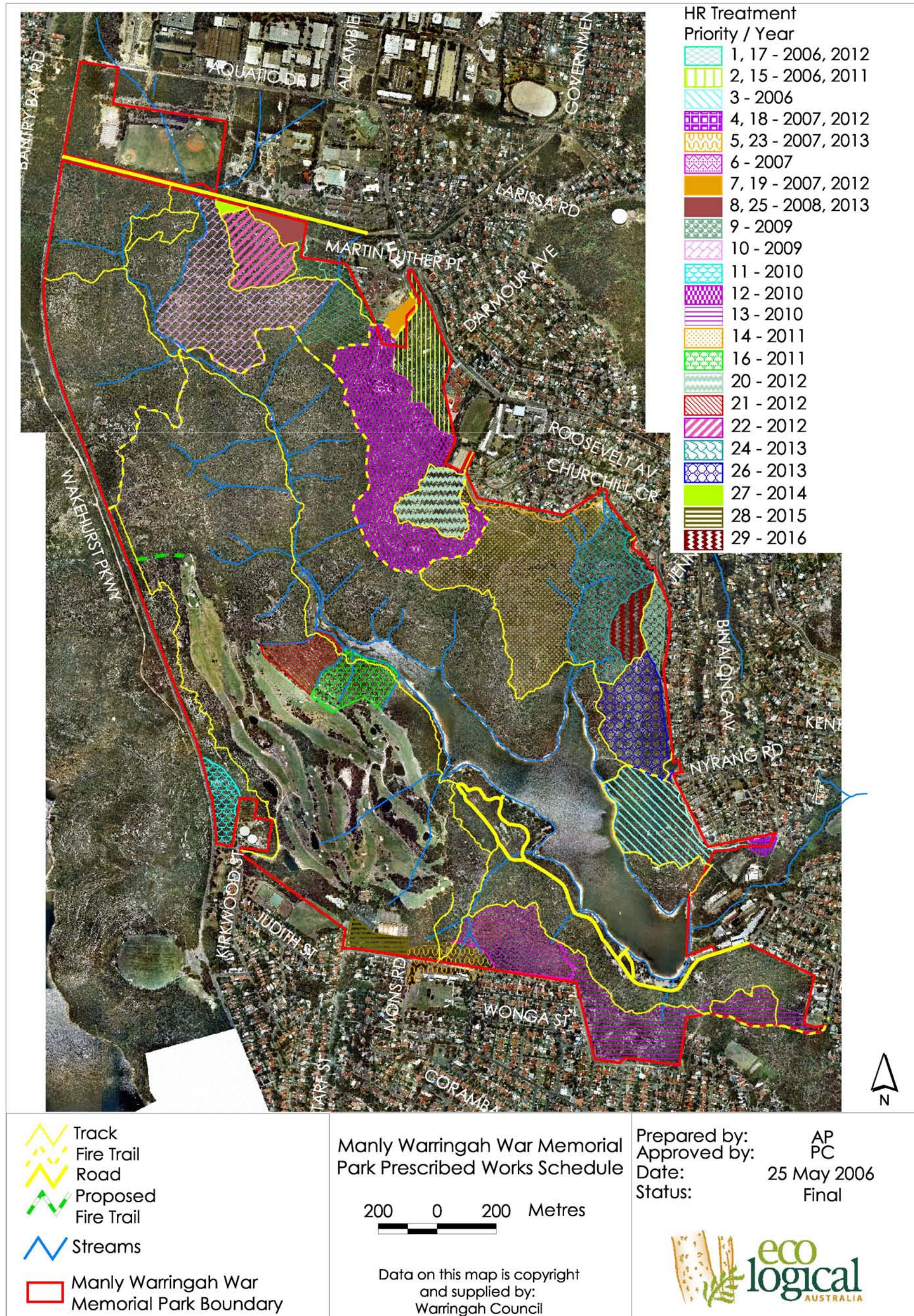


Table 4 Operation Schedule for Manly Warringah War Memorial Park

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
APZ 1	APZ	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	Maintain fire trail to specifications	-	Subject to Council's FMAZ program priorities*	Sewer Pipe, Fire trail, Storm water pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	APZ - Applied in accordance to development/ landownership boundary
APZ 2	APZ (OPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up. Treatment to be undertaken for Priority 4 & 19 - Burning.	Maintain fire trail to specifications. A current Active Evacuation Plan required for adjacent retirement village	1,17	2006, 2012	Sewer Pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	OPA - 10m
APZ 3	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up. Treatment to be undertaken for Priority 4 & 19 - Burning.	Maintain fire trail to specifications. A current Active Evacuation Plan required for adjacent retirement village	1,17	2006, 2012	Sewer Pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	IPA - Applied to logical Boundary

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
APZ 4	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	Sewer Pipe, Car park, Park Office, Road	-	Historically significant area	Crown land CCM Warringah Council	IPA - Applied in accordance to development/ landownership boundary
APZ 5	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	Sydney Water Infrastructure	-	Historically significant area	Sydney Water	IPA - Applied in accordance to development/ landownership boundary
APZ 6	APZ	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	Storm water pipe	-	Historically significant area	Scalabrini Village	APZ - Applied to logical Boundary
APZ 7	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up. Treatment to be undertaken for Priority 5 & 17 - Burning.	-	2,15	2006, 2011	-	-	Historically significant area	Crown land CCM Warringah Council	IPA - 25m

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
APZ 8	APZ (OPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up. Treatment to be undertaken for Priority 5 & 17 - Burning.	-	2,15	2006, 2011	-	-	Historically significant area	Crown land CCM Warringah Council	OPA - 15m
APZ 9	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities♦	Sewer pipe, Play equipment, Wooden Bridge, Storm water pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	IPA - 30m
APZ 10	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	Reduce loads between Building and Rd. A current Active Evacuation Plan required	-	Subject to Council's FMAZ program priorities♦	Warringah Aquatic Center, Storm water pipe	-	-	Crown land CCM Warringah Council	IPA - Applied in accordance to development/ landownership boundary , to a minimum of 10m

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
APZ 11	APZ	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up. Treatment to be undertaken for Priority 7 & 22 - Burning.	-	4,18	2007, 2012	Storm water pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	APZ - 20m
APZ 12	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	-	-	Historically significant area	Crown land CCM Warringah Council	IPA - 20m
APZ 13	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	Sewer Pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	IPA - 25m
APZ 14	APZ	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up. Treatment to be undertaken for Priority 8 - Burning & Priority 27 - Manual fuel reduction.	Burn area to be restricted to the Northern side of Manning St	5,23	2007, 2013	Storm water pipe, Track	Duffys Forest EEC: Silvertop Ash-Brown Stringybark Forest	Historically significant area	Crown land CCM Warringah Council, Balgowlah North Public School	APZ - 60m

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
APZ 15	APZ	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	Track	-	Historically significant area	Crown land CCM Warringah Council	APZ - 25m
APZ 16	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	Fire trail , Track	-	Historically significant area	Crown land CCM Warringah Council	IPA - 25m
APZ 17	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	Sewer Pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	IPA - 30m
APZ 18	APZ	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	Track	-	Historically significant area	Crown land CCM Warringah Council	APZ - 20m
APZ 19	APZ (IPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities*	Track	-	Historically significant area	Crown land CCM Warringah Council	IPA - 25m

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
APZ 20	APZ	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities♦	Sewer Pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	APZ - 20m
APZ 21	APZ (OPA)	Initial weed removal and long term weed suppression, hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities♦	Track	-	Historically significant area	Crown land CCM Warringah Council	OPA - Applied to logical Boundary
FEZ 1	FEZ	Exclude fire/quick suppression	-	-	-	Wakehurst Golf Course	-	Aboriginal art, Unknown historical feature	Crown land CCM Warringah Council and leased by Wakehurst Golf Club Limited	-
FEZ 2	FEZ	Exclude fire/quick suppression	-	-	-	-	-	Historically significant area	Crown land CCM Warringah Council	-
FEZ 3	FEZ	Exclude fire/quick suppression	-	-	-	Track	-	Historically significant area	Crown land CCM Warringah Council	-
FEZ 4	FEZ	Exclude fire/quick suppression	-	-	-	-	-	Historically significant area	Crown land CCM Warringah Council	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
FEZ 5	FEZ	Exclude fire/quick suppression	-	-	-	-	-	Historically significant area	Crown land CCM Warringah Council	-
FEZ 6	FEZ	Exclude fire/quick suppression	-	-	-	Track	-	Historically significant area	Crown land CCM Warringah Council	-
LMZ 1	LMZ	-	-	-	-	Fire trail, Storm water pipe, Track	Duffys Forest EEC: Silvertop Ash-Brown Stringybark Forest, Red-crowned Toadlet, <i>Microtis angusii</i>	Historically significant area, Aboriginal art, Unknown historical feature	Crown land CCM Warringah Council	-
LMZ 2	LMZ	-	-	-	-	Track, Road, Car park, Picnic Equipment	-	Historically significant area, Aboriginal art	Crown land CCM Warringah Council	-
LMZ 3	LMZ	Burning	-	21	2012	Track	-	Historically significant area	Crown land CCM Warringah Council	-
LMZ 4	LMZ	Burning	-	16	2011	Track	-	Historically significant area, Aboriginal art	Crown land CCM Warringah Council	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
LMZ 5	LMZ	-	-	-	-	Power lines, Storm water pipe	Duffys Forest EEC: Silvertop Ash-Brown Stringybark Forest	-	Crown land CCM Warringah Council	-
LMZ 6	LMZ	-	-	-	-	Sports Fields, Car Park, Sewer Pipe, Power Lines, Storm water pipe	Duffys Forest EEC: Silvertop Ash-Brown Stringybark Forest	-	Crown land CCM Warringah Council	-
LMZ 7	LMZ	-	-	-	-	Sewer Pipe, Power Lines, Storm water pipe	-	-	Crown land CCM Warringah Council	-
LMZ 8	LMZ	-	-	-	-	Track	-	Historically significant area	Crown land CCM Warringah Council	-
LMZ 9	LMZ	-	-	-	-	Track	-	Historically significant area	Crown land CCM Warringah Council	-
LMZ 10	LMZ	-	-	-	-	Track	Duffys Forest EEC: Silvertop Ash-Brown Stringybark Forest, un-named <i>Prostanthera spp</i>	Historically significant area	Crown land CCM Warringah Council	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
SFAZ - Low fuel 1	SFAZ - Low fuel	Burning	Maintain fire trail to specifications	1,17	2006, 2012	Sewer Pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ - Low fuel 2	SFAZ - Low fuel	Burning	-	8,25	2008, 2013	Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ - Low fuel 3	SFAZ - Low fuel	Burning	-	7,19	2007, 2012	Fire trail	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ - Low fuel 4	SFAZ - Low fuel	Burning	-	2,15	2006, 2011	Sewer Pipe, Fire trail	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ - Low fuel 5	SFAZ - Low fuel	Burning	-	4,18	2007, 2012	Storm water pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ - Low fuel 6	SFAZ - Low fuel	Burning	Maintain fire trail to specifications	1,17	2006, 2012	Sewer Pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ - Low fuel 7	SFAZ - Low fuel	Treatment to be undertaken for Priority 8 - Burning & Priority 27 - Manual fuel reduction	Burn area to be restricted to the Northern side of Manning St	5,23	2007, 2013	Storm water pipe, Track	Duffys Forest EEC: Silvertop Ash-Brown Stringybark Forest	Historically significant area	Crown land CCM Warringah Council	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
SFAZ - Low fuel 8	SFAZ - Low fuel	Burning		1,17	2006, 2012	Sewer Pipe, Fire trail, Track	Duffys Forest EEC: Silvertop Ash-Brown Stringybark Forest	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 9	SFAZ	Burning	-	13	2010	Track, Storm water pipe, Sewer Pipe	Grey-headed Flying-fox, Eastern Bent-wing Bat	Historically significant area	Crown land CCM Warringah Council	
SFAZ 10	SFAZ	Burning	-	28	2015	Sewer Pipe, Storm water pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 11	SFAZ	Burning	-	3	2006	Fire trail , Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 12	SFAZ	Burning	-	27	2014	Sewer Pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 13	SFAZ	Burning	-	22	2012	Sewer Pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 14	SFAZ	Burning	-	24	2013	Sewer Pipe, Storm water pipe, Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 15	SFAZ	Burning	-	29	2016	Track	-	Historically significant area	Crown land CCM Warringah Council	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
SFAZ 16	SFAZ	Burning	-	26	2013	Fire trail , Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 17	SFAZ	Burning	-	14	2011	Sewer Pipe, Fire trail, Track	Rosenberg's Goanna	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 18	SFAZ	Burning	-	12	2010	Sewer Pipe, Fire trail, Track	Duffys Forest EEC: Silvertop Ash-Brown Stringybark Forest	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 19	SFAZ	-	-	-	-	Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 20	SFAZ	-	-	-	-	-	-	Historically significant area	Sydney Water	-
SFAZ 21	SFAZ	-	-	-	-	-	-	Historically significant area	Sydney Water	-
SFAZ 22	SFAZ	Burning	-	10	2009	Sewer Pipe, Fire trail, Track	Duffys Forest EEC: Silvertop Ash-Brown Stringybark Forest	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 23	SFAZ	Burning	-	20	2012	Fire trail , Track	-	Historically significant area	Crown land CCM Warringah Council	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities (EEC)	Aboriginal or Cultural Sites	Land Tenure	Zone Widths
SFAZ 24	SFAZ	Burning	-	9	2009	Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 25	SFAZ	Burning	-	11	2010	Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 26	SFAZ	-	-	-	-	Sewer Pipe - Road, Track	-	Historically significant area	Crown land CCM Warringah Council	-
SFAZ 27	SFAZ	Burning		6	2007	Track		Historically significant area, Aboriginal art	Crown land 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:

- Significant species *Angophora crassifolia* found within APZ 14

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 a Review of Environmental Factors (See Section 2.5) 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 June 2005 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, 6
- The "Manly Warringah War Memorial Park Fire Regime Management Poster" (Appendix 8, ELA, 2005).
- Digital data provided to Council.

6.3 Fire Management Plan Review

The goal of this plan is to guide the management of fire within the Manly Warringah War Memorial Park 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
 - Protection of aboriginal and culturally significant sites from fire damage
 - Prevention of fire damage to threatened, locally or regionally significant species, endangered populations and endangered ecological communities
 - Visitation of current social attitudes to determine success of proposed management strategies
 - Evaluate reasonableness 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 Manly Warringah War Memorial Park

Table 1: Known threatened flora within 5km of Manly Warringah War Memorial Park

Scientific Name	Common Name	Recorded Within Park	Source
<i>Acacia bynoeana</i>	Bynoe's Wattle		DEC 2004
<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark		DEC 2004
<i>Genoplesium baueri</i>			DEC 2004
<i>Grevillea caleyi</i>			DEC 2004
<i>Pimelea curviflora</i> var. <i>curviflora</i>			DEC 2004
<i>Syzygium paniculatum</i>			DEC 2004
<i>Tetradlea glandulosa</i>			DEC 2004
<i>Microtis angusii</i>		X	Warringah Council
<i>un-named Prostanthera spp</i>		X	Warringah Council

Table 2: Known threatened fauna within 10km of Manly Warringah War Memorial Park*

Scientific Name	Common Name	Recorded Within Park
<i>Botaurus poiciloptilus</i>	Australasian Bittern	
<i>Calidris alba</i>	Sanderling	
<i>Calidris tenuirostris</i>	Great Knot	
<i>Collocephalon fimbriatum</i>	Gang-gang Cockatoo	
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	
<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>Isodon 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	X
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	
<i>Ninox strenua</i>	Powerful Owl	
<i>Pandion haliaetus</i>	Osprey	
<i>Phascolarctos cinereus</i>	Koala	
<i>Phoebastria fusca</i>	Sooty Albatross	
<i>Polytelis swainsonii</i>	Superb Parrot	
<i>Pseudophryne australis</i>	Red-crowned Toadlet	X
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	X
<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 melanophrys</i>	Black-browed Albatross	
<i>Tyto novaehollandiae</i>	Masked Owl	
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	X
<i>Xanthomyza phrygia</i>	Regent Honeyeater	

*Source: DEC 2004

Appendix 3 – Known Significant Flora Within 5km and Significant Fauna Within 10km of Manly Warringah War Memorial Park

Table 1 Known significant flora within 5km of Manly Warringah War Memorial Park*

Scientific Name	Common Name	Significance	Recorded Within Park
<i>Acacia brownii</i>	Heath Wattle	Threatened in northern Sydney	
<i>Angophora crassifolia</i>		Nationally significant species	X
<i>Angophora hispida</i>	Dwarf Apple	Biogeographically significant	
<i>Arthrochilus prolixus</i>		Threatened in northern Sydney	
<i>Boronia fraseri</i>		Nationally significant species	
<i>Boronia thujona</i>		Biogeographically significant	
<i>Callistemon salignus</i>	Willow Bottlebrush	Threatened in Warringah	
<i>Corybas undulatus</i>	Tailed Helmet Orchid	Nationally significant species	
<i>Crocea saligna</i>		Biogeographically significant	
<i>Darwinia diminuta</i>		Nationally significant species	
<i>Darwinia procera</i>		Nationally significant species	
<i>Eucalyptus luehmanniana</i>	Yellow-top Ash	Nationally significant species	
<i>Eucalyptus robusta</i>	Swamp Mahogany	Threatened in northern Sydney	
<i>Eucalyptus stricta</i>	Mallee Ash	Threatened in northern Sydney	
<i>Gonocarpus salsoloides</i>		Nationally significant species	
<i>Grevillea speciosa</i>	Red Spider Flower	Biogeographically significant	
<i>Hibbertia nitida</i>		Nationally significant species	
<i>Lomandra brevis</i>		Nationally significant species	
<i>Lomandra fluviatilis</i>		Nationally significant species	
<i>Melaleuca thymifolia</i>		Threatened in northern Sydney	
<i>Melichrus procumbens</i>	Jam Tarts	Threatened in northern Sydney	
<i>Persoonia pinifolia</i>	Pine-leaved Geebung	Biogeographically significant	
<i>Rulingia hermanniifolia</i>		Nationally significant species	
<i>Symphionema paludosum</i>		Threatened in northern Sydney	

*Source: DEC 2004

Table 2 Known significant fauna within 10km of Manly Warringah War Memorial Park*

Scientific Name	Common Name	Significance
<i>Acrobates pygmaeus</i>	Feathertail Glider	Threatened in Warringah
<i>Amphibolurus muricatus</i>	Jacky Lashtail	Threatened in Warringah
<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>Boiga irregularis</i>	Eastern Brown Tree Snake	Threatened in northern Sydney
<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>Hirundapus caudacutus</i>	White-throated Needle-tail	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>Notechis scutatus</i>	Mainland Tiger Snake	Threatened in northern Sydney
<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>Pogona barbata</i>	Eastern Bearded Dragon	Threatened in Warringah
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	Threatened in northern Sydney
<i>Pseudophryne bibronii</i>	Bibron's Toadlet	Threatened in northern Sydney
<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

Scientific Name	Common Name	Significance
<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 significant species identified within the park

Appendix 4 – Warringah Local Government Area Hazard Reduction Guidelines

Appendix 5 – Fire Management Plan Methodology

Appendix 6 – Detailed APZ Maps



- Manly Dam and Streams
- Manly Warringah War Memorial Park Boundary
- Road
- Fire Trail
- Official Track
- APZ



Detailed APZ Map 1

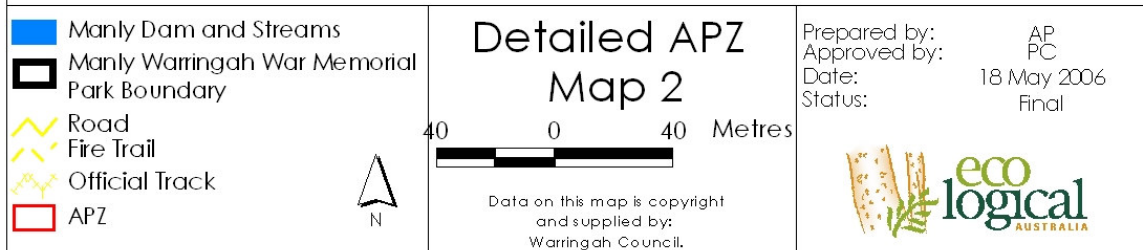
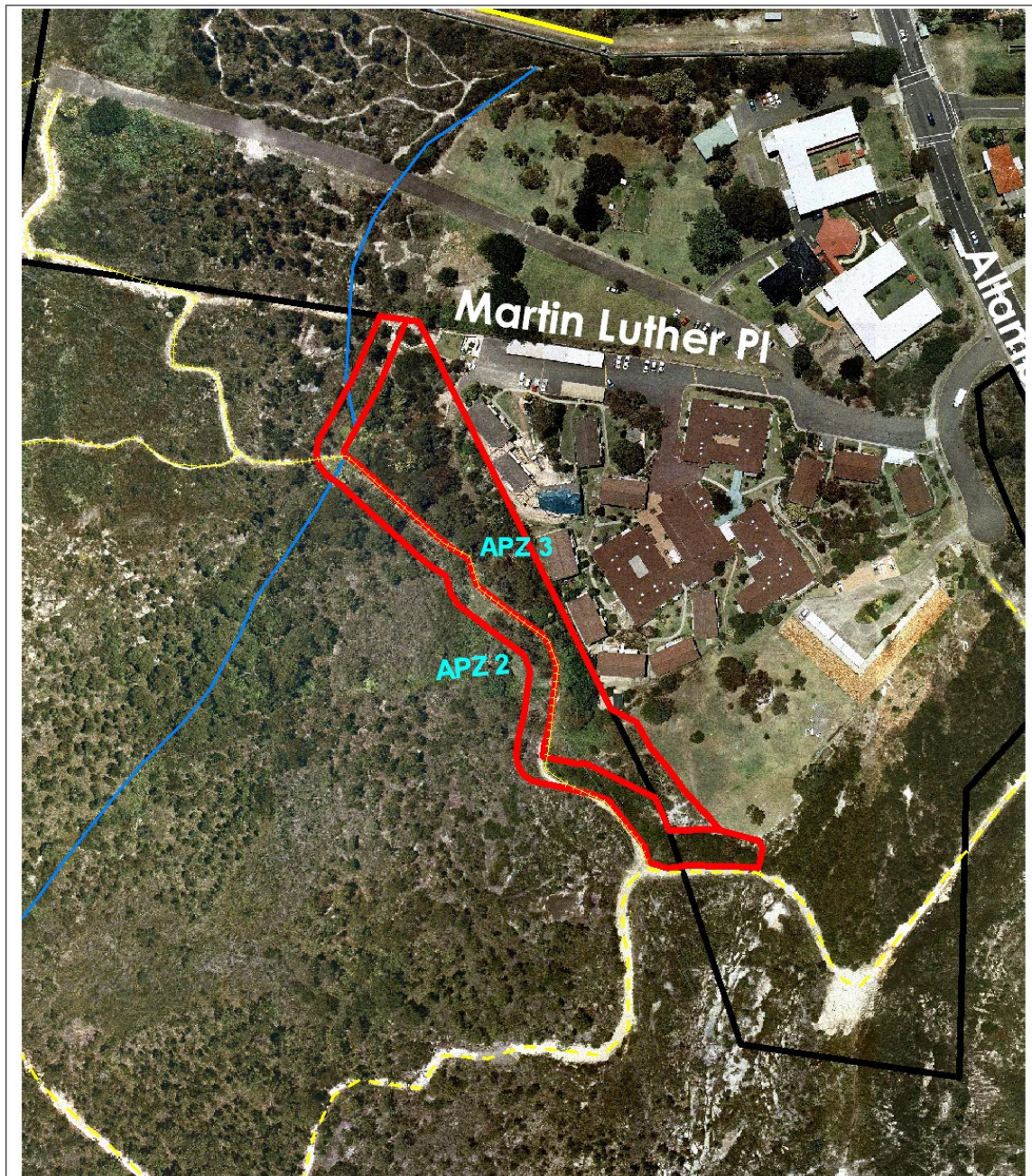
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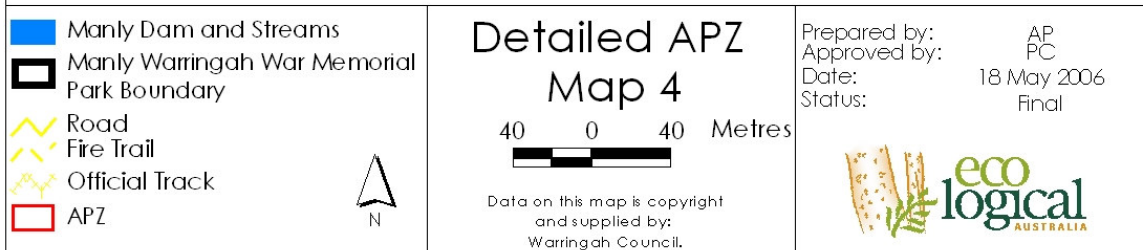
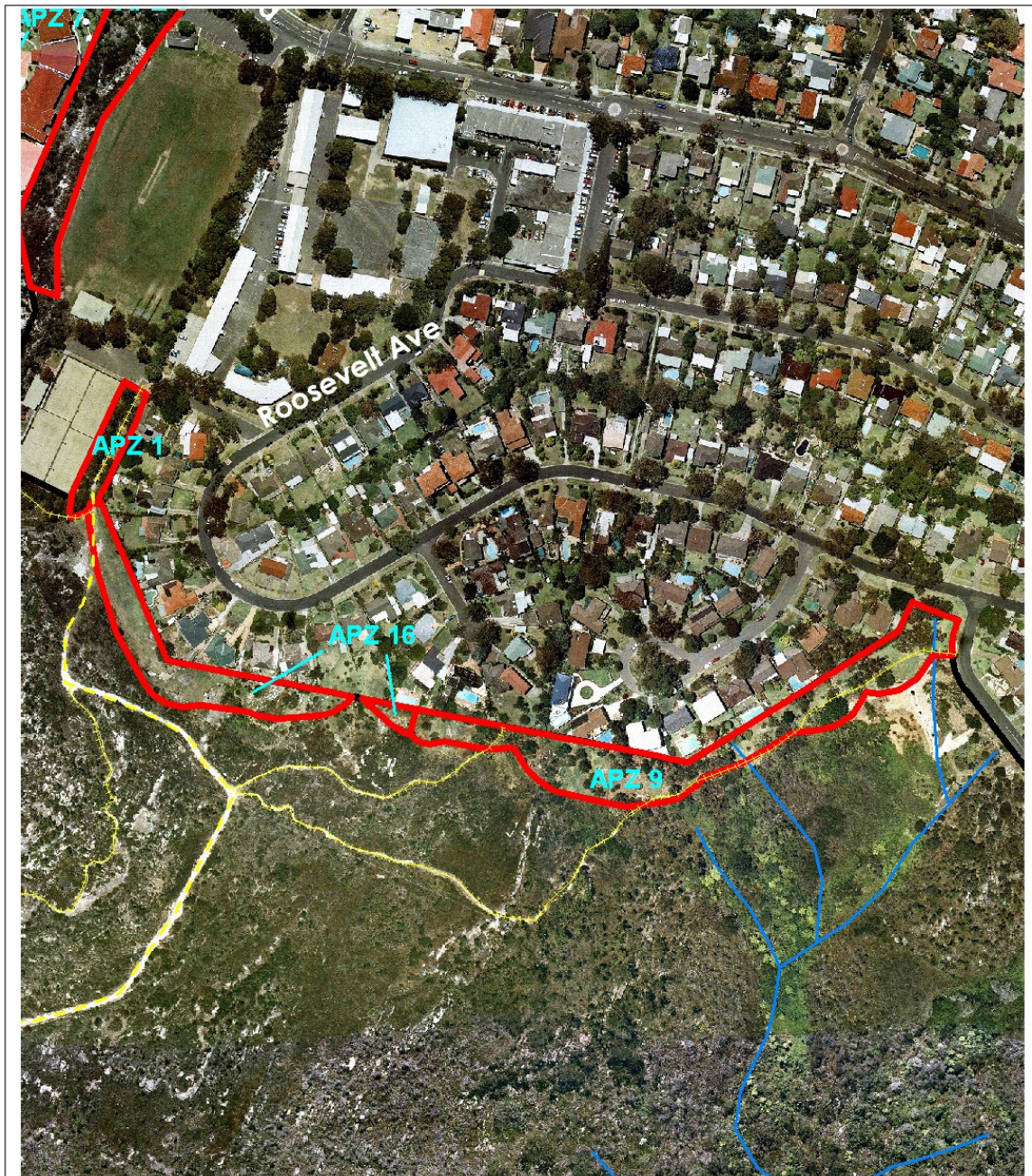
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Approved by: PC
Date: 18 May 2006
Status: Final







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- Manly Dam and Streams
- Manly Warringah War Memorial Park Boundary
- Road
- Fire Trail
- Official Track
- APZ



Detailed APZ Map 5

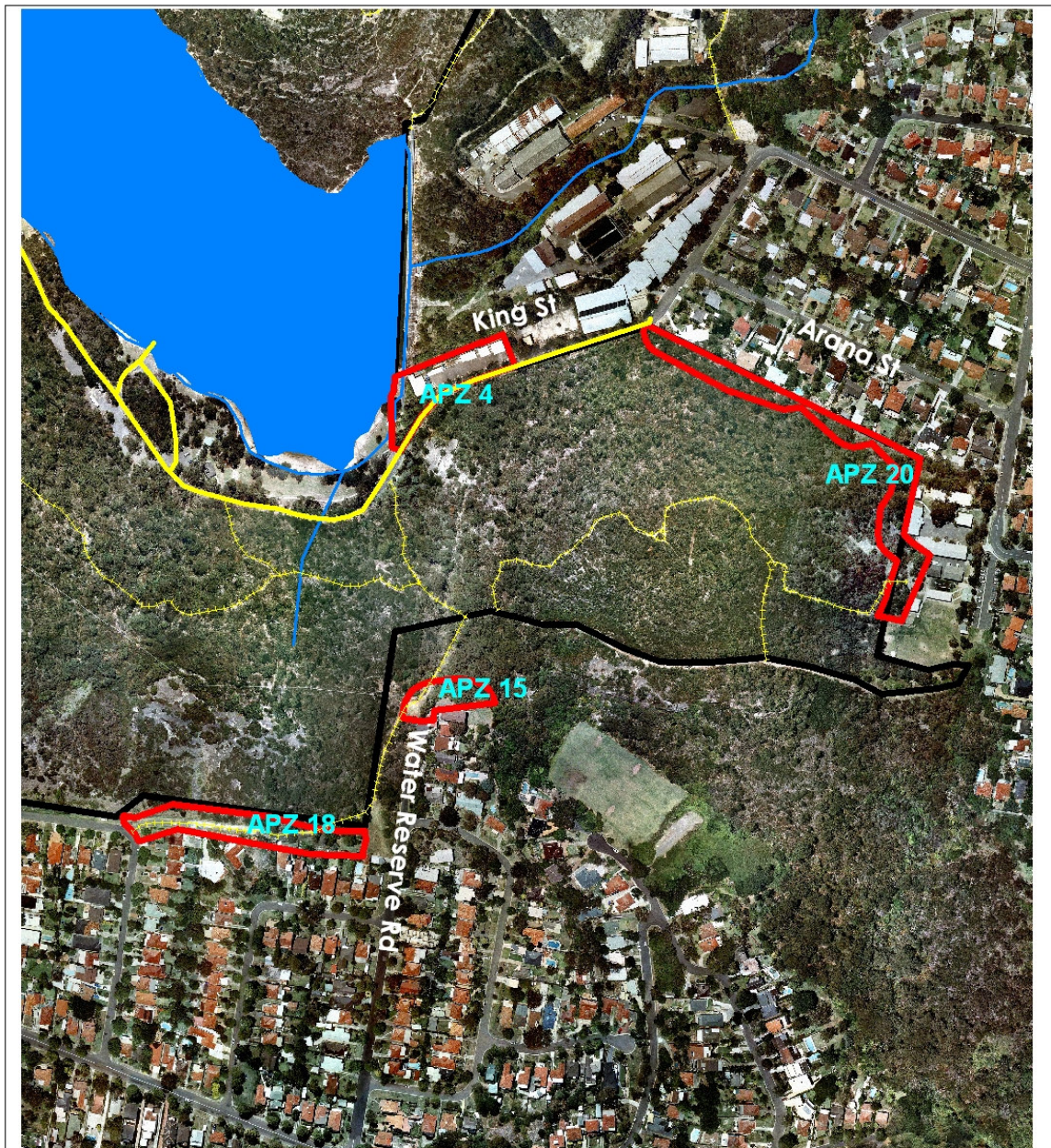
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Status: Final





- Manly Dam and Streams
- Manly Warringah War Memorial Park Boundary
- Road
- - - Fire Trail
- - - Official Track
- APZ



Detailed APZ Map 6

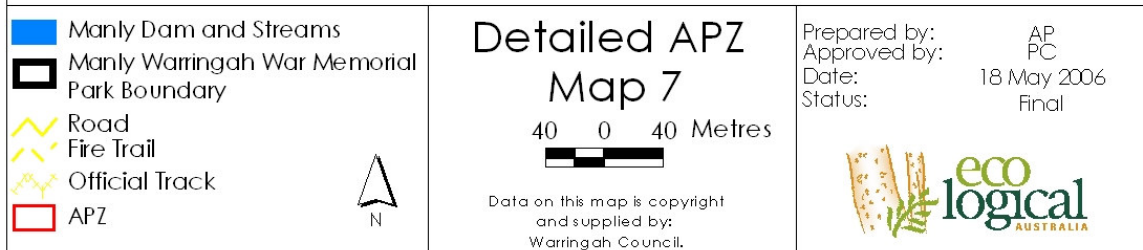
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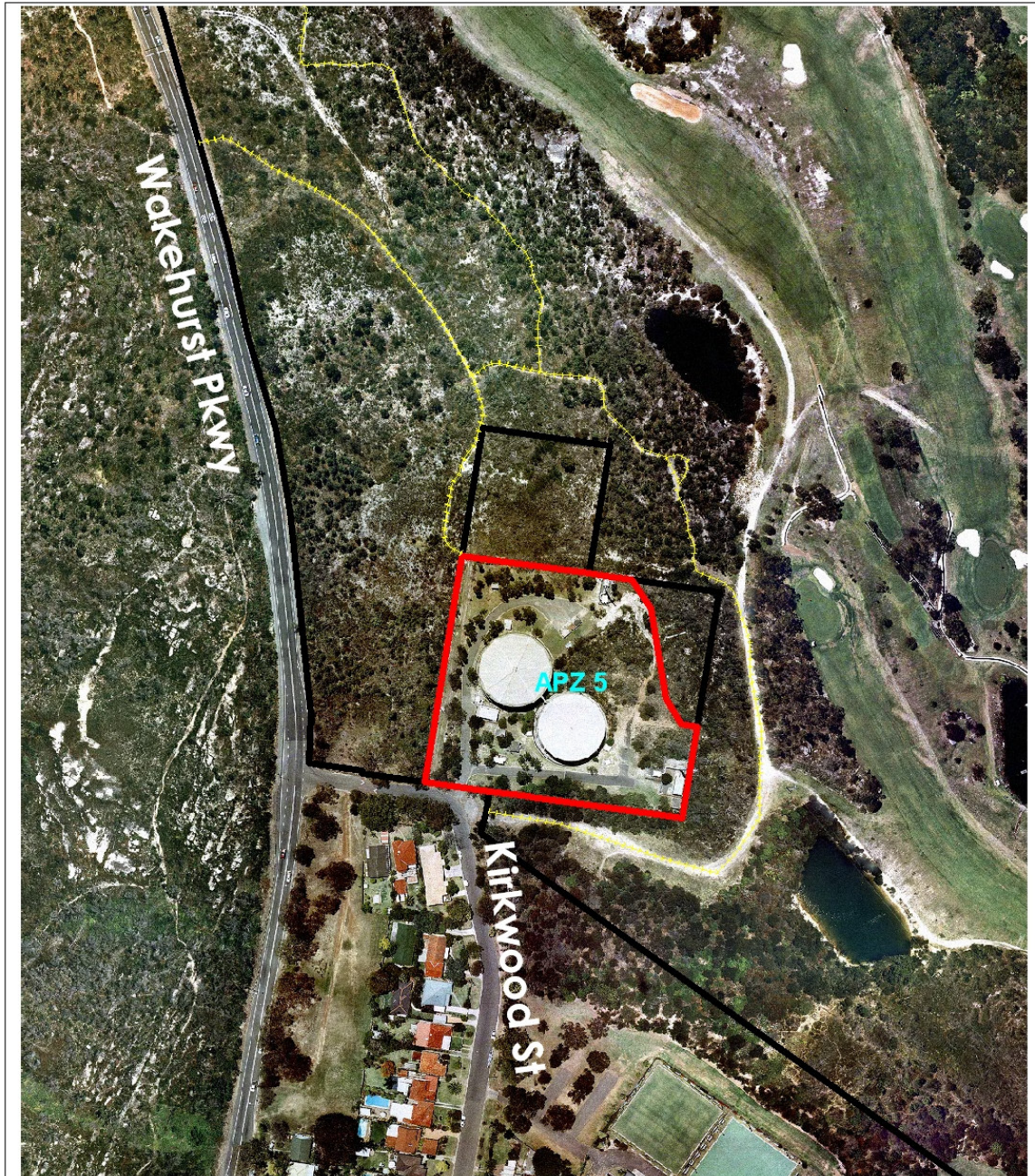


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- Manly Dam and Streams
- Manly Warringah War Memorial Park Boundary
- Road
- - - Fire Trail
- - - Official Track
- APZ



Detailed APZ Map 8

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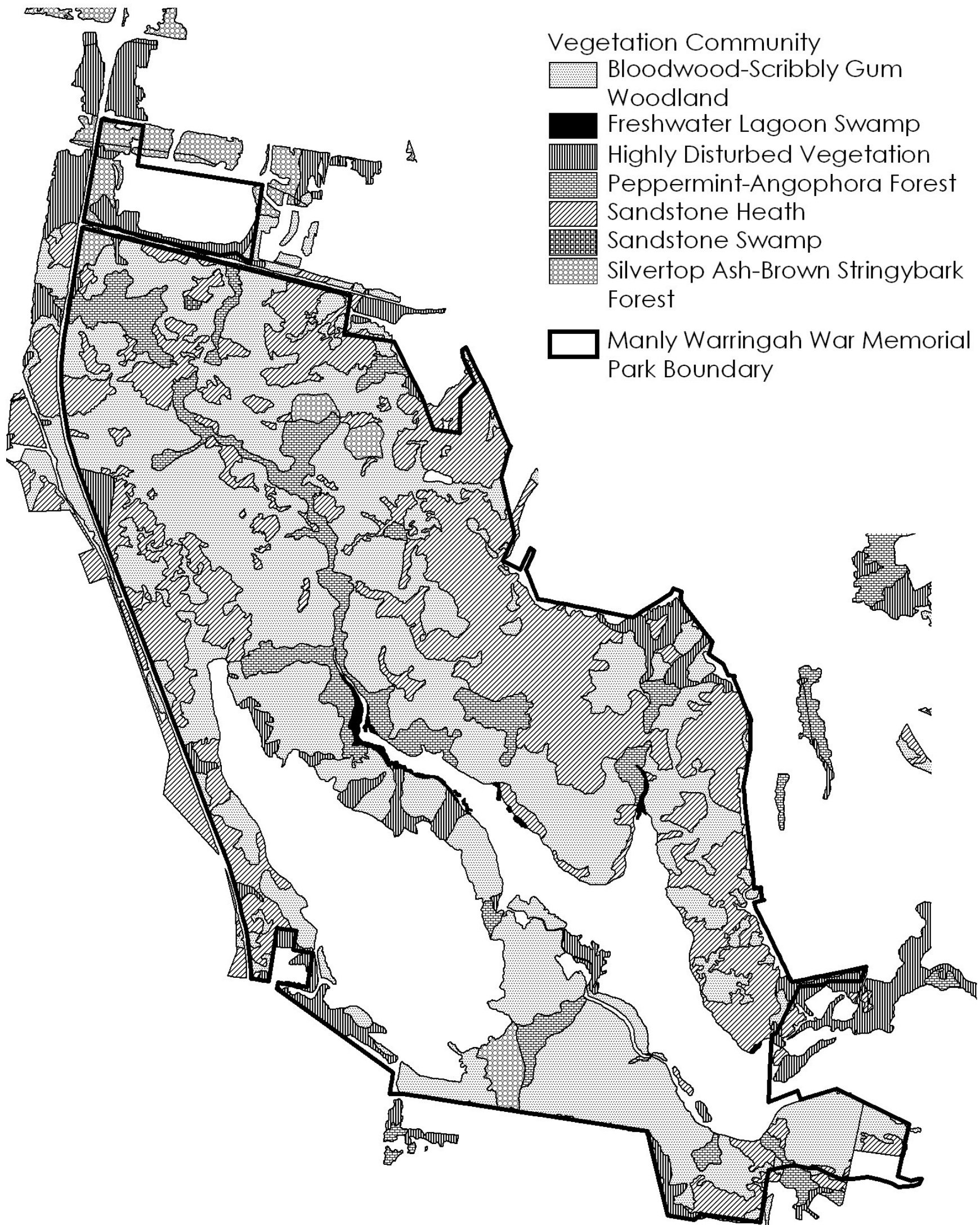


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Appendix 7 –Vegetation Community Overlay



Appendix 8 – Manly Warringah War Memorial Park Fire Regime Management Poster