

**BANGALLEY HEADLAND RESERVE AND
NORTH AVALON HEADLAND**

PLAN OF MANAGEMENT

Pittwater Council

Adopted 21 October 2002

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Landuse-Planning Table

Permissible Uses Exempt (these may be subject to approval under Part 5 of the EPA Act 1979)	Permissible Uses Requiring Development Consent	Prohibited Uses
Bush regeneration, habitat restoration and weed control	Utility installations and similar	Extractive industries and agriculture
Fire hazard reduction activities	Buildings ancillary or incidental to the reserve	Sporting facilities
Ecological burns	Major public drainage works	Permanent private access across a reserve
Multi-use tracks other than motor vehicle	Major rock / soil stabilization works and earthworks	Commercial signage
Boardwalks and minor bridges (council)	Major facilities (not buildings) being viewing platforms, bridges, educational facilities and the like	Dumping of refuse (including building materials, soil, fill, household wastes, etc.)
Temporary activities or developments requiring a lease or licence under the Local Government Act (1993)	Commercial Eco-tourism Activities	Vegetation removal not in accordance with Councils Tree Preservation and Management Order
Appropriate sustainable low impact recreation activities and facilities (other than buildings)	Vehicle access (emergency access, fire breaks and service trails).	Private alienation or encroachment
Minor public drainage and stormwater works	Non-intrusive memorials commemorating community members	Introduction of exotic flora and fauna
Minor fences (council)		Playground facilities
Compliance, directional, interpretive, identification and safety signs (council)		Flood structures (damming and reduction of environmental flows)
Environmental education activities		Removal of habitat features such as soil, leaf litter, rocks, stones, pebbles and the like
Any use as permitted under Council's Tree Preservation and Management Order		Recreational motor sports (including 4-wheel driving, motorbike riding, etc.)
Minor rock works and earthworks associated with soil stabilization and erosion control		Domestic drainage outlets
Feral animal control and eradication.		Horse riding facilities
Biodiversity recovery and enhancement		Unleashed dog exercise areas

		Water extraction
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1. Overview

1.1. Background and Location

Bangalley Reserve and North Avalon Headland reserves are important areas of foreshore, escarpment and remnant bushland in North Avalon on the Barrenjoey Peninsula. They are located between the north head of Avalon Beach and the south head of Whale Beach being bounded to the west by private properties along Marine Parade, Watkins Road, Binburra Avenue, Whale Beach Road and Rayner Road.

The Reserves cover an area of ridge-slope and elevated escarpment, the highest point of which is Bangalley Trig at 116metres above sea level. Spectacular views to all points of the compass are provided by look out points within the Reserves. Access to these points is provided by the Bicentennial Coastal Walkway that currently is a loop track beginning and returning to the car park provided off Marine Parade and also continues down to Whale Beach Road. The Reserves are important as they contain significant geological features, a highly scenic escarpment, a variety of vegetation communities and habitats for a range of fauna.

Bangalley Reserve and North Avalon Headland Reserve includes lands reserved under the County of Cumberland Planning Scheme in the 1950's and subsequent open space contributions from subdivisions in the area. The Reserve is now owned and administered by Pittwater Council. There are also areas zoned as county open space and Crown land that adjoin the reserve. These areas are not under the direct control of Council and do not come under the management of this plan. However they are of a very similar nature to the reserve and this plan could be used as a guideline for the management of these areas.

Figure 3 shows the different areas covered by this Plan of Management and the Reserve boundaries in relation to the surrounding locality and adjoining land uses.

The Reserves that comprises this Plan are classified as Community land and are further categorised as ***natural areas*** under Section 36(4) of the Local Government Act, 1993. ***Natural areas*** are then further categorised as ***escarpment*** and ***bushland***. Figure 1 A and B shows the land applying to these categories.

The community land categories of Council's open space and recreation settings inventory differ from those of the Local Government Act, 1993. Under Council's inventory the areas covered in this plan comprise the following categories: Beach and Foreshore, Bushland and Hilltop/ Bluff/ Headland.

As a requirement of the Local Government Act, 1993, Councils must prepare a Plan of Management for public land which is classified as community land. Plans of Management may also be prepared for Crown Land under the Crowns Land Act, 1988.

This draft Plan of Management provides a framework for the management of the Reserve and describes the management objectives, performance targets, actions and performance assessments to be used in the management of these reserves in line with the core objectives for ***Natural areas, Bushland and Escarpment***. This document will ensure that the natural and environmental sensitive areas are conserved and managed and that the scenic and recreational

values of the Reserve are fully realised, consistent with their environmental value and risk management issues.

Figure 1 A. Bangalley Headland, Land Categorisation

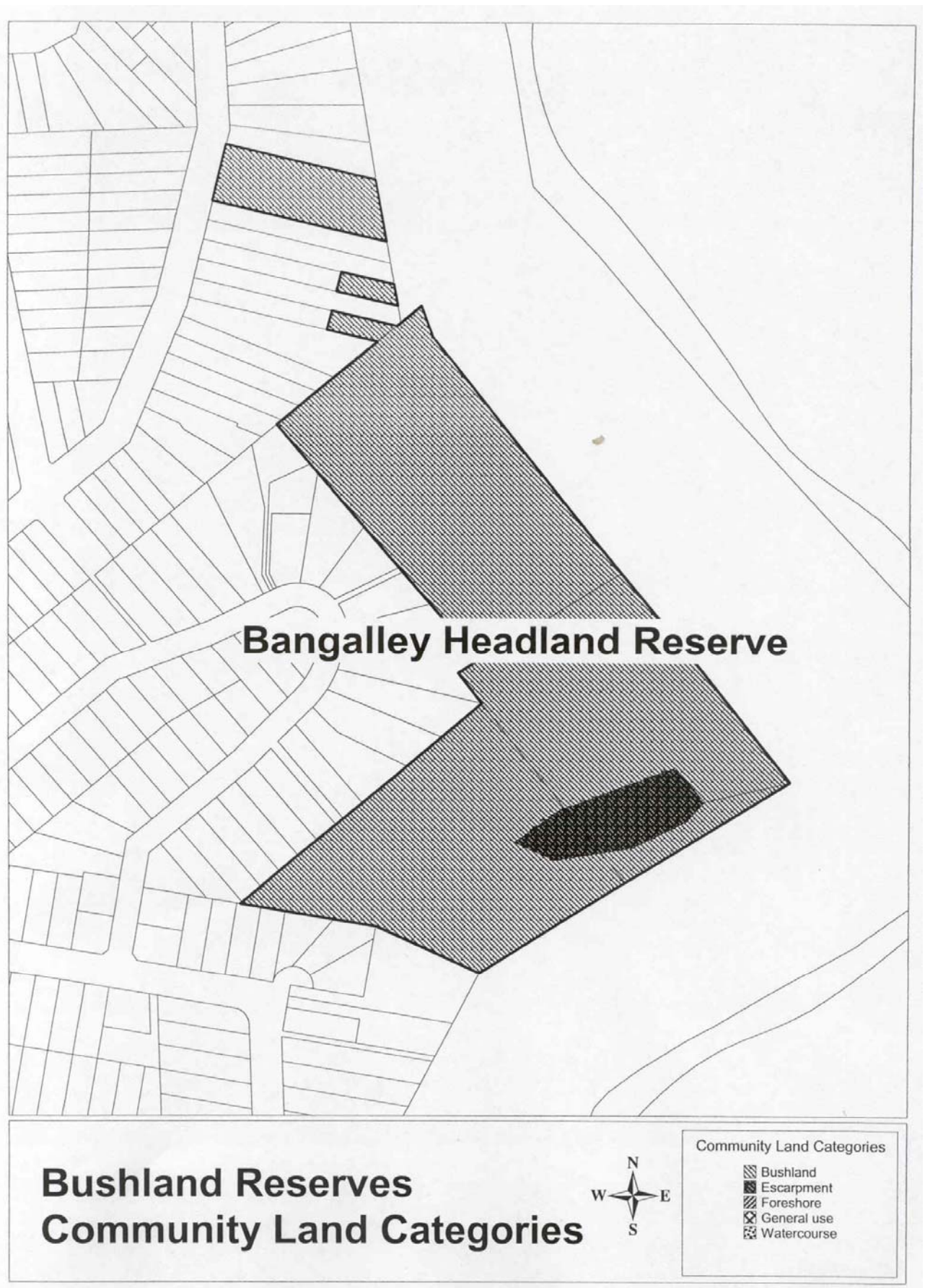
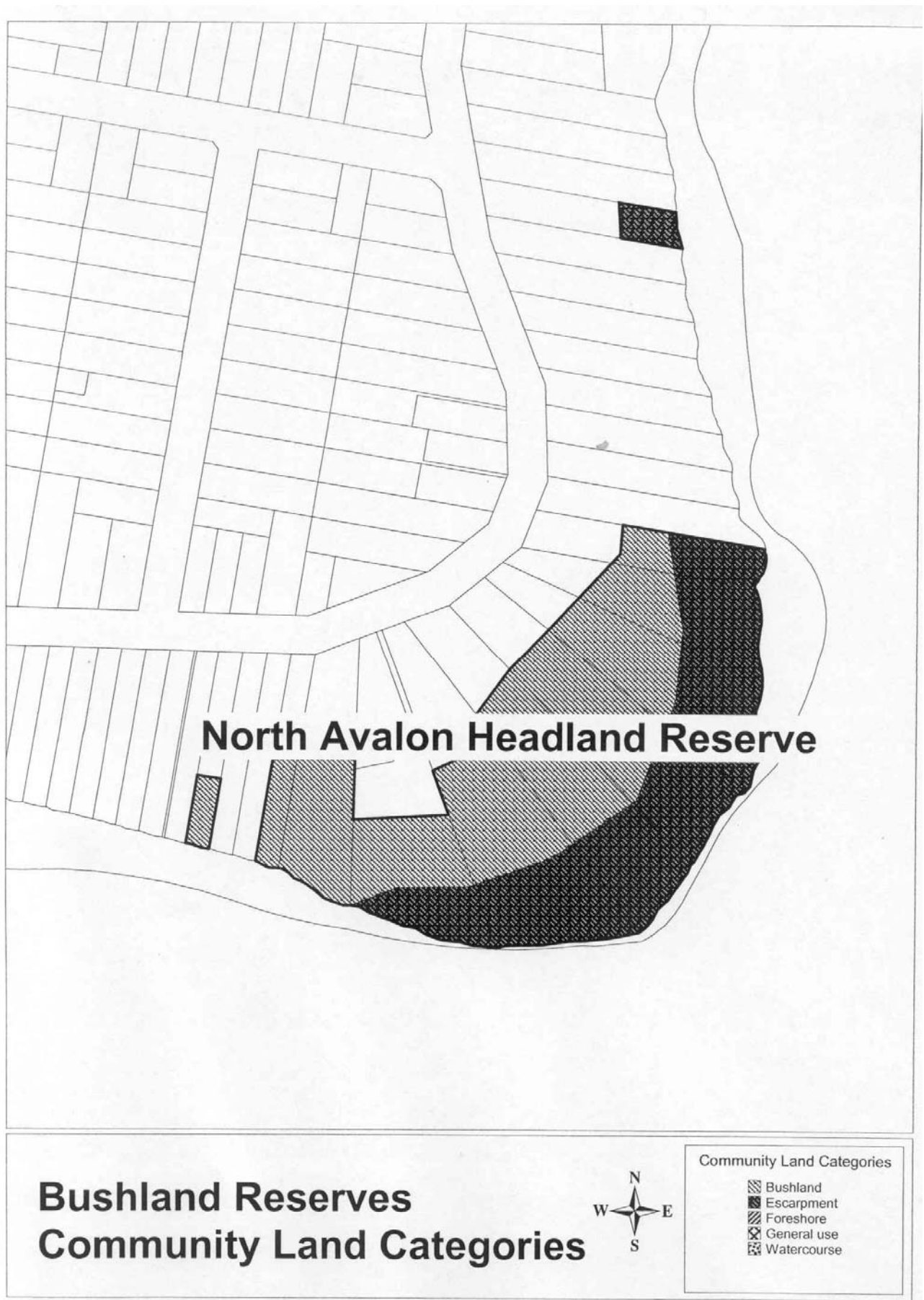


Figure 1 B: North Avalon Headland Land Categorisation



1.2. Tenure of Land

Bangalley Headland Reserve and North Avalon Headland reserves comprise Council owned land and land under Councils care control and management. All water front areas are vacant crown land or Crown land reserved as Careel Headland reserve but these do not come under the management of this plan.

North Avalon headland is made up of the following lots

Council owned land

1//500734

1//500733

Department of Planning owned land but under Councils care control and management.

3//576219

7//553660

1//567825

5//550893

7//578026

1//630352

1//630486

41//592826

Bangalley Headland reserve is made up of the following lots.

71//22275

1//178999

70//22275

216//17189

B//399383

B//102329

Adjoining Cumberland County open space 9(b) should be included in the management of the reserve once it comes into the ownership or formal management of Pittwater council.

1.3. Zoning

The land assessed in this Plan of Management is zoned 6(a): Existing Recreation, under the Pittwater Local Environmental Plan, 1993. Figure 4a & 4b illustrate the zoning of lands covered by this plan as well as indicating the surrounding zoning of adjoining properties.

Figure 2 Location

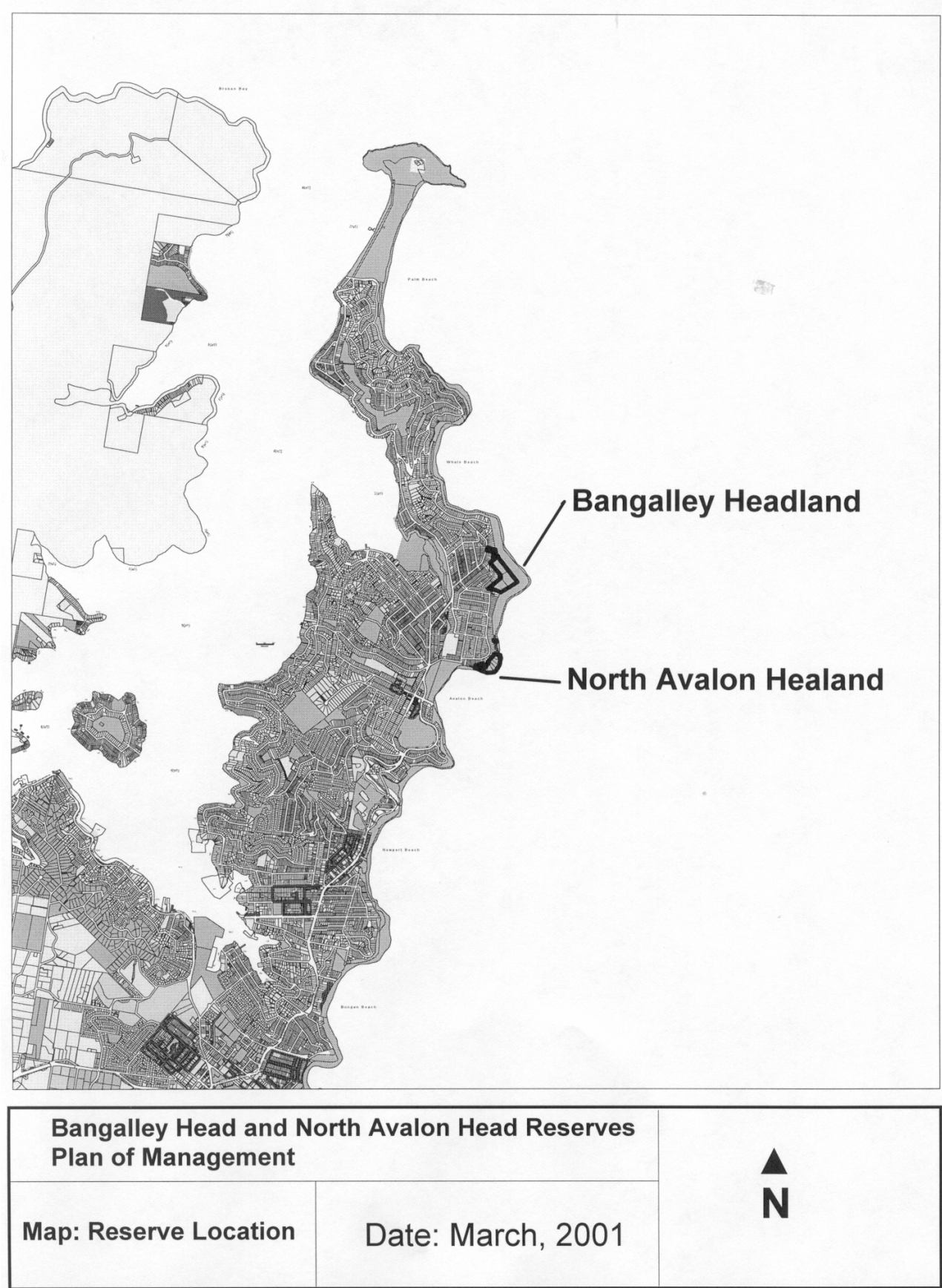
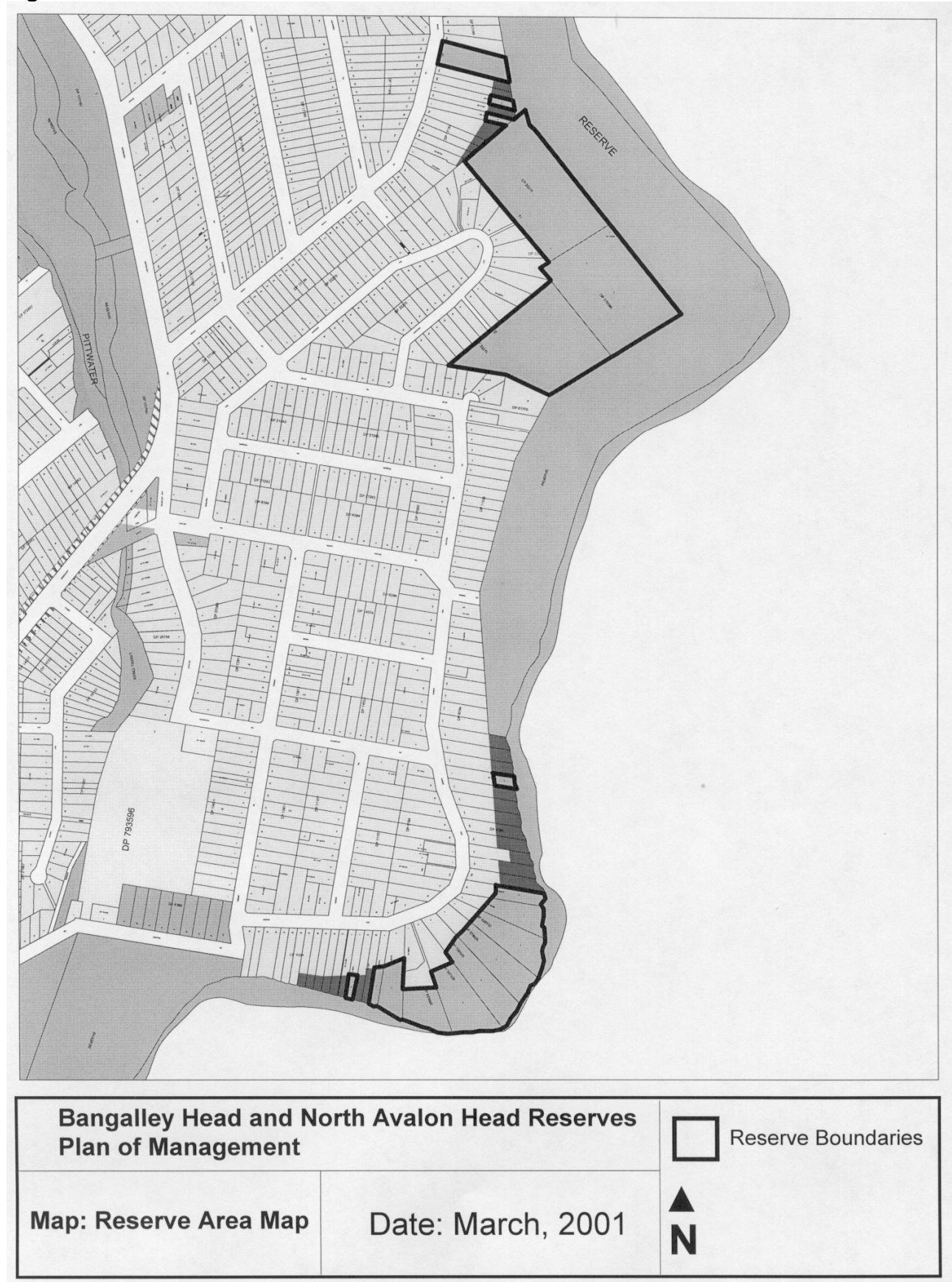


Figure 3 Reserve Area



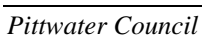
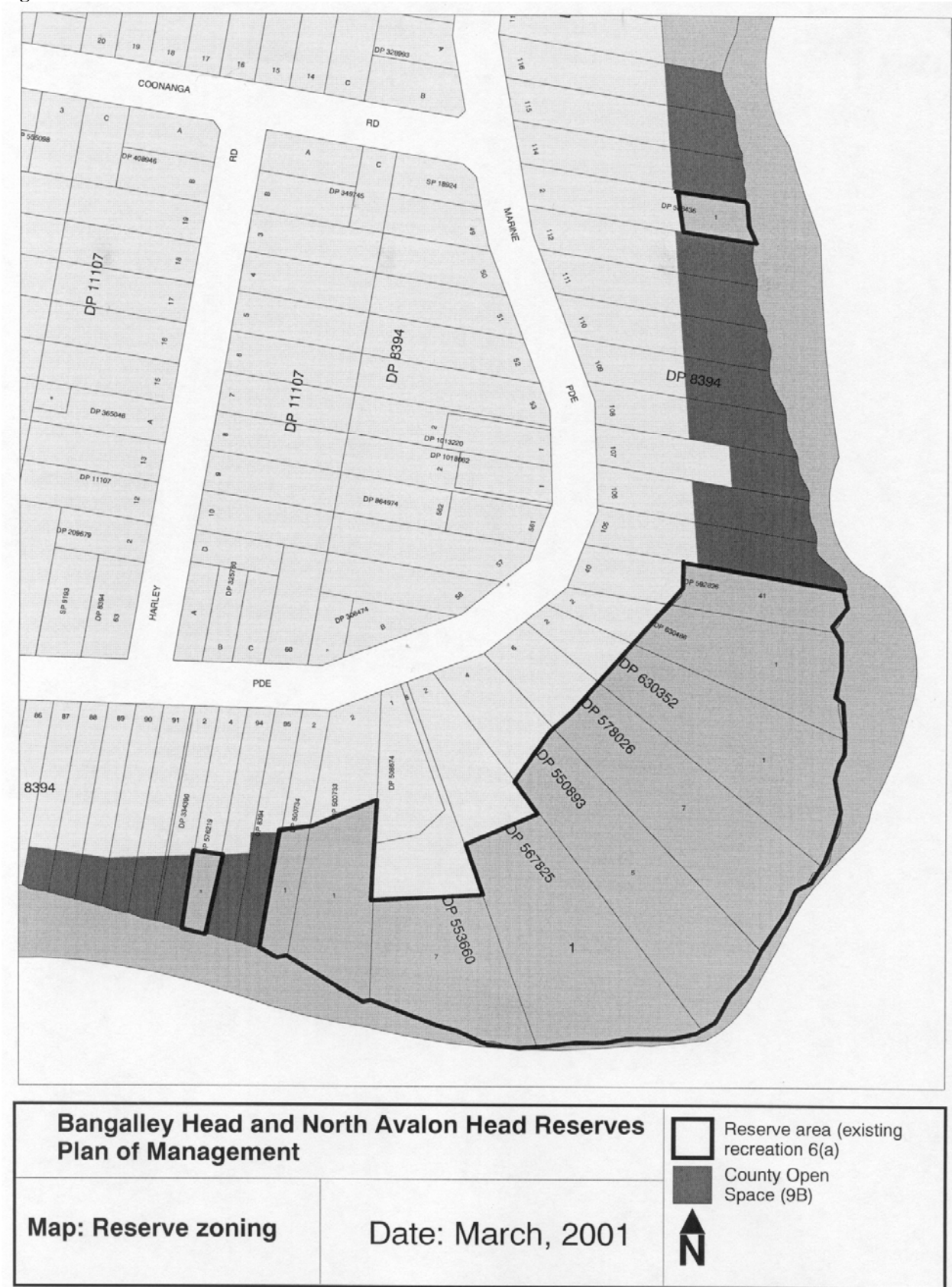


Figure 4b. North Avalon Headland.



1.4. Adjoining Land Uses

Adjoining land use consists of residential properties to the west, Avalon Beach Reserve to the south and Whale Beach Reserve to the north. A number of blocks adjoining the reserve and the residential areas are zoned County Open Space and are likely to be included in the reserve in the future. All rock platform areas and foreshore areas are vacant Crown land and do not come under the management of this plan. The use of this land is low level recreation.

1.5. Council's Land Management Goals, Policies and Plans

Council's current management goals and strategies relating to parks and reserves are contained within Council's Management Plan 2001 - 2006 and Council's Landscape Management Policy, 1993. These documents have been used to guide the outcomes of this Plan. Council's Management Plan vision is 'to be leaders in the provision of local government services, to strive to conserve, protect and enhance the natural and built environment of Pittwater and to improve the quality of life for our community and for future generations.'

Council's Urban Bushland Plan of Management Volume 1 was adopted in 1996. It superceded the earlier Urban Bushland Management Plan, for which the parts relevant to Pittwater were adopted in 1992. This plan sets out Council's management goals for natural vegetation, fauna and headlands that are key elements of the Reserve. The Coastal Flora and Fauna Study, 1997 refers to the vegetation types and fauna species that exist in the reserve.

Council is currently preparing a Coastal Management Strategy to update the existing Strategy, prepared by Warringah Council in 1985. This strategy will address in detail coastal management issues for the Pittwater area as a whole.

Most of the area covered by Bangalley Reserve and North Avalon Headland Reserve falls within the definition of bushland under the State Environmental Planning Policy 19 - Bushland in urban areas. This State policy sets aims and objectives to conserve and where necessary, regenerate the vegetation, its fauna and any cultural heritage items (such as any Aboriginal sites), to encourage appropriate and sympathetic use by the public. As is the case with all areas of Pittwater, the Tree Preservation and Management Order applies to all areas of bushland and open space covered in this Plan.

1.6. Planning Process

The process of preparing this Plan of Management for Bangalley Reserve and North Avalon Headland Reserve has included a consultation phase to ensure that the Plan incorporates and reflects the views of the prime users and adjoining landholders. Amendments to the Local Government Act require that council must hold a public hearing in respect of a proposed plan of management if the proposed plan would have the effect of categorising or recategorising community land.

The Draft Plan of Management was on public exhibition for a minimum of 28 days, to enable all interested individuals or groups to forward written submissions to Council within a further 14 days. Council did not receive any submissions as a result of the exhibition. Once adopted by Council, the Plan of Management process moves into the implementation/consolidation phase subject to funding and resource allocation.

2. Basis for Management

2.1. Local Government Act - Core Objectives

Amendments to the Local Government Act have required that new objectives be met in relation to community land. Community land within the study area falls into the following categories, "**natural area**" and then further to "**bushland**" and "**escarpment**"- each of which has its own set of core objectives, which are set out below.

The core objectives for management of community land categorised as a **natural area** are (Section 36 E):

- (a) to conserve biodiversity and maintain ecosystem function in respect of the land, or the feature or habitat in respect of which the land is categorised as a natural area, and*
- (b) to maintain the land, or that feature of habitat, in its natural state and setting, and*
- (c) to provide for the restoration and regeneration of the land, and*
- (d) to provide for community use of and access to the land in such a manner as will minimise and mitigate any disturbance caused by human intrusion, and*
- (e) to assist in and facilitate the implementation of any provisions restricting the use and management of the land that area set out in a recovery plan or threat abatement plan under the Threatened Species Conservation Act 1995 or the Fisheries Management Act 1994.*

The core objectives for management of community land categorised as **bushland** (Section 36J) are:

- (a) to ensure the ongoing ecological viability of the land by protecting the ecological biodiversity and habitat values of the land, the flora and fauna (including invertebrates, fungi and micro-organisms) of the land and other ecological value of the land, and*
- (b) to protect the aesthetic, heritage, recreational, educational and scientific values of the land, and*
- (c) to promote the management of the land in a manner that protects and enhances the quality of the land and facilitates public enjoyment of the land, and to implement measures directed to minimising or mitigating any disturbance caused by human intrusion, and*
- (d) to restore degraded bushland, and*
- (e) to protect existing landforms such as natural drainage lines, watercourses and foreshores, and*
- (f) to retain bushland in parcels of a size and configuration that will enable the existing plant and animal communities to survive in the long term, and*
- (g) to protect bushland as a natural stabiliser of the soil surface.*

The core objectives for management of community land categorised as an **escarpment**

(Section 36L) are:

(a) to protect any important geological, geomorphological or scenic features of the escarpment, and

(b) to facilitate safe community use and enjoyment of the escarpment.

2.2. State Environmental Planning Policy No 19

State Environmental Planning Policy No 19 - Bushland in Urban Areas was made to protect remnant bushland in urban areas within New South Wales. The Policy applies to land zoned or reserved as Public Open Space. Under the Policy Councils may prepare plans of management for bushland areas within such land. Circular No B13 of the Department of Planning states that a management plan should:

- describe the bushland in light of the aims and objectives of the Policy;
- include measures to enable the recreational use of bushland, where appropriate;
- specify the intended methods of bushfire hazard reduction, measures to prevent bushland degradation and restore degraded areas.

The Department has also published management guidelines for urban bushland. The guidelines identify the need to prepare a resource inventory of the bushland area, to identify management objectives and strategies, and to derive an action plan for the bushland.

2.3. Coastal Protection Act

The State Government provides guidance to Local Government on policies that should apply to management of the coastline through the Coastal Protection Act and NSW Coastal Policy.

In exercising functions under the Coastal Protection Act, the Minister for Public Works has control over development within the coastal zone. The minister is to have regard to the principles of ecologically sustainable development (Section 37A).

A public authority (e.g. Council) shall not, without the concurrence of the Minister:

(a) carry out any development in the coastal zone, or

(b) grant any right or consent to a person:

(i) to use or occupy any part of the coastal zone, or

(ii) to carry out any development in the coastal zone,

If, in the opinion of the Minister, as advised from time to time by the Minister to the public authority, the development or the use or occupation may, in any way:

(c) adversely affect the behavior or be adversely affected by the behavior of the sea or an arm of the sea or any bay, inlet, lagoon, lake, body of water, river, stream or watercourse, or

(d) adversely affect any beach or dune or the bed, bank, shoreline, foreshore, margin or flood plain of the sea or an arm of the sea or any bay, inlet, lagoon, lake, body of water, river, stream or watercourse.

2.4. NSW Coastal Policy

The Coastal Protection Act established the Coastal Council. This Council formulated the NSW

Coastal Policy, which has the following goals:

- protect, rehabilitate and improve the natural environment
- recognise and accommodate coastal processes and hazards
- protect and enhance aesthetic qualities
- protect and enhance cultural heritage
- ecologically sustainable development and use of resources
- ecologically sustainable human settlement
- appropriate public access and use
- information to enable effective management
- integrated planning and management

Objectives are to:

- protect conservation values, conserve biodiversity, improve water quality, manage environment in the public interest
- natural processes and hazards given a high priority, climate change recognised and considered
- areas of high aesthetic quality protected, development to complement surrounding environment, towns to reinforce identities
- cultural heritage items and landscapes managed and conserved, rights and needs of indigenous people recognised
- sustainable resource use facilitated, land use and management plans developed and "best practice" approaches developed
- minimise urban impact on environment, compact and contain urban development, rural residential development located to minimise impact; housing and lifestyle choice
- public access to be increased when environmentally sustainable and risks to human safety minimised
- data and information to be collected and co-ordinated; compatible databases to be developed; information to be made more accessible; education and awareness programs to be developed
- consistent and complimentary decision making; co-ordinated implementation of policy; local government management to be integrated; consider national coastal zone strategy.

2.5. Crown Lands Act

Part of the foreshore adjoining the reserve is Crown land and therefore is subject to the Crown Lands Act, 1989. While this land is not provided for in this plan the issues should be taken into account in this plan where appropriate. The act allows for plans of management and lists the following principles (section 11):

- that environmental protection principles be observed in relation to the management and administration of Crown land;
- that the natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible;
- that the public use and enjoyment of appropriate Crown land be encouraged;
- that, where appropriate, multiple use of Crown land be encouraged;
- that, where appropriate, Crown land should be used and managed in such a way that both land and its resources are sustained in perpetuity; and
- that Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles.

2.6. Threatened Species Conservation Act

The objectives of the Threatened Species Conservation Act, 1995 are to:

- conserve biological diversity and promote ecologically sustainable development
- protect critical habitat of those threatened species, populations and ecological communities that are endangered
- eliminate or manage certain processes that threatened the survival or evolutionary development of threatened species, populations and ecological communities
- ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed; and
- encourage conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative arrangement.

In assessing any development requiring consent, Council must decide (based on the eight factors in Section 5A of the EPA Act) whether the proposed development will have a significant effect on threatened species, populations or communities listed in the Act. For council land that is declared “critical habitat or included in a “recovery plan” or in a “threat abatement plan” there are special provisions for plans of management. There are a number of species in the reserve that are listed in schedules of the TSC Act including the potential for Koala and Squirrel Gliders. Both listed as vulnerable under Schedule 2 and the Koala is a threatened community in Pittwater under Schedule 1 Part 2 but at present there are no declared critical habitats, recovery plans or threat abatement plans that apply to this land.

2.7. Local Objectives

In accordance with the core objectives set out above, Council’s broad management goals as stated in Section 1.5 of this Plan, and through identification of the functions, use and key issues relating to Bangalley Reserve and North Avalon Headland Reserve, the following additional local objectives have been established to:

- ❖ protect and enhance the natural environment and scenic landscape qualities of the reserve.
- ❖ prevent weed invasion and control weed species occurring in the reserve.
- ❖ consolidate the areas of bushland which have and will continue to regenerate, through the use of approved bush regeneration techniques.
- ❖ continue the maintenance and where necessary the upgrading of the Bicentennial Coastal Walkway.
- ❖ identify areas of bushland which are in need of regeneration and subsequently set an action plan for this process.
- ❖ continue to provide opportunities for low impact recreational, scientific and educational use of the reserve.
- ❖ achieve a balance between the needs of recreational users and the sustainability and specific demands placed on the natural coastal environment.
- ❖ identify inaccessible areas for safety reasons and where appropriate erect appropriate

signage and exclusion barriers.

2.8. Statement of Significance

The Reserves have significance as an example of the urban bushland in Sydney, which is one of few major cities in the world with substantial areas of natural bushland.

Urban bushland areas throughout the Sydney region are significant because:

- they contribute to the landscape quality of the city;
- they provide habitat for plants and animals, which would otherwise become regionally extinct;
- they provide a corridor for the movement of migratory and nomadic animals, particularly birds, through the urban area;
- they provide an educational resource and the first contact point with nature for many urban residents;
- they enable urban residents to undertake recreational pursuits in a bushland setting; and
- they are important for scientific studies, providing a record of the original landscape and vegetation and the changes wrought by urban development.

These Reserves have particular significance because:

- they support an unusual diversity of plant communities within a relatively small area;
- they include samples of vegetation communities of local conservation significance, namely Broad-leaved Mahogany Woodland, a vegetation type poorly conserved in Pittwater LGA, a small patch of littoral rainforest, the Lilly-Pilly Low Open Forest and Bangalley Head She-Oak Closed Heath, the only location of this community in Pittwater;
- they protect populations of one plant species of national conservation significance; *Rulingia hermaniifolia*;
- they protect populations of two plant species of regional significance Bolwarra (*Eupomatia laurina*) and Black Plum (*Diospyros australis*);
- they provide suitable habitat and shelter for many fauna species of state conservation significance being Common Bentwing Bat, Large Pied Bat, Osprey and Sooty Oystercatcher. They also assist in conservation of endangered populations of the Koala and Squirrel Glider and provide potential habitat for the threatened Glossy Black-cockatoo; and
- they support a population of the Long-nosed Bandicoot, a formerly widespread species that has become rare in the Sydney metropolitan area. Two other regionally significant species, the Reef Egret and Peregrine Falcon, also inhabit the reserves.

The key issues that affect management of the Reserves are discussed in Section 5.

3. Park Description

3.1. Location & History

The Reserves occupy headland and escarpment bushland in the suburb of Avalon. The Reserves comprise two headlands that form part of the escarpment between Avalon and Whale Beaches. Consequently, the main topographical feature of the Reserve is the vertical precipices of Hawkesbury and Narrabeen Sandstone. Moderate to steep sloping land falls away from the escarpment westwards to the residential area of north Avalon.

Aboriginal people of the Guringai group lived in the area for several thousand years prior to 1788. Govett, an employee of the Survey-General Mitchell, recorded local aborigines fishing successfully for snapper using starfish for bait from rock platforms along the northern beaches coastline (S&G Champion, 1997). Two locations in the reserve demonstrate prior use of the area by aboriginal people. Due to concerns regarding possible vandalism, the exact locations of these sites are not available to the public.

During the 19th century what is now Bangalley Reserve and North Avalon Headland Reserve was part of a 1400 acre (560 hectares) grant made in 1833 to Father John Therry, an early Catholic chaplain (Pollon, 1988). Father Therry had plans at one time to deliver lectures in the St Michaels Cave and even build a church above it. A number of early accounts describe excursions to the cave and the nearby "Hole in the Wall", a natural arch, which collapsed in 1867. The adjacent land was subdivided in 1914 as part of "Careel Ocean Beach Estate". It is presumed that the three large blocks of land that comprise the bulk of the reserve's bushland were dedicated as open space during this subdivision.

3.2. Topography, Geology, Soils and Land Units

In the bushland areas of the Reserves, typical slopes are about 25% with elevation ranging from 50 metres above sea level near Whale Beach Road to 116 metres AMSL at Bangalley Trig site. The escarpment has vertical cliffs and the foreshore has slopes of varying degrees.

Within the escarpment are a number of vertical doleritic dykes including St Michaels Cave. These were probably formed during the Jurassic era. St Michael's Cave is a significant geological feature that extends approximately 110 metres into the cliff face. The dolerite is evident in a band approximately one meter in width at the roof of the cave. The cave has a maximum height and width of 15 metres and 10 metres respectively (Coffey & Partners, 1987).

The ridge crest geology is Hawkesbury sandstone of medium to coarse-grained quartz sandstone, with very minor shale and laminite lenses. A short distance down slope, the Narrabeen shales and sandstones of the Newport Formation outcrop. These sediments underlie most of the Reserves. Figure 6 indicates the geology of the area.

The North Head soil landscape occurs on the relatively level crest of the reserve. Below the crest is soil of the Hawkesbury landscape, characterised by the large percentage of rock outcrop. Both these soil landscapes are generally, shallow, stony, highly permeable and of low fertility. North Avalon Head and a narrow band between Careel and Bangalley Heads has soil of the Watagan landscape which is derived from Narrabeen Sandstone. It is deeper and more fertile than the Hawkesbury sandstone soil. The lower slopes, e.g. near Whale Beach Road, have soils of the Erina landscape, which are also derived from sandstones, and claystones of the Narrabeen sandstone. Figure 5 indicates the soil landscapes of the area.

Figure 5, Soil Map

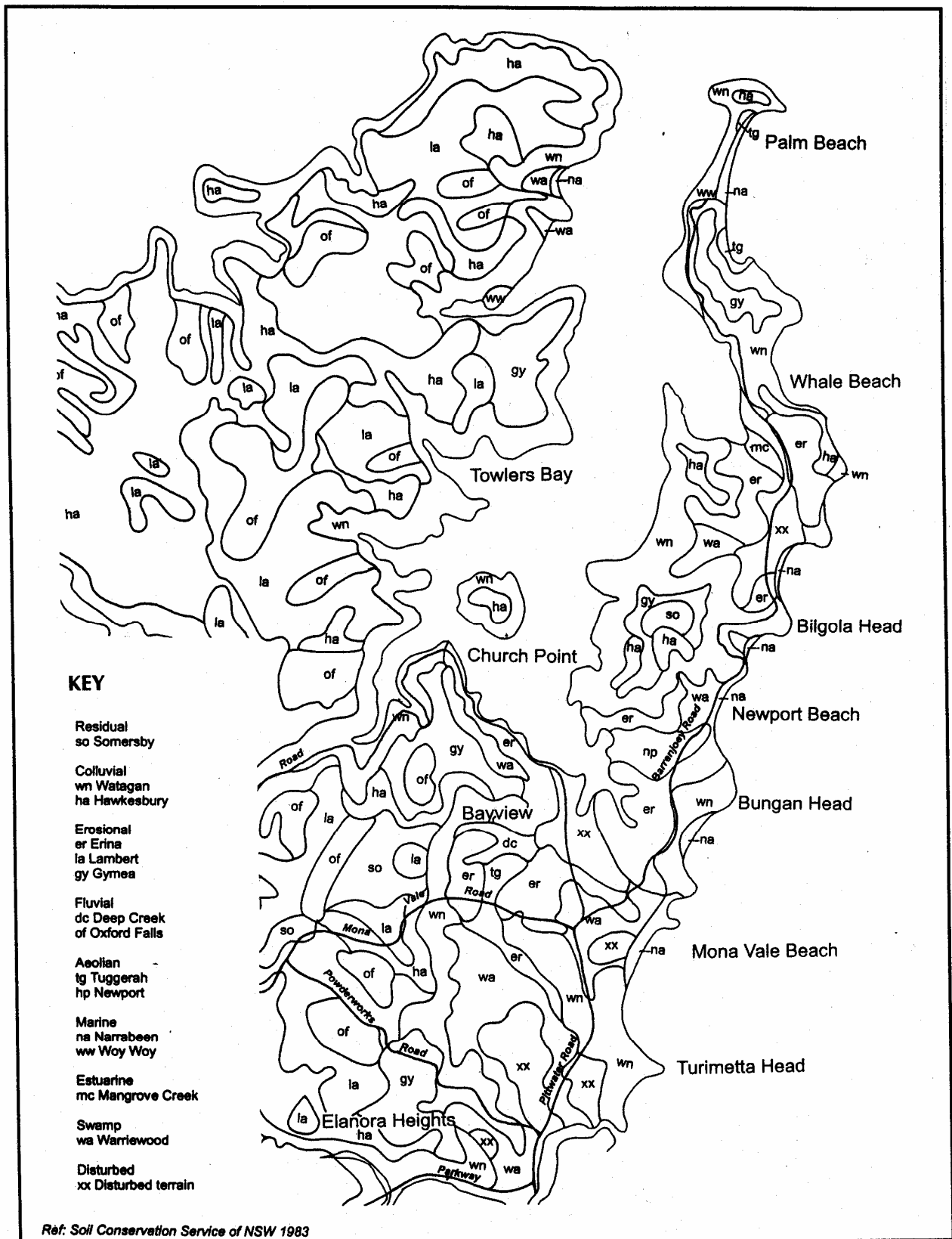
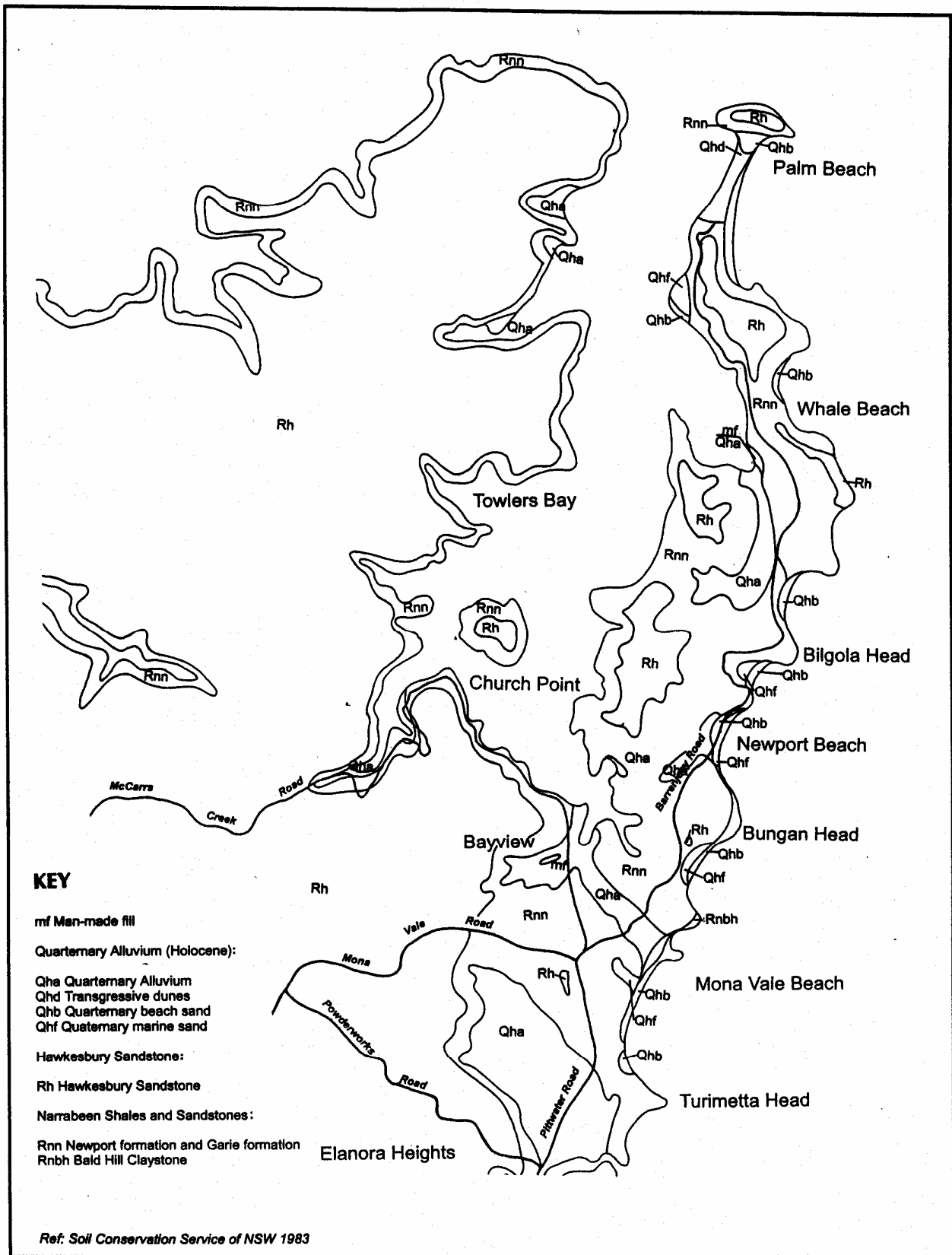


Figure 6, Geology Map



3.3. Vegetation

3.3.1. Vegetation Community Description

Species lists, vegetation descriptions and vegetation maps have been collated from a range of sources of varying age and reliability. Therefore they should be considered indicative only of the vegetation in the reserve and should not be considered of a high level of accuracy.

The distribution of plant communities in Bangalley and North Avalon Headland Reserves were re-assessed as part of the development of this management plan. This description of plant communities is based on earlier work by Marita Macrae, field observations, aerial photograph interpretation and consultation with Chris Wright, Councils Senior Bush Regenerator. This management plan identifies six plant communities within the area. Figures 7 and 8 show the distribution of these plant communities in the reserve.

Open Woodland/Open-forest

The northern part of the reserve and west facing slopes support a woodland or open-forest dominated by Scribbly Gum (*Eucalyptus haemastoma*), Sydney Peppermint (*E. piperita*), Red Bloodwood (*Corymbia gummifera*) and Broad-leaved Mahogany (*E. umbra*). This community apparently occurs on the upper strata of Narrabeen group sediments. Scribbly Gum is more frequent on crests whilst Sydney Peppermint increases in abundance on slopes. Associated tree species include Bangalay (*E. botryoides*) and Rough-barked Apple (*Angophora floribunda*).

Shrub species present include Black She-Oak (*Allocasuarina littoralis*), Scrub She-Oak (*Allocasuarina distyla*), Coast Banksia (*Banksia integrifolia*), Hairpin Banksia (*Banksia spinulosa*), *Breynia oblongifolia*, Hopbush (*Dodonaea triquetra*), Dogwood (*Jacksonia scoparia*), *Lasiopetalum ferrugineum*, Mock Olive (*Notelaea longifolia*) and *Persoonia linearis*.

Ground layer species include *Entolasia marginata*, *Dianella caerulea* var. *producta*, Burrawang (*Macrozamia communis*), Blady Grass (*Imperata cylindrica*), *Xanthorrhoea media* and Kangaroo Grass (*Themeda australis*).

Low Open Forest

A sheltered gully below a cliff to the south of the trig supports a low open-forest dominated by Lilly-Pilly (*Acmena smithii*) and Rusty Fig (*Ficus rubiginosa*). Emergent trees of Coast Banksia (*Banksia integrifolia*) are present through the community. Another small tree species present is Grey Myrtle (*Backhousia myrtifolia*).

Shrub species present include Scrub She-Oak, Heath-leaved Banksia (*Banksia ericifolia*) and *Melaleuca hypericifolia*.

The community includes a number of species of vines and a diversity of ferns. These species include Common Maidenhair (*Adiantum aethiopicum*), Rasp Fern (*Doodia aspera*), Lawyer Vine (*Smilax australis*), False Sarsaparilla (*Smilax glyciphylla*) and Coral Fern (*Gleichenia dicarpa*). Of particular interest is the closed canopy that occurs when *Cissus antarctica* and *Cissus hypoglauca* fill the gaps of the otherwise open canopy of this community.

This community is a depauperate form of littoral rainforest and is of local conservation significance as examples of littoral rainforest remaining in the Pittwater local government area are extremely rare.

Broad-leaved Mahogany Woodland

Woodland or low woodland dominated by Broad-leaved Mahogany (*Eucalyptus umbra*) occurs on Hawkesbury Sandstone near Bangalley Trig and on nearby west and north facing slopes.

Associated tall shrub species include Coast Banksia and Scrub She-Oak. Smaller shrub species include *Acacia myrtifolia*, Sweet-Scented Wattle (*Acacia suaveolens*), Hopbush, *Pultenaea daphnoides*, *Hakea gibbosa* and *Leucopogon juniperinus*.

Ground layer species include *Dianella caerulea* var. *producta*, Flannel Flower (*Actinotus helianthi*), Swamp Pennywort (*Centella asiatica*), Kidney Weed (*Dichondra repens*) and Spiny Mat-Rush (*Lomandra longifolia*).

Bangalley Head is the only location for this community in the Pittwater local government area due to the restricted nature of the soil landscape on which it occurs, hence is of local conservation significance.

Coastal Scrub, Shale

Lower slopes, south west of Bangalley Trig and south of North Avalon head support a scrub community dominated by Coastal Teatree (*Leptospermum laevigatum*), Coast Banksia and Coast Wattle (*Acacia sophorae*).

There is a ground layer of medium density, with a range of grasses, vines and grass-like plants. These include Kangaroo Grass, Sea Rush (*Juncus kraussii*), Dusky Coral Pea (*Kennedia rubicunda*), *Dianella revoluta*, Spiny Mat-rush, Scented Marsdenia (*Marsdenia suaveolens*) and Old Man's Beard (*Clematis aristata*).

This community is present in a number of coastal reserves within the Pittwater local government area.

Coastal Scrub, Sandstone

The spine of the spur leading south from Bangalley Trig and rocky areas between the Trig and the Lilly-Pilly Low Open Forest support a closed scrub community dominated by Scrub She-Oak and Coast Banksia.

Associated shrub species include Coast Wattle, Coastal Teatree, *Hakea gibbosa*, *Hakea dactyloides*, *Lasiopetalum ferrugineum*, *Epacris pulchella*, *Grevillea sericea*, *Melaleuca hypericifolia* and *Zieria laevigata*.

The ground layer is generally sparse. Common ground layer species include Spiny Mat-Rush, Common Maidenhair, False Bracken (*Calochlaena dubia*), Weeping Meadow Grass (*Microlaena stipoides*) and *Oplismenus imbecillis*.

This community is similar to coastal scrub communities which occur elsewhere in the Pittwater local government area, such as at Attunga Reserve and on Barrenjoey Head.

Low Heath

Bangalley Head She-Oak Closed Heath occurs in the area around Bangalley Trig and the headland to the east supports a closed heath community dominated by Scrub She-Oak.

Associated shrub species include *Acacia myrtifolia*, Heath-leaved Banksia, *Melaleuca hypericifolia*, *Epacris pulchella*, *Hakea gibbosa* and *Leucopogon juniperinus*.

Ground layer species include *Opercularia aspera*, *Billardiera scandens*, Kangaroo Grass, Spiny Mat-Rush and *Entolasia stricta*.

Bangalley Head is the only location for this plant community in the Pittwater local government area, hence is of local conservation significance.

3.3.2. Significant Plant Species

Rulingia hermaniifolia is a low, spreading shrub with small, wrinkled leaves. It occurs along the coast from Jervis Bay to Broken Bay (Bouddi National Park) and is coded 3RCa on the ROTAP database (Briggs & Leigh, 1995). In Pittwater, it is only known from Bangalley Head.

Black Plum (Diospyros australis) is a tall shrub or small tree, the leaves of which have a pale yellowish-green undersurface. It occurs in coastal rainforests from southern NSW to north Queensland. The only other known locations in Pittwater are Barrenjoey Head, Avalon Dunes, Palmgrove Park and a remnant tree in Coonanga Rd, Avalon. It is also known from Bouddi and Royal National Parks.

Bolwarra (Eupomatia laurina) is a shrub or small tree with spreading branches from near the base. It occurs in rainforest or wet forests along the coast and Blue Mountains, including Darling Mills Creek at Baulkham Hills and Royal and Ku-ring-gai Chase National Parks. Apart from Bangalley Reserve and North Avalon Headland Reserve, it has been recorded at Loquat Valley Reserve, Crown of Newport Reserve, Angophora Reserve, Stapleton Park, McKay Reserve and nearby private lands.

3.3.3. Fire and Vegetation

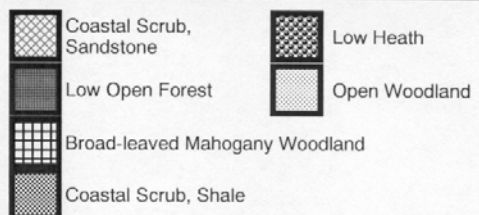
Fire has not played a prominent role in the reserves in recent times until a significant fire event on the 30th and 31st October, 2001. This fire was believed to be deliberately lit and consumed approximately 1.8 hectares to the south east of the Trig station. The regeneration of this area will be closely monitored and regeneration works will be implemented if needed. The use of control plots and photo sites will be used to effectively monitor the progress of the site.



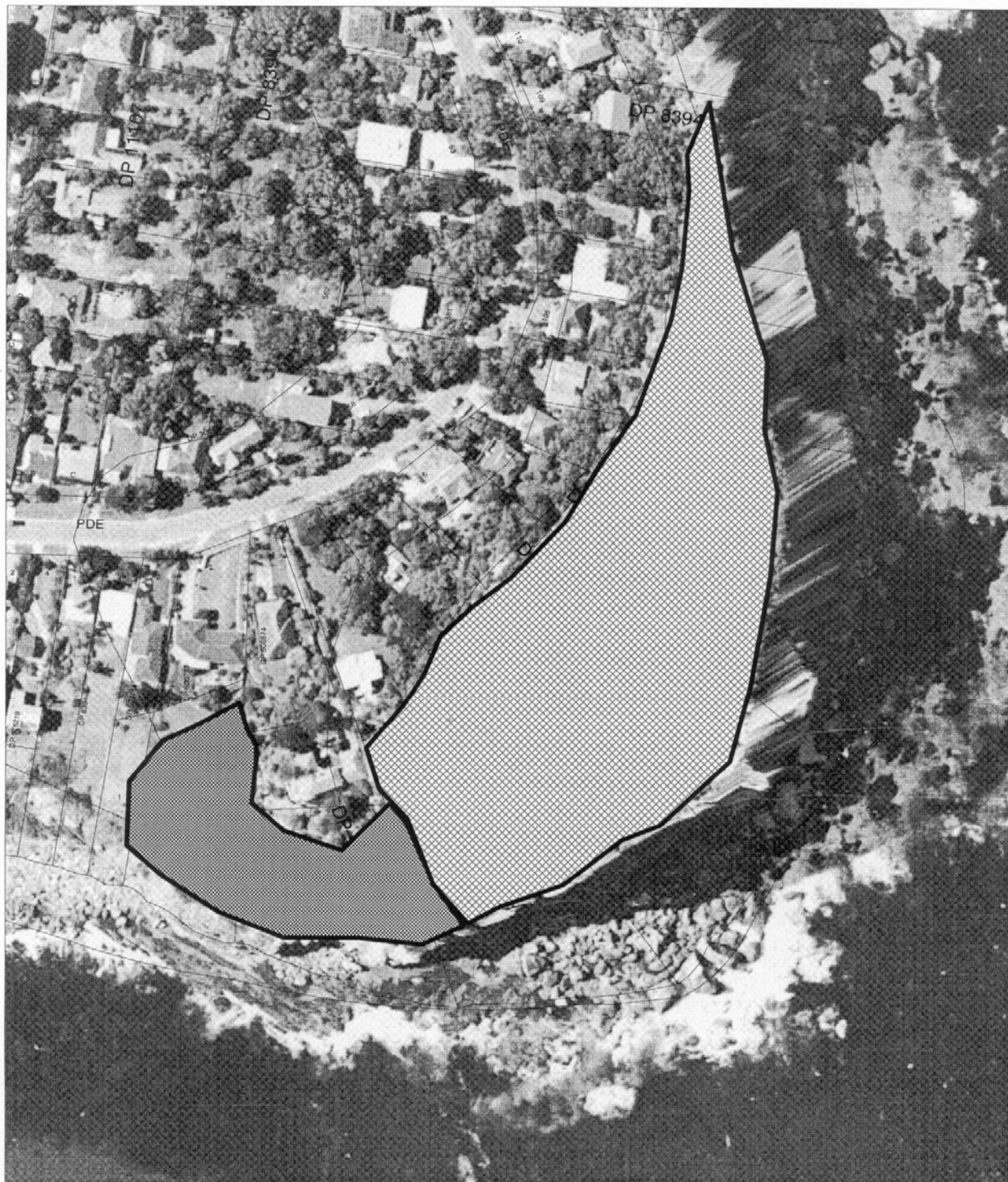
Bangalley Headland Plan of Management

Vegetation Map Bangalley Head

Date: September, 2001



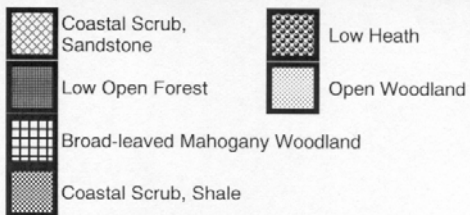
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Bangalley Headland Plan of Management

Vegetation Map North Avalon Headland

Date: September, 2001



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3.4. Fauna

3.4.1. Threatened Fauna

St Michael's Cave is a very significant fauna habitat as it is used for roosting by several hundred Common Bentwing Bats (*Miniopterus schreibersii*) and some Large-eared Pied Bats (*Chalinolobus dwyeri*). Both species are listed as vulnerable under the Threatened Species Conservation Act, 1995. The bats in St Michael's Cave were commented upon as early as 1862 by a visiting member of the St Benedict's Society as "flitting to and for through the gloom (conjuring) up dramatic scenes, such as the Weird Sisters in Macbeth" (S&G Champion, 1998).

Although trapping and spotlighting surveys have failed to detect the Squirrel Glider, the Reserve provides potential habitat. It has been recorded less than a kilometre away at Careel Bay and is favored by the presence in the reserve of suitable tree hollows and the winter-flowering Coast Banksia (*Banksia integrifolia*), one of its key feeding resources (Quin, 1996, Smith, 1996, Smith & Smith, 1998).

There is also suitable habitat for the Glossy Black-cockatoo (*Calyptorhynchus lathami*), an occasional visitor to the Peninsula, foraging on she-oaks (*Allocasuarina spp*) in the Reserve.

The Osprey (*Pandion haliaetus*) has been recorded at nearby Whale Beach. The foreshores of the Reserve provide suitable foraging habitat. Though thought to nest at Narrabeen Lake, the Reserve' cliffs could provide an alternative, more protected nesting location.

The Sooty Oystercatcher (*Haematopus fuliginosa*) has been recorded on the rock platforms adjacent to Bangalley Reserve and North Avalon Headland Reserve (sources quoted in Burcher & Lembit, 1997) and is likely to use the foreshore areas adjacent to the Reserve. The NSW population of this species is estimated to be only 200 individuals. It inhabits rocky shores in summer where it feeds on a wide range of prey including molluscs, crustaceans and sea worms. In winter, it is also reported to forage on washed-up seaweed on beaches, due to reduced period for exposure of intertidal feeding sites.

The Koala (*Phascolarctos cinereus*) population in Pittwater LGA is believed to be in the order of six to eight individuals (Smith and Smith, 1998). The Reserve acts as a possible refuge and feeding area for the species due to the presence of Scribbly Gum (*E. haemastoma*) and other favored Eucalypts. The most recent sighting of Koalas in the vicinity of the Reserve was in 1989 (Smith & Smith, 1990). Most sightings in the 1990s have been recorded between the southern side of Careel Bay and Algona Reserve, Bilgola Plateau (Smith and Smith, 1998). In common with other reserves on the Barrenjoey Peninsula, the Bangalley Reserve and North Avalon Headland Reserve has a low abundance (3%) of major food trees suitable for the species (Smith & Smith, 1998). However, the Smiths' study also shows that 90% of the trees in the reserve are healthy. Therefore, the reserve would be vital to re-establishment of the population in the northern part of the Peninsula.

3.4.2. Other Significant Fauna Species

The low forest in the lee of the wind is habitat for arboreal mammals and an important local refuge for the Long-nosed Bandicoot.

The scrub and heath areas of the Reserve are an important local habitat area due to the presence of scrub dominated by *Banksia ericifolia*. During winter, this plant flowers profusely and the area is alive with both migrant and resident honeyeaters (eg Little Wattlebird *Anthochaera chrysoptera* and White-naped Honeyeater *Melithreptus lunatus*) as well as lorikeets (eg Rainbow Lorikeet *Trichoglossus haematodus* and Scaly-breasted Lorikeet *T.chlorolepidotus*).

The Peregrine Falcon (*Falco peregrinus*) hunts along the cliff-line and sometimes roosts on ledges below. This species was formerly listed as endangered in NSW. It appears to be recovering well after a decline induced by the herbicide DDT and is reinhabiting many urban areas.

The Eastern Reef Egret (*Egretta sancta*) is an inhabitant of rock platforms, beaches and tidal flats where it feeds on fish, marine invertebrates and insects. Like the Sooty Oystercatcher it is sedentary or part nomadic. It is regarded as scarce in NSW (Morris et al., 1981; Blakers et al, 1984). It has been recorded on the rock platforms adjacent to the Reserve.

During field work for this plan of management a Brahminy Kite (*Haliastur indus*) was sighted above Bangalley Head. There have only been a few records of this species in the Sydney area which is the extreme southern limit of its distribution.

3.5. Aboriginal Sites

At the height of the last Ice Age, the coastline was 20 to 45 kilometres east of its present location. Pittwater was a valley between Barrenjoey Ridge and the Lambert Peninsula. Gradual warming led to a rise in sea levels, with the coastline 12 kilometres east of its present location 10,000 years B.P. (before present).

Bangalley Reserve and North Avalon Headland Reserve was occupied by aboriginal people of the Guringai group. Aboriginal people lived in the area for several thousand years prior to 1788. There is one known shelter and art site in the Reserve and at least one midden. Further sites may be located in the future.

3.6. European Heritage

The National Trust's list of sites of significance for industrial archaeology does not record any sites in Bangalley Reserve and North Avalon Headland Reserve. No such sites are evident in the Reserve and the land use history of the Reserve indicates that sites of European cultural significance are unlikely to occur in the Reserve. As such sites can be more evident following fires it is recommended that searches for European heritage items could be undertaken at such time. The headlands on Barrenjoey Peninsula have all been listed on the Australian Heritage Commission's Register of the National Estate.

3.7. Recreational Usage

Recreational usage of the Reserve is confined to bushwalking, sightseeing and accessing fishing spots. A section of the Bicentennial Coastal Walkway, which links Dee Why to Palm Beach, is located in the reserve. This begins at Marine Parade, ascends to the Trig Station, skirts the escarpment, then returns towards Marine Parade through the woodland vegetation.

Many visitors shun the climb to the top and simply enjoy the views from near Marine Parade, where some seating is provided. Access to St Michael's Cave is prevented by a 3 metre steel picket fence topped and bottomed with razor wire. The other caves at Careel Head are reached via hazardous informal paths and rock climbing, which is strongly discouraged as it is highly hazardous.

4. Management Issues

4.1. Vegetation and Fire Management

Bush regeneration work has been carried out in the Reserves by staff and more recently by volunteers co-ordinated by Pittwater Council.

The fact that the Reserves occur upslope of residential development means that problems experienced in other reserves such as urban run-off and drainage modification means that bush regeneration has a high likelihood of long term success.

Weed sources include seed brought into the Reserves by exotic and native birds, seeds and propagules from vehicle and foot traffic, escapes from adjacent gardens, garden rubbish and wind-blown seed.

The most widespread and prolific weeds in Bangalley Reserve and North Avalon Headland Reserve identified by Marita Macrae were Asparagus Fern (*Protasparagus aethiopicus*), Lantana (*Lantana camara*) and Bitou Bush (*Chrysanthemoides monilifera*). Macrae recorded 39 weed species in the Reserve in 1988.

One of the areas worst affected by weed invasion is the piece of land within the Reserves which fronts Whale Beach Road, where weeds have escaped from gardens of adjacent lots into the Reserve. Other areas that are difficult to manage in the reserve include the cliff edges that have isolated Bitou and Asparagus. Track edges have traditionally been areas on high weed density due to disturbance but can be managed but periodic spraying and mowing.

Weed control priorities identified in 1988 by Macrae were :

- the control and removal of Asparagus Fern
- annual removal of Bitou Bush (*Chrysanthemoides monilifera*)
- control of weeds and follow-up maintenance of the Lilly-Pilly Low Closed Forest
- bush regeneration of the western slopes of the Reserves working down slope from the crest
- treatment of isolated pockets of weed invasion
- control of weeds along the Bicentennial Coastal Walkway

Like any urban bushland area the change in fire regimes can significantly impact on the native bushland. Bangalley Headland and North Avalon Head have been subject to very few fires in recent times with the exception of approximately 1.8 hectares of bushland that was burnt in October 2001. This area is being monitored to assess natural regeneration of the burnt areas and to ensure weeds species do not establish in these areas.

Objectives:

- To conserve the vegetation diversity and structure in the reserve.
- To control, contain or eradicate introduced flora species in the reserve.
- To increase awareness of the public in relation to the flora and their impacts on the flora of the reserve.
- To increase awareness of neighbours regarding the effects of weeds on native flora and their potential to invade bushland.
- To monitor the regeneration of the reserve from fire.

Performance targets

- The maintenance of natural bushland areas within the reserves, particularly along the Bicentennial Coastal Walkway.
- Timely responses to cases of dumping, clearing and vandalism.
- Raise community awareness regarding the likely positive effects of bush regeneration.
- Effective recruitment of residents to become volunteer bush regenerators
- The minimisation of weed infestation in the areas regenerating from fire.

Action:

- Maintain and where possible expand volunteer bush regeneration groups in the area
- Respond promptly to vegetation clearing and dumping.
- To inform residents of the ecological value of the reserve and ways that they can ensure the long-term conservation of the reserve.
- Provide educational and interpretive signs as part of the Bicentennial Coastal Walkway.
- To monitor the regeneration and implement weed control and supplementary planting where needed.
- To undertake the development of a fire action plan/strategy in consultation with the Rural Fire Service, to be approved by the bushland management committee. This should consider ecological and community safety.

Performance assessment

- Monitor cover and distribution of weeds through time and assess regeneration programs.
- Monitor community involvement in bushcare groups.
- Attitudes of neighbours to be monitored through response to information provided, written complaints and compliments.
- Formal survey of attitudes and understanding to be considered every five years.
- Monitor control plots to assess progress of natural and aided regeneration.

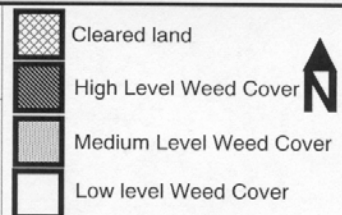


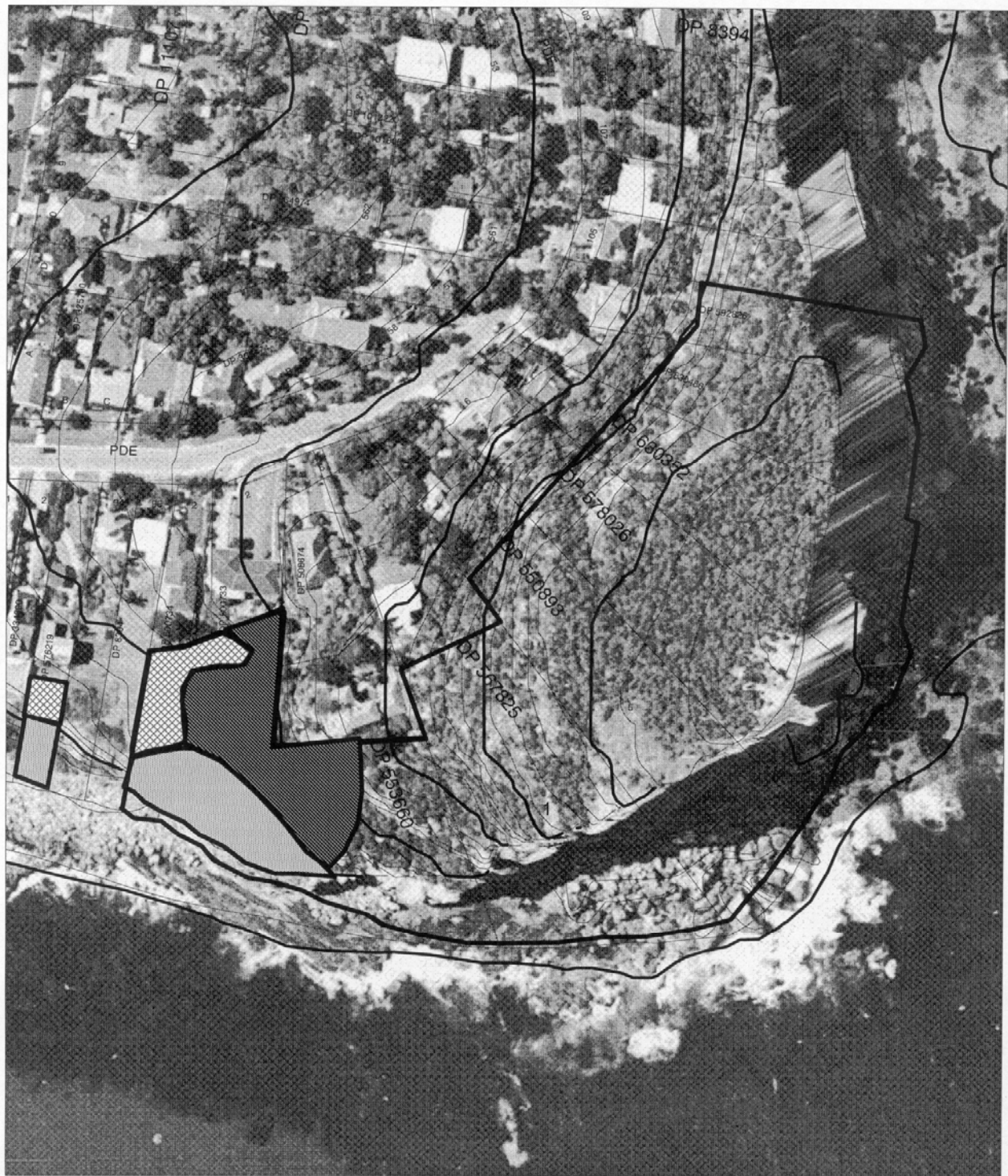
Bangalley Headland Plan of Management

Map: Weed Cover

(all unzoned areas in the reserve are low weed density)

Date: August, 2001



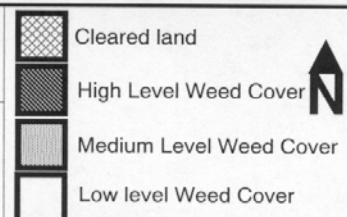


North Avalon Headland Plan of Management

Map: Weed Cover

(all unzoned areas in the reserve are considered low weed density)

Date: August, 2001



4.2. Recreation

Walking is the primary recreation activity undertaken in the reserve and is the only activity that is actively managed for in the reserve.

Bicentennial Coastal Walkway

Currently, the section of the Bicentennial Coastal Walkway within the Reserve does fulfil its function as part of the link between Dee Why and Palm Beach. The route starts and finishes at the Marine Parade car park, without any through route to the north.

A study was undertaken by Elegant Concepts (1999) to assess the feasibility of extending the walkway to Careel Head at the end of Rayner Road. This study found that such an extension would be feasible and would provide walkers with a variety of coastal views and vegetation communities. However, it did not address the question of safety which is a considerable issue in light of the steep descents and proximity to cliffs. Furthermore, the proposed route passes very close to private residences and does not significantly increase the variety of vegetation experienced. An alternative would be for Council to upgrade and reopen the track that takes walkers to Whale Beach Road through the tongue of the Reserve that extends to this road. Signposting at this point could direct walkers to Whale Beach or back to the Marine Parade car park.

Objectives:

- To provide for appropriate, low impact, sustainable recreation activities on the headland reserve.
- To consider the safety of the users in the management of the reserve.
- To provide appropriate interpretive signage in the reserve (directive, environmental and prohibitive).
- To prohibit and minimise the inappropriate access, use and vandalism of the reserve.

Performance targets:

- The continuation of only permissible recreational activities in the reserve.
- The maintenance and upgrade of tracks and facilities in the reserve.
- The provision of appropriate signage.
- No inappropriate use or access to the reserve.

Actions:

- Considering re-routing and formalising the track from the loop return point to Whale Beach Road. This should be done in a manner to discourage unnecessary access to potentially dangerous viewing points.
- The implementation of a construction and maintenance program for track and facilities in the reserve.
- Identify inappropriate uses and implement strategies to cease those activities.
- The review and development of appropriate signage in the reserve.

Performance assessments:

- Periodic walk through assessments to assess impacts of recreation are to be undertaken and management actions prescribed.
- Attitudes of neighbours will be monitored through response to information provided, written complaints and compliments.
- Formal survey of attitudes and understanding will be considered every 5 years.

4.3. Boundaries and Neighbours

At Bangalley Reserve and North Avalon Headland Reserve there are some management problems arising from adjacent urban development. The problems include minor rubbish dumping, straying by domestic pets and escape of garden plants. At North Avalon Head there also appears to be significant encroachment with areas of heath having been converted to lawn.

The absence of clear definition of the boundary between private land and the some parts of the Reserves could lead to future management problems, but the current informal boundary is part of the character of the locality. The erection of low scale, sympathetic fencing between private property and the Reserves should be required where applicable as a condition of consent for new buildings or development.

Some of the residential lands adjacent to the Bangalley Reserve and North Avalon Headland Reserves are classified as "fragmented bushland" under Council's Development Control Plan for the Conservation of Biodiversity in Pittwater. Should any of these sites be redeveloped, the DCP requires that a minimum of 80% locally indigenous plant species be used in site landscaping. Enforcement of this measure would aid the viability of fauna and flora within the reserves.

Objectives:

- To protect the Reserves from impacts associated with boundary effects and neighbours.
- To foster appreciation of the reserves natural attributes in neighbouring residents.
- To manage fire risk in the reserve.

Performance Target:

- The reduction in the impacts on the Reserves from neighbouring properties.
- Reclaim land encroachments in the reserve.
- The management of fire risk associated with the reserve.

Actions:

- Educate the neighbours in relation to the importance of the Reserves.
- Removal of encroachments.
- To consult with Rural Fire Service for best fire risk management in the reserve.

Performance Assessments:

- Monitor Reserves to identify encroachments.
- Monitor community understanding and attitudes through feed back and periodic survey.

4.4. Fauna Management

Records of fauna species present in the Reserves will be maintained by Council staff. The Council will act to increase public awareness on the significance of the Reserves for a range of threatened and regionally significant species. Specifically, Council will need to highlight:

- the threat that disturbance of St Michael's Cave may have on threatened and protected bats. This threat has largely been abated by the erection of the security fence, which prevents humans from entering the cave.
- the impact of recreational use of the adjacent rock platforms on intertidal invertebrates and the local populations of Sooty Oystercatchers and Reef Egrets.

Apart from human-induced habitat modification, another major threat to the fauna of Bangalley Reserve and North Avalon Headland Reserve is the presence of introduced predators in the surrounding residential area. Cats particularly are likely to hunt in the Reserves at night and take bandicoots, possums, small birds and reptiles. They are also a source of the disease toxoplasmosis which has been known to kill bandicoots in the northern Sydney area (Wildlife Information & Rescue Service, pers. comm.). The only confirmed records of Squirrel Glider in Pittwater have been from cat kills. Dogs are regarded as one of the major causes for decline of the Avalon Koala colony accounting for 20-40% of koala deaths (Smith & Smith, 1990).

Dogs and cats are prohibited in the reserve but the effects of free ranging pets in the surrounding urban area can have a significant impact on fauna in the reserve. The only practical way of reducing this threat is an on-going public education program highlighting the negative impact that domestic pets have on fauna. Interpretative signage at the Reserve's picnic area should also include information on the detrimental impact of unrestrained domestic pets on native fauna.

Black Rats are also likely to occur in the Reserves. This species is an omnivore and may prey on the eggs of reptiles and birds. Considering the likely rapid replacement of rats in the Reserves by those from nearby residences a control program would probably be ineffective. Foxes have also been detected at McKay Reserve (Smith & Smith, 1992) and would be likely to also prey on fauna at Bangalley Reserve and North Avalon Headland Reserve. A baiting program targeting areas on the Pittwater Peninsula has been implemented as part of the regional fox control program but does not include Bangalley or North Avalon at this stage.

Objectives:

- To monitor, conserve and where appropriate enhance the habitat of the reserves for native species, particularly for those that are threatened or significant.
- To promote awareness of native fauna and processes that threaten these species.
- To conserve populations of threatened fauna including Common Bent-wing Bats, Large-eared Pied Bats, Osprey and the locally significant Sooty Oystercatcher, Reef Egret, Long-nosed Bandicoot and the Perigrine Falcon.
- To conserve habitats for endangered populations of Squirrel Gliders, Koalas and for the threatened Glossy Black-cockatoo.
- To control or eradicate introduced fauna in the reserve

Performance targets:

- The conservation of the diversity and distribution of habitats and resources for native fauna species.
- The increase in awareness of and reduction in threatening processes such as predation by cats and foxes in the reserve.

- Reduction in the abundance and distribution of introduced fauna in the reserve such as cats, foxes, dogs, myna birds and rabbits.

Actions:

- Implement and support regeneration and where appropriate revegetation programs with a focus on fauna habitat species.
- Erection of an interpretive sign near the Marine Parade access point illustrating the threatened and significant fauna species in and adjacent to the reserve.
- Control of domestic cats and dogs through a public education campaign and by impoundment of free-roaming dogs.
- Conduct neighbour education program about native fauna and the threat cats and dogs are to native fauna if not contained.
- Implement a program of introduced fauna control or eradication if appropriate.
- Update/ rewrite leaflet about Bangalley Headland and North Avalon Headland Reserves.

Performance assessments:

- Monitor the abundance and distribution of introduced fauna species to assess effectiveness of control and eradication programs.
- Attitudes of neighbors will be monitored through response to information provided, written complaints and compliments.
- Formal survey of attitudes and understanding will be considered every 5 years.

4.5. Cliff Face Management/ Risk Management

The reserve is designated as having slip potential. Warning signs both along the headland and on rock platforms below have been erected to attract the attention of users as to the likely risks involved with precipitous drops and rock falls.

Due to safety concerns following a partial collapse of its roof during 1983, the stability of St Michaels Cave was investigated by Coffey & Partners (1985). They found that gaining access to the cave was probably as dangerous as being in the cave. The cave was subsequently fenced off by Warrigah Shire Council. The original fence was a steel pole and chain wire structure which eventually succumbed to the elements with frequent assistance from local vandals. The present structure was installed by Pittwater Council in 1992.

Potentially unstable rock masses were also identified by Coffey Partners at the southern end of Whale Beach. These have been stabilised by remedial works involving grooming of the rock face and erection of safety netting over the escarpment. Further work, including underpinning of potentially unstable rock, is planned.

Given the proximity to vertiginous cliffs and steep descents involved, any proposal to extend the Bicentennial Coastal Walkway to Whale Beach Road and/or Rayner Road would need to be preceded by risk management assessment of the route.

Objectives:

- To preserve the natural landform through the preservation of natural vegetation and landscape processes.
- To minimise human induced processes that accelerate erosion.
- To manage risk to the public utilising the Bicentennial Coastal Walkway.

Performance targets:

- The reduction of human induced acceleration of erosion.
- The provision of a Bicentennial Coastal Walkway with a low to moderate level of risk to users.

Actions:

- To assess the risks related to landscape processes and recreational use.
- Identify problem areas and implement strategies to reduce risk to acceptable levels.
- To identify safety issues and prescribe management actions to reduce risks to the public.

Performance assessments:

- To assess the effectiveness of management activities in reducing erosion.
- To assess effects of drainage management on the reserve.
- Assessment of risks and risk management.

4.6. Cultural Heritage Management

The Reserves are known to contain at least one shelter site with rock art and one Midden. These provide valuable information regarding the occupation of the area by the Guringai Tribe. The surrounding area contains a number of aboriginal sites including shelter caves, art sites and middens.

No significant European cultural heritage sites are known to be located in the reserves.

Objectives:

- To conserve the known and potential cultural heritage values of the headland.
- To increase community awareness of the local indigenous heritage.

Performance targets:

- The protection of known or potential heritage sites from degradation.

Actions:

- To prescribe management actions aimed at the conservation of the known or potential cultural values of the headland.
- To consult with indigenous land councils in reference to appropriate heritage management.

Performance assessments:

- Whether complete documentation of known heritage values is recorded.
- The identification and protection of known or potential heritage values.

5. References

- Blakers, M., Davies, S.J.J.F., & Reilly, P.N.(1984), *The Atlas of Australian Birds* Royal Australasian Ornithologists Union, Melbourne University Press.
- Briggs, J.D., & Leigh, J.H., (1995), *Rare or Threatened Australian Plants*. CSIRO Publishing, Collingwood.
- Burcher, P. & Lembit, R. (1997) *Coastal Flora & Fauna Study*. Report prepared for Pittwater Council.
- Champion, S&G (1997) *Manly, Warringah and Pittwater (Vol.1) 1788-1850*. Fast Books Glebe.
- Champion, S&G (1998) *Manly, Warringah and Pittwater (Vol.2) 1850-1880*. Fast Books Glebe.
- Coffey & Partners (1985) Report to Warringah Shire Council on stability of St Michaels Cave.
- Coffey & Partners (1987) *Coastal Headlands in Warringah Shire*. Report to Warringah Shire Council.
- Elegant Concepts (1999) *Feasibility Study: Extension of the Warringah-Pittwater Coastal Walk from Bangalley Headland to Careel Head, Whale Beach*. Report prepared for Pittwater Council.
- Macrae, M (1988)
- Morris, A.K., McGill, A.R., & Holmes, G. (1981), *Handlist of Birds in New South Wales*. NSW Field Ornithologists Club, Sydney.
- Pollon, F. (1988) *The Book of Sydney Suburbs*.
- Quin, DG (1995) *Population ecology of the Squirrel Glider (Petaurus norfolcensis) and the sugar Glider (P.breviceps) (Marsupalia: Petauridae) at Limeburners Creek on the central North Coast of New South Wales*. Wildlife Research 22(4) pp 471 -506.
- Smith, A. P (1996) *Adequacy of fauna assessments, proposed subdivision, 5A Wollombi Road, Bilgola*. Report to Pittwater Council
- Smith, P & Smith, J (1998) *Management Plan for Koalas and Other Threatened Fauna in Pittwater*. Report prepared for Pittwater Council
- Smith. J and Smith, P. (1990), 'Decline of the urban Koala (Phascolarctos cinereus) population in Warringah, Sydney' *Australian Zoologist* Vol. 26 No. 3&4.
- Smith. J and Smith, P. (1992), *Flora and Fauna Survey of Mackay Reserve*. Report to Pittwater Council

Appendix 1 Plant Species List For Bangalley Reserve and North Avalon Headland Reserve.

Family	Genus species	Record
ACANTHACEAE	Pseuderanthemum variabile	
ADIANTACEAE	Adiantum aethiopicum	
APIACEAE	Actinotus helianthi	
	Centella asiatica	
	Hydrocotyle acutiloba	
	Platysace linearifolia	
ARALIACEAE	Poliscias sambucifolia	
ASTERACEAE	Cassinia longifolia	
	Craspedia glauca	
BIGNONIACEAE	Pandorea pandorana	
BLECHNACEAE	Blechnum cartilagineum	
	Doodia aspera	
CASSYTHACEAE	Cassytha pubescens	
CASUARINIACEAE	Allocasuarina distyla	
	Allocasuarina littoralis	
CYPERACEAE	Gahnia sieberana	
	Isolepis nodosus	
	Lepidosperma laterale	
DILLENIACEAE	Hibbertia obtusifolia	
	Hibbertia pedunculata	
	Hibbertia dentata	
EPACRIDACEAE	Brachyloma daphnoides	
	Epacris pulchella	
	Leucopogon parviflorus	
EUPHORBIACEAE	Breynia oblongifolia	
	Micranthemum ericoides	
EUPOMATIACEAE	Eupomatia laurina	
FABACEAE	Hardenbergia violacea	
	Jacksonia scoparia	
	Kennedia rubicunda	
	Mirbelia rubifolia	
	Platylobium formosum	
	Pultenea daphnoides	
	Pultenea elliptica	
GERANIACEAE	Geranium homeanum	
GLEICHENIACEAE	Gleichenia rupestris	
GOODENIACEAE	Dampiera stricta	
	Goodenia bellidifolia	
	Goodenia ovata	
	Scaevola ramosissima	
IRIDACEAE	Patersonia sericea	
LAMIACEAE	Plectranthus parviflorus	
	Westringia fruticosa	
LILIACEAE	Dianella caerulea	
	Schellhammera undulata	
	Stypandra umbellata	
	Thysanotus juncifolius	
LINDSAEACEAE	Lindsaea linearis	
LOGANIACEAE	Mitrasacme polymorpha	
MENISPERMACEAE	Sarcopetalum harveyanum	

MIMOSACEAE	Acacia brownei	
	Acacia myrtifolia	
	Acacia suaveolens	
	Acacia mearnsii	
MYRSINACEAE	Rapanea variabilis	
MYRTACEAE	Acmena smithii	
	Angophora floribunda	
	Baeckea imbricata	
	Callistemon rigidus	
	Corymbia gummifera	
	Eucalyptus piperita	
	Eucalyptus umbra	
	Leptospermum attenuatum	
	Leptospermum laevigatum	
	Melaleuca hypericifolia	
	Melaleuca thymifolia	
	Tristania laurina	
ORCHIDACEAE	Caleana major	
OLEACEAE	Notelaea laurina	
OSMUNDACEAE	Todea barbara	
PHILESIACEAE	Eustrephus latifolius	
	Geitonoplesium cymosum	
PITTOSPORACEAE	Billardiera scandens	
	Pittosporum undulatum	
POACEAE	Imperata cylindrica	
	Themeda australis	
PROTEACEAE	Banksia ericifolia	
	Banksia integrifolia	
	Banksia oblongifolia	
	Banksia serrata	
	Banksia spinulosa	
	Grevillea sericea	
	Hakea dactyloides	
	Hakea gibbosa	
	Hakea sericea	
	Hakea teretifolia	
	Isopogon anemonifolius	
	Persoonia levis	
	Persoonia linearis	
PTERIDACEAE	Pteridium esculentum	
	Pteris tremula	
RUTACEAE	Zieria laevigata	
SANTALACEAE	Exocarpos cupressiformis	
SAPINDACEAE	Dodonea triquetra	
SMILACACEAE	Smilax glyciphylla	
STERCULIACEAE	Lasiopetalum ferrugineum	
	Rulingia hermanifolia	
THYMELEACEAE	Pimelia linifolia	
VIOLACEAE	Viola hederacea	
VITACEAE	Cissus antarctica	
XANTHORRHOEACEAE	Lomandra obliqua	
	Xanthorrhoea media	
ZAMIACEAE	Macrozamia communis	

Appendix 2 Bangalley Reserve and North Avalon Headland Reserve Weed List

Legend: Weed Type: W= Woody, H= Herbaceous, V= Vines, B= Bulb.
Priority: P= Primary, S= Secondary.

Genus species	Common Name	Weed Type	Priority
Acetosa sagittata	Turkey Rhubarb	V	P
Ageratina adenophora	Crofton weed	H	S
Andropogon virginicus	Whiskey Grass	H	S
Araujia sericiflora	Moth Vine	V	P
Bidens pilosa	Cobblers pegs	H	S
Briza sp.	Shivery Grass	H	S
Chrysanthoides monilifera sub. rotundata	Bitou	W	P
Chrysanthoides monilifera sub. monilifera	Boneseed	W	P
Chlorophytum comosum	Spider plant	H	S
Cinnamomum camphora	Camphor Laural	W	P
Cirsium vulgare	Thistle	H	S
Colacasia esculentum	Elephant ears	H	P
Conzya sp.	Fleabane	H	S
Crassocephalum crepidoides	Thick head	H	S
Erharta erecta	Panic-velt Grass	H	S
Erigeron karvinskiaus	Seaside daisy	H	S
Hedera sp.	Ivy	V	P
Hedychium gardnerianum	Sweet ginger	H	P
Hydrocotyle bonariensis	Penny wort	H	P
Hypochoeris radicata	Cats ear	H	S
Ipomea indica	Morning glory	V	P
Lantana camara	Lantana	W	P
Ligustrum lucidum	Privet (large leaf)	W	P
Ligustrum sinense	Privet (small Leaf)	W	P
Lilium formosanum	Formosum Lilly	B	S
Lonicera japonica	Honey Suckle	V	P
Nephrolepis cordifolia	Fishbone	H	P
Ochna serrulata	Mickey mouse plant	W	P
Olea europea var. africana	African olive	W	P
Paspalum dilatatum		H	S
Pennisetum clandestinum	Kikuyu	H	S
Phytolacca octandra	Ink weed	H	S
Plantago lanceolata	Lambs tongue	H	S
Protoasparagus aethiopicus	Asparagus fern	H	P
Pyracantha sp.	Firethorn	W	S
Raphiolepis sp.	Indian Hawthorn	W	S
Rubus fruticosus	Blackberry	H	P
Senecio sp.	Fireweed	H	S
Senna pendula	Cassia	W	P
Setaria gracilis	Pigeon grass	H	S
Sida rhombifolia	Paddies lucherne	H	P
Solanum mauritanum	Wild Tobacco	W	P
Solanum nigrum	Blackberry Nightshade	H	S
Sonchus oleraceus	Sow thistle	H	S
Stenotaphrum secundatum	Carpet grass	H	S
Tradescantia albiflora	Wandering jew	H	P
Watsonia bulbilifera	Watsonia	B	P

Appendix 3 Bangalley Reserve and North Avalon Headland Reserve Fauna List

Key

Reference

UBW -Urban Bushland Survey Winter; UBS - Urban Bushland Survey Summer; sources in B&L - Burcher & Lembit, (1997); S&S - Smith & Smith (1998); P - present study; L - likely to occur

Status

R=resident F=frequent visitor W=winter migrant

O=occasional or uncommon visitor S=summer migrant

Bold = regionally significant species ***Bold Italic*** = Threatened Species

Common name	Scientific name	Status	Reference
<u>Birds</u>			
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	R	S&S
Reef Egret	<i>Egretta sacra</i>	F	B&L
Osprey	<i>Pandion haliaetus</i>	F	S&S
Black-shouldered Kite	<i>Elanus notatus</i>	F	UBS
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	F	UBS
Whistling Kite	<i>Haliastur sphenurus</i>	F	UBS
Brahminy Kite	<i>Haliastur indus</i>	O	P
Australian Kestrel	<i>Falco cenchroides</i>	R	UBW
Peregrine Falcon	<i>Falco peregrinus</i>	F	UBW
Spotted Turtle-dove	<i>Streptopelia chinensis</i>	R	UBS
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	F	UBW
Galah	<i>Cacatua roseicapilla</i>	F	UBW
Glossy Black-cockatoo	<i>Calyptorhynchus lathami</i>	O	L
Australian King-Parrot	<i>Alisterus scapularis</i>	F	UBS
Crimson Rosella	<i>Platycercus elegans</i>	F	UBS
Eastern Rosella	<i>Platycercus eximius</i>	F	UBW
Musk Lorikeet	<i>Glosopsitta concinna</i>	O	L
Little Lorikeet	<i>Glosopsitta pusilla</i>	O	L
Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>	O	L
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	F	UBS
Common Koel	<i>Eudynamys scolopacea</i>	S	L
Southern Boobook	<i>Ninox novaeseelandiae</i>	R	L
Tawny Frogmouth	<i>Podargus strigoides</i>	R	P
Kookaburra	<i>Dacelo novaeguinea</i>	R	UBS
Sacred Kingfisher	<i>Halcyon sancta</i>	S	UBS
Dollarbird	<i>Eurystomus orientalis</i>	S	UBS
Welcome Swallow	<i>Hirundo neoxena</i>	F	UBS
Richard's Pipit	<i>Anthus novaeseelandiae</i>	F	L
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	R	UBS
Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	R	UBS
Golden Whistler	<i>Pachycephala pectoralis</i>	R	UBS
Leaden Flycatcher	<i>Myiagra rubecula</i>	S	L
Black-faced Monarch	<i>Monarcha melanopsis</i>	S	L
Grey Fantail	<i>Rhipidura fuliginosa</i>	R	L
Willie Wagtail	<i>Rhipidura leucophrys</i>	R	UBS

Superb Fairy-wren	Malurus cyaneus	R	UBS
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Common name	Scientific name	Status	Reference
Variegated Wren	Malurus lamberti lamberti	R	L
White-browed Scrubwren	Sericornis frontalis	R	UBS
Brown Thornbill	Acanthiza pusilla	R	UBS
Eastern Spinebill	Acanthorhynchus tenuirostris	R	UBS
Red Wattlebird	Anthochaera carunculatus	R	L
Little Wattlebird	Anthochaera chrysoptera	R	UBS
Yellow-faced Honeyeater	Lichenostomus chrysops	W	UBW
White-naped Honeyeater	Melithreptus lunatus	W	UBW
Noisy Friarbird	Philemon corniculatus	R	L
White-cheeked Honeyeater	Phylidonyris nigra	R	UBS
New Holland Honeyeater	Phylidonyris novaehollandiae	R	L
Scarlet Honeyeater	Myzomela sanguinolenta	W	L
Spotted Pardalote	Pardalotus punctatus	R	UBS
Silvereye	Zosterops lateralis	R	UBS
Red-browed Finch	Emblema temporalis	R	L
Grey Butcherbird	Cracticus torquatus	R	UBS
Australian Magpie	Gymnorhina tibicen	R	UBS
Pied Currawong	Strepera graculina	R	UBS
Australian Raven	Corvus coronoides	R	UBS
<u>Mammals</u>			
Sugar Glider	Petaurus breviceps	R	L
<i>Squirrel Glider</i>	<i>Petaurus norfolcensis</i>	R?	L
Common Ringtail Possum	Pseudocheirus peregrinus	R	UBS
Common Brushtail Possum	Trichosurus vulpecula	R	UBS
Long-nosed Bandicoot	Perameles nasuta	R	UBS
Grey-headed Flying-fox	Pteropus poliocephalus	O	L
Gould's Wattled Bat	Chalinolobus gouldii	R	UBS
<i>Common Bent-wing Bat</i>	<i>Miniopterus schreibersii</i>	W?	S& S
<i>Large-eared Pied Bat</i>	<i>Chalinolobus dwyeri</i>	W?	S& S
Fox*	Vulpes vulpes	F	L
Rabbit*	Oryctolagus cuniculus	R	UBS
<u>Reptiles</u>			
Golden-crowned Snake	Cacophis squamulosus	R	L
Yellow-faced Whip Snake	Demansia psammophis	R	UBS
Leaf-tailed Gecko	Phyllurus platurus	R	L
Eastern Water Skink	Eulamprus quoyii	R	UBS
Striped Skink	Ctenotus robustus	R	L
Copper-tailed Skink	Ctenotus taeniolatus	R	L
Grass Skink	Lampropholis delicata	R	L
Garden Skink	Lampropholis guichenoti	R	UBS
Three-toed Skink	Saiphos equalis	R	L
Weasel Skink	Saproscincus mustelina	R	L
Blue-tongued Lizard	Tiliqua scincoides	R	L
Red Bellied Black Snake	Pseudechis porphyriacus	R	M

