



WARRINGAH COUNCIL

Mountain Biking in Warringah

Research and Directions

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Warringah Council

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Executive Summary

The Warringah Local Government Area has a rich beach and bush landscape that is popular for outdoor sport and recreation activities. Mountain biking (see Section 1 for definitions) is one such activity attracting people to the local bushland environment. It is recognised as a growing activity across much of Australia including Warringah (see Section 2).

In recent years Council has received numerous requests to increase the number of authorised mountain bike tracks in Warringah (see Section 1). The purpose of this paper is to conduct strategic level investigations and present an evidence based foundation to inform planning for future facilities.

At present, mountain biking opportunities in Warringah and the broader northern Sydney region are disjointed with little to no connectivity between trails. Manly Warringah War Memorial Park (hereafter referred to as Manly Dam) has approximately 11 kilometres of combined fire trails and single track¹ accessible for mountain bike riding. Mountain biking is also permitted on fire trails in both Garigal and Ku-ring-gai Chase National Parks. The National Parks and Wildlife Service NSW (NPWS) are investigating the potential to increase the provision of mountain bike tracks in northern Sydney, including the possibility of single track (see Sections 3 and 4). Increasing trends in mountain bike riding in Warringah (see Section 2) and across Australia and a projected population increase for Sydney of 1.7 million people between 2006 and 2036² will put additional pressure on regional recreation facilities such as Manly Dam and national parks.

There are a large number of unauthorised mountain bike tracks in Warringah (see Section 4), particularly in areas such as Oxford Falls and Red Hill. Unauthorised tracks are often developed by riders to provide a particular riding experience or a level of track difficulty that is not available on authorised tracks. They can also be developed when authorised tracks reach a high level of user capacity which can lessen the experience for some riders who then look elsewhere for tracks to suit their needs and wants. Many unauthorised mountain bike tracks were originally walking tracks, while others may have originally been 4WD access tracks or power line or drainage easements. Some tracks have been forged by the riders themselves.

Unauthorised trails, including technical features such as jumps and bridges that have not been planned, constructed or managed in a sustainable manner, can have a significant impact on track erosion, threatened species and damage to Aboriginal heritage (see Section 5 and Appendix E). There are also safety and liability issues concerned (see Section 5).

The NPWS Sustainable Mountain Bike Strategy³ has identified that the provision of a small number of high quality mountain bike experiences is a key strategy for reducing unauthorised mountain biking and track construction. The Strategy highlights the success of this approach at Glen Rock State Conservation Area, which has seen a significant decline in the creation of illegal tracks. However, the extent to which an increase in provision would reduce instances of unauthorised access would depend on how well the available facilities meet the demands.

This document discusses the current status of the provision of mountain biking facilities in Warringah in addition to the complexity of issues surrounding any increase in provision (see Section 4). There are two primary factors limiting Council's opportunities to increasing the number of authorised mountain bike tracks. Firstly, Council does not own or manage much of the land that is currently being used for unauthorised mountain biking. Unauthorised tracks often traverse multiple land tenures thereby further complicating any opportunities to formalise them, as well as presenting problems related to trespassing. Secondly, the cost of planning, constructing, managing and maintaining tracks can be high (see Section 5) and securing appropriate funding sources can be difficult.

¹ Single track mountain biking takes place on narrow trails that are only wide enough for one rider at a time.

² NSW Government (2010)

³ Office of Environment & Heritage NSW (2011)

Given the constraints mentioned above, Council has identified modest opportunities for links and improvements that may enhance overall connectivity of the existing trail network. Opportunities for substantial increases in mountain bike provision in Warringah are contingent upon either the establishment of partnerships with other landowners (e.g. NPWS) or through enhancing the mountain bike facilities already under the control of Council, that is, enhancing the quality and diversity of trails at Manly Dam. Further investigations into the feasibility of options presented in this paper will require financial and project support to assess the likely costs and benefits. Possible future opportunities for mountain bike provision are summarised in Table 1 and discussed in greater detail in Section 4.

Council will continue to liaise with various land owners and managers in northern Sydney regarding their intentions for increasing the number of authorised mountain biking facilities so as to maintain an understanding of the regional provision and to identify potential future opportunities for authorising cross tenure tracks.

Table 1 Summary of future mountain biking opportunities in Warringah

Opportunity	Where	Landowner/manager	Constraints	Complexity (based on constraints)	Priority
Formalised trail/link	Forestville Park to Garigal National Park	Warringah Council NPWS	Forestville Park POM to be completed in 2012 and clarify the permissibility of mountain biking Currently no formal trail in the National Park to link with – pending confirmation of proposed Bantry Bay loop Aboriginal heritage Threatened species	High	High
New or improved trails	Manly Dam	Council managed Crown	Pending review of POM Competing user interests Impact on vegetation Availability of resources	High	High (for improved trails) Medium (for new trails)
Formalise existing trails or develop new trail/s – consideration should be given to providing trails for Downhill and/or Free riding, for which there is a high demand yet no formal provision	Oxford Falls/ Red Hill	Crown – to be managed by Warringah Council in the future MLALC NPWS Dept of Ed Sport & Rec Crown under lease Private Warringah Council	Multiple land owners – existing trails traverse multiple land tenures Land not currently managed by Warringah Council Draft Oxford Falls Regional Crown Reserve PoM enables mountain bike provision to be reviewed Aboriginal land claims on some Crown Land Threatened species/communities	High	High
New Cross Country and Downhill trails and skills park	Belrose Waste Management Centre	Waste Asset Management Corporation	Not Council land Need third party to manage Geotechnical constraints Health and safety	High	High
Mountain bike hub	Warringah Aquatic Centre precinct	Warringah Council Potentially other land owners depending on size and scope of project	May be dependent on the NPWS moving ahead with their proposed mountain bike loop at Garigal National Park Threatened species in nearby bush land Aboriginal land claims in vicinity	Medium	High

			Funds for capital and operations		
			Retaining access for current users of Aquatic Reserve		
Dirt jump/ pump track	Condover Reserve	Warringah Council	Ambiguous if POM permits it	High	Medium
Link – as per Regional Multiple Use Trail Strategy	Condover Reserve	Warringah Council	Resource allocation	High	Medium
Links	Manly Dam Loop to proposed Bantry Bay loop in Garigal NP	Warringah Council NPWS Crown	Pending development of Bantry Bay loop in Garigal NP Pending Manly Dam POM review Aboriginal land claims MLALC land in vicinity Road based linkages already available Safety issues with riders crossing Wakehurst Parkway	High	Medium
Dirt jump/ pump track	Terrey Hills Oval	Warringah Council	Requires management by a community group Permitted in POM	Medium	Low
Formalised trail/link	Booralie Trail, Duffys Forest	Warringah Council NPWS Private	Needs to be re-routed around private property POM required for Council land Need to liaise with NPWS re link to Cullamine fire trail Threatened species Potential conflict and safety concerns for horses and riders	Medium	Low
Formalise trail/link	Cullamine Track to Bibbenluke Track – via Booralie Trail, Duffys Forest	Council to take over ownership of piece of land adjoining National Park in the future NPWS	Council's ownership of land has not been finalised and POM would be required Bibbenluke Trail in National Park is currently unauthorised for mountain bikes May require some road riding Potential conflict and safety concerns for horses and riders	High	Low
Formalised trail/link	JJ Melbourne Hills, Terrey Hills to Garigal National Park	Warringah Council NPWS	JJ Melbourne Hills POM allows for potential link to National Park for mountain bikes Currently no formal trail in the National Park to link with Threatened species/communities	Medium	Low
Formalised links – as per Regional Multiple Use Trail Strategy	Linking Ku-ring-gai LGA to Warringah LGA via Garigal National Park	Ku-ring-gai Council NPWS	Multiple land owners Little Council owned/managed land in the area, therefore largely out of Council's control – but can express support	High	Low

		MLALC Warringah Council Crown	Threatened species Aboriginal heritage		
Mountain bikers establish their own trails	On land deemed appropriate with constraints having been taken into consideration	Mountain bikers to take out lease and manage trails themselves	Capacity of the mountain biking community Complexity of multiple land tenures Aboriginal land claims Threatened species Aboriginal heritage	High (for mountain bikers) High (if Council is land manager/owner) Low (for Council if not land owner/manager)	Low

1.0 Introduction

Warringah's bushland environment provides an inviting backdrop for outdoor recreational pursuits such as mountain biking. Public submissions made to Council's 2009 Recreation Strategy highlighted an increased demand for facilities suitable for mountain biking and other off-road cycling within Warringah. The 2009 Recreation Strategy outlined the need to further determine Council's role and involvement in the provision of off road cycling opportunities through the completion of research and consultative activities. This document is a key component in this process.

1.1 Objectives

- Identify the current mountain biking opportunities in Warringah, both authorised and unauthorised (including, where possible, tracks in National Parks and other land tenures)
- Identify the demographics of mountain bike riders in Warringah, including how many riders there are, where they ride and how often
- Identify opportunities for increasing the provision of mountain biking in Warringah – including cross tenure opportunities
- Identify the constraints to increasing the provision of mountain biking in Warringah
- Identify the issues relating to planning, constructing, managing and maintaining mountain bike tracks, including cost, environmental impacts and other trail users

1.2 Scope

This document addresses the current and future opportunities for mountain biking as per the objectives listed above. For the purpose of this paper the term 'mountain biking' is used throughout this document to describe all forms of off-road cycling that does not take place on roads or formal bike paths, unless otherwise stated. Mountain bike riding is defined as simply the riding of a bicycle either on a dirt trail or other unpaved track, trail or surface.⁴ It is beyond the scope of this study to consider other forms of recreational cycling, for example on formal paths or as a method of transport.⁵

There are many styles of riding associated with mountain biking, including the following:

Cross country	Trails are often a combination of single track and fire trails, but many riders have a preference for primarily single track.
Free riding	Riding over natural and constructed technical features such as rocks, logs, elevated bridges, jumps, drop-offs and teeter-totters.
Downhill / Descending	Trails descend steeply and are technically challenging. Longer trails require riders to be shuttled to the top.
All Mountain	A cross between the free riding and cross country bikes. Bikes are designed to accommodate almost all kinds of riding terrain and can be ridden up hill or down hill.
Dirt Jumping	Riding bikes over shaped jumps made from mounds of dirt and becoming airborne between mounds.

⁴ Eco Access (2007)

⁵ For further information on these types of cycling see Warringah Council's *Warringah Bike Plan* (2010)

Pump Track	A flat circuit track with bumps and elevations designed to be ridden without pedaling. Riders use their body to 'pump', that is, push down into the dip and pull themselves up the crest.
BMX	BMX (Bicycle motocross) was inspired by motocross racing and involves racing around a dirt track with jumps and obstacles.
Trial Riding	Trial riding consists of hopping and jumping bikes over obstacles without touching a foot on the ground.
Four Cross	Mountain-cross or four-cross is where four riders compete on a specially designed steep descent with a highly challenging course with a mix of natural and man-made features.

Although there are various types of mountain bike riding, there are primarily three levels of involvement: recreational riding, active riding and competitive riding. It is primarily the first two levels that are addressed in this paper.

1.3 Brief history

The mountain bike was developed in the 1970's through the merging of the road bicycle and the BMX (bicycle motocross) into a full sized bicycle, with gears and wide tyres suitable for riding off-road or on the road.⁶ By the mid-1980's, mountain bikes were appearing in bicycle shops around the world and races began in many countries. The first MTB World Championships were held in Durango Colorado USA in 1990 where there were two events - cross country and downhill. There are now five distinct disciplines in the annual World Championships - Olympic Cross Country, Marathon Cross Country, mountain bike 24-hour event, traditional downhill and the shorter downhill oriented Four Cross. Beyond these five disciplines, there are many event variations, especially for the cross country riders, such as 6-hour, 8-hour, 12-hour, mountain bike stage races and short track cross country events. Mountain bike cross country racing was first contested as an Olympic Sport in 1996, with BMX being contested for the first time in 2008. All Mountain racing is also growing in popularity.

The development of purpose built facilities and trails across the world have increased significantly over the last 16 years. Further discussion on participation rates is explored in the following section.

1.4 Consultation

An online survey of residents and visitors who ride mountain bikes in Warringah was conducted between Thursday 30 June and Sunday 31 July. Council received 1647 completed surveys. There were 2984 'views' of the survey. Questions were not compulsory which enabled people to answer only the questions they were comfortable with. For instance, some people chose not to answer personal demographic questions such as age and income. The number of responses for each question therefore varies.

The survey was promoted via the Manly Daily, the Manly Dam mountain bike email list, online forums, bike shops, mountain bike clubs and posters located at the head of mountain bike trails. People under 16 years of age were unable to be targeted specifically, however, emails regarding the survey were sent to schools within Warringah, School Representative Councils and Youth Council representatives.

Following the survey a meeting was held with a group of mountain bike riders to discuss the survey results and the possible opportunities for increasing the provision of mountain biking in Warringah. Participants were selected from mountain clubs, bike shops and randomly selected survey respondents who indicated an interest in being involved in future consultation.

⁶ Chiu & Kriwoken (2003)

Consultation was also undertaken with the National Parks and Wildlife Service NSW, the managers of various mountain bike trails from around Australia, other local councils and the Metropolitan Local Aboriginal Land Council.

Public exhibition of the draft document (24 November to 15 December 2011) was publicised through similar means to those outlined above for the online survey, with the addition of posters in the vicinity of future mountain bike trail opportunities.

1.5 Relationship to other Council documents

This document brings together opportunities identified in several existing Council documents as well as identifying new opportunities, thereby enabling a whole of Council perspective on the future of mountain biking in Warringah. Relevant Council documents include the 2009 Recreation Strategy, 2007 Warringah Regional Multiple Use Trail Strategy, 2010 Warringah Bike Plan and various Plans of Management.

2.0 Background

2.1 Participation & demographics

Demographic and participation data of mountain bike riders in Warringah

There has been much media attention regarding the increasing popularity in mountain biking both in Warringah as well as Australia generally. Due to mountain biking being primarily an unorganised activity there is limited data available on the exact number of people participating, how often, where and when. To gain information on rider demographics and participation rates in Warringah, an online survey was conducted of residents and visitors who ride within the local government area. This section provides an overview of participation rates, club memberships and other data, providing a picture of what is happening in mountain biking in Warringah.

Warringah's online survey of mountain bike riders received 1647 responses from people who participate in mountain biking. Forty seven percent (n= 1644) were from the Warringah local government area. Riders from Manly and Pittwater combined constituted a further 10% of respondents. Respondents were from 236 different suburbs, primarily Sydney based, with a strong input also from the Central Coast. There were a small number of responses from Melbourne, Brisbane, Canberra, Perth and Christchurch, New Zealand

Respondents were predominantly male (92%, n=1497) and reported themselves as more likely to be married or defacto (77%, n=1498) compared to those who reported being single (23%). The largest proportion of respondents were from the 35-49 age group (57%, n=1504) (Figure 1). There were also large numbers of 25-34 year olds (29%). Many respondents stated that they were participating in the survey on behalf of their families and wanted it noted that children and youth are not always able to voice their own needs. They are highly educated, with 70% (n=1499) having an Undergraduate degree or higher (Figure 2). Forty three percent (n=1422) reported being in the top Australian Bureau of Statistics income category of \$104,000 gross annually or more (Figure 3).

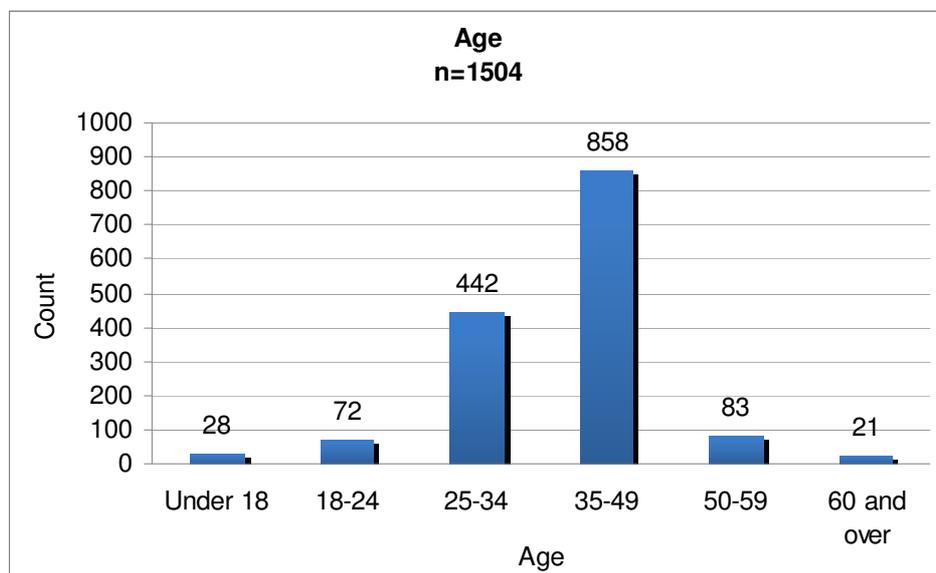


Figure 1 Age of riders (Warringah Council 2011)

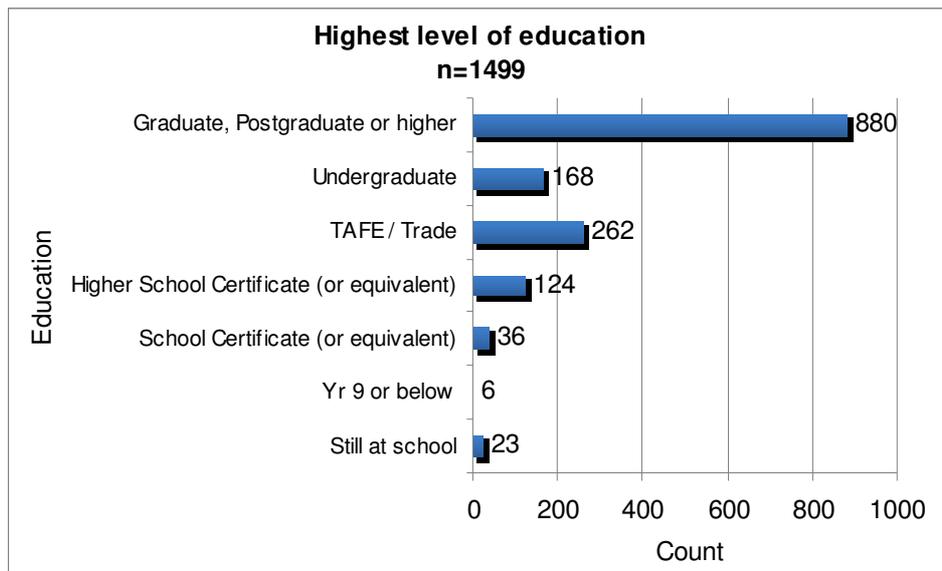


Figure 2 Level of education (Warringah Council 2011)

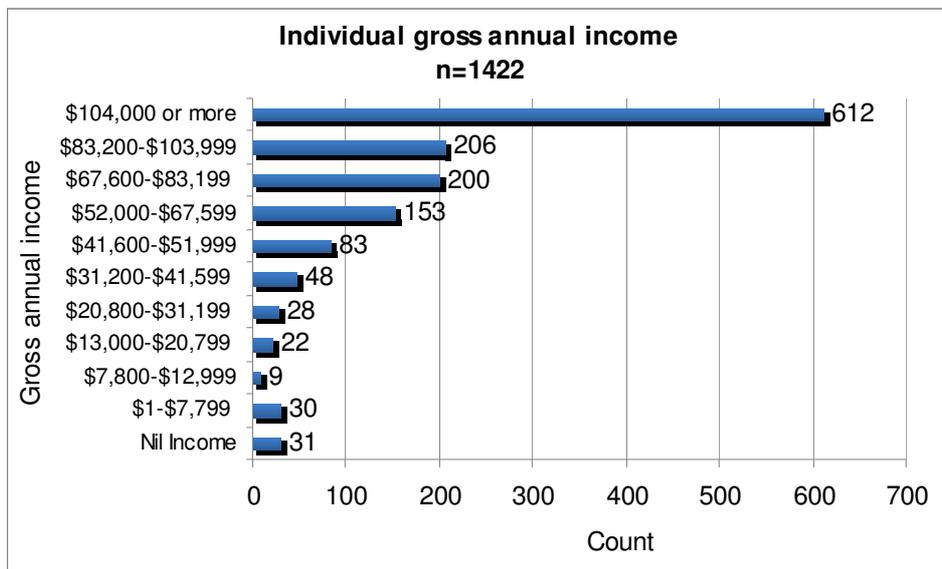


Figure 3 Individual gross annual income (Warringah Council 2011)

The majority of respondents are of Intermediate (44%, n=1647) or Advanced (41%) level of skill (Figure 4), with 69% (n=1590) riding often (once a week) or very often (more than once a week) (Figure 5). According to Table 2, under 18s, 18-24 year olds and 50-59 year olds are more likely to ride very often (more than once per week), with 25-34 year olds, 35-49 year olds and those 60 years and over more likely to ride often (every week). Twenty eight percent (n=1580) listed that they were a member of a mountain bike club, group or organisation.

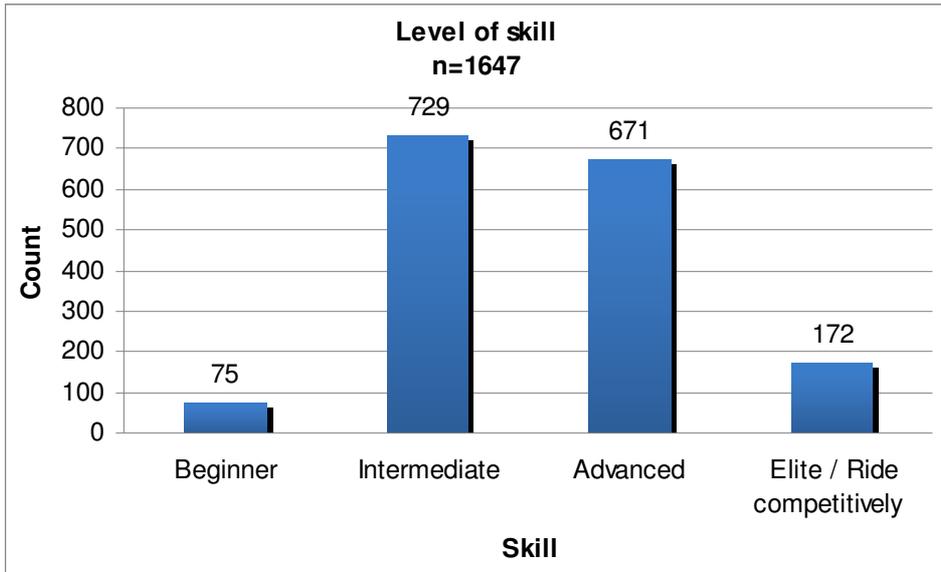


Figure 4 Level of skill (Warringah Council 2011)

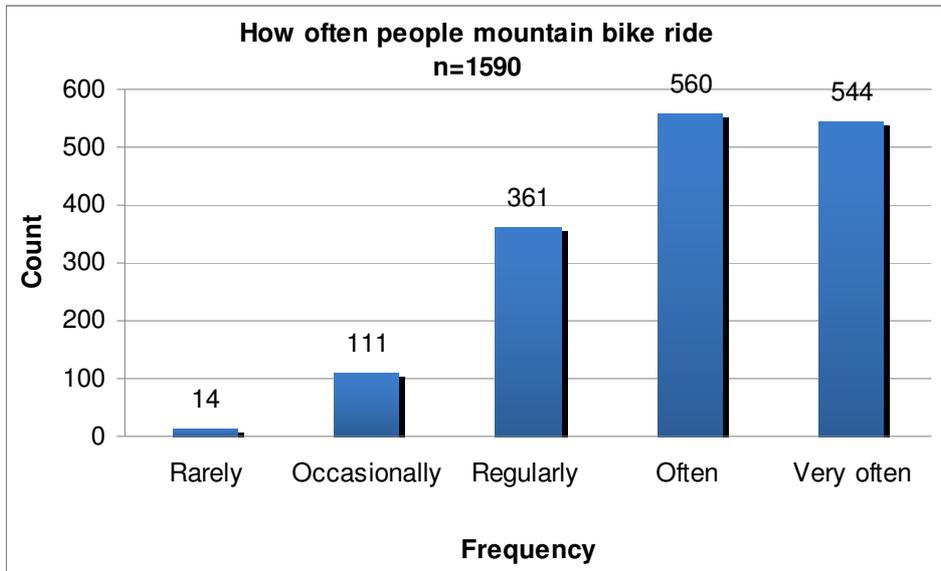


Figure 5 How often people ride. Rarely = once or twice a year, Occasionally = once every couple of months, Regularly = once or twice a month, Often = every week, Very often = more than once a week. (Warringah Council 2011)

Table 2 Cross tabulation of age versus how often people ride (Warringah Council 2011)

How often do you go mountain bike riding?						
Age	Rarely	Occasionally	Regularly	Often	Very often	Row Totals
Under 18	0	1	4	7	16	28
	0%	3.57%	14.29%	25%	57.14%	1.86%
18-24	0	2	14	22	34	72
	0%	2.78%	19.44%	30.56%	47.22%	4.79%
25-34	1	29	104	166	142	442
	0.23%	6.56%	23.53%	37.56%	32.13%	29.39%
35-49	6	61	197	305	289	858
	0.7%	7.11%	22.96%	35.55%	33.68%	57.05%
50-59	2	11	14	26	30	83
	2.41%	13.25%	16.87%	31.33%	36.14%	5.52%
60 and over	1	1	5	9	5	21
	4.76%	4.76%	23.81%	42.86%	23.81%	1.4%
Column Total	10	105	338	535	516	1504
Column Percent	0.66%	6.98%	22.47%	35.57%	34.31%	100%

Large numbers of participation in all riding styles were reported (Figure 6). Cross country riding (combined fire trails and single track or primarily single track) is the most popular discipline overall, followed by free riding, downhill, fire trails, dirt jumping and BMX respectively. 'Other' styles reported included All Mountain, pump track, cyclo-cross, trials, enduro, four cross, mountain unicycling, technical, jumps, mountain bike orienteering, short course, touring and velocross.

As shown in Table 3, cross country (combined single track and fire trails) received the highest percentage of responses across all age groups with the exception of under 18s. Cross country single track ranked second as a percentage across all age groups with the exception of under 18s and 18-24 year olds. A higher percentage of under 18s and 18-24 year olds participate in free riding, downhill, dirt jumping and BMX when compared to the other age groups.

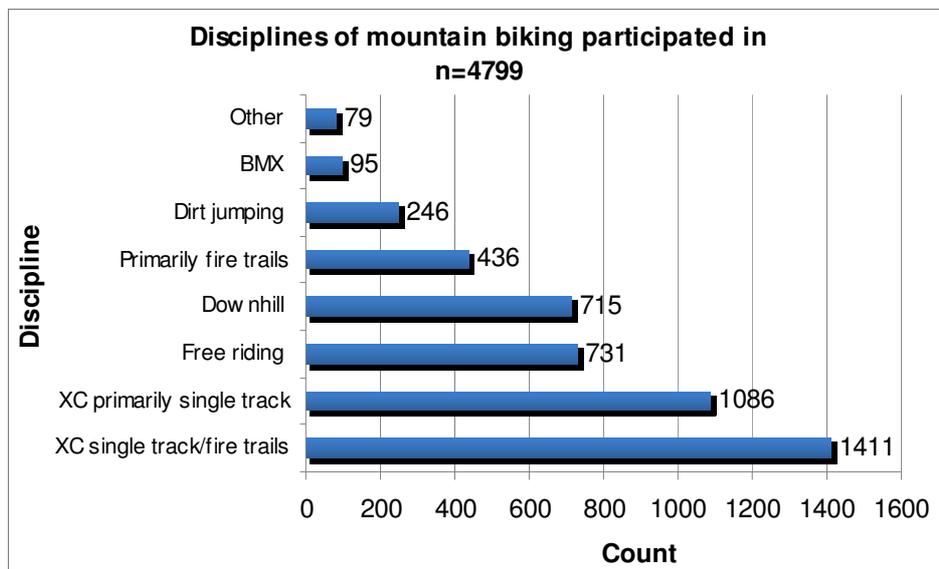
**Figure 6 Disciplines of mountain biking participated in (Warringah Council 2011)**

Table 3 Cross tabulation of age versus style of mountain biking participated in. Note that because not all respondents stated their age, only those that did could be included in this cross tabulation. (Warringah Council 2011)

Disciplines of mountain biking participated in										
	Cross country (combined single track/ fire trails)	Cross country (primarily single track)	Primarily fire trails	Downhill	Free riding	Dirt jumping	BMX	Other	Row Totals	
Age	Under 18	14 14.14%	15 15.15%	8 8.08%	21 21.21%	22 22.22%	12 12.12%	6 6.06%	1 1.01%	99 2.25%
	18-24	52 19.26%	47 17.41%	18 6.67%	50 18.52%	48 17.78%	33 12.22%	16 5.93%	6 2.22%	270 6.14%
	25-34	373 27.13%	304 22.11%	108 7.85%	221 16.07%	230 16.73%	92 6.69%	25 1.82%	22 1.6%	1375 31.29%
	35-49	761 31.52%	581 24.07%	235 9.73%	343 14.21%	342 14.17%	80 3.31%	35 1.45%	37 1.53%	2414 54.94%
	50-59	77 40.53%	40 21.05%	23 12.11%	19 10%	24 12.63%	2 1.05%	1 0.53%	4 2.11%	190 4.32%
	60 and over	18 39.13%	8 17.39%	6 13.04%	6 13.04%	5 10.87%	1 2.17%	1 2.17%	1 2.17%	46 1.05%
	Column Total	1295	995	398	660	671	220	84	71	4394
	Column Percent	29.47%	22.64%	9.06%	15.02%	15.27%	5.01%	1.91%	1.62%	100%

Respondents ride in all seasons, with slightly more people riding in spring and autumn than summer and winter (Figure 7). Respondents most commonly ride with friends and small groups (3-4 people), however, there were also large numbers who reported riding alone or in groups of two (Figure 8). There were 344 (8.4%) people who reported riding with their family.

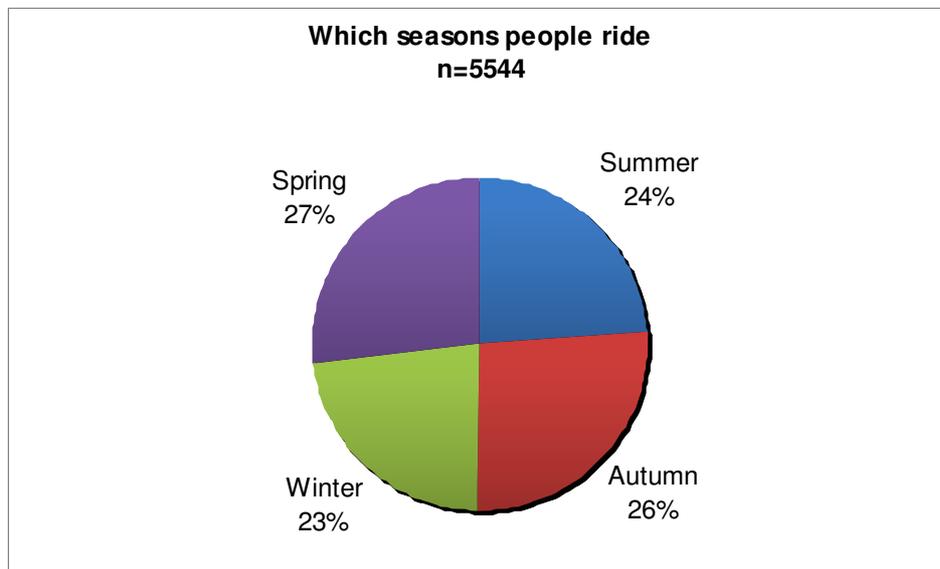


Figure 7 Seasons people ride in (Warringah Council 2011)

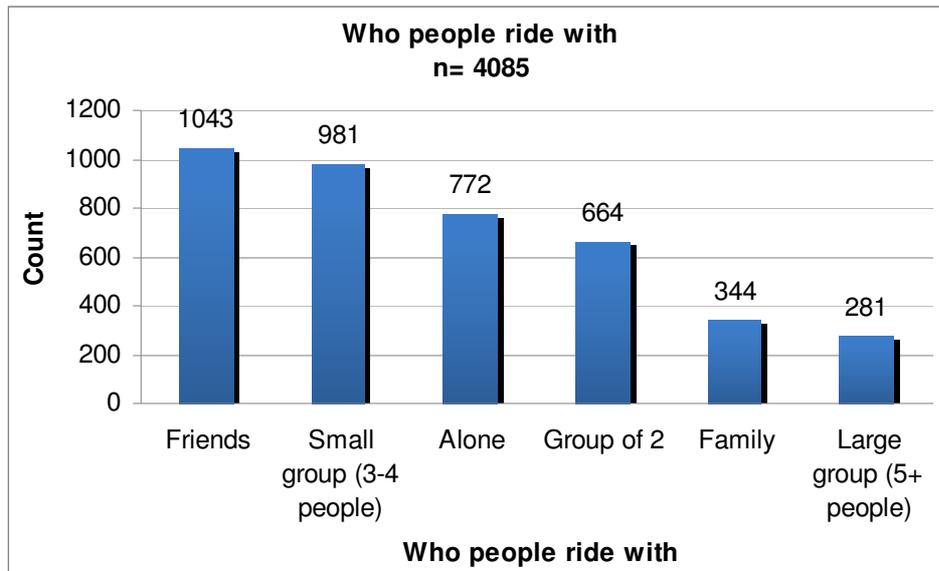


Figure 8 Who people ride with (Warringah Council 2011)

Motivations for riding vary (Figure 9), with respondents able to select as many answers as were applicable. Exercise, appreciation of nature/ scenery and socialising were the top three motivations reported, followed by excitement/risk, relaxation and competition respectively. The category of excitement/risk proved quite controversial, with a large number of respondents stated that excitement and risk should not be categorised together. They argued that an activity can be exciting without being risky. This question was based on a previous study in New Zealand⁷ to enable the motivations for riding in the two areas to be compared. The results revealed the same ranking in both studies for the top four motivations, however it is likely that more respondents in the Warringah survey would have selected 'Excitement' as a motivation if it were not categorised together with 'Risk'. Examples of 'Other' responses included fun, challenge and family time. Many also stated mental health and wellbeing related motivations.

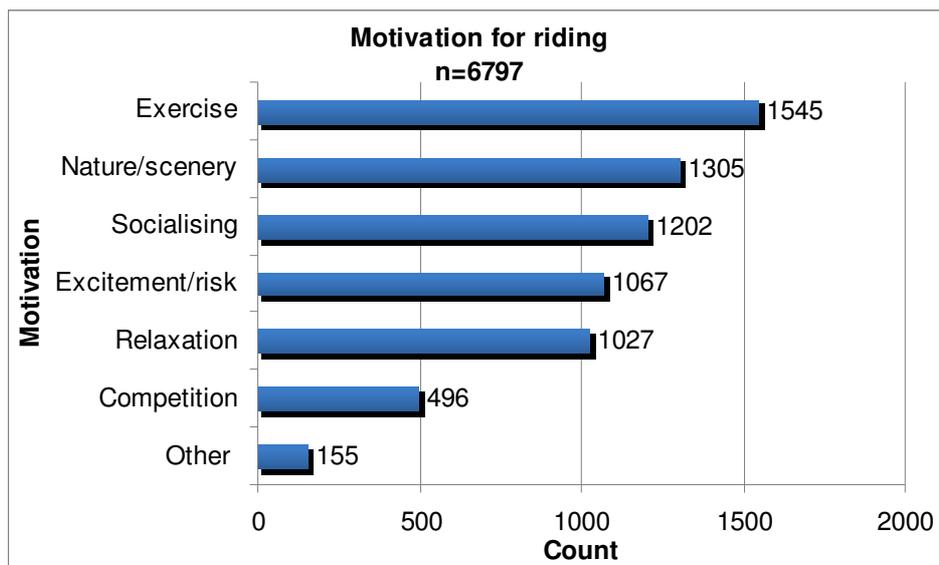


Figure 9 Motivations for riding (Warringah Council 2011)

⁷ Chiu & Kriwoken (2003)

Respondents commonly combine other activities with their rides such as a picnic or BBQ, camping, and photography which were the top three responses respectively, followed by swimming, walking, walk the dog and bird watching (Figure 10). Of the 'Other' activities combined with rides, 90 people indicated food and beverage type activities such as breakfast, lunch, coffee or the pub.

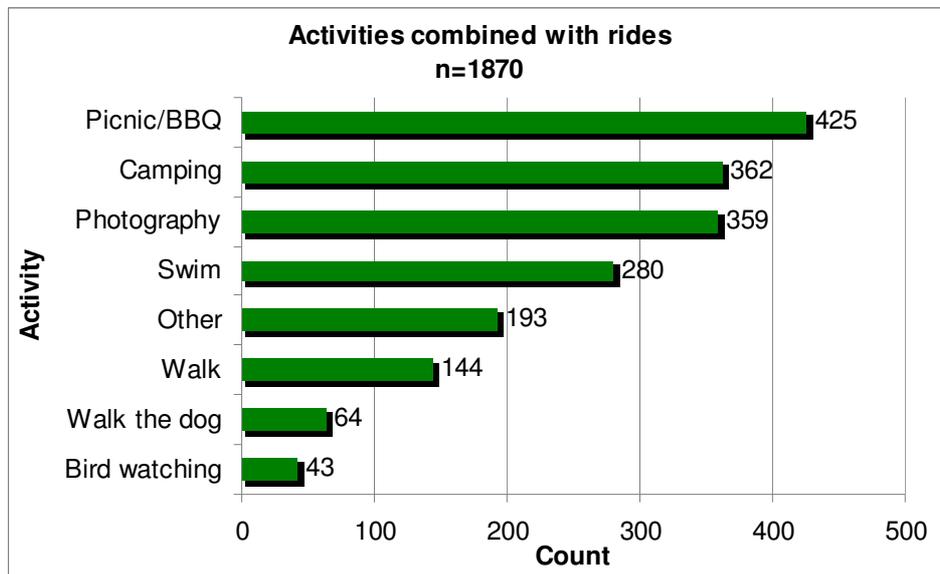


Figure 10 Activities combined with rides (Warringah Council 2011)

More respondents reported travelling to trails by car (55%, n=2295) than by bike (40%), but they also stated that they prefer to ride where possible – for instance, if there were appropriate (and safe) road linkages. A further five percent specified travelling by train and ferry (Other). Some respondents travel by ferry to Manly and then ride to Manly Dam. Others travel by train to access trails in the Blue Mountains and north and south coasts. Furthermore, Figure 11 indicates that many people are willing to travel great distances to access a particular mountain bike experience.

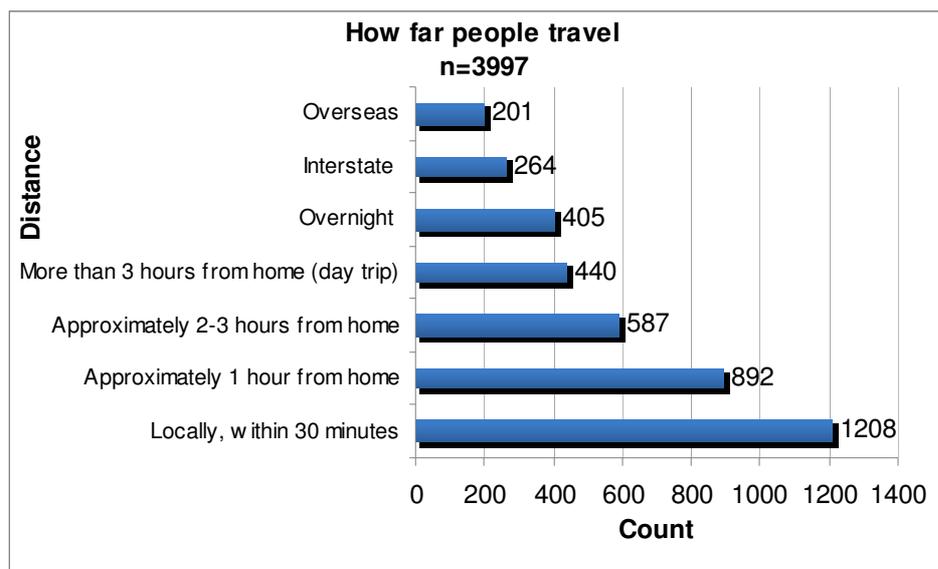


Figure 11 How far people travel for a particular mountain bike riding experience (Warringah Council 2011)

2.2 Health and wellbeing

A review of the literature on the benefits of outdoor activities, undertaken by Dickson et al. (2008), broadly categorises the opportunities as being for people to connect with nature (the natural environment), connect with other people (interpersonal) and connect with themselves (personal).⁸ Furthermore, the review highlights the lesser recognised benefits of engaging with nature as ranging from better coping skills, reduced crime, greater curiosity, enhanced cognitive skills, improvements in symptoms of Attention Deficit Disorder and Attention Deficit Hyperactivity Disorder, as well as the restorative value of 'green exercise'.

Responses to Warringah's online survey are consistent with Dickinson et al. (2008). As mentioned previously, the top three motivations were exercise, appreciation of nature/scenery and socialising (Figure 9). Several respondents stated that mountain biking has not only improved their health, but was responsible for an overall improvement in lifestyle:

Manly Dam is a beautiful area which has fresh sea air circulating. it [sic] is a social event for me in that both friends and colleagues [sic] plan and ride at Manly Dam together. Our fitness levels have gone up (all in our 30's) and through the biking networkwe [sic] have made more friends. Sunday mornings at the Dam have replaced Saturday nights out.

mountain biking changed my life for the better. i [sic] stopped smoking and drinking in pubs and got back into exercise and feel that i [sic] have much more purpose in life, giving me happiness and enjoyment like no other interest has before. i [sic] get to enjoy my local environment and appreciate life and nature.

Twenty five respondents stated motivations related to mental health, including to combat depression, stress relief, as therapy, headspace, happiness, an escape and just to "get away from it all". One respondent also reported spiritual motivations.

Many respondents ride with their children to help keep them healthy and give them a positive outlet. It provides meaningful family time, gets them outdoors and away from electronic devices.

The environment can also benefit from people engaging in activities in a natural setting, with research indicating that people who engage with nature as children are more likely to grow into adults that have a respect and appreciation for the conservation of the natural environment.⁹

Charles et al. (2008) identify five broad categories of barriers or constraints that are commonly identified in leisure research: the costs of participating in leisure activities; lack of time and/or the pressure of other commitments; inadequate or inaccessible facilities; isolation (including social isolation and geographical isolation); and lack of skills and abilities.¹⁰ The report establishes a link between the need for living environments to be conducive to out-of-doors activities, such as walking and cycling, as well as social environments conducive to shared experiences and support networks.

⁸ Dickson et al. (2008)

⁹ Wells & Lekies 2006

¹⁰ The last point is from Hinch et al. (2005) in Charles et al. (2008)

3.0 Provision of mountain biking in neighbouring areas

The provision of mountain bike facilities in NSW has been slower than in other States and Territories. While there are ample opportunities to ride fire trails located in National Parks and State Forests, there are limited authorised trails for riding single track and downhill, particularly at an advanced level. Until recently the provision of mountain bike facilities in NSW has been ad hoc. The October 2011 release of the NPWS whole-of-government Sustainable Mountain Strategy goes some way toward more effective planning and is evidence of the sport's growing acceptance by land managers as a legitimate recreational activity.

To enable effective planning for mountain biking within Warringah, it is important to have an understanding of what is happening regionally and further a-field. This section discusses mountain bike provision within close proximity to northern Sydney, according to land ownership or management, and the progress being made towards addressing the increasing need for mountain bike facilities.

3.1 NSW State Government

NSW Government released its Bike Plan in May 2010. Two of the Bike Plan actions specifically address mountain bike facilities:

- Section 2 - CREATE CONNECTED CYCLING NETWORKS - Page 23, Section 2.23 - 'Promote cycle access to and through designated NSW National Parks and Crown reserves, including the use of sustainable mountain biking trails'
- Section 5 - GROW JOBS IN CYCLING - Page 43, Section 5.1 - 'Identify and promote cycle tourism opportunities such as
 - (c) Mountain Biking in the Snowy Mountains and Blue Mountains and linkages across other National Parks and publicly managed lands'

National Parks and Wildlife Service NSW (Office of Environment and Heritage)

During the past decade, the NPWS has seen an increase in mountain biking within metropolitan National Parks.¹¹ A steady increase in the unauthorised riding of mountain bikes on walking tracks has been observed and there is evidence of increased track erosion and cases of conflict between walkers and riders in some areas.¹²

The *NSW Taskforce on Tourism and National Parks*¹³ made a series of recommendations in 2008 regarding opportunities for an enhanced level of sustainable tourism in NSW parks and reserves. This report highlights the need for the NSW government to commit to sustainable nature tourism as a priority. In 2010 the Department of Environment, Climate Change and Water (now Office of Environment and Heritage) released a discussion paper that reviews their cycling policy and discusses opportunities for sustainable mountain biking in NSW National Parks.¹⁴ Subsequently, OEH's Sustainable Mountain Bike Strategy was released in October 2011. The Strategy discusses the northern beaches area as being one of the few places that could potentially be suitable for an increase in mountain bike provision. Council has been, and will continue to, work with NPWS to assist in ensuring that any trail system developed compliments the current provision and considers the demands and needs of the community. This is discussed in greater detail in Section 4.

There has also been some earlier progress for the provision of mountain biking in NSW's National Parks. Since 2002, mountain biking has been permitted in areas of the Royal National Park as part of the NSW NPWS *Royal Area Trial Cycling Management Plan*. The trial is currently considered successful due to limited user conflict, no new creation of unauthorised trails over the last 8 years

¹¹ DECCW NSW (2010a)

¹² NSW NPWS (2002)

¹³ DECCW (2008)

¹⁴ DECCW NSW (2010b)

and the local mountain bike community have been actively involved in monthly maintenance programs which has improved the sustainability of the trails and decreased the environmental impact of riding in the park.¹⁵ Royal National Park staff have been waiting on the finalisation of the mountain bike strategy before formalising the single track mountain bike trails permanently.¹⁶

In addition, Mount Annan Botanic Garden (in Camden local government area) has recently opened a series of enduro mountain bike trails and a pump track is also in the planning stages. The development of the enduro track was undertaken in association with installation of new electrical poles within an Integral Energy easement.¹⁷ Furthermore, the *Glenrock State Recreation Area Draft Plan of Management* has also made provisions to authorise mountain bike activity.

Crown Lands Division (Department of Primary Industries NSW)

The Crown Lands Division (formally the Land and Property Management Authority) do not have a specific policy regarding mountain biking aside from legislative requirements. Any recreational activity on Crown Land must be in line with the Crown Lands Act 1989, in particular sections 10 and 11 of the Act. Section 10 specifically ensures that the land is managed for the benefit of the people of NSW and Section 11 outlines the principles of land management which is to be adhered to in relation to crown owned land, such as environmental protection and encouraging multiple uses by the public.

There is considerable areas of Crown land in Warringah, particularly in the Oxford Falls valley, most of which is not currently under Council's formal management. The Land and Property Management Authority (now the Crown Lands Division) prepared a draft Oxford Falls Regional Crown Reserve Plan of Management, which discusses mountain bike provision in the area. Management of the Reserve following the Gazettal of the POM may involve the establishment of a Trust to which Warringah Council will be a party. The implications of this are discussed in greater detail within Section 4.

Sydney Catchment Authority

The Sydney Catchment Authority (SCA) is a New South Wales Government agency which manages Sydney's drinking water catchments and supplies bulk water to Sydney Water and other agencies.

The NSW Government announced in 2008 that it was considering a proposal to open up restricted catchment areas to mountain biking, much of which is National Park.¹⁸ It has been further reported in *Mountain Biking Australia* (2010) that progress is being made with the SCA as some management trails have been opened within disused management areas.¹⁹ There are now areas of the Woodford Catchment open for recreational use, with the process having included discussions with local and state lobby groups. The SCA is currently considering opening other areas within NSW for mountain bikes.²⁰

While there may be an increase in future provision in the Sydney catchment, local riders would have to travel 1-3 hours outside the area to take advantage of this.

Forests NSW

Mountain bike provision is considered an appropriate activity and is permitted on State Forests roads and designated mountain bike tracks. No cycling is permitted on walking trails. The Forests NSW (Department of Primary Industries NSW) publication *Living, working and playing ...forests 2005-2009* provides a framework for recreation, sport, tourism and training within State Forests.

¹⁵ Millar G, (2010) Ranger, Royal National Park, Personal Communication

¹⁶ Millar G (2010) Ranger, Royal National Park, Personal Communication

¹⁷ Botanic Gardens Trust (2010)

¹⁸ Geliot (2009)

¹⁹ Mountain Bike Australia (2010)

²⁰ Shee (2010)

This publication advocates for the provision of appropriate and responsible nature based recreation, sport, tourism and training.

The mountain bike trails in Ourimbah (one of the closest permissible single tracks to Warringah residents outside of Manly Dam) are managed and maintained by the Central Coast Ourimbah Mountain Bike Club under a permit issued by Forest NSW. The club runs eight cross country and eight downhill races each year. Motor bikes, horses and walkers are not permitted on these single tracks.

The extensive network of roads through State Forests provides cyclists with a variety of mountain biking opportunities. Rides range from easy to highly challenging. Specific mountain bike trails are available in Tumut State Forest (Hume Region), Wingello State Forest (Monaro Region) on the south coast (Southern Region) and Awaba and Ourimbah (Central Region).

3.2 Local Councils

There are many similarities between Warringah's situation and that of neighbouring councils in so far as there is an apparent growing number of mountain bike riders in natural areas, including areas where riding is unauthorised. There is evidence that this is causing unacceptable levels of environmental degradation at some locations. As is the case with Warringah, neighbouring councils are constrained in their ability to identify and fund suitable sustainable trails and associated facilities.

Pittwater Council

Pittwater Council are experiencing increasing use of their reserves by mountain bike riders. There are concerns regarding erosion, the building of structures in reserves, and mountain biker's use of pedestrian pathways.²¹

There is some consideration for a preliminary investigation into the possible formalisation of a trail in the Ingleside escapement area.²² Mountain bike riding is currently prohibited in Ingleside Chase Reserve, however, the Plan of Management states that there will be an investigation into "the feasibility of a recognised mountain bike track in the reserve, which would involve comprehensive and rigorous environmental impact assessment and having no environmental impact."²³

Hornsby Shire Council

In 2008 Hornsby Shire Council completed an Unstructured Recreation Strategy which outlined the future direction for the provision of additional recreational facilities. During the exhibition of this document there were over 150 submissions requesting more mountain bike facilities. This led to further investigation into the provision of mountain bike trails as there were no formalised mountain bike trails or facilities for public use in the Shire.²⁴

Following the completion of the Hornsby Mountain Bike Trail Plan by International Mountain Biking Association – Australia, construction of an intermediate graded loop is due to commence at Old Mans Valley in 2011/12. Later stages will include a beginner track and a pocket park containing a skills circuit, pump track and jump runs.²⁵

Ku-ring-gai Council

Jubes Mountain Bike Park at Golden Jubilee Fields was officially opened in October 2011. The facility includes skills development, pump track and 800 meters of single track. The facility was proposed in the council's Unstructured Recreation Strategy which received 200 submissions of

²¹ Beharrell M (2010) Pittwater Council Personal communication 8 July 2010

²² Beharrell M (2010) Pittwater Council Personal communication 8 July 2010

²³ Pittwater Council (2002)

²⁴ Hornsby Shire Council (2008)

²⁵ Hornsby Shire Council (2010)

support and only one against. The \$128,000 project was jointly funded by Council's Environmental Levy and the NSW Government.

Ku-ring-gai Council also manage 2 single track loops (3.5 and 4 km) which link with a firetail to form an extensive trail between Wahroonga and Turramurra. These trails were developed through a small environmental grant to the Turramurra Off Road Cyclists (TORC) in 2008. TORC originally proposed 6 trails throughout the local government area. Council agreed to the current two after extensive investigation and consultation.

The trails are currently maintained though volunteer working bees organised by TORC. However all volunteers must register with Council's bush care program prior to working on the trails and are supervised by a bush care specialist when working. Ku-ring-gai Council reported that they are currently investigating how major works on these trails may be funded in the future.

There is consideration being given to the formalisation of a downhill facility in the Ku-ring-gai area. There are currently two unauthorised areas being used by downhill riders and the formal provision of one would reduce the impact on the other while accommodating the large number of riders using these facilities. The cost of closing and rehabilitating both areas is also a consideration.

The primary emphasis for the development of mountain bike facilities and trails is to remove riders from more sensitive bushland and be able to effectively manage the trail network. Discussions with Ku-ring-gai Council have indicated their willingness to explore opportunities with NPWS and Warringah Council regarding the trails linking the St Ives area to Warringah through Garigal National Park²⁶ – as per the 2007 Warringah Regional Multiple-Use Trails Strategy (see Appendix B). Warringah manages very little land in this area but has provided in principle support.

Manly Council

In June 2011 Manly Council officially opened The Grove Bike Park, containing dirt jumps and a pump track. The track was originally built by local riders and was developed into an official track by Manly Council following requests from the Seaforth North Precinct Community Forum and local bike riders. The track has proven to be a popular facility and caters for the beginner to intermediate rider.

Blue Mountains City Council

Blue Mountains City Council have been working extensively with the community to establish authorised areas for riding and close down other areas that are too environmentally sensitive to sustain cycling activities. There are many opportunities for cross country riding. However, downhill riding in particular was identified in the *Nature Based Recreation Strategy 2005 to 2015* as requiring facilities that would minimise unauthorised use of natural areas.²⁷

In 2002 BMCC adopted an interim Dirt Jump Strategy aimed at managing unauthorised dirt jump construction. Although a review is pending, the Strategy still applies. In the meantime, four interim sites are accessible to the public in addition to a formal BMX track at Lawson which is maintained by the Lawson BMX Club. The four interim sites are all on land managed by council. Construction is done by the users under the guidance of signage which delineates the area. This is monitored by Council who also do weed removal and attend to rubbish when required. Issues arising from time to time include; track building spreading outside the designated area; items such as car seats and iron to be incorporated into jumps being brought onto the site; ghetto blasters being used which disturb neighbours; soil erosion in steeper areas; dumping of rubbish in the past; and neighbourhood angst where jumps are located close to houses.²⁸ Overall the model is reported as generally working well, however the construction of unofficial sites is an ongoing issue. This is an indication that the current available dirt jump sites do not meet community need.

²⁶ Lewis, Mary Lou (2010) Ku-ring-gai Municipal Council, Personal Communication June 2010

²⁷ Blue Mountains City Council (2004)

²⁸ Kidd, T (2011) Blue Mountains City Council, Personal Communication 27 October 2011

Willoughby City Council

Willoughby City Council has a pump track at Northbridge and dirt jumps at Castle Cove. The Northbridge track was constructed by council some years ago and recently modified to create a pump track. The Castle Cove track was unauthorised and the local riders approached Council regarding formalising them. Council built the trails with the assistance of riders who supplied volunteer assistance with regard to design and labour. Council performs weekly safety checks, and while the tracks are covered by Council's insurance, there are safety warnings stating that riders use the track at their own risk. Working bees initiated by the riders approximately every six months to cover small modifications to the track. Proposed modifications are reviewed by Council prior to the working bee for approval. The total cost of the Castle Cove track is difficult to determine as the material has been sourced for free by the riders and the labour is voluntary. Approximately \$15-20,00 has been spent on the two sites including paying for design and machinery (bobcat). The model is reported as working well and is receiving only positive feedback from the community. The riders group keep Council informed and are happy with what has been provided in terms of the commitment the Council has shown toward meeting their needs. The one point stressed by WCC is the importance of creating a rider consultation group. The riders have proved themselves to be keen, with a wealth of knowledge, skills and willingness to help.

3.3 Summary

The lack of a state-wide strategy has resulted in the provision of mountain bike facilities being ad hoc and lacking in connectivity between the various land tenures. The development of the NPWS Sustainable Mountain Bike Strategy goes some way toward rectifying this as they work with other land managers to consider whole-of-government, cross tenure trails.

There are currently many opportunities being investigated for new and/or improved mountain bike trails in the areas in and around Warringah, including within National Parks as well as neighbouring councils. Further a field, within 1-3 hours drive, there are presently opportunities for riding at places such as Ourimbah, Awaba, Royal National Park and the Blue Mountains. It is therefore important for Warringah Council to consider the regional distribution of trails when planning for new or improved facilities. This will ensure that, where possible, the supply of trails can better meet the demand.

In terms of resourcing trails, as shown in the case studies of Councils such as Willoughby and Blue Mountains, the cost of developing and maintaining smaller, localised dirt jump type facilities can be minimised through the use of volunteer labour and donated materials. Resources are discussed in greater detail in Section 5.

The current status of mountain biking in Warringah as well as the opportunities and constraints for increasing the provision of facilities, including potential partnerships with other land managers (e.g. NPWS), are outlined in the following section.

4.0 Mountain biking in Warringah: current situation, opportunities and constraints

The demand for mountain bike facilities in Warringah has increased over the last five years and Council has had numerous requests for additional facilities and improved maintenance of trails.

Council received twenty eight submissions to the draft Recreation Strategy in 2009, and the most common issues raised were:

- The need for additional mountain bike and off-road cycling facilities in Warringah
- The need to cater for the increasing popularity of off-road cycling, including the various styles and skill level
- Additional resources for off-road cycling within Manly Warringah War Memorial Park

Similarly, responses to Warringah's online survey of riders revealed a strong theme calling for equity of access to natural areas for mountain biking and equity of resource allocation when compared with other sport and recreation activities.

As will be seen in the following analysis, moderate opportunities exist to increase the provision of mountain bike facilities in Warringah which warrant further investigation.

4.1 Riding preferences in Warringah

There are several key mountain biking areas in Warringah, these include Manly Dam, Oxford Falls, Red Hill, Garigal National Park (Cascades, Bantry Bay and Oxford Falls) and Ku-ring-gai Chase National Park. According to Warringah's online survey of riders, Manly Dam ranked the highest in terms of the areas in Warringah where people prefer to ride (Figure 12). Oxford Falls and Red Hill ranked second and third respectively, despite largely being unauthorised for mountain biking. Many of those selecting Terrey Hills and Duffys Forest are possibly referring to trails within Ku-ring-gai Chase National Park, however, they were kept as distinct categories because some of the trails cross more than one land tenure. Of the 'Other' responses, 102 of 142 were trails not within Warringah, thereby highlighting that many people are not aware of the local government boundaries. A further 15 'Other' responses specified Narrabeen Lagoon trail, which is not considered within the definition of mountain biking being used for this document. Freedom dirt jumps at Manly Vale ranked highest of the 'Other' areas, with 15 responses. It is likely that many of the responses for the category of Manly Vale/ Balgowlah/ Condoval Reserve were also referring to the Freedom dirt jumps. Some respondents noted that they no longer ride where access has been denied. The answer to this question therefore provides a snap shot in time based on the accessibility of trails when the survey was undertaken.

When asked what respondent's favourite areas to ride are in the whole of northern Sydney, the top 5 are in Warringah, with Manly Dam again receiving the most responses, followed by Ku-ring-gai Chase National Park/ Terrey Hills/ Duffys Forest, Red Hill/ Cromer, Oxford Falls and Garigal National Park respectively (Table 4). Trails around the Sport and Recreation centre was ninth and Freedom dirt jumps came in at equal tenth along with the dirt jumps at Castle Cove.

As mentioned previously, the most common styles of riding within Warringah are cross country, free riding and downhill (see Section 2). When asked if there were any styles of riding not catered for in the northern Sydney region 54% (n=1513) replied no. Many pointed out that the styles are catered for but not necessarily legally. A higher percentage of under 18s and 18-24 year olds believed there were styles not catered for (Table 5). Of those who believed there are styles not catered for (46% n=1513), all forms of riding were specified. The styles raised the most in terms of limited provision were authorised single track, downhill and free riding. All Mountain, dirt jumps and skills parks also rated highly. Longer trails, loops, trails suitable for events and the need to cater for varying ability and technical challenge were mentioned, as was the lack of connectivity between trails. When asked about the importance of certain trail features, the sustainability of the environment and the sustainability of the track rated highest, followed by variety, single track and

length (Table 6). The lowest rating features were remoteness, facilities (e.g. toilets and tap water) and car parking. For a full breakdown of the data related to Table 6 please see Appendix G.

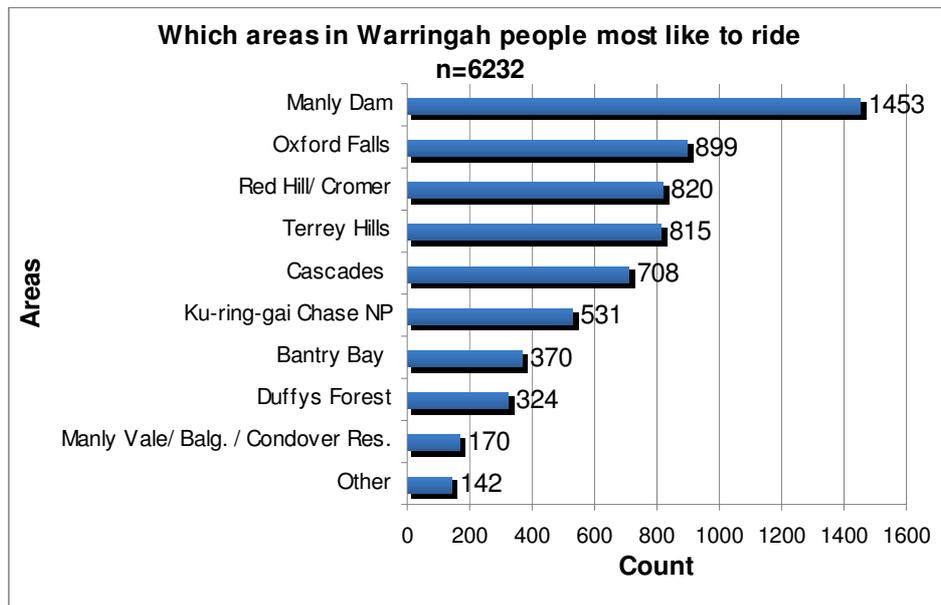


Figure 12 Areas in Warringah people most like to ride (Warringah Council 2011)

Table 4 Top 10 areas to ride in Northern Sydney (Warringah Council 2011)

Rank	Area/ Trail	Response	Percent
1	Manly Dam (many respondents link with Bantry Bay)	1346	41.1%
2	Ku-ring-gai Chase National Park/ Terrey Hills/ Duffys Forest e.g. Duckholes, Centre, Perimeter, Long	437	13.3%
3	Red Hill/ Cromer	380	11.6%
4	Oxford Falls	376	11.5%
5	Garigal National Park (236 specified trails in the vicinity of Cascades e.g. Quarry, Heath, Upper and Lower Cambourne, 38 specified Bantry Bay)	305	9.3%
6	St Ives/ Warimoo/ Showground/ Wildflower	106	3.2%
7	Hornsby/ Berowra/ Galston	46	1.5%
8	Lane Cove National Park	42	1.3%
9	Sport and Rec/ Narrabeen Lake	22	0.7%
10	Castel Cove Dirt Jumps	21	0.6%
10	Freedom Dirt Jumps	21	0.6%
	Other	176	5.4%
	Total & Percent	3278	100%

Table 5 Cross tabulation of age versus whether or not people think there are styles of mountain biking not catered for in northern Sydney. (Warringah Council 2011)

Are there any styles of mountain biking not catered for in northern Sydney?			
Age	No	Yes	Row Totals
Under 18	9 31.03%	20 68.97%	29 1.96%
18-24	32 44.44%	40 55.56%	72 4.86%
25-34	224 50.79%	217 49.21%	441 29.76%
35-49	474 56.56%	364 43.44%	838 56.55%
50-59	48 59.26%	33 40.74%	81 5.47%
60 and over	17 80.95%	4 19.05%	21 1.42%
Column Total	804	678	1482
Column Percent	54.25%	45.75%	100%

Table 6 Importance of trail features (Warringah Council 2011)

Trail features	Count	Score	Unimportant	Of little importance	Neutral	Important	Very important
1. Length	1523	4.100					
2. Circuit	1506	3.758					
3. Track features/terrain (easy to moderate)	1476	3.770					
4. Track features/terrain (difficult)	1492	4.007					
5. Technical trail features (such as jumps)	1489	3.469					
6. Aesthetics/scenery	1506	3.726					
7. Close to home	1509	3.416					
8. Remoteness	1490	2.759					
9. Single track	1514	4.302					
10. Variety	1514	4.338					
11. Sustainability of the track/track condition/maintenance	1517	4.485					
12. Sustainability of the natural environment	1514	4.479					
13. Safety, for example, good sight lines	1513	3.607					
14. Facilities, for example, toilets or tap water	1509	2.615					
15. Car parking	1513	2.987					
16. Signage	1509	3.329					
Average		3.697					

4.2 Authorised and unauthorised trails

Warringah has a complex matrix of land ownership and a myriad of authorised and unauthorised trails that are well used and it is common for trails to traverse two or more land tenures. A complex matrix of land ownership across large contiguous areas of bushland impact on the potential to achieve a cohesive network of authorised mountain bike trails. There are many instances where an area of public land will contain authorised mountain bike trails that adjoin private land where unauthorised trails have been developed unofficially. This is a key constraint to achieving a number of objectives in relation to improved outcomes for mountain bike facilities, including; the orderly development and management of trails; consistent environmental outcomes; maintenance regimes; and promotion of trails.

Currently, mountain biking is permitted on designated trails at Manly Dam and on fire trails within Garigal and Ku-ring-gai Chase National Parks. Mountain bike riding on walking tracks in National Parks is not permitted unless otherwise stated. There are small areas accessible to bikes at Anembo Reserve and Red Hill Reserve and there is a BMX track at J.J. Melbourne Hills Memorial Reserve. Access to all other trails in Warringah, including fire trails, would require the appropriate consent. Consent may require a Plan of Management and/or development consent and all trails would require environmental precautions to be followed.

Many of the trails being used in Warringah were originally used by walkers, 4WDs, trail bikes, service access roads and drainage easements. Some trails have been forged by mountain bike riders themselves. In some cases one track may change from authorised to unauthorised many times as it moves across the different land tenures. For instance, a fire trail being used for mountain biking may be authorised in the sections running through a national park and unauthorised when it crosses into land owned by MLALC.

With the aim of verifying which trails in Warringah are authorised for mountain bike access and which are not, the maps in Appendix G document the commonly known and used trails in Warringah - with some overlap into neighbouring council areas. Many of the trails have been taken from publicly available maps on websites such as NoBMoB,²⁹ because this is where a large proportion of riders are getting their information, as will be discussed further below. Riding on any other trails, other than those marked as authorised on the maps in Appendix G, is likely to be unauthorised and may be considered as trespassing by various land owners.

There is much confusion within the mountain bike community regarding knowledge of which trails are authorised for mountain bike access and which trails are not. This was evident by the survey response which illustrated that a larger proportion of respondents were not at all confident or only somewhat confident (57%, n=1584) in their knowledge of which trails were authorised, compared to those who were confident or very confident (43%) (Figure 13). The two most common means of sourcing trail information are via the Internet and other riders (Figure 14). These results indicate the importance of having clear and accurate information on trails that is accessible to the public, and similarly, clear disclaimers for web-based promotions of trails that are not. This will enable people to make informed decisions about whether or not they want to ride at a particular location.



Figure 13 People's confidence in which trails are authorised for mountain biking and which are not (Warringah Council 2011)

²⁹ Northern Beaches Mountain Biking Group: <http://nobmob.com/>

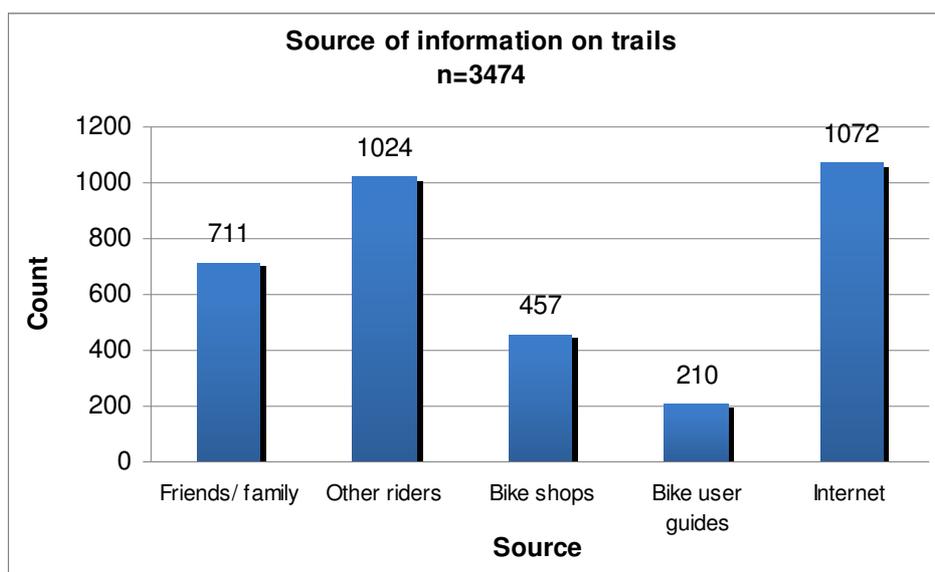


Figure 14 Where people get their information about trails (Warringah Council 2011)

4.3 Warringah trails

Manly Warringah War Memorial Park (Manly Dam)

Refer to Map A Land Tenure and Map A Environmental Factors, Appendix G.

Manly Dam provides the only authorised single track in Warringah, with the 11 km loop being a combination of single track and fire trail. The trail's development as a mountain bike facility occurred as a response to the increasing presence of bikes on the walking trails. The current Plan of Management (POM) allows bikes on specific areas within the Park, including fire trails. The POM is currently being revised and will address the future of mountain biking as well as other values of the park, for example bushland conservation, walking and water skiing.

Manly Dam receives a high volume of mountain bike use. As mentioned previously it is the most popular trail in Warringah according to the online survey (Figure 12). A survey undertaken in March 2011 recorded weekday usage at 20 riders per hour in the morning and 40 per hour in the afternoon.³⁰ Numbers increase on the weekend, with 80 riders per hour recorded for a Saturday morning, largely comprising families (parent and child) and groups of friends. Numbers lowered to 40 per hour in the afternoon, with the number of family groups dropping significantly.

The release of the Draft Manly Warringah War Memorial Park Plan of Management is anticipated for late 2011. One of the key issues being addressed is the risk management for the shared use of tracks. The code of Conduct is also being reworked and enhanced.

With plans to consider a new loop trail within Garigal National Park (see further details below), consideration should be given to encouraging safe links between the two trails. At present many riders take the risk of crossing Wakehurst Parkway at potentially dangerous locations. Safe places to cross include the footbridge to the north and at the lights to the south near Seaforth Oval. These options involve a small amount of road riding. Opportunities to formalise links through the bushland on both sides of the road would require significant resource allocation. Furthermore, many parcels of land on each side of the road are subject to Aboriginal land claims.

³⁰ ML Traffic Engineers (2011)

Bantry Bay - Garigal National Park & Forestville Park

Refer to Map A Land Tenure and Map A Environmental Factors, Appendix G.

Much of Garigal National Park falls within the boundaries of Warringah, although it is managed by NPWS. Council manages several parcels of land that adjoin the national park, including Forestville Park, and therefore Council is required to liaise with the NPWS from time to time over cross-boundary issues.

There are a number of fire trails in the area where cycling is permissible, however there are also a number of unauthorised trails causing erosion. Unauthorised mountain bike riding is occurring on many walking tracks within the national park in addition to some new trails that have been forged by riders themselves.

Some areas in this region are considered to be environmentally sensitive and culturally significant and there is concern regarding the impact of bike riding in areas that have not been designated for the purpose. The persistent riding of bikes over Aboriginal engravings in areas unauthorised to mountain bikes is an ongoing management concern for NPWS, Council and the Metropolitan Local Aboriginal Land Council. The process for putting protective measures in place is lengthy.

The authorised trails within the national park are relatively short and disjointed but do cater for the beginner and intermediate rider. NPWS are currently considering increasing the provision of authorised tracks in this region as a means of addressing the increasing number of riders and the development and use of unauthorised trails.³¹

Council manages Forestville Park, a piece of Crown land which sits to the north of this section of Garigal National Park. Forestville Park has two sportsgrounds as well as a considerable area of natural bush. A Plan of Management is currently under preparation and will address the permissibility of mountain biking. There is a trail leading from the south-east corner of the playing fields, through the bush and into the adjoining national park. The use of this trail by mountain bikes is currently unauthorised. There is potential to formalise this trail for use by mountain bikes so as to provide an authorised link to the national park. Planning will need to consider the proximity of sensitive Aboriginal heritage. There will be further consultation with local residents and other trails users as the Forestville Park Plan of Management is developed.

As mentioned previously, there is an opportunity to encourage safe linkages between trails at Bantry Bay and the Manly Dam loop. Council will continue to liaise with NPWS regarding this.

Oxford Falls Valley

Refer to Map B Land Tenure and Map B Environmental Factors, Appendix G.

The Oxford Falls valley contains a large amount of bushland and is adjacent to Garigal National Park. It is a unique area in an otherwise urban region. The trails in the Oxford Falls valley traverse land owned by NPWS, MLALC, the Crown, Crown under lease and the Department of Planning.

There are many unauthorised trails in this area. Cultural and environmental sensitivities are of concern to land managers. Many of the trails traverse multiple land tenures, which in turn increases the complexity of the un/authorised status of trails. For instance, according to the Garigal National Park POM, mountain biking is permitted on fire trails, yet when the fire trail crosses into another land tenure the permissibility of mountain bike riding is up to the land owner/ manager's discretion. NPWS are considering developing new mountain bike trails in this section of Garigal National Park. Should this go ahead there may be an opportunity to develop linkages through other land tenures such as Crown Land.

Previously, Manly Warringah Mountain Bike Club has run various competitions and courses in this region that traversed several land tenures. Access was initially granted by MLALC, however, the

³¹ OEH (2011)

increasing damage to the environment by bikes and 4WDs caused MLALC to withdraw permission. The National Parks and Wildlife Service has also enforced the Garigal National Park Plan of Management thereby only allowing bikes on fire trails and not on walking tracks.

The Warringah Regional Multiple Use Trail Strategy identifies the Slippery Dip Track as an existing track, however, it notes that sections of the trail run through private property. As seen on Map B Land Tenure (Appendix G), much of the trail crosses land owned by MLALC. At this stage MLALC is against any mountain bike riding on their properties within the Morgan Road Belrose area, including both sides of the road and within the vicinity of Lizard Rock, pending further investigation.³² MLALC intend to do an inspection of their boundaries and all bike trails and jumps on their land. They are particularly concerned over the sacred sites within these areas that they state are being treated with contempt and disrespect. Damage can also occur through ignorance. MLALC will be looking to solutions to stop any further damage.

There is also considerable Crown land in this area, although the majority is currently not under Council's care and control. The Land and Property Management Authority (now the Crown Land Division) has prepared a draft Oxford Falls Crown Reserve Plan of Management. The Draft aims to consolidate the Crown land in the area under one management regime (see Appendix C for lots to be included in the Reserve). It considers a number of management options including the possibility of it being managed jointly by Council in the form of a Trust. The Draft identifies that there are insufficient recreational resources available, particularly for certain user groups, such as mountain bikers. In response the Draft suggests that a strategic assessment of lands within the OFRCR be conducted to negotiate access and amenity (facilities) for recreational groups, including mountain bikers. There are also many unmade roads in the Oxford Falls area that could be made formally available to mountain bikers. During the strategic review of lands, consideration should be given to the potential for trails to cater for the styles of Downhill and Free riding, for which there is high demand yet no formal trails exist in the region.

Four land parcels owned by the Department of Planning in the vicinity of Deep Creek are currently managed by Council and have sections of two trails that run into the National Park. Trails on this land are unauthorised and are causing significant environmental damage. A Plan of Management will be developed in the coming years and will address the permissibility of mountain bike access.

It should be noted that many parcels of Crown land in this area is subject to an Aboriginal land claim, including some that fall within the draft Oxford Falls Regional Crown Reserve Plan of Management.

Red Hill

Refer to Map B Land Tenure and Map B Environmental Factors, Appendix G.

All trails in this area are unauthorised, with the exception of Red Hill Reserve.

The Red Hill area near Cromer is very popular due to the topography, beautiful scenery and undeveloped natural areas. Evidence of unauthorised trail building includes the development of jump structures made from wooden and plastic crates. Erosion and damage to natural areas including threatened species has been reported and the riding of bikes over Aboriginal engravings is an ongoing issue for land managers. The most significant environmental damage in the Red Hill area is from the construction of dirt jumps and motocross riding.

The land in this region is owned or managed by a variety of land owners including the Land and Property Management Authority (Crown), MLALC, Warringah Council and Catholic Church groups.

Many of the parcels of Crown land in the Red Hill area fall under the draft Oxford Falls Regional Crown Reserve Plan of Management. Following gazettal of the POM, much of the area will therefore be included in the strategic assessment of land which will include consideration of the

³² Email and telephone communication with MLALC, 14 October 2011

suitability for mountain bike access. Unmade roads and power line easements in this area have the potential to be integrated into any future mountain bike trails that may be considered.

Cascades – Garigal National Park

Refer to Map C Land Tenure and Map C Environmental Factors, Appendix G.

This is a popular area, used extensively by walkers, horse riders and mountain bikers.

There are approximately 20 kilometres of fire trails in the national park available for mountain biking, yet there is also evidence of unauthorised trail development and use. The NPWS have expressed concern regarding user conflict as well as the environmental impact of bike usage in the vicinity of the cascades.

There are some trails which continue outside of the National Park that according to Council data run through land owned by MLALC. As seen in Map C Land Tenure, the Heath Track is a fire trail primarily within the national park, however, according to the data available to Council, small sections appear to cross into MLALC land. An opportunity exists for MLALC and NPWS to confirm their boundaries and enable formal access along the whole length of the Heath Track fire trail. Alternatively, riders could be directed onto more appropriate trails in the area.

Ku-ring-gai Council have expressed an interest in having discussions with the NPWS and Warringah Council about the possibility of providing links through the National Park from Ku-ring-gai through to Warringah. While Warringah do not own or manage any land in this area Warringah has expressed in principle support.

The trail named Mona Vale Road Link on Map C Land Tenure (Appendix G), currently provides a link between St Ives Showground and Terrey Hills. Parts of this trail have previously been authorised for horse access, however, the trail crosses three different land tenures and permissibility could not be ascertained. The Multiple Use Trails Strategy (see map at Appendix B) suggests that there may be an opportunity to formalise a trail in this area.

Ku-ring-gai Chase National Park/ Terrey Hills /Duffys Forest

Refer to Maps C, D and E Land Tenure and Maps C, D and E Environmental Factors, Appendix G.

There are many trails throughout this area which are used extensively by walkers, horse riders and mountain bikers. Most trails are located entirely in the national park although some trails also cross Crown and private property, including MLALC land.

There may be an opportunity to improve mountain bike provision in this area. It may be possible to formalise the Booralie Trail and link to it to the Bibbenluke Track. This option is complex. It is reliant on land transfers, a Plan of Management, NPWS collaboration and for parts of the existing unauthorised Booralie Trail to be re-routed around private property. The potential for conflict or safety concerns between mountain bikers and horses that frequent the area, particularly on steep areas of trail where bikes increase speed, would also require serious consideration.

There is an opportunity to develop a BMX/ dirt jump/ pump track type facility at Terrey Hills Oval. In the 1980s a BMX track was constructed beside the oval by the local Scout community. The track was extended beyond its original footprint without Council's knowledge, causing damage to threatened flora. There was also concern by Council that some jumps were a safety risk. Council considered fencing off the site, but following strong support from the community to keep it Council agreed to allocate a small section of the reserve to the future development of a BMX track. The Plan of Management³³ has categorised this portion of land as sportsground to enable this to occur. Such a facility would require a community organisation to be established to take care of the facility and supervise its maintenance. A draft plan was submitted for Council's consideration, however, the details regarding funding and administration were never formally discussed.

³³ Threatened Bushlands Reserves (Duffys Forest Ecological Community) Plan of Management

JJ Melbourne Hills Memorial Reserve

Warringah's only designated BMX track is located in J.J. Melbourne Hills Memorial Reserve at Terrey Hills. The maintenance of the track is undertaken by the Manly Warringah BMX Club who are based at the facility for training and events. The track is available for the public to hire via Council's reserve booking system. At all other times the track is accessible to the general public.

Unauthorised mountain bike riding has been increasing as riders use the Reserve to access to national park. The current Plan of Management identifies the opportunity to develop links between the Reserve and Garigal National Park as a way of managing the environmental impacts and protecting the Reserve's environmental values. This could link in with NPWS consideration of developing further trails in the area, thereby providing a starting/finishing point with parking and amenities. It must be noted, however, that this park gets very busy during BMX and horse riding activities.

Freedom dirt jumps

The "Freedom" dirt jumps at Manly Vale are unauthorised and are considered unsafe. The jumps (which are on land managed by both Manly and Warringah Councils) have been fenced off pending ongoing consultation between Warringah and Manly Councils and local riders. A decision on the future of the site will be made in the near future.

Consideration has been given to the opportunity to establish a dirt jump facility nearby should the Freedom dirt jumps be closed permanently. Please see further discussion below under Condover Reserve.

Condover Reserve

The Multiple Use Trail Strategy identifies the opportunity to provide a link between Manly Dam and Burnt Bridge Creek multi-use trail via Condover Reserve. This work is yet to be done.

It may be possible to develop a dirt jump track within Condover Reserve. While the plan of management is ambiguous, it does not preclude dirt jumping. The plan of management gives in principle support to the 'Rationalisation of tracks and access as appropriate within reserves – this includes track closure, track realignment/remediation and track construction.'³⁴ The permissibility would need to be investigated further. Feasibility would be dependent on risk management and the ability to insure it. The logistics of what type of facility is needed, and where in Warringah, would need to be determined in consultation with riders and then consideration could be given to whether or not there is a suitable location within the reserve or elsewhere in the LGA.

Warringah Aquatic Centre and surrounds

Council is preparing a Site Development Strategy to determine how the WAC will meet the aquatic, sport and recreational needs of the community into the future. The study will determine a long-term development strategy for improvements at the WAC site, both aquatic and non-aquatic, that are financially sustainable and best meet current and future community needs. Through the WAC community engagement process it has been suggested that it could provide a mountain bike hub which links to trails at Manly Dam as well as those that have been proposed by the National Parks and Wildlife Service for Garigal National Park. Consideration would need to be given to appropriate road linkages and bike parking in accordance with Council's Bike Plan. The site may also accommodate smaller mountain bike facilities such as a pump track and a skills park as well as a meeting place with facilities including parking, showers and refreshments. This is a conceptual proposal at this stage which will be considered along with other proposals for the WAC site. The development of the WAC Site Development Strategy will involve community consultation in line with Council's Community Engagement Policy and Matrix. Investigations will also include and acknowledge the current users of aquatic reserve (e.g. baseball).

³⁴ Warringah Council (2008b)

Belrose Waste Management Centre

Waste Asset Management Corporation owns and operates the Belrose Waste and Recycling Centre located at Crozier Road, Belrose. Landfill operations are due to cease in November 2014 and recently there have been discussions regarding the future use of this site. An Enhancement Fund is available for use on the site post landfill.

In February 2010 WSN Environmental Solutions (the former owner) released a Future Use Concept Plan for the site for public comment.³⁵ One of the options listed in this paper was the development of a dedicated mountain bike facility, with the possibility of catering for cross country, downhill and a skills park (e.g. jumps and technical features). This option would require a third party to manage the facility and assume all ongoing costs. Warringah Council provided in principle support for this option and recommended that 'further investigation of options, available funding and opportunities for third party involvement in future recreational uses at the Belrose Waste and Recycling Centre be referred to the NSW Government for consideration'.³⁶

One of the benefits of developing this site for mountain biking is that it is already degraded thereby not requiring any loss of native bushland. Should such a facility be developed in Warringah a further analysis of the potential links and connectivity of these trails to others in Warringah (e.g. Garigal National Park) should be considered, as well as the role that such a facility would play in the regional provision of mountain bike trails in the area.

Summary

In summary, large tracks of bushland, hilly terrain and easily accessible trail system, together with the close proximity of Warringah to the rest of Sydney, has attracted mountain bikers to this region and as a result the demand for the provision of suitable facilities has increased. Compared to other parts of Sydney, the Warringah area is providing access to trails that is not available in other council areas. Hence the large numbers of riders travelling to ride at Manly Dam and other Warringah locations. However, the region is currently failing to meet the demand for facilities such as single track, free riding and downhill. The demand for such facilities should be taken into consideration when investigating the feasibility of the opportunities that have been outlined above.

As illustrated throughout this section, the complexity of land ownership limits opportunities to increase provision of mountain biking without the requirement for significant cooperation between the various land owners. There are opportunities for Council to work with NPWS and Ku-ring-gai Council to develop or improve links. The gazettal of the Oxford Falls Regional Crown Reserve Plan of Management will also enable a strategic review of land and its suitable uses. It is therefore important for Council to continue to liaise with the various land owners in and around Warringah to stay alert to their intentions and work collaboratively where possible. Determining the feasibility of the opportunities discussed in this section requires further research, with associated financial and project support to assess the cost and benefits of the options proposed.

³⁵ WSN Environmental Solutions (2010)

³⁶ Warringah Council (27 April 2010)

5.0 Management Issues

5.1 Resources

Infrastructure costs

Providing and maintaining mountain bike infrastructure is a costly exercise requiring ongoing funding. Cost estimates were obtained, where possible, for case study sites from across Australia (see full details of case studies in Appendix D). The costs varied substantially according to the condition of original trails, the necessity to forge new trails, difficulty of the terrain, length of trail and quality of the track. For instance, in terms of construction, the cross country trail at You Yangs Regional Park, Geelong, Victoria, cost approximately \$500 per kilometre for flat sections compared to \$6,000 per kilometre for the steepest sections.

It is not possible to estimate the cost of upgrading existing trails or developing new trails in Warringah without conducting feasibility studies on individual proposals, including the necessary impact assessments. However, the maintenance costs of purpose built facilities in NSW Forests have proven to be lower than on existing trails that are adapted for mountain bike access.³⁷ Further research would therefore be required to investigate the opportunities outlined herein.

Funding

The scale of any future track works in Warringah would need to take funding availability into consideration. Importantly, Council needs to consider the ongoing operational and maintenance costs, not simply capital funding made available via grants. A shortage of funding is a significant factor limiting any potential increase in mountain bike facilities in Warringah. The case studies in Appendix D outline many different funding sources ranging from state government grants (Eagle Mountain Bike Park, SA, Munda Biddi, WA, Stromlo Forest Park, ACT), local government funding (Gap Creek, Mt Cootha, Brisbane, QLD and Manly Dam) and jointly funded projects such as Wellington Park Mountain Bike Trails in Hobart which was funded collaboratively by Hobart City Council, Glenorchy City Council, Parks and Wildlife Service and the Office of Sport and Recreation Tasmania. Federal, state and local government grants are sometimes made available for projects such as track construction.

The mountain bike community is also known to proactively seek access to land and funding through alternative means. The construction of trails in You Yangs Regional Park, Geelong, Victoria, received no funding from Parks Victoria (SA Government) but was paid for through community and business sponsorships, local government grants, community grants to clubs and club fundraising efforts. In a further example, the Hunter Mountain Bike Association HMBA secured an Operational Permit through Forests NSW for use of the Awaba State Forest on the Central Coast of NSW. The site currently contains the Monkey Downhill trail and the first stages of an 8km purpose built cross country circuit. Long term it is planned to have an extensive network of single trails within the permit area.³⁸

There may be opportunities for the mountain bike community to take on their own lease or license of land to establish mountain bike trails in Warringah. However, this exercise can be complex, time consuming and costly.

There are also many examples around the world that have a user pays system in place. Respondents to Warringah's online survey of riders found that 50% (n=1525) were willing to pay for a purpose built facility, with a further 37% saying maybe. Methods suggested for a user pays system included annual permits. Some commented that access to the rate payer funded Manly Dam should remain free, while others were willing to pay if the facilities offered something special. Some said they would rather volunteer time for track maintenance than pay, while others said they

³⁷ Stewart, P, (2011) Personal communication, Forests NSW.

³⁸ Forests NSW (2009)

would rather pay and have somebody else do the work. The use of volunteers is discussed in greater detail below.

In Warringah there are several reasons why this may prove difficult. For example, there would be costs associated with providing staff for revenue collection or pay station monitoring, supervision of users, management and maintenance. Furthermore, there would be many alternative trails providing 'free' access despite being unauthorised and most tracks in Warringah have multiple entry points that would be difficult police, with fencing off entire tracks being unfeasible due to the costs associated with construction and the likely damage to the bushland environment.

Economic opportunities

There are various economic benefits that can be derived from mountain biking activities. According to the Cycling Promotion Fund³⁹ between 1998 and 2005, 73.4% of bicycle sales in NSW and ACT were mountain bikes, which is the highest percentage sold compared to the other Australian States. This is significant given that the Australian bicycle industry is worth approximately \$1 billion and employs an estimated 6,000 people. They also report that 2009 was the tenth consecutive year Australians bought more bicycles than cars and 2009 and the 8th year in a row that bicycle sales have exceeded 1 million.

To date there have been no formal studies in Warringah into the economic benefits of mountain biking or tourism generally. Warringah's online rider survey found that 50% of respondents (n=1517) spent more than \$1,000 per year on mountain biking – not including the purchase of a bike (Figure 15). This amount includes accommodation, accessories, repairs, food and travel. As mentioned previously, when respondents were asked what other activities they combine with their rides, 90 people stated food and beverage related activities such as breakfast, lunch, coffee the pub. However, a site or region specific survey would need to be conducted to quantify amounts spent in the Warringah (and neighbouring) area and exactly what it is spent on. For example, a 2006 study conducted at the Murray to Mountains Multi-use Rail Trail, found that one quarter of the cyclists surveyed did not purchase food and beverages within the study region.⁴⁰

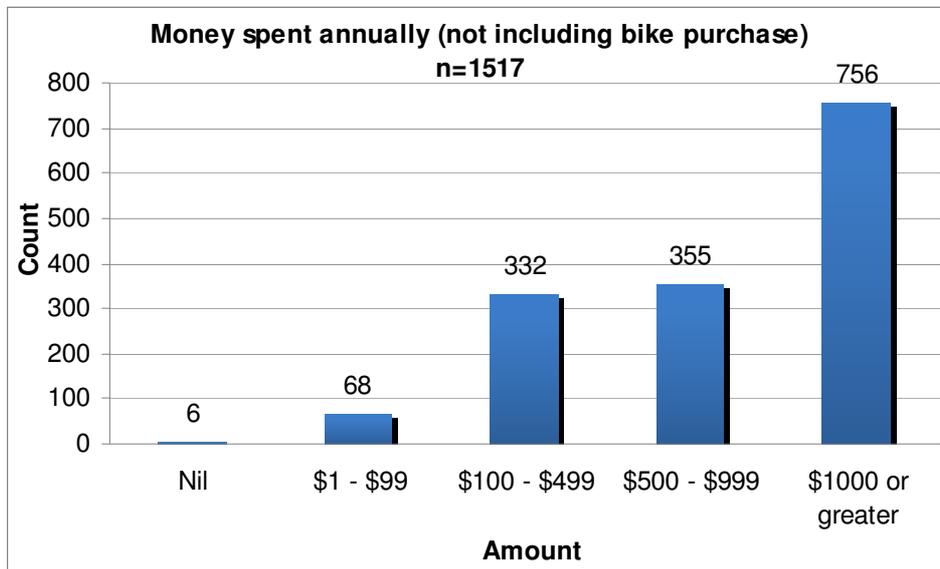


Figure 15 Amount of money people spend annually on mountain biking - not including the purchase of a bike. This includes travel, food, accommodation, repairs and accessories (Warringah Council 2011)

³⁹ Cycling Promotion Fund (2010)

⁴⁰ Beeton (2006)

Manly Dam is one example whereby Warringah Council ratepayers provide a regional facility for which people from a broader geographical area benefit. This is supported by the 53% of survey respondents who indicated that they live outside the Warringah area. Other regional facilities being funded by Warringah Council include Warringah Aquatic Centre, Brookvale Oval and the various sporting fields. Warringah therefore needs to be cautious about taking on new regional assets that may not be financially self sufficient.

If new or improved trails accessible for mountain biking are to be developed in Warringah consideration also has to be given to the possible displacement and subsequent financial disadvantage of other less geographically mobile trail users, such as horse riders. This would be of particular importance in the Terry Hills and Duffys Forest area.

The economic benefits have to be weighed up against the costs (discussed previously), in particular the cost of planning, constructing, maintaining and managing a trail. There are also many mountain bike trails around Australia and internationally that have a user pays or entry cost system that help to offset the costs of operations and maintenance. This is also discussed in greater detail in Section 5.

Volunteers

The use of volunteers from the mountain bike community is common. For instance there are regular volunteer groups working on trails at Gap Creek, Mt Cootha (Brisbane), Munda Biddi Trail (WA), Pemberton Mountain Bike Park (SA), Wellington Park Mountain Bike Trail (Tas), and You Yangs Regional Park (Vic). See Appendix D for further information on these facilities. The extent of the involvement of volunteers can vary from weed removal, track development and maintenance and event management.

Warringah's online survey of riders indicated that 89% (n=1502) were willing to participate in voluntary trail maintenance, with 43% (n=1511) having previously participated. Respondents commented that they would like to get involved but that there was limited opportunity in northern Sydney. Many asked for a greater opportunity to be involved.

The cost of facilitating a volunteer program incurs expenses such as providing a site supervisor, training, tools, protective clothing and equipment and insurance. The time invested can include that spent on planning, conducting risk assessments, liaising, coordination, on site work and reporting.

Manly Dam has successfully used volunteers in the past for working bees and maintenance days. While the Dam is not currently coordinating a volunteer group it is proposed to re-introduce the volunteer program in 2012/13.

Smaller facilities such as dirt jumps

Due to the smaller, localised nature of dirt jumping and pump tracks, these types of facilities can sometimes be more feasible and within the scope of what a Council can provide. Another distinction of these facilities is that they can be located within established urban areas and have a relatively small footprint in terms of their land area. The development of a dirt jump facility at Castle Cove within Willoughby local government area provides a positive case study of how the collaboration between a council and riders can result in a facility that meets the needs of this particular demographic of riders in a cost effective manner. See Section 3 for further details on the dirt jumps at Castle Cove. The feasibility of developing new dirt jump or pump track facilities would be dependent on a demand and location analysis and financial considerations, including capital and ongoing operational costs.

5.2 Impacts of mountain biking on the natural environment

Potential impacts of mountain biking are similar to those of other recreational activities such as hiking and horse riding, however the severity of the impact varies. The impacts are dependent on the areas geology, topography, slope, soil, rainfall and general environmental health. Past and current land use practices such as forestry, landfill or mining activities also determine the potential

impact. The initial trail design and ongoing maintenance (or lack of) can further influence the type, level and rate of impacts.

Soil type and texture, for example, can influence the erodability and drainage of a track. In Warringah the soil is primarily derived from Hawkesbury sandstone and Narrabeen shale and ranges from coarse sand to sandy loam and is considered highly erodible across much of the local government area. An assessment of the soil type found on each proposed new trail would need to be undertaken during the planning stage to ensure appropriate design, construction and maintenance. The same would apply if considering formalising an unauthorised trail.

Damage can include soil erosion, compaction and nitrification, downstream sedimentation and decreased water quality, changes in hydrology, trail widening, the exposure of roots, rocks and bedrock and impacts on native animals including habitat loss. Impacts specific to off-road cycling activities include soil and vegetation damage from skidding, with trail ruts and incisions becoming more severe when cyclists ride during wet conditions.

Several studies (discussed in greater detail in Appendix E) have investigated the environmental impacts of mountain biking, including comparing the impacts from mountain biking to other recreational activities such as hiking and horse riding. While horse riding is known to cause greater damage than both mountain biking and hiking, most studies find that the impacts from mountain bikes and hiking are not statistically significant on flat dry tracks. However, when other variables such as skidding, riding up slopes and riding in the wet are factored in, mountain biking has been found to cause significantly greater damage than hiking, specifically in terms of increased erosion.

When asked in Warringah's online survey if riders believed mountain biking had a greater impact on the environment than walking, 34% (n=1515) either agreed or strongly agreed (Figure 16). When asked if people ride on the trails when wet, 59% (n=1531) reported that they do so occasionally, with a further 5% stating often. It must be noted that the two questions above did not enable respondents to elaborate on whether trails were built in a manner that enabled sustainable riding in wet conditions. Further information on the sustainability of trails can be found in the following section.

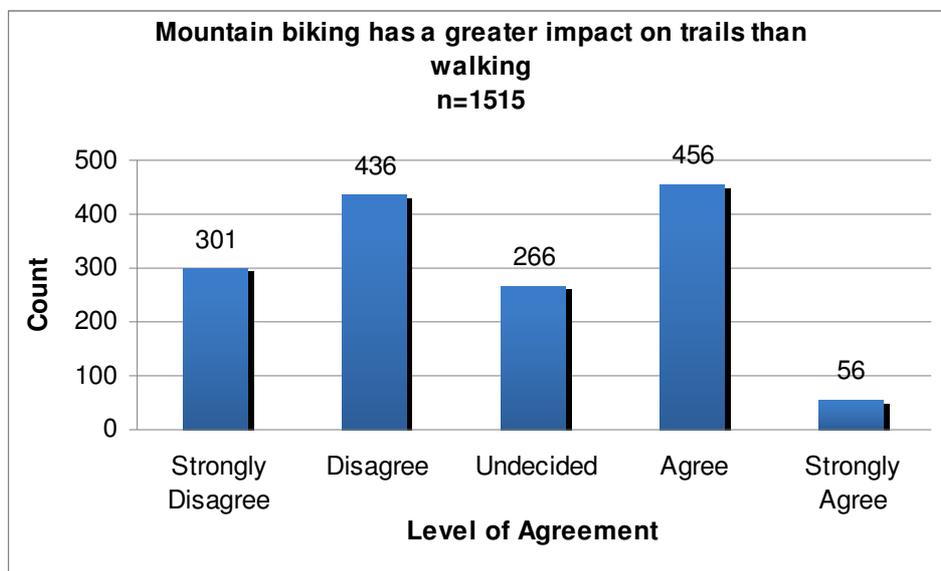


Figure 16 Level of agreement with the statement that mountain biking has a greater impact on trails than riding (Warringah Council 2011)

As mountain bikers are also known to travel greater distances than hikers over the same time period, their impact can be further increased. It is interesting to note, however, that several studies have found that while the impacts on tracks from off-road cycling are cumulative, there is also a

curvilinear effect in that a rapid initial change is followed by a reduction in the rate of change.⁴¹ This is most likely due to prolonged use resulting in the hardening of the track through compression or erosion down to harder soils. For a detailed critical literature review of the biophysical impacts of mountain biking please see Appendix E.

An assessment of mountain bike impacts undertaken at Manly Warringah War Memorial Park (Manly Dam) in 2007⁴² indicated that while much of the trail system was coping with the high usage, there were instances of trail damage as a result of mountain bike riding. The assessment revealed examples of track widening which was evident by exposed rocks and vegetation roots. There were cases where multiple routes had been developed such as detouring around specific obstacles and vegetation damage included some incidences of major impacts to vegetation such as terminal damage to vegetation including complete removal. Frequent areas of poor track surface and instability were evident by loose sands, mobile gravel and dislodged rocks, with track treatments having failed in some places. Active erosion was prominent in certain areas, including channelling and rilling. Drainage was also an issue with incidences of ponding and deposition being exacerbated by active erosion. Informal access tracks have been developed by the public, as have track modifications to enhance the performance and technical use of the trail system. Since this assessment was performed in 2007 some track improvements and modifications have been undertaken by Council and monitoring and maintenance is ongoing.

The construction of unauthorised trails, jumps, bridges and other technical features specific to mountain biking activities have been shown to impact on flora and fauna as well as causing irreparable damage to culturally significant Aboriginal sites and places. The impact of night riding on nocturnal animals is difficult to gauge. But the fact that 69% of respondents to Warringah's online survey said they ride at night occasionally or often means that this is an issue that land managers need to take into consideration (Figure 17).

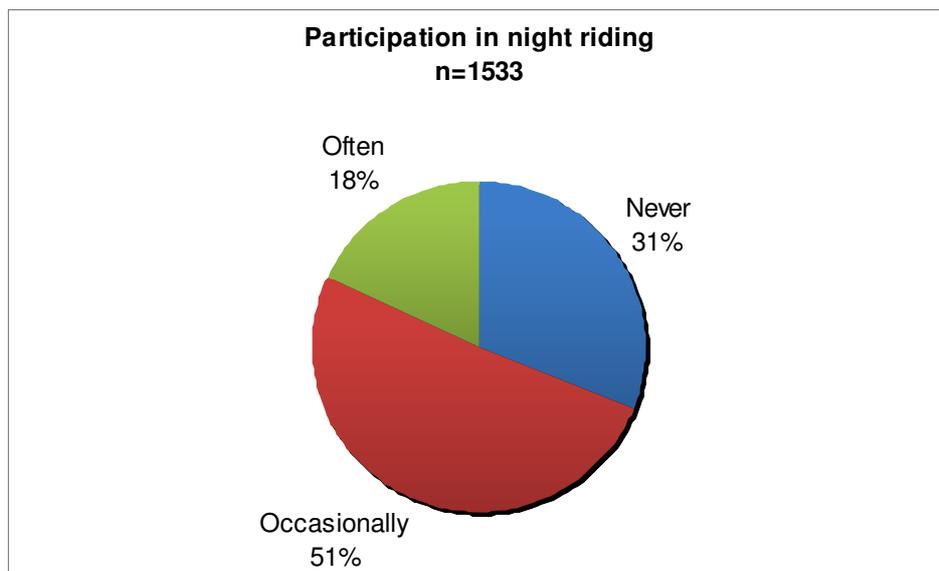


Figure 17 Participation in night riding (Warringah Council 2011)

With respect to Aboriginal heritage, an unauthorised trail in Forestville that is well used by mountain bikers crosses directly over an Aboriginal engraving. Recurring damage is also occurring at Red Hill and Oxford Falls despite large penalties being applicable. More stringent laws protecting Aboriginal heritage under the NPWS Act in so far as it is no longer a defence to claim that a site was 'unknowingly' damaged or destroyed. This highlights the importance of careful planning and trail design and is an example of the potential for irreversible damage to occur when

⁴¹ Bjorkman (1998); Hammitt & Cole (1998); Chiu & Kriwoken (2003)

⁴² Gondwana Consulting (2008)

members of the public develop their own trails without the appropriate knowledge base, such as the locations of threatened species or Aboriginal heritage.

5.3 Sustainable trails

The environmental impacts of mountain biking can be lessened in some circumstances if tracks are properly designed and situated. The opinion of the respondents to Warringah's rider survey is consistent with this statement in that 98% agreed or strongly agreed that mountain biking can be managed in a way that minimises the impact on the natural environment (Figure 18).

According to the International Mountain Bike association (IMBA), a sustainable trail will protect the environment, meet the needs of its users, requires little maintenance and minimises conflict between different user groups.⁴³

IMBA's five essential elements of sustainable trails take careful consideration of the trail's grade (degree of slope):

- A trail's grade should not exceed half the grade of the hillside or sideslope that the trail traverses. For instance, if a sideslope grade is 16% then the trail grade should not exceed 8%. If the trail grade exceeds half the sideslope then it is considered a fall-line trail and water will flow down it rather than across it, causing erosion.
- Avoid flat areas where water may pool rather than drain away.
- An average trail grade of 10% is sustainable for most soil types.
- Grade reversals allow regular intervals for water drainage so it cannot gain volume, momentum and erosive power.
- The downhill or outer edge of a trail should tilt slightly down (by 5%) and away from the high side to encourage water to sheet across and off the trail instead of funnelling down its centre.

Downhill trails are usually steeper than shared, recreational trails, whereby the greater speeds and forces mean that Downhill trails erode more quickly and may require relatively more maintenance and drainage than other trails.

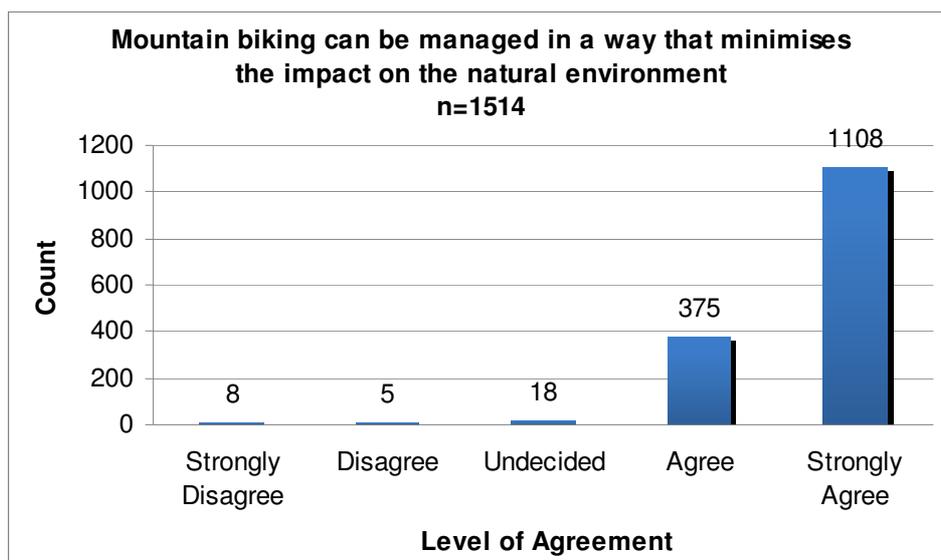


Figure 18 Level of agreement with the statement that mountain biking can be managed in a way that minimises the impact on the natural environment (Warringah Council 2011)

⁴³ IMBA (2004)

An unsuitable track surface may require modification. It is possible to 'armour' a trail that is susceptible to erosion or wet conditions by paving the trail. This can be done with rocks through flagstone paving, stone pitching, raised tread construction, a boulder causeway or natural rock outcrops. As an alternative to rock, other materials suitable for armouring can include concrete blocks, garden pavers, slabs of concrete and rot-resistant wood.

Tracks can also be treated with a variety of man-made materials. Man-made soil hardeners can be broadly grouped into three categories: chemical binders; physical binders; and geosynthetics. For instance, surfaces treated with a nylon/polypropylene liner and covered with material made from recycled tyres have been shown to produce only 1% of the sediment yield when compared to untreated track surfaces.⁴⁴ However, man-made soil hardeners are more costly than natural materials and do not last as long on trail grades in excess of 5 percent.

5.4 Other trail users

Bushland trails provide varied experiences for different users. In most instances trail users are friendly to each other, with few reported cases of conflict. In Warringah's online survey of riders, the large majority reported no conflict with other trails users (Figure 19). It must be noted, however, that the survey was of riders only, and did not allow other trail users an opportunity to answer the same questions. Furthermore, the questions around conflict did not enable the cause of the conflict to be identified, but was rather aimed at collecting conflict statistics.

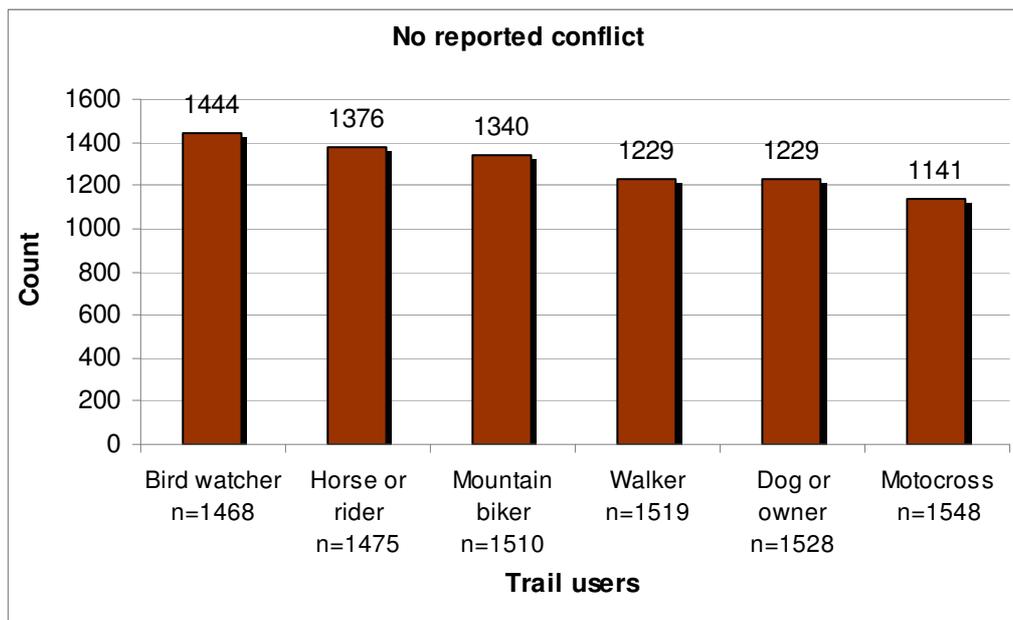


Figure 19 The number of mountain bikers who reported no conflict with certain other trail users (Warringah Council 2011)

Of the Warringah online survey respondents that did report conflict, the highest rate was with motocross riders (Figure 20). Reports of conflict on trails with dogs/dog owners also rated higher than with walkers. When broken down into the type of conflict, walkers ranked second behind motocross riders for verbal conflict. In terms of collisions and near collisions or falls, mountain bike riders reported much higher rates of conflict with motocross riders, other mountain bikers and dogs/dog owners, than was reported for walkers. Small children riding bikes on the same trails as

⁴⁴ Bjorkman (1998)

older, more experienced riders was also reported as a potential collision risk. A small number of physical conflicts (fights) were also reported, with motocross riders and dogs/dog owners ranking first and second respectively and other mountain bike riders and walkers tying for third. Conflict with bird watchers and horses, as reported by mountain bikers, were relatively lower when compared to that of other trail users.

Another group of stakeholders that needs to be considered in terms of potential conflict is local residents. Conflict between local residents and mountain bikers may include issues over street parking, rubbish and the noise associated with early morning and night riding.

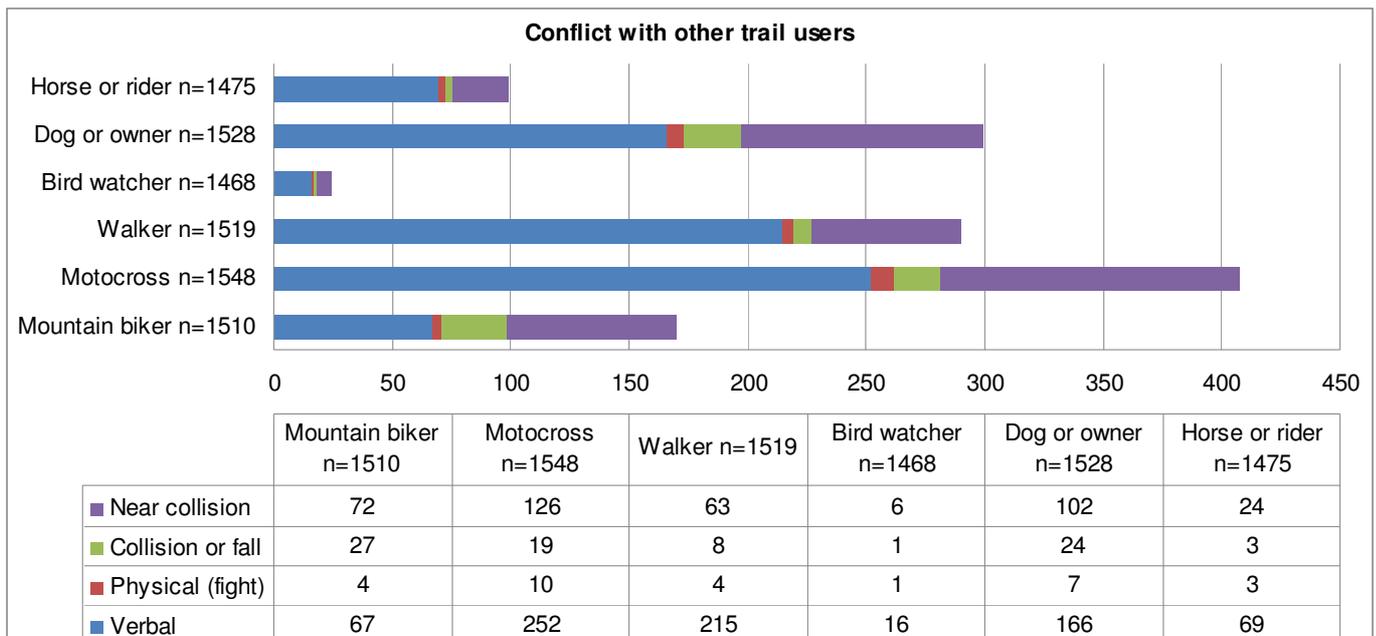


Figure 20 Breakdown of the types of conflict reported by mountain bikers with other trail users (Warringah Council 2011). Please note the survey question did not ask for the cause of the conflict but was rather aimed at collecting statistics only. It also did not ask whether the conflict had occurred in Warringah or elsewhere.

The term ‘asymmetric’ conflict perception has been used to describe a situation where “those whose activities, appearance and behaviour are causing others to perceive a conflict, are themselves unaware that they are doing so and are unaware of any conflict.”⁴⁵ The term ‘goal interference’⁴⁶ is also commonly used to describe the dissatisfaction of some users with a particular recreational experience due to the actions of other users. This could be considered the case between mountain bikers and walkers or horse riders whereby it is more likely the walkers and horse riders who have concerns about mountain bikers rather than the other way around. The concern for instance from the horse riding community that an increase in mountain bikers using trails frequented by horse riding could displace the horse riders and cause financial disadvantage due to horse riders being less geographically mobile than mountain bikers.

A survey conducted with hikers, mountain bikers and dual users (people who hike and ride) found that each of these three groups reported a higher rate of observed conflict as stemming from mountain bikers than from hikers.⁴⁷ This is evidence that many mountain bikers themselves acknowledge the inappropriate behaviour coming from a subset of their own community. Similarly, a study by Chui and Kriwoken (2003) found that while 9% of riders reported having been subjected

⁴⁵ Cessford (1995)

⁴⁶ Jacob and Schreyer (1980)

⁴⁷ Carothers et al. (2001)

to abuse from walkers, 20% of 'other users' reported bikes travelling at excessive speeds, 9% reported a lack of warning from riders on approach and 7% reported rudeness from riders.

Even so, of the 368 walkers surveyed in Cessford's (2002) study regarding the trial of a shared track in New Zealand, 42% agreed that people over-estimate the conflict between walkers and bike riders, with a further 41% selecting neutral rather than disagree. In the online survey conducted for Warringah's research, 80% of riders either agreed or strongly agreed with the same statement, with a further 14% undecided (Figure 21). Cessford's study also asked walkers if people over-estimate the danger to walkers from bikes, with 38% agreeing and a further 36% selecting neutral. When Warringah's survey asked the same question of riders, 78% either agreed or strongly agreed, with a further 14% undecided (Figure 22). One respondent also commented that the question could have been reversed in so far as asking whether walkers can pose a danger to riders.

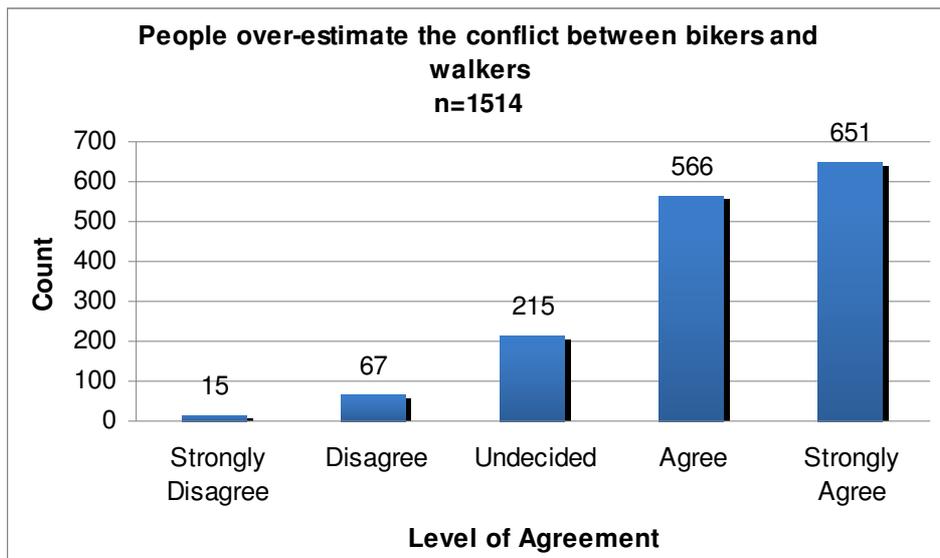


Figure 21 Level of agreement with the statement that people over-estimate the conflict between bikers and walkers (Warringah Council 2011)

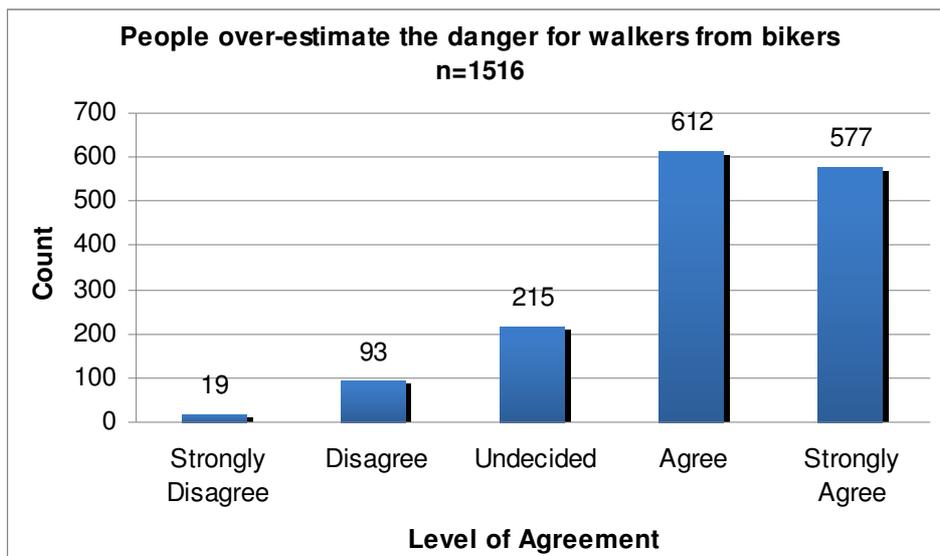


Figure 22 Level of agreement with the statement that people over-estimate the danger for walkers from bikers (Warringah Council 2011)

Cessford also reported that 32% of the walkers who said that having mountain bikes on the track negatively affected their experience had not actually encountered a bike during the study period. Of those that did not encounter a bike 59% of people 40 years and over claimed that having bikes on the track negatively affected their enjoyment, compared to 73% of walkers under 40 who stated that there was no effect. These results reinforce the idea that many people have pre-conceived perceptions about mountain bike activities. Nevertheless, it has been shown that the mere threat of having a cyclist suddenly appearing is enough to diminish the experience.⁴⁸

When riders in Warringah were asked if mountain biking can co-exist with other trail users, 88% agreed or strongly agreed (Figure 23). Similarly, in Cessford's (2002) study in New Zealand the majority of walkers were supportive of the trialled shared track, despite reporting conflicts, and did not want biking banned. Chui and Kriwoken's (2003) study in Tasmania also found that there was considerable tolerance for shared tracks and that the actual conflicts between mountain bikers and other recreational users were uncommon. The level of support for shared tracks in Warringah however, will vary on a case by case basis. As the feasibility of the proposals in this document are investigated in greater detail, the concerns of other trail users and residents in those areas will need to be considered.

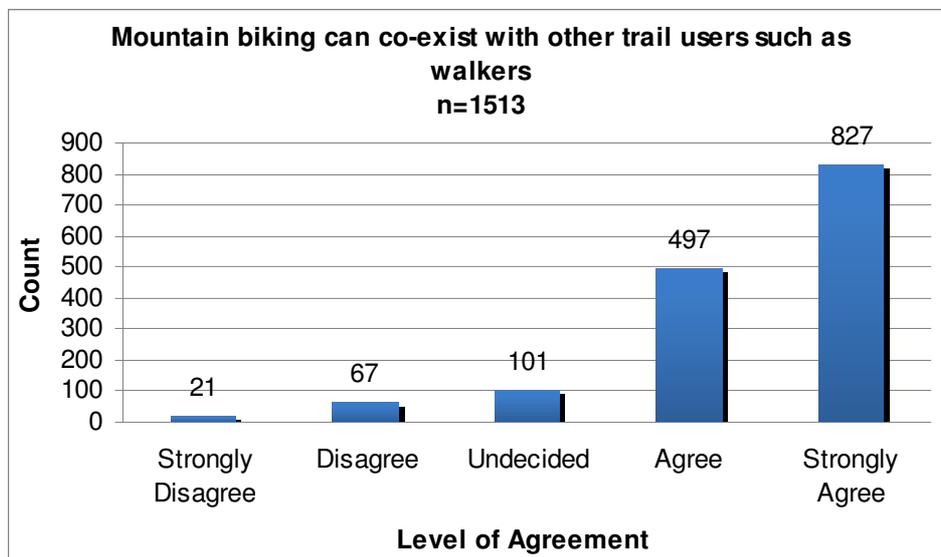


Figure 23 Level of agreement with the statement that mountain biking can co-exist with other trails users such as walkers (Warringah Council 2011)

The primary issue with shared tracks is the risk of collision, particularly on winding narrow tracks with blind corners. Steep sections of trail enable riders to gain speed which can spook horses and decrease the reaction time of riders. On fire trails the width of the track provides more space for both parties to manoeuvre to avoid a collision, yet the smoother and wider trail allows bikes to reach greater speeds. Further issues that have been raised in past research include riders passing too close to walkers, riding too fast, riding out of control and not giving way.⁴⁹

Some safety issues can be averted through appropriate trail design and maintenance, particularly by minimising blind corners and increasing sight lines. For already existing tracks this may be more difficult to manage. Educating mountain bikers about the appropriate Code of Conduct could assist in mitigating some safety concerns, for instance, only 63% (n=1510) of riders responding to Warringah's online survey were familiar with the various codes being used. Alerting walkers and

⁴⁸ Horn (1994)

⁴⁹ Carothers et al. (2001)

horse riders (perhaps through signage) to the permissibility of riding on certain trails and making trails one way could also minimise the chance of surprise encounters.

5.5 Safety and liability

As a land owner and manager, liability is a key consideration across all Council operations. The potential for, and existence of, liability depends on the facts and circumstances of each case. Accordingly, it is beyond the scope of a document such as this to consider Council's potential liability in respect of mountain-biking in detail. A comprehensive and systematic risk management process would minimise the risk of personal injuries resulting from mountain-biking and could reduce exposure to liability. Whether it is appropriate for Council to establish a risk management process will depend on the Council's role and responsibilities in respect of the mountain-biking in question. Depending on the facts and circumstances of each case, a range of measures may be appropriate to manage risks associated with mountain bike trails that Council facilitates or operates, including trail maintenance and signage, as well as other risk management techniques.

6.0 Conclusion

The extensive natural landscape in Warringah provides considerable opportunities for participation in outdoor activities such as mountain biking. There are extensive trail networks within Warringah, however, a key issue, and indeed a constraining factor, is that the network comprises both authorised and unauthorised facilities crossing multiple land tenures. With a large number of unauthorised trails in Warringah causing significant environment and cultural damage, acknowledging the issue and planning appropriately may limit any further unauthorised trail construction.

A number of opportunities to increase mountain bike facilities in Warringah have been identified in this analysis (see summary in Table 1). Following community consultation, if Council resolves to adopt this research paper, the next step is to explore the opportunities in greater detail and determine their feasibility as part of Council's recreational planning and works programs. Further consultation on particular trails may occur as appropriate and in line with Council's Community Engagement Policy.

Council has a duty of care in relation to any facilities it owns, designs and operates and safety and liability is a key consideration. If Council in the future were to develop more facilities a comprehensive and systematic risk management regime would need to be in place.

Opportunities that can be solely driven by Warringah Council are limited due to the complexity of land tenure, combined with the sensitive nature of the landscape (erodible soils, threatened species and Aboriginal heritage). The need to partner with other land managers is therefore a key component.

It is foreshadowed that Manly Dam will continue to be maintained as an important regional mountain biking facility, with an opportunity to enhance the diversity and quality trails. Research into the possibility of new and/or improved mountain bike tracks in Garigal National Park is welcome and Warringah will continue to liaise with NPWS regarding this. It may be that the improvements in trails being planned in Garigal National Park and neighbouring councils will alleviate pressure on the Manly Dam loop as well as unauthorised trails in places such as Oxford Falls and Red Hill. Furthermore, the gazettal of the Oxford Falls Regional Crown Reserve Plan of Management will enable a strategic review of lands to take place, with the appropriateness of mountain biking activities to be addressed.

The unmet demand (according to survey results) for certain styles of riding such as single track, free riding, downhill and dirt jumps, should be considered further as the feasibility of the identified opportunities are investigated. Continuing to consult with riders will assist in determining the key needs and priorities.

7.0 Appendices

Appendix A Mountain Biking in Warringah: rider survey (30 June – 31 July 2011)

Introduction

Council is seeking information from both residents and visitors who participate in mountain biking in Warringah. For the purpose of this survey the term mountain biking is used to encompass all forms of off-road cycling that does not take place on roads or formal bike paths. The survey aims to collect demographic and participation data. The survey is being conducted concurrently with and independently of the review of the Manly Warringah War Memorial Park (Manly Dam) Plan of Management. While the Manly Dam Plan of Management considers mountain biking within the park boundaries, this survey seeks to look more broadly at mountain biking activities across Warringah and the northern Sydney region. The data collected from this survey will provide useful and current information about the people who participate in mountain biking in Warringah and their riding experiences. It will therefore aid Council in planning for local facilities. The survey takes approximately 10 minutes to complete. Your responses will be strictly confidential and data from this research will be reported only in the aggregate. Thank you very much for your time and support. Please start with the survey now by clicking on the Continue button below.

1. Do you participate in off road cycling / mountain biking?

1. Yes
2. No (If you answer no here you are not eligible to participate in this survey)

2. What suburb do you live in?

1. Allambie Heights
 2. Beacon Hill
 3. Belrose
 4. Brookvale
 5. Collaroy
 6. Collaroy Plateau
 7. Cottage Point
 8. Cromer
 9. Curl Curl
 10. Davidson
 11. Dee Why
 12. Duffys Forest
 13. Forestville
 14. Frenchs Forest
 15. Freshwater
 16. Ingleside
 17. Killarney Heights
 18. Manly Vale
 19. Narrabeen
 20. Narraweena
 21. North Balgowlah
 22. North Curl Curl
 23. North Manly
 24. Oxford Falls
 25. Queenscliff
 26. Terrey Hills
 27. Wheeler Heights
 28. Other (please specify)
-

3. What disciplines of off road cycling do you participate in? Please tick all that apply.

1. Cross country (combination of single track and fire trails)
2. Cross country (primarily single track)
3. Primarily fire trails
4. Downhill (trails descend steeply and are technically challenging)
5. Free riding (riding over natural and constructed technical features such as rocks, bridges, jumps or drop offs)
6. Dirt jumping (riding over jumps made from mounds of dirt and becoming airborne between mounds)
7. BMX (riding around a dirt track with jumps and obstacles)
8. Other (please specify)

4. What do you consider your skill level to be?

1. Beginner
2. Intermediate
3. Advanced
4. Elite / Ride competitively

5. How often do you go mountain bike riding?

1. Rarely (once or twice a year)
2. Occasionally (once every couple of months)
3. Regularly (once or twice a month)
4. Often (every week)
5. Very often (more than once a week)

6. What is your motivation for mountain bike riding? Please tick all that apply.

1. Exercise
2. Appreciation of nature/scenery
3. Excitement/risk
4. Competition
5. Socialising
6. Relaxation
7. Other (please specify)

7. Who do you usually ride with? Please tick all that apply.

1. Alone
2. Family
3. Friends
4. Group of 2
5. Small group (3-4 people)
6. Large group (5+ people)

8. Are you a member of an organised mountain bike club, association, group or other cycling organisation?

1. No
2. Yes (please specify)

9. Which areas in Warringah do you most like to ride? Please tick all that apply. (Please note this question relates to all trails in Warringah including National Parks, Crown land and other publicly and privately owned or managed land)

1. Manly Dam
2. Manly Vale/Balgowlah/Condoover Reserve
3. Bantry Bay (Garigal National Park/Forestville/Seaforth)
4. Cascades (Garigal National Park/Belrose/Davidson)
5. Oxford Falls
6. Red Hill/Cromer
7. Terrey Hills
8. Duffys Forest
9. Ku-ring-gai Chase National Park
10. Other (please specify)

10. What are your favourite trails/areas to ride in the northern Sydney region, from Palm Beach in the north, Mosman in the south and west to Hornsby/Berowra? Please list up to five.

11. How confident are you in your knowledge of which trails are authorised for mountain bike riding and which trails are not?

1. Not at all confident
2. Somewhat confident
3. Confident
4. Very confident

12. Where do you get your information about trails? Please tick all that apply

1. Friends/family
2. Other riders
3. Bike shops
4. Bike user guides
5. Internet (please specify websites)

13. How would you rate the following features in terms of the provision of a good mountain bike trail?

Feature	Unimportant	Of little importance	Neutral	Important	Very important
Length	<input type="checkbox"/>				
Circuit	<input type="checkbox"/>				
Track features/terrain (easy to moderate)	<input type="checkbox"/>				
Track features/terrain (difficult)	<input type="checkbox"/>				
Technical trail features (such as jumps)	<input type="checkbox"/>				

Feature	Unimportant	Of little importance	Neutral	Important	Very important
Aesthetics/scenery	<input type="checkbox"/>				
Close to home	<input type="checkbox"/>				
Remoteness	<input type="checkbox"/>				
Single track	<input type="checkbox"/>				
Variety	<input type="checkbox"/>				
Sustainability of the track/track condition/maintenance	<input type="checkbox"/>				
Sustainability of the natural environment	<input type="checkbox"/>				
Safety, for example, good sight lines	<input type="checkbox"/>				
Facilities, for example, toilets or tap water	<input type="checkbox"/>				
Car parking	<input type="checkbox"/>				
Signage	<input type="checkbox"/>				

14. Are there any particular styles of mountain bike riding that you believe are not catered for in the northern Sydney region?

1. No
2. Yes (please specify)

15. In which seasons do you prefer to ride? Please tick all that apply.

1. Summer
2. Autumn
3. Winter
4. Spring

16. Do you go mountain bike riding at night?

1. Never
2. Occasionally
3. Often

17. Do you go mountain bike riding in the rain or soon after rain when the trails are wet?

1. Never
2. Occasionally
3. Often

18. What mode of travel do you take to get to a trail?

1. Bike
2. Car
3. Other (please specify)

19. On average, how far do you travel for a mountain biking experience? Please tick all that apply.

1. Locally, within 30 minutes
2. Approximately 1 hour from home
3. Approximately 2-3 hours from home
4. More than 3 hours from home (day trip)
5. Overnight
6. Interstate
7. Overseas

20. Do you combine any other activities with your rides? Please tick all that apply.

1. Picnic/BBQ
2. Swim
3. Walk
4. Camping
5. Bird watching
6. Photography
7. Walk the dog
8. Other (please specify)

21. Approximately how much money do you spend on mountain biking each year – not including the purchase of a bike? For example, food, accommodation, travel, bike parts and accessories.

1. Nil
2. \$1 - \$99
3. \$100 - \$499
4. \$500 - \$999
5. \$1000 or greater

22. Would you be willing to pay a small fee for access to a purpose built mountain bike track?

1. Yes
2. No
3. Maybe

23. Have you ever been involved in any conflict with other trail users whilst mountain biking? Please tick all that apply.

	No	Yes, verbal	Yes, physical (fight)	Yes, collision or fall	Yes, near collision
Another mountain biker	<input type="checkbox"/>				
Motocross/trail bike rider	<input type="checkbox"/>				
Walker	<input type="checkbox"/>				
Bird watcher	<input type="checkbox"/>				
Dog or dog owner	<input type="checkbox"/>				
Horse and/or rider	<input type="checkbox"/>				

24. Are you familiar with the International Mountain Bike Association Code of Conduct, or a similar code?

1. Yes
2. No

25. Have you ever participated in voluntary track maintenance?

1. Yes
2. No

26. Would you be willing to participate in voluntary track maintenance in the future?

1. Yes
2. No

27. Please indicate your agreement with the following statements:

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Mountain biking has a greater impact on trails than walking	<input type="checkbox"/>				
Mountain bike riding can be managed in a way that minimises the impact on the natural environment	<input type="checkbox"/>				
Mountain biking can co-exist with other trail users such as walkers	<input type="checkbox"/>				
People over-estimate the danger for walkers from bikes	<input type="checkbox"/>				
People over-estimate the conflict between bikers and walkers	<input type="checkbox"/>				

The following questions are aimed at collecting personal demographic data. These questions are optional, however, the information collected will provide useful information about who the primary trail users are in Warringah.

28. What is your gender?

1. Male
2. Female

29. What is your age?

1. Under 18
2. 18-24
3. 25-34
4. 35-49
5. 50-59
6. 60 and over

30. What is your current marital status?

1. Single
2. Married/Defacto

31. What is your individual gross weekly income?

1. Nil Income
2. \$1-\$149 per week (\$1-\$7,799 per year)
3. \$150-\$249 per week (\$7,800-\$12,999 per year)
4. \$250-\$399 per week (\$13,000-\$20,799 per year)
5. \$400-\$599 per week (\$20,800-\$31,199 per year)
6. \$600-\$799 per week (\$31,200-\$41,599 per year)
7. \$800-\$999 per week (\$41,600-\$51,999 per year)
8. \$1,000-\$1,299 per week (\$52,000-\$67,599 per year)
9. \$1,300-\$1,599 per week (\$67,600-\$83,199 per year)
10. \$1,600-\$1,999 per week (\$83,200-\$103,999 per year)
11. \$2,000 or more per week(\$104,000 or more per year)

32. What is your highest level of education?

1. Still at school
2. Yr 9 or below
3. School Certificate (or equivalent)
4. Higher School Certificate (or equivalent)
5. TAFE / Trade
6. Undergraduate
7. Graduate, Postgraduate or higher

33. Are there any additional comments you would like to add?

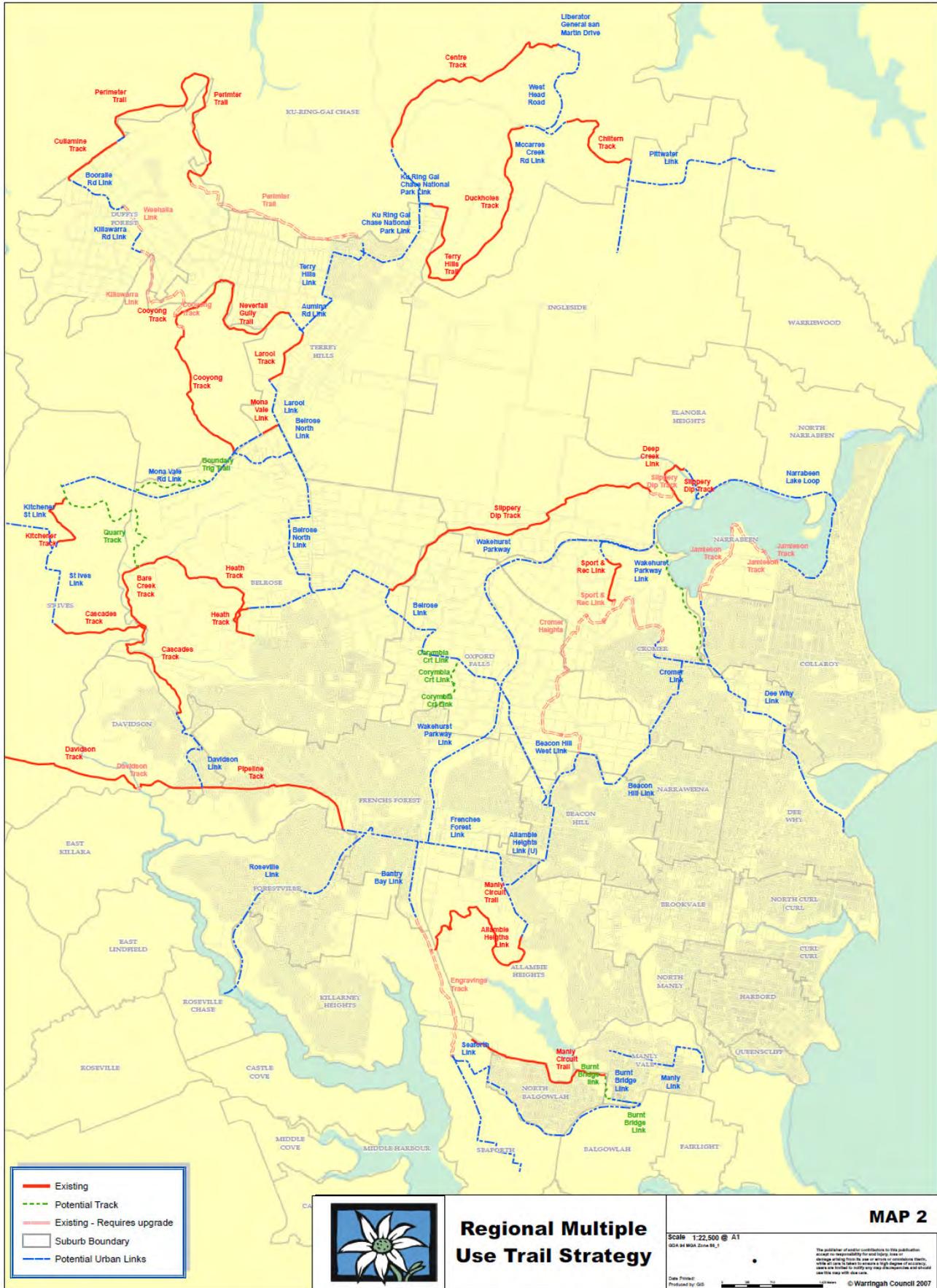
If you would like to be involved in future consultation regarding mountain bike riding in Warringah please enter your details below. Your name and email address will not be associated with your survey responses.

Name

Organisation (if applicable)

Email address

Appendix B Regional Multiple-Use Trails Strategy



Appendix C Draft Oxford Falls Regional Crown Reserve Plan of Management

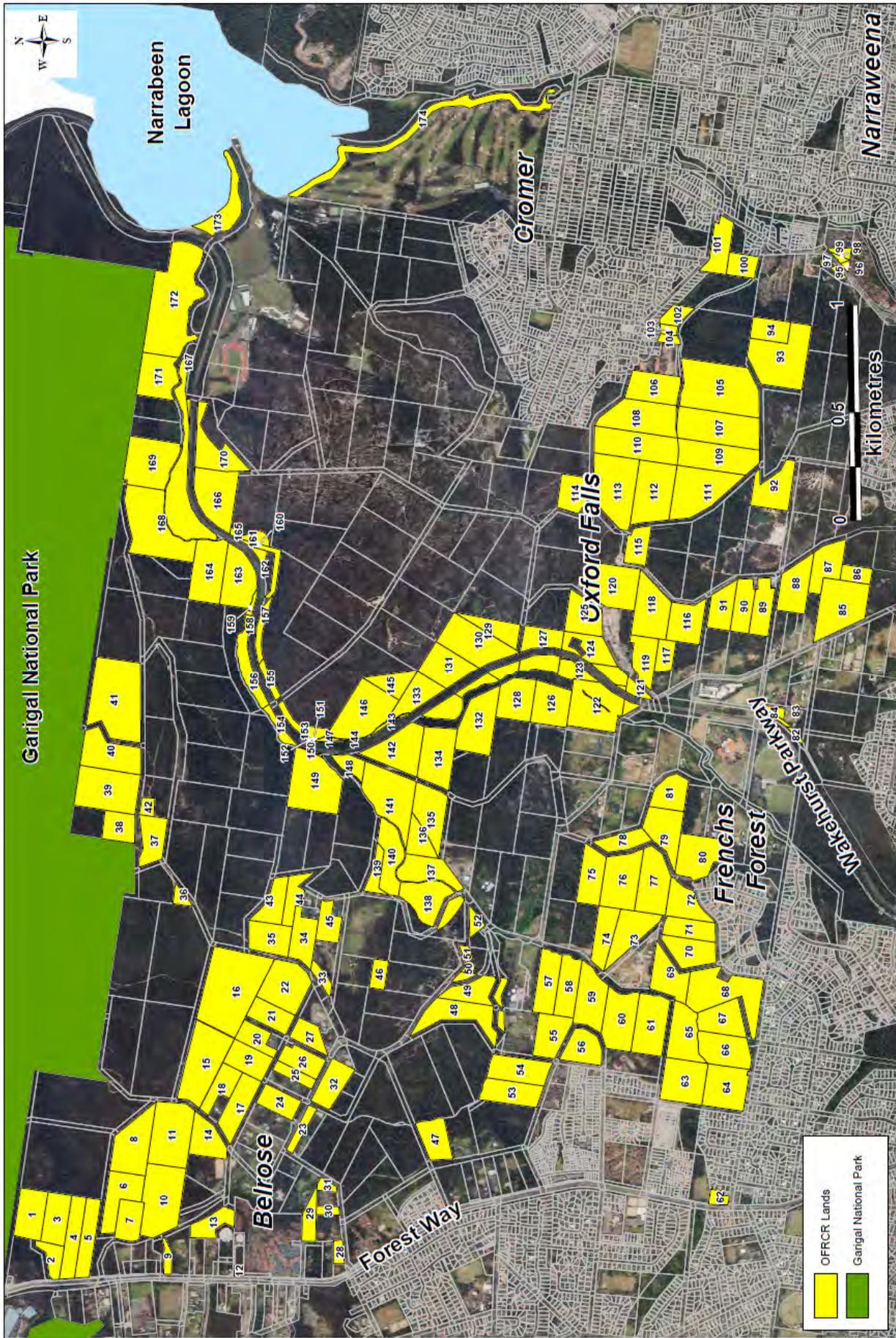


FIGURE 1.1
STUDY AREA
J:\ENV\LJ2800\Figures

Oxford Falls Regional Crown Reserve
Plan of Management

Cardno
Lawson Treloar
LJ2800/R2554/V2
July 2010

Appendix D Case studies of mountain bike tracks across Australia

Case study: Eagle Mountain Bike Park, Leawood Gardens, South Australia⁵⁰

Trail / facility name	Eagle Mountain Bike Park, Leawood Gardens, South Australia
Local Gov area/ suburb	The park includes areas within both the City of Mitcham and Adelaide Hills
Description/ overview	<p>There is approximately 21kms of cross country mountain bike trails as well as a specifically designed downhill trail, National competition level 4X track, skills development park, jumps park and a trials area.</p> <p>The park was constructed as a result of the development of the State Mountain Bike Plan. The site was a quarry until the mid 1990s and there was approx 5km of existing fire-track already onsite. Although much of the site was degraded there are pockets of sensitive and threatened bushland.</p> <p>Construction begun in 2003 although the Park was not officially opened until 2006.</p> <p>The Park is regularly used by both the Adelaide Mountain Bike Club (cross country) and the Inside Line Club (downhill); it is also used regularly by Bike SA, local schools and tour groups.</p>
Constructed by	<p>The trail network was designed by Bicycle SA in consultation with the local MTB community, conservation organisations and state and local government agencies. A local mountain bike construction company completed the final design and construction of the original network utilising the IMBA guidelines and techniques for sustainable trails.</p> <p>A second trail building company has been involved in the ongoing development of the trails since the initial track construction.</p> <p>The Green Corp program and several volunteer programs such as CVA Better Earth and Correctional Services work teams have been involved in the track construction. Green Corps is a federal government environmental traineeship program.</p> <p>The actual development of the Park has been managed by the Office for Sport and Recreation (ORS) South Australia.</p>
Currently Managed by	<p>The State Government Department of the ORS own and manage this site.</p> <p>A working party was developed with representatives from ORS , Department of Environment and Natural Resources, the two local government areas, Department of Planning and Local Government, Bicycle SA, the two mountain bike clubs, Greening Australia, Trees for Life and the Adelaide & Mt Lofty Ranges Natural Resources Management Board. This group has since broken into 2 groups – one assisting with the management of the mountain bike areas and the other involved in the conservation of the natural areas in the park.</p>
Cost of construction (\$)	<p>The following were given as approximate costings for the construction of the mountain bike park:</p> <ul style="list-style-type: none"> – \$500,000 land purchase – \$300,000 cross country track construction – \$150,000 down hill construction – \$80,000 four cross – \$20,000 Trials – \$100,000 other costs including signage, fencing and marketing etc – = 1,150,000 (approximately)

⁵⁰ Personal communication with M Krieg (September 2010) Office of Recreation and Sport SA

	<p>In addition to the above approximately \$100,000 has been spent on the road to ensure vehicle access specifically for competitions and tour operators. Another \$35,000 was spent on the development of a bridge to improve drainage.</p> <p>The rehabilitation of the conservation areas in the park cost approximately \$250,000.</p>
Construction funded by	<p>Most of the project was funded by South Australian Government, through direct funding provision and/or various grant programs.</p> <p>In kind support in the form of planning advice and administration support was offered by the two local councils.</p>
Annual operational costs (\$)	<p>There is a budget of approximately \$100,000 per year for maintenance and improvements to mountain bike facilities. This covers a part time caretaker who is employed to undertake basic maintenance as well as being responsible for opening and closing the site each day. It also includes Project Officer time approx 0.5 FTE and approximately \$10,000 a year for weed control each year (however this is only provides basic weed maintenance).</p>
Annual operational costs funded by	<p>All costs are funded by the South Australian Government at this stage.</p> <p>There are a number of competitions and events run each year which does generate some income for the Park. There are between 6 to 8 medium to large events each year with over 200 participants at any one time. Big events are charged at \$2 per person and \$500 event fee. Smaller events and skill sessions are \$50 per day as well as the \$2 per participant. There are 2 year licence agreements in place with the clubs. Schools are not charged unless they are racing which is then \$2 per head.</p>
Involvement of Volunteers	<p>Volunteers are primarily enlisted through the various clubs who use the park; there is currently no formal program.</p> <p>However there is an intention to start up a monthly program with the assistance of IMBA Australia - who will be providing insurance coverage, initial program coordination and staff and volunteer training.</p>
Major issues/ Extra information	<p>Access –the topography makes it difficult to provide a good level of visitor facilities such as café, toilets and roads needed to increase exposure and participation and attract more competitions, events and skills sessions.</p> <p>Maintenance – only just keeping up with what is required. It is difficult to generate a regular income stream without ancillary facilities. At this stage it is thought that the usage does not warrant extra funding however it is difficult to increase participation without the existence of the appropriate ancillary facilities.</p> <p>Australian MTB Championships – Eagle park is the venue for 2010-2012 event. Winning this event has been a key driver for investment into the facility.</p>
Future plans	<p>There are a number of plans in place for the development of new mountain bike trails and ancillary facilities, however these have yet to be confirmed or funded.</p> <p>It is hoped a Master Plan will be developed for the park in the medium term.</p> <p>Engaging a third party such as Bicycle SA to manage and operate the park on behalf of the state government is a possible option for the future.</p>

Case study: Gap Creek, Brisbane⁵¹

Trail / facility name	Gap Creek, Mt Cootha, Brisbane, QLD
Local Gov area/ suburb	Brisbane City Council
Description/ overview	Gap Creek is a reserve on the western side of Mt Cootha. There are 14kms of single use cross country mountain bike trail and links to the multiuse and fire trails.
Constructed by	The trails were originally either walking or fire trails and have been redeveloped as mountain bike trails. All trails have been developed using the IMBA guidelines.
Currently Managed by	The trails are managed by Council through the Trail Care Program, which aims to facilitate community participation in the care and restoration of Brisbane's natural areas. The trail Care program is managed, operated and funded entirely by the Council. It provides regular liaison, training, materials and equipment to approved on-ground volunteers projects on Council land. The Council employs a fulltime Trail Care Group Leader to manage this program.
Cost of construction (\$)	Unspecified
Construction funded by	Council funds all costs related to the mountain bike trail development and the Trail Care Program.
Annual operational costs (\$)	Approximately \$65,000 is allocated for staff position and vehicle. Maintenance costs unspecified.
Annual operational costs funded by	All costs funded by the Council.
Involvement of Volunteers	The Trail Care Program is a program aimed at getting all the mountain bike trails developed and maintained by volunteers. There is one main group of volunteers working at Gap Creek, they then break into smaller teams to work on specific sections of the trail. The volunteer team work once a month for approximately 4 hours. They are trained using the IMBA guidelines etc.
Major issues/ Extra information	User conflict between riders and other users. The Enduro riders (ride long and fast) are a very big user of the trail system and they go a lot faster than other riders and they wish to have a one way system, however there is not necessarily enough trails to justify this. There are up to 20 entry points to the park which has made education of the users more difficult.
Future plans	The manager of the Trail Care Program has just begun using counters in an attempt to understand the usage the mountain bike trails to enable the development of a strategic plan/ works programs etc. Over 1500 riders entered the park from one entry point over a 5 week period.

⁵¹ Personal Communication with Steven Schumacher (September 2010) Brisbane City Council.

Case Study: Munda Biddi, Western Australia⁵²

Trail / facility name	Munda Biddi Trail , Western Australia
Local Gov area/ suburb	<p>This trail is Western Australia's first long-distance off-road cycling trail, planning to run from Mundaring to Albany (1000km). It currently runs from Mundaring to Nannup (498 km).</p> <p>The Munda Biddi Trail Foundation is a not-for-profit organisation that was originally formed to assist the Department of Environment and Conservation and other land managers to get the trail project off the ground. It works primarily to coordinate the volunteers program and the marketing and promoting of trails and facilities. The Foundation has a Memorandum of Understanding with the Department of Environment and Conservation.</p> <p>The Foundation was formed in 1999 by a group of mountain bike enthusiasts.</p>
Description/ overview	<p>There is currently 498kms of trail which is a combination of single track, rail track and fire trail.</p> <p>There are 7 camping grounds along the 500km at this stage.</p>
Constructed by	By the Department of Conservation, Western Australian Government using prisons crews. This keeps the costs down and enables ongoing skill development of the individuals in the crews.
Currently Managed by	<p>The construction is managed by the Department of Conservation, who currently have a project coordinator, three project officers, one part time admin officer and two construction supervisors working on this project</p> <p>There are three paid staff members in the Foundation: An executive officer, Community Development Officer and an Administration and Volunteer Coordinator.</p>
Cost of construction (\$)	<p>The total funding for this track is approximately \$5 million. It is estimated that each kilometre of track costs approximately \$4000 per kilometre, which includes construction officer, contractors, signage and other operating costs. It does not include any other staff or crossings and camp sites.</p> <p>Foundation has been given \$3 million to complete the trail from Nannup to Albany – on behalf of DEC. This also includes the engagement of a Community Development Officer to promote the trail, including attracting volunteers and working with local businesses in ensure they cater for cyclists.</p>
Construction funded by	<p>The funding has primarily come from the Royalties for Regions' program which is specifically for projects in the regional areas. Approximately \$2.5 million has come through this program. The DEC has provided approximately \$1.5 million for the project planning, management and supervision</p> <p>Small grants from groups such as the Lottery Commissions have also been a funding source. Some of these grants have been possible through DEC's relationship with the Foundation as they can apply for grants not normally accessible to government agencies.</p>
Annual operational costs (\$)	The maintenance of the trails are included in the per kilometre cost. However costs are quite low as the trails are built sustainably and all machinery is hired or leased. There are limited ongoing maintenance costs.
Annual	The operating costs are funded by the Royalties for Regions program and DEC.

⁵²Personal communication with Sarah Holland at Mundi Biddi Trail Foundation and Kerstin Tender at the Department of Environment and Conservation WA (2010)

operational costs funded by	<p>The Foundation receives grants from the government and sponsorship (main sponsor is Alcoa). Income is also derived from membership to the foundation, events.</p> <p>DEC provide the equipment and pay for the training provided to the volunteers. Once registered with the Foundation the volunteers are covered under the DEC insurances and risk management programs.</p>
Involvement of Volunteers	<p>The DEC uses prison crews to construct or maintain the trails and therefore do not have a need to use volunteers. The Munda Biddi Trail Foundation does however manage a volunteers program to undertake basic track and campsite maintenance which is funded by the DEC.</p> <p>The Volunteers program currently has 91 volunteers - who participate in maintenance, events or on the board of directors. Each volunteer who wishes to undertake maintenance adopts a specific section of the trail (there are 43 sections) and works on the track pruning and camp site cleaning. Maintenance and work on the actual track is undertaken by DEC. The Foundation is modelled on the Bibbulmun (WA) walking track volunteer program and foundation.</p> <p>DEC commented on the success and importance of the relation between their department and the Foundation in the development, management and promotion of this project and the resultant facilities.</p>
Major issues/ Extra information	<ul style="list-style-type: none"> • Relatively new program – there are some issues in getting the volunteers to report back on progress etc. • The program has and will take considerable time to complete.
Future plans	The completion of the entire trail is expected in 2012.

Case study: Ourimbah, NSW⁵³

Trail / facility name	Ourimbah
Local Gov area/ suburb	Wyong
Description/ overview	Cross country and Downhill
Constructed by	Originally illegal trails which have been maintained and upgraded by the Central Coast Ourimbah Mountain Bike Club following a permit being granted to them manage the trails. New trails are subject to an application process including environmental assessment.
Currently Managed by	Central Coast Ourimbah Mountain Bike Club hold the Recreational Occupation Permit which covers a specific area. State Forests have certain responsibilities such as annual inspections.
Cost of construction (\$)	Costs covered by CCOMTB.
Construction funded by	CCOMTB
Annual operational costs (\$)	CCOMTB pay an annual fee plus and additional usage for event with over 100 people. They also pay the rates.
Annual operational costs funded by	CCOMTB
Involvement of Volunteers	Organised through CCOMTB
Major issues/ Extra information	<ul style="list-style-type: none"> - Illegal trails are an ongoing environmental issue. - When the members of the club change it can make the partnership between CCOMTB and State Forests difficult. State Forests encourage the club to have a long term plan so that new members know what the long term goals are.
Future plans	

⁵³ Personal communication with P Stewart (October 2011), Forests NSW.

Case study: Pemberton Mountain Bike Park, Western Australia⁵⁴

Trail / facility name	Pemberton Mountain Bike Park, Pemberton, Western Australia
Local Gov area/ suburb	Manjimip Shire, 3.5 hours from Perth and 3 hours from Albany in Western Australia. Pemberton is a small town with a population approximately 1400
Description/ overview	This facility was built in 2009 through a combined effort from the Pemberton Business Centre, the local cycling community and the Education Department Camp School. It has approximately 8kms of dedicated single track and another 10 km of fire trail which is considered multiuse, by both cyclists and walkers. There is also a skills area which includes a jump track.
Constructed by	The trails were built by a local trail builder who was overseen by a volunteer manager and the Business Centre Board.
Currently Managed by	The trails are managed by the Manager of the Camp School on a voluntarily basis. He also currently manages the volunteers, management plans and future development.
Cost of construction (\$)	Approximate costs of construction included: <ul style="list-style-type: none"> – 4.5km trail \$127,000, – jump track \$30,000, – bikes for the camps \$12,000, – wooden trail structures, bridges and other trail features \$23,000, – signage \$10,000, – promotions at \$1,000 – development of management plan \$10,000. Totally approximately: \$203,000
Construction funded by	The group were given an \$180,000 grant from the Federal Government, Department of Health and Aging and an \$11,000 grant from the State Government (South West Development) for the development of the concept plan. Local sponsorship was also obtained.
Annual operational costs (\$)	Public Liability - \$3500 per year. Volunteers Insurance – approximately \$800 per year There is no budget for trail maintenance although there is considered to be very few maintenance issues along the trail.
Annual operational costs funded by	The Business Centre currently pays for the insurances however in an attempt to cover this the following fee structure has been agreed upon: <ul style="list-style-type: none"> – \$2.20 per child attending camp – approximately 2000 per year – \$10 per adult who is a tourist of the Park – these are voluntary and are not enforced at this stage. – \$25 per adult per year in local area – again these are voluntary. Events will also be charged for in the future.
Involvement of Volunteers	Volunteer groups meet once a month, with around 10 people per session. There has been a number of training sessions and educations days to assist the volunteers. Free meals are provided to volunteers on working bee days.
Major issues/	There is definitely a need for rubbish bins.

⁵⁴ Personal communication with Mark Hudson (August 2010), Camp School Manager, Education Department of Western Australia

Extra information	<p>Due to the thickness of the forest a lot of debris falls from the trees, a burn is planned in the coming year.</p> <p>The park has a risk management plan in place and there have been no major incidences at this stage. The trails are well constructed and maintained.</p>
Future plans	<p>There are three management plans:</p> <ol style="list-style-type: none"> 1. Overall plan for the Park 2. Downhill 3. Skills track and jump <p>In the long term the Manager would like to see a 'northside equipment' component in the skills area – this is basically a wooden structures and platform section which popular in Canada.</p> <p>There are plans to further improve signage, produce maps and develop an interactive web page for others to contribute pictures etc. There are also plans to prepare regional mountain bike trail maps and information to make the most of the Munda Bididi trail which will be coming through the town in the near future.</p>

Case Study: Stromlo, ACT⁵⁵

Trail / facility name	Stromlo Forest Park
Local Gov area/ suburb	ACT Government, Department of Territory and Municipal Services, Territory Venues and Events- Stromlo
Description/ overview	<p>This park is a multiuse recreational facility which includes Mountain bike trails, Road Cycling criterion circuit, a purpose built grass cross country running track and equestrian trails. There are approximately 76 kilometres of mountain bike trails in the park.</p> <p>An event pavilion is currently the only structure onsite and houses an event room/kitchen, male and female toilets, showers and change rooms and a store room. A small park has recently been added and includes a children's playground and a bitumen bike track along with a BBQ and shelter.</p>
Constructed by	<p>This is an ACT Government facility which was constructed by Cardno Young and various sub-contractors.</p> <p>The initiation and construction process was managed by the Chief Ministers Department.</p>
Currently Managed by	<p>Stromlo Forest Park is currently managed by Territory Venues and Events, Department of Territory and Municipal Services, ACT Government. A traffic counter at a single entry point calculated that over 177,000 mountain bikers came to the Park in 2009. Further counters are being purchased in the near future.</p> <p>Territory Venues and Events are contracted to manage the park. There is one fulltime staff member and a number of other staff who work for the company who also contribute to the operations of the park.</p> <p>There is an online booking system for event management.</p>
Cost of construction (\$)	The entire facility cost approximately \$10 million. Figures for the mountain bike section were not provided.
Construction funded by	Funding for the entire park was provided by the ACT Government through its Capital Works program.
Annual operational costs (\$)	<p>This information was not provided. There are a number of maintenance contractors engaged for various roles within the park, including:</p> <ul style="list-style-type: none"> - Track maintenance contractor who is currently employed to maintain and repair trails, - A contractor who provides advice on track issues and a range of other maintenance tasks within the park. - Security contractor used to open and close the park and provide security patrols. - Cleaning contractor used to clean the event pavilion and toilets and a grounds maintenance contractor used to maintain our grass cross country running track, gardens and grounds. - A Range of other contractors for a whole range of other maintenance and repairs tasks such as plumbing, electrical etc.

⁵⁵ Personal communications and emails with Jeffery van Aalst (September 2010), Venue Manager Stromlo Forest Park.

Annual operational costs funded by	The ACT Government currently fund the parks operations. The park is free to the general public although events are charged a \$50 event room and PA fee as well as \$2 per participant.
Involvement of Volunteers	Canberra Off Road Cyclists (CORC) were consulted and involved with the initial planning and development stages. Occasionally CORC provide some volunteers to assist with some basic track work, e.g. pruning shrubs, clearing rocks and minor clearing work. The majority of the trail maintenance and construction work is under contract.
Major issues/ Extra information	Stromlo Forest Park is a multi-user facility. The hill area is shared by both cyclists and equestrians. Safety management involves an operational risk assessment, a universal trail rating, signage which includes an indemnity clause, some gated trail sections on the Downhill track (these are only opened for experienced and skilled riders and clubs), ongoing track inspections and repairs as required as well as ongoing input from stakeholders and park users. There is a general understanding by park users that they use the park at their own risk as it can be a relatively dangerous sport.
Future plans	Territory Venues and Events have recently undertaken an extensive master planning process to guide the future of Stromlo Forest Park. This plan is not yet publicly available.

Case study: Thredbo, NSW⁵⁶

Trail / facility name	South East Mountain Biking Company, Thredbo, NSW
Local Gov area/ suburb	Snowy River Council, Kosciusko National, NSW National Parks and Wildlife Service - Park and Kosciusko Thredbo (head lessee)
Description/ overview	Since the 1990s Thredbo has been a popular location for mountain biking through the summer months. There are trails suitable for cross country (fire trails and single track), downhill and four cross.
Constructed by	Kosciusko Thredbo (KT) is the main lessee and sub leases to South East Mountain Biking Co (SE MTB Co) to run the mountain bike facilities. KT has 2 full time staff between November and May working on bike and walking trails. SE MTB Co runs a staff of around 6 during this period, consisting of 2 mechanics, 2 guides and 2 office staff. The guides and mechanics do trail work as required.
Currently Managed by	KT is the land manager as a lessee of NSW National Parks and Wildlife Service. There is a further agreement with SE MTB Co as a sub lessee to run the mountain biking operations.
Cost of construction (\$)	All existing trails, so minimal costs involved in upkeep other than labour. Some dirt and hale bales used throughout the season. The 4 cross course costs approx \$5,000 to build each year, including earth works, machinery & labour. Any design works are done in house.
Construction funded by	KT and SE MMTB allocates a portion of all chairlift tickets sold for mountain bikers to trail building and revegetation.
Annual operational costs (\$)	There is equivalent to 2 full time staff for 6 months. However the maintenance and related resource requirements could be reduced with the redevelopment of trails to improve sustainability. The trails were built prior to the IMBA standards were recognised.
Annual operational costs funded by	Fees are obtained through chairlift ticket sales. Increased from \$69 to \$75 this year for a single day, unlimited runs.
Involvement of Volunteers	Due to the seasonal nature of this facility there is limited involvement of volunteers.
Major issues/ Extra information	<ul style="list-style-type: none"> • Lack of trails to meet demand. • Due to nature of private organisation in a National Park there is considerable bureaucracy and paperwork. • There are restrictions on re routing trails. • The steep terrain is both an asset and liability.

⁵⁶ Personal Communication and email from Jane Corban, South East Mountain Biking Company (October 2010)

Case study: Wellington Park, Tasmania⁵⁷

Trail / facility name	Wellington Park Mountain Bike Trails, Wellington Mountain, Hobart, Tasmania (Tasmania)
Local Gov area/ suburb	Covers 5 local government areas – Hobart, Glenorchy, Kingborough, Huon Valley and Derwent Valley. The Glenorchy Mountain Bike Park is adjacent to this facility.
Description/ overview	<p>There is a wide variety of trails, catering for all levels. A majority of trails were originally walking trails and have been retrofitted to be considered multiuse. As all fire trails are open for use by mountain bike riders, there is a wide variety of bike riding options available that cater for all levels. Mountain bike tracks within Wellington Park include all fire trails, North South Track, Pipeline Track, Radfords Track, O'Gradys Falls Track and sections of the Silver Falls Track.</p> <p>The Pipeline Track and Silver Falls Tracks were originally classified as walking tracks and have now been re-classified to be multi-use tracks. There is a downhill mountain bike section (Radfords Track) and a number of cross country loops including the North South Track that is currently being completed.</p> <p>The park is adjacent to the Glenorchy Mountain Bike Park (GMBP) which was established in 2005 by the Glenorchy City Council, Office of Sport and Recreation and the Glenorchy Mountain bike Association Inc. The GMBP provides a wide range of trails and facilities including a downhill course cross country, mountain cross, direct jumps and trails/ skill area. The park is primarily maintained by volunteers ran by Glenorchy City Council.</p>
Constructed by	<p>Wellington Park is managed by the Wellington Park Management Trust. The coordination of strategies and procedures is implemented by the Trust, and a regional approach to planning and management maintained.</p> <p>The Trust, its membership and Constitution is specified in the Wellington Park Act 1993.</p> <p>An objective of the Trust is to provide sustainable opportunities for recreation, tourism and education, while conserving the environmental, cultural and water catchment values of the area. Park management is guided by the Wellington Park Management Plan.</p> <p>Co-operatively, the Trust and on-ground management agencies carry out maintenance activities within the Park. The cost of maintaining existing tracks and building new tracks is borne by the land management agency (i.e. Hobart City Council, Glenorchy City Council and the Parks and Wildlife Service), with the assistance of grants from external bodies including the Office of Sport and Recreation.</p> <p>The Trust developed the Wellington Park Bike Strategy in 2005. The development and promotion of mountain biking in Wellington Park is guided by the Wellington Park Bike Strategy 2005. The 2005 Strategy followed the five year review of the Bike Strategy 2000, itself prepared in accordance with the <i>Wellington Park Management Plan 1997</i>. The Strategy provides a framework for the sustainable use of the Park for bike riding, and identifies education and awareness materials required.</p>
Currently Managed by	<p>Strategic governance of tracks and trails in Wellington Park is undertaken by the Wellington Park Management Trust (the Trust), with on-ground management of those facilities undertaken by the appropriate land manager (i.e. Hobart City Council, Glenorchy City Council and the Parks and Wildlife Service).</p> <p>The Constitution and membership of the Trust is specified in the Act and includes Hobart and Glenorchy City Councils, Tasmania Parks and Wildlife Service, the</p>

⁵⁷ Personal Communication Michael Easton, Manager Wellington Park (August 2010) and Richard Greenhill (October 2010) Hobart City Council.

	<p>Department of Primary Industries, Parks, Water and Environment, Southern Water and Tourism Tasmania. The Trust committee have been involved in the development and endorsement of the Wellington Park Bike Strategy 2005.</p> <p>The bike strategy provides a framework for sustainable bike riding in the park and endorses the use of the International Bicycling Association (IMBA) guidelines.</p>
Cost of construction (\$)	<p>Impossible to estimate the cost of building all existing fire trails and tracks used by bike riders in Wellington Park.</p> <p>However, the North South Track is a new multi-use track that has been built so that mountain bike riders can ride from The Springs in Wellington Park to the Glenorchy Mountain Bike Park, a distance of approximately 10 kilometres. The track is being built in four stages due to the cost and complexity of the project. Total cost of the North South Track, once complete will exceed \$1.1 million.</p>
Construction funded by	Hobart City Council, Glenorchy City Council, Parks and Wildlife Service, Office of Sport and Recreation Tasmania (Tasmanian State Government).
Annual operational costs (\$)	<p>The exact costs in regards to the mountain bike trails in this Park are unknown due to the complexity and different budgeting processes of each of the agencies involved with this Park.</p> <p>No entry fees charged to access Wellington Park.</p>
Annual operational costs funded by	All of the five Councils contribute to the annual operating costs of the Park.
Involvement of Volunteers	<p>Hobart City Council has engaged Green Corps teams and individual volunteers to assist in the construction of Stage 1 and 2 of the North South Track.</p> <p>The Glenorchy City Council manage a large number of volunteers in building the Glenorchy Mountain Bike Park and the section of the North South Track that is solely on Glenorchy City Council land.</p>
Major issues/ Extra information	<ul style="list-style-type: none"> • The availability of tracks for mountain bike riders in the Park does not meet the apparent need. This lack of facilities include those for cross-country riders as well as down-hill riders. The result of this is the creation of un-authorized tracks built within the Park and a frustration between land management agencies and bike riders alike. • Conflict of use between walkers, cyclists and dog walkers. • The primary charter of the Park is to protect and reserve the Park. The provision of mountain bike tracks is sometimes in conflict to this charter. • One of the trails which is a short downhill is used as a downhill by young riders in particular – there is a tendency for parents to drop off near top of ride and then the riders go down into Hobart. The trail has had to be closed to walkers due to the speed they cyclists are travelling.
Future plans	<p>Funding has been secured to develop the third and final stage of the North South track which will link through to Glenorchy Mountain Bike Park.</p> <p>There are plans to further develop master plans for bike facilities across Hobart to spread the load and impact – this was identified in the Tasmanian Bike Plan</p>

Case study: You Yangs, Victoria⁵⁸

Trail / facility name	You Yangs Regional Park, Geelong, Victoria
Local Gov area/ suburb	The park runs across two local government areas: Geelong City Council and Wyndham City Council
Description/ overview	There are 50km of environmentally sustainable trails in the Park. The Park has the only two publicly owned down hill cross country runs in Victoria. In 2002 it was estimated that there were 5000 visitors to the mountain bike trails, in 2009 it was estimated that there was between 80,000 to 90,000 people riding the trails. The overall visitation of the parks also doubled in this time however the percentage of those cycling has increased more than any other activity in the Park.
Constructed by	<p>Parks Victoria is both the manager and owner of the trails. A working party was established to assist in designing and constructing the trail as well as attracting sponsorship. The working party provides assistance in the ongoing development and operations of the trail, as is seen as a joint partnership between all groups, who include:</p> <ul style="list-style-type: none"> • Parks Victoria staff • Recreation staff from both Councils. • Representatives from both Geelong MTB club and You Yangs Inc. • Local independent riders. • Local bike shop owners. <p>Terms of reference have been developed for the working party operations and provide directions as to each person's role and responsibility.</p> <p>The trail was physically constructed by Parks Victoria staff and volunteers, using IMBA guidelines and sustainable trail techniques.</p>
Currently Managed by	<p>The trails are managed by Parks Victoria under the guidance of the working party. The working party terms of reference assist in the management of the trails and related facilities.</p> <p>A Strategic Plan for the mountain bike facilities has been developed to provide long term direction for the Park.</p>
Cost of construction (\$)	<p>The two downhill courses cost approximately \$20,000 to \$ 30,000 each, due to the need to impact the ground. This costing does not include labour which was provided by volunteers.</p> <p>The cross country trail costs varied depending on the inclination and topography; the flat trails cost approximately \$500 per kilometre where as the steepest trails cost up to \$6000 per kilometre. Approximately 30 kilometres of the trail is within the plantation area of the park, which is flat.</p> <p>It is estimated that the signage which includes trail head signs, information boards and steel shelters cost in excess of \$60,000.</p>
Construction funded by	There were no funds provided by Parks Victoria for the development of the trails. All costs were paid for through community and business sponsorships, local government grants, community grants to the clubs and club funding raising efforts. Labour was provided for free with many of the local riders working on the trails as well as offering relevant machinery and tools for no cost.
Annual operational	It is thought that it costs approximately \$20,000 to \$30,000 to maintain the trails and facilities each year.

⁵⁸ Personal communication Mark Urquhart (25 August 2010) Parks Victoria

costs (\$)	
Annual operational costs funded by	<p>Most costs are paid through ongoing sponsorship and most labour and plant hire is undertaken by volunteers. It is anticipated that volunteers work the equivalent of 2 days a week to maintain the trails. At least a half a day each week is set aside by two rangers to also work on the trails.</p> <p>Income is generated through Club events and competitions; however this money goes directly to Parks Victoria and not the park. There are also 17 licensed tourist operators using the mountain bike trails and related facilities. All funds generated by these groups go directly to Parks Victoria.</p>
Involvement of Volunteers	<p>Volunteers are very much a key to the ongoing operations and development of this facility; they are heavily involved in the maintenance and management of this facility. There are approximately 4 large scale working bees each year as well as smaller work days each fortnight.</p>
Major issues/ Extra information	<p>The issue of safety and possible litigation is a concern. Although there are appropriate safety practices in place mountain biking is a risky outdoor activity and there are accidents on the trails. It estimated that an ambulance is called into the Park at least once a week and an air ambulance required once a month.</p> <p>There is as Mountain Bike strategy in place which outlines the safety standards and maintenance requirements of the trails. It is considered highly important that practices are put in to place to ensure the highest safety standards. The Park uses the Vic Roads inspection schedule as a basis for their inspection schedule of the trails.</p>
Future plans	<p>It is felt that the park has the capacity to cater for another 20 kilometres of trail when funding becomes available.</p> <p>There are also plans as listed in the current Mountain Bike strategy to lease the Visitor Centre to an external company to develop a bike hire, manage the event permits and café style area etc – similar to the Lysterfield Park model.</p> <p>There are also plans to sell advertising space in the main mountain bike car park - this space is only used by mountain bikers and all funds would go directly back to the park and its mountain bike facilities.</p>

Appendix E Critical review of the literature on the environmental impacts of mountain biking

There have been several studies assessing the environmental impacts of off-road cycling. Many have occurred in the USA with a smaller number having been conducted in Australia. Care must be taken when superimposing results from the USA onto Australian case studies as the geology, soils and vegetation differ greatly between the two nations, for instance, many Australian environments are more susceptible to erosion. Even so, with so few Australian case studies, benefit can be gained from critically analysing the methods and findings of research conducted locally, nationally and internationally to determine how it may be applicable to formal and informal tracks and trails in Warringah.

While there has been little research comparing the impacts from different styles of riding (downhill, free-riding etc), there have been several studies (discussed below) that compare the impacts from different user groups (mountain bikes, hiking, horses and vehicles). However, the NSW National Parks and Wildlife Service has suggested that the environmental impacts can differ according to the type of bike rider. In their study conducted in the Royal National Park south of Sydney, they found that recreational riders tend to keep to the trails and those they refer to as 'soul riders' do not.⁵⁹

Influence of soil type and texture

Soil texture is a variable that influences the erodability of a track⁶⁰ and therefore soil type and texture would need to be considered prior to developing for mountain biking. Soil texture is dependent on the percentage of sand, silt and clay which subsequently determines the drainage characteristics of the soil. The finer the soil (fine sands and silts) the higher the erodability. Conversely, the coarser the soil (coarse sands and soils, possibly of mixed grain sizes and small rocks) the better the drainage and the more resilient to erosion. Other soil characteristics influencing potential track damage include organic content, consistency, depth, moisture and temperature levels.

In Warringah, the soils vary from the sandy soils derived from Hawkesbury sandstone to the clay rich soils from the Narrabeen shale. Due to the diverse soils in the region, soil type and texture is one factor that would need to be assessed prior to the development of new trails for mountain biking or the formalisation of existing trails.

Soil and sediment loss (erosion)

In data gathered from riders in the USA, United Kingdom, Australia and New Zealand, mountain bikers themselves ranked hiking as having a lesser impact on the environment than bikes.⁶¹ However, there is conflicting scientific research regarding this. In Big South Fork National Park, USA, a study found that mountain biking had the lowest estimated soil loss when compared to hiking, horses and All Terrain Vehicles (ATV), although the overall results were not statistically significant.⁶² The mountain biking track, however, was acknowledged by the authors as receiving only low to moderate use when compared to the level of use for the other track types.

Similarly, research in Montana, USA, used 66 by 66 cm sample plots to compare the sediment loss and water run-off on existing trails with respect to off-road cycling, motorcycles, horse riding and hikers.⁶³ Each plot was passed over 100 times. On pre-wetted plots hikers were found to produce the second largest sediment yield behind horses, with motorcycles and off-road cycling producing the least. Even so, the sediment yield from the hiker plots and off-road cycling plots were not found to be significantly different from each other nor the control plots. Only horses generated

⁵⁹ NSW NPWS (2002)

⁶⁰ Goett & Alder (2001)

⁶¹ Symmonds & Quisenberry (2000)

⁶² Olive & Marion (2009)

⁶³ Wilson & Seney (1994)

significantly more sediment yield than the control sites under both wet and dry conditions. It has been suggested, however, that the simulated rainfall was only equivalent to one third of the natural rainfall and therefore there may not have been enough kinetic energy to properly test differences in erosion.⁶⁴

On the other hand, a study by Chiu & Kriwoken⁶⁵ found that the impacts of off-road cycling on track surface elevation (a function of compaction and erosion) were slightly greater than hiking when compared on flat, dry sections of an abandoned fire trail in Tasmania, although again the results were not statistically significant. In the same study, however, riding on wet sites, up steep hills and skidding, were found to have a higher impact (statistically significant) than riding on flat, dry sites.

Surprisingly though, in Chiu & Kriwoken's study, the impact from riding around sharp corners was not found to be significantly different from riding on sections of straight track. This result was in contrast to an earlier study reported by Hawes,⁶⁶ who assessed the impacts of skidding during racing events. One explanation for this anomaly is that the skidding would be greater during a racing event than would ordinarily occur in a recreation setting.⁶⁷

Research has also found that while walkers and off-road cyclists exert similar pressures on flat ground, a walker exerts a maximum pressure when descending a hill of 56kg cm² while a mountain bike with high profile tyres exerts a maximum pressure when riding uphill of a mere 14 kg cm².⁶⁸ This study concluded that the type of user and whether they are travelling up hill or down hill has a major influence on soil compaction.

Furthermore, an assessment comparing trail position, trail slope angle alignment, grade, water drainage and type of use, found that trail position was the greatest determinant of soil loss, with valley positions significantly more eroded than mid-slope and ridge trails.⁶⁹ It was hypothesised that this was due to a combination of the periodic flooding-related erosion of trail substrates and for being in a lower watershed position where water run-off volumes and rates are highest. For these reasons the authors suggest that trails in floodplain areas should be avoided, trails should be located above the frequent flood levels, designed to ensure appropriate drainage and that more erosive types of uses, such as horses and ATV, be restricted from trails in riparian areas. In Warringah these factors could be taken into consideration when developing or maintaining trails around lagoons and water ways, for instance Manly Dam and Narrabeen Lagoon.

A further determinant of soil loss was found to be trail alignment, with trails that follow the contour allowing better drainage (on the downhill side) when compared to trails that follow the 'fall-line'.⁷⁰

In addition, another significant factor in the erosion of tracks used for mountain biking is slope, with downhill slopes and curves being the most susceptible to erosion.⁷¹ Similarly, a comparative study of five different ecological regions in Southwestern USA finds that trail slope has a significant effect on maximum trail incision (rut development).⁷² Results indicate that as the slope increased, the incision increased. It was also found that, generally, as slope increased, trail width increased, however, these results were not statistically significant. Importantly, though, significant differences were identified between the different ecological regions for both trail width and maximum incision, therefore, again, it is important to stress that targeted research is required at each site rather than making management decisions based on generalisations from studies in other areas that may have very different environmental conditions and features.

⁶⁴ Pickering et al. (2010)

⁶⁵ Chiu & Kriwoken (2003)

⁶⁶ Hawes (1997)

⁶⁷ Chiu & Kriwoken (2003)

⁶⁸ Wöhrstein (1998)

⁶⁹ Olive & Marion (2009)

⁷⁰ Olive & Marion (2009)

⁷¹ Goett & Alder (2001)

⁷² White et al. (2006)

Fauna and flora

There have been relatively fewer studies looking at the impacts of recreation activities on wildlife, with no known studies in Australia. In the USA, however, a comparison of the impacts of ATVs, mountain biking, hiking and horse riding concluded that each activity has an energetic cost affecting the feeding, resting and travelling habits of the North American Elk.⁷³ As expected, the ATV had the greatest impact. For both the mountain bike and hiker treatments Elk spent more time travelling, less time resting and a similar amount of time feeding. It is suggested that as these activities are quieter than ATVs, once the Elk had moved away they were able to resume foraging to make up for lost energy. When exposed to horse riding Elk spent slightly more time travelling, slightly more time resting and slightly less time feeding. The authors concluded that while the impacts from mountain biking and hiking were similar, the Elk showed no sign of habituation to either. For all treatments, once the disturbance ended the behaviour of the Elk returned to patterns similar to the controls. Similarly, a separate study comparing the impacts of hikers and mountain bikers on bison, mule deer and pronghorn antelope found that there was little difference in alert distance, flight distance or distance moved.⁷⁴

In contrast, a comparison between vehicles, mountain bikers and hikers found that desert bighorn sheep in Utah, USA, were more likely to flee in the presence of hikers (61% of encounters) when compared to vehicles (17%) and mountain bikers (6%).⁷⁵ This was explained by suggesting that hikers were more likely to approach the animals and to be in unpredictable locations (off the track). Vehicles and mountain bikes, on the other hand, are largely confined to the trail. It was also found that the animal's responses varied seasonally in relation to lambing time. Furthermore, many of the sheep avoided the road corridor in the high use area all together, equating to a 15% reduction in potential suitable habitat. In addition, an informal review of impacts also suggests that reptiles that sun themselves on tracks, for instance snakes and lizards, are susceptible to injury and death from mountain bikes travelling too fast to notice them in time to avoid them.⁷⁶

With respect to impacts on vegetation, Chiu & Kriwoken (2003) report that damage from off-road cycling was observed to develop a relatively narrow groove towards the centre of the track, while hiking produced a more spread out impact. This is in keeping with the findings of a earlier study in Ontario, Canada, by Thurston & Reader (2001) that compared the effects of experimentally applied mountain biking and hiking on understory of s deciduous forest vegetation and found that while the mean species loss (average loss of species) did not differ significantly between mountain biking and hiking, the impact was greater in the centre of the track for mountain biking (80% compared to 71% for hiking), similar in the middle zone (27% for biking and 26% for hiking) and greater in the outer zone of the track for hiking (11% compared to 8% for biking) (see Figure 3). This study also suggests that while the immediate impacts can be severe, rapid recovery can be expected when the activities are discontinued.

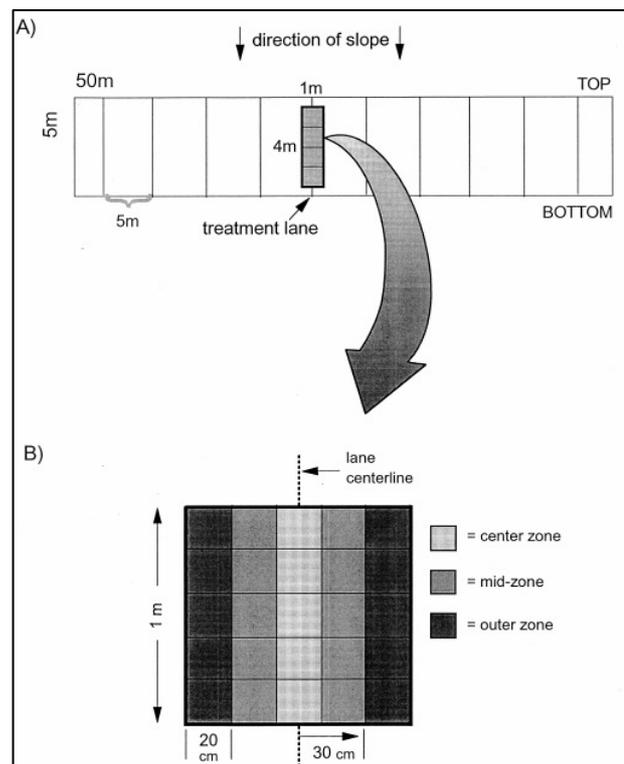


Figure 24. (A) Location of the ten treatment lanes per 50m x 5m block. (B) Enlargement of a 1m x 1m quadrat showing the three quadrat zones (centre, middle, outer). (Source Thurston & Reader 2001)

⁷³ Naylor et al. (2009)

⁷⁴ Taylor & Knight (2003)

⁷⁵ Papouchis et al. (2001)

⁷⁶ Vanderman (2005)

These studies on the impacts of recreational activities on fauna and flora have relevance to Warringah in that the construction of new trails or the formalisation of informal trails would need to consider the potential impact on native flora and fauna, particularly those listed as endangered or vulnerable. In Warringah there are approximately 400 species of native animals, over 900 native plant species and 37 different vegetation communities. Over 70 species and ecological communities are officially listed as endangered or vulnerable, including those that are permanent and migratory. The presence of threatened migratory species means that seasonal variations would need to be considered. Furthermore, while the rates of mountain bikers participating in night rides in Warringah are not known, the potential impacts on nocturnal species would also need to be considered.

Summary

Several studies have found that while the impacts on tracks from off-road cycling are cumulative, there is also a curvilinear effect in that a rapid initial change is followed by a reduction in the rate of change.⁷⁷ This is most likely due to prolonged use resulting in the hardening of the track through compression or erosion down to harder soils.

While several studies have not found impacts from off-road cycling and hiking on flat, dry tracks to be significantly different, it must be remembered that skidding, riding on slopes and in the wet, which have each been shown to have a significant impact, are an integral component off-road cycling activities. So while for statistical reasons these variables have been separated, the collective impact must be considered, including the compounding effect of cyclists often travelling much longer distances than hikers.

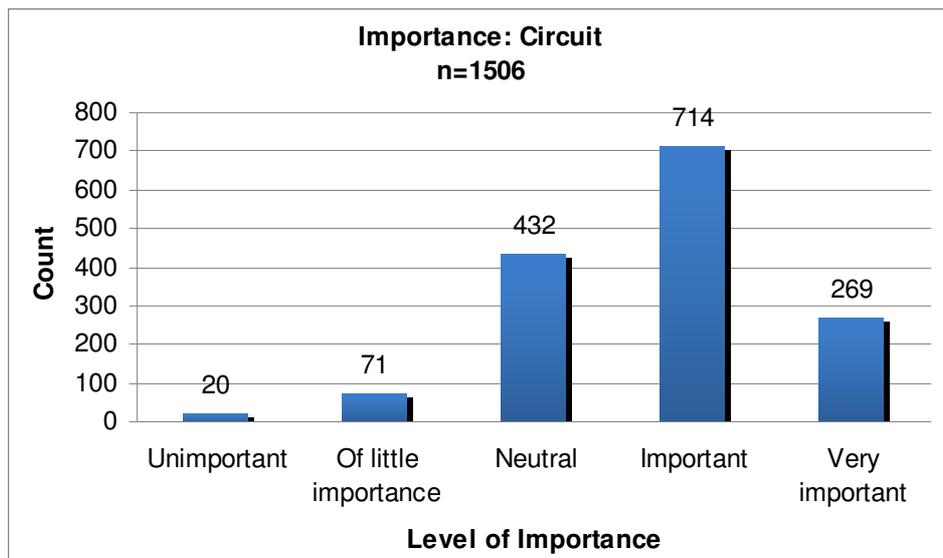
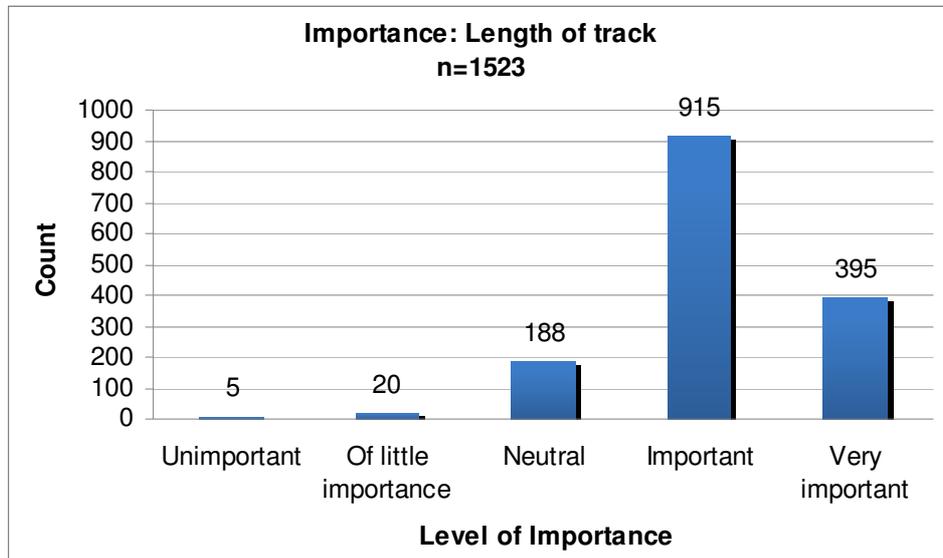
The variations in the results from these studies and the knowledge that the severity of impacts is dependent on so many variables suggests that the sustainability of each trail/track should be researched independently.

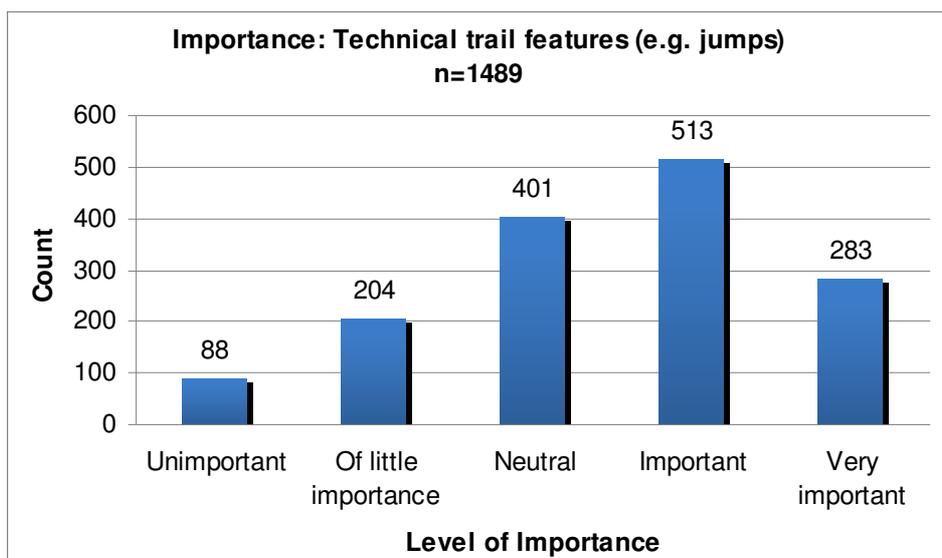
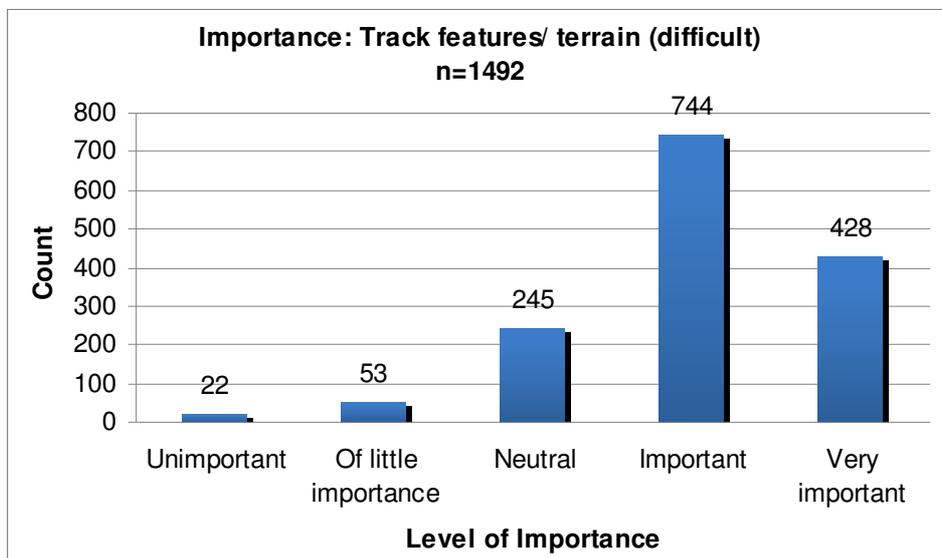
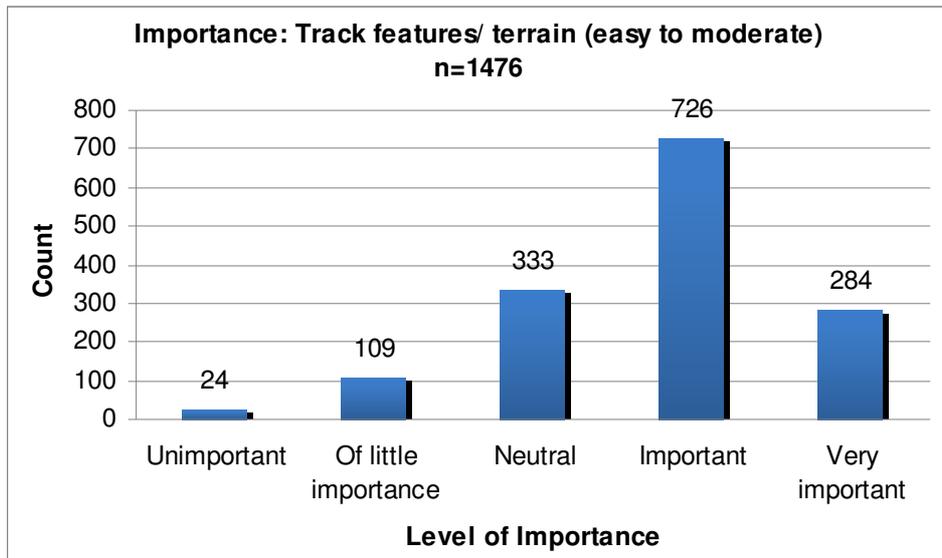
The biophysical impacts of mountain biking can be minimised if tracks are properly designed, located, managed and maintained. Minimising the likelihood of cyclists creating new and damaging trails may be achieved through education riders about how to minimise environmental impacts and by ensuring that their needs are addressed appropriately.

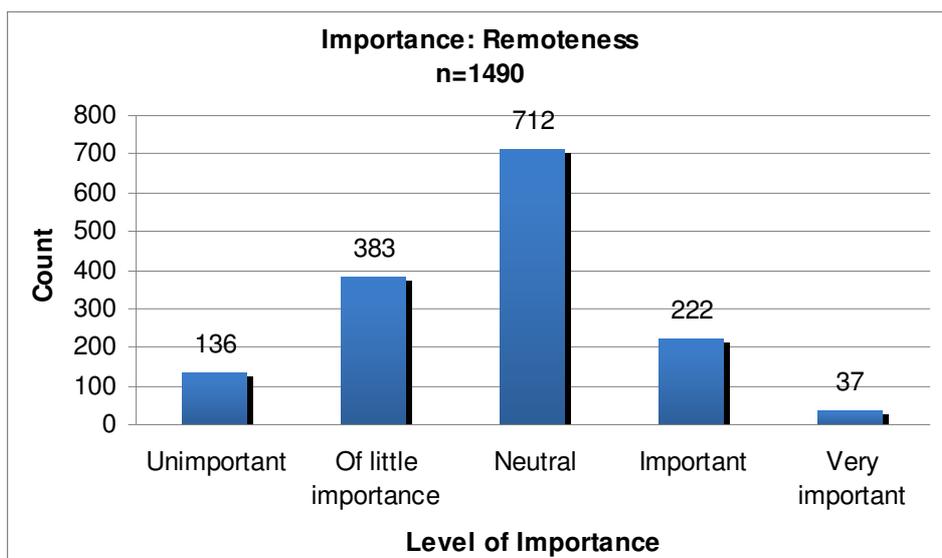
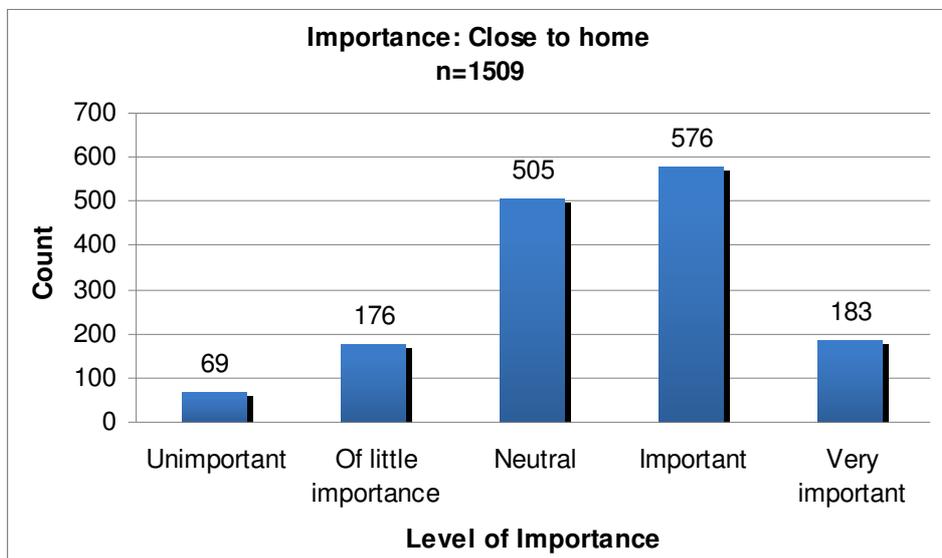
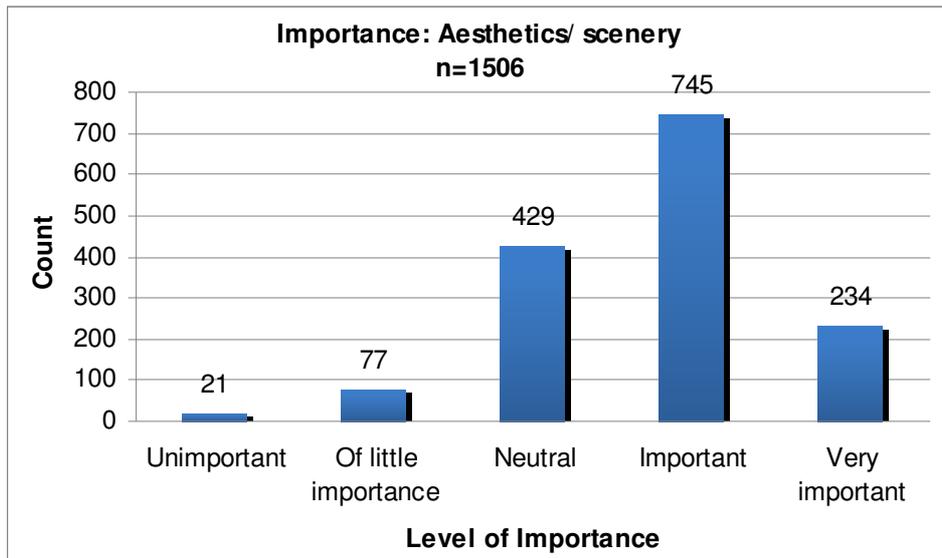
⁷⁷ Bjorkman (1998); Hammitt & Cole (1998); Chiu & Kriwoken (2003)

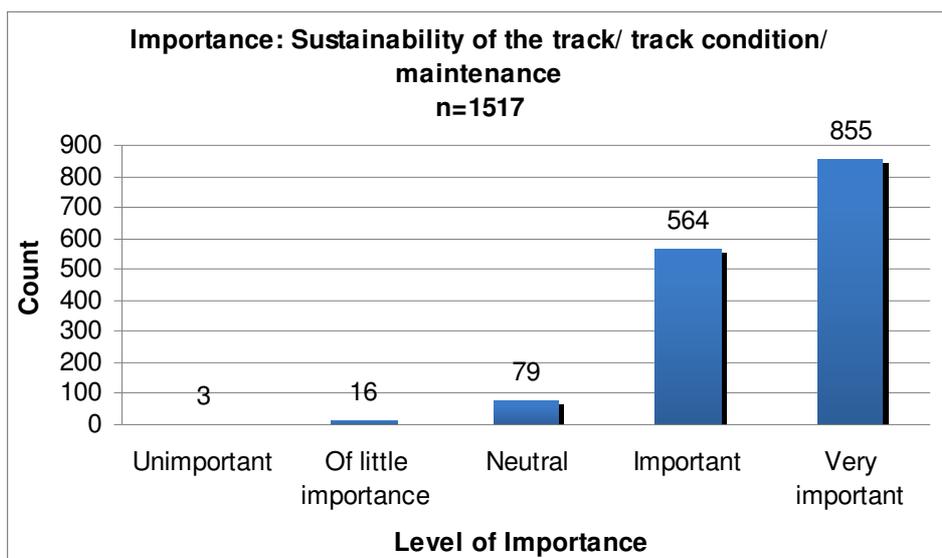
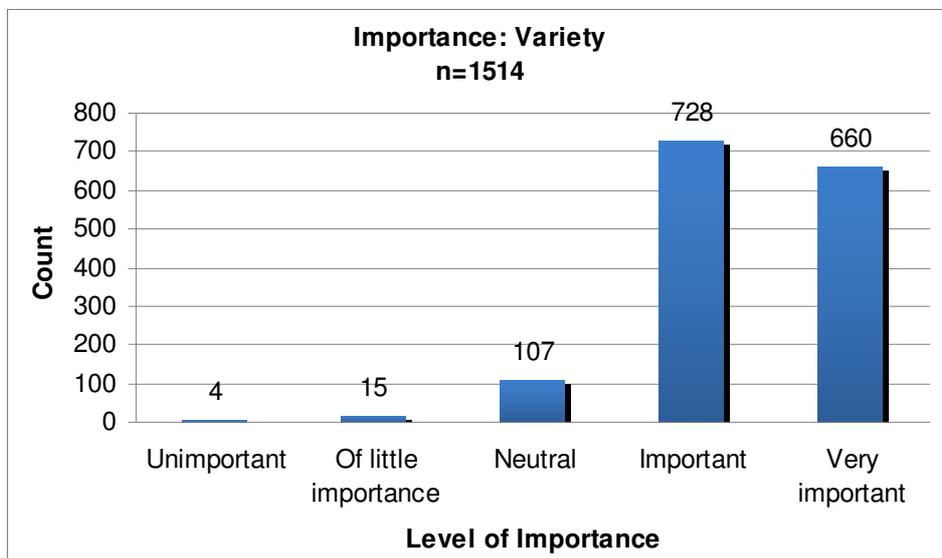
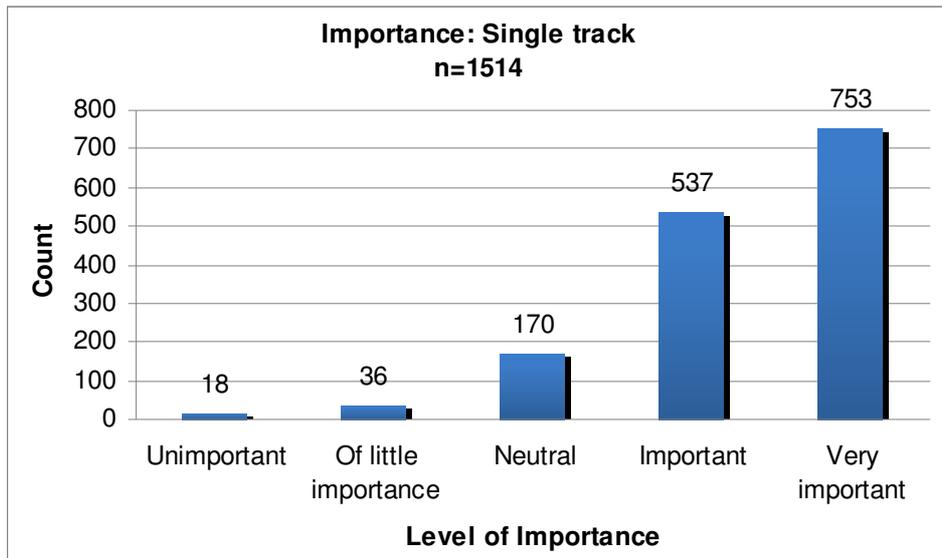
Appendix F Importance of trail features

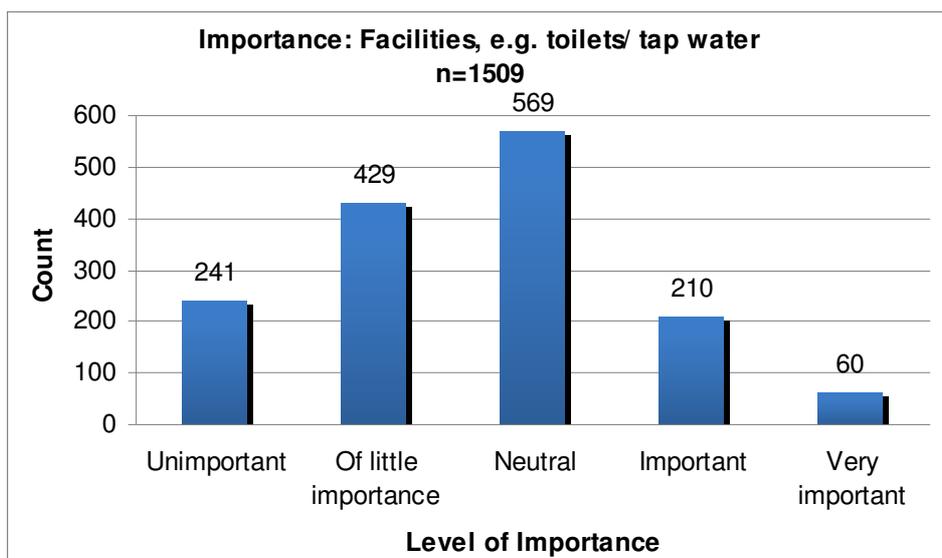
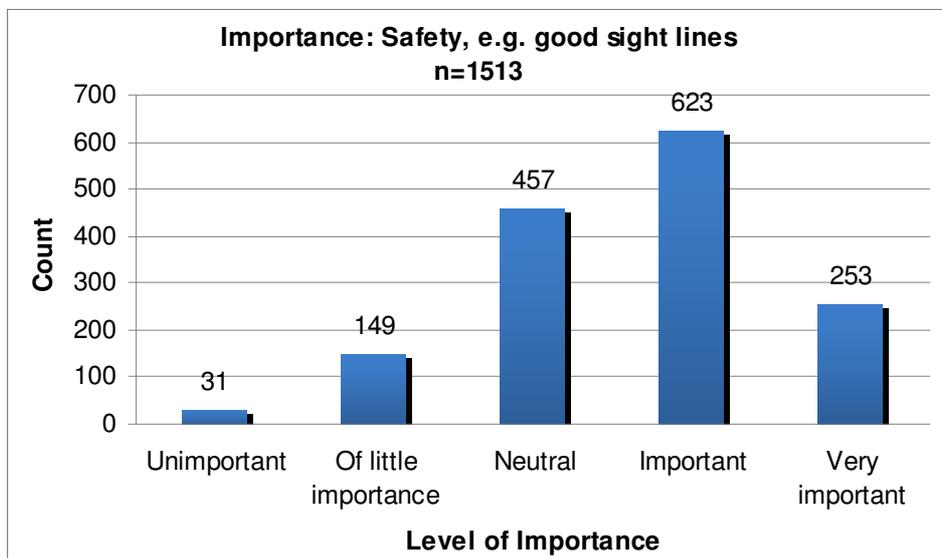
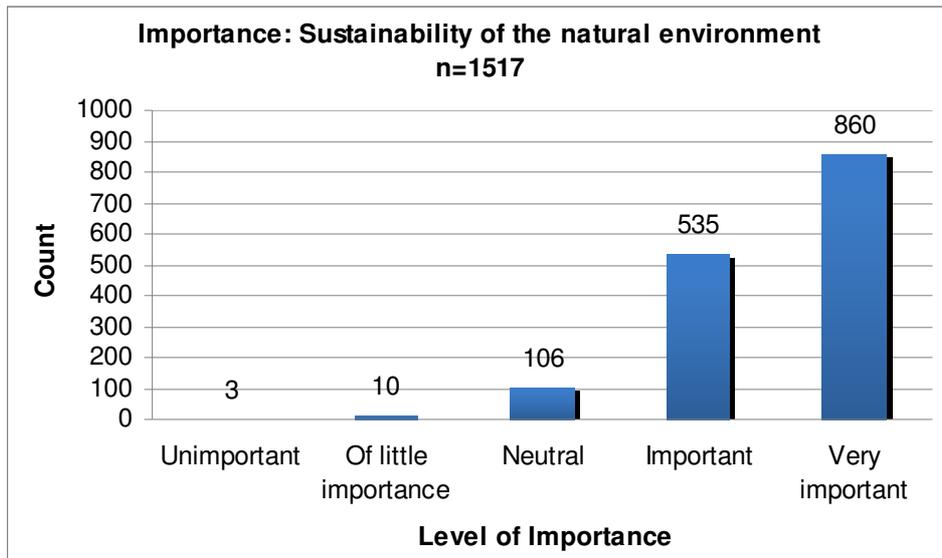
The following charts provide a further breakdown of the rider survey data contained in Table 6 in the body of the document.

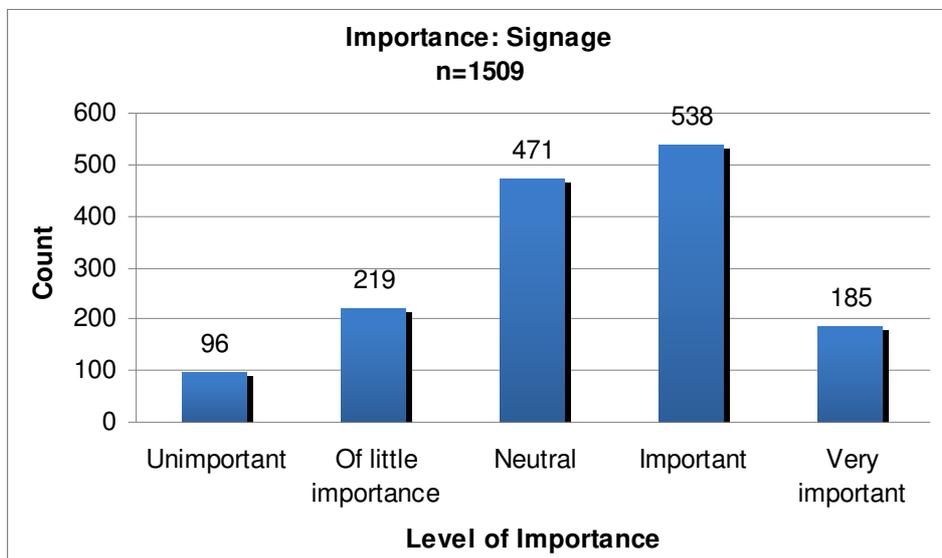
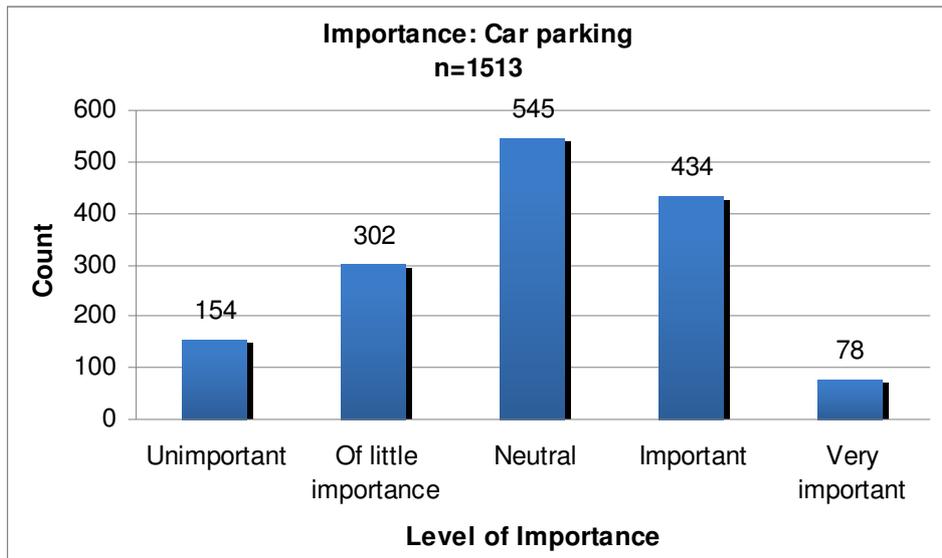




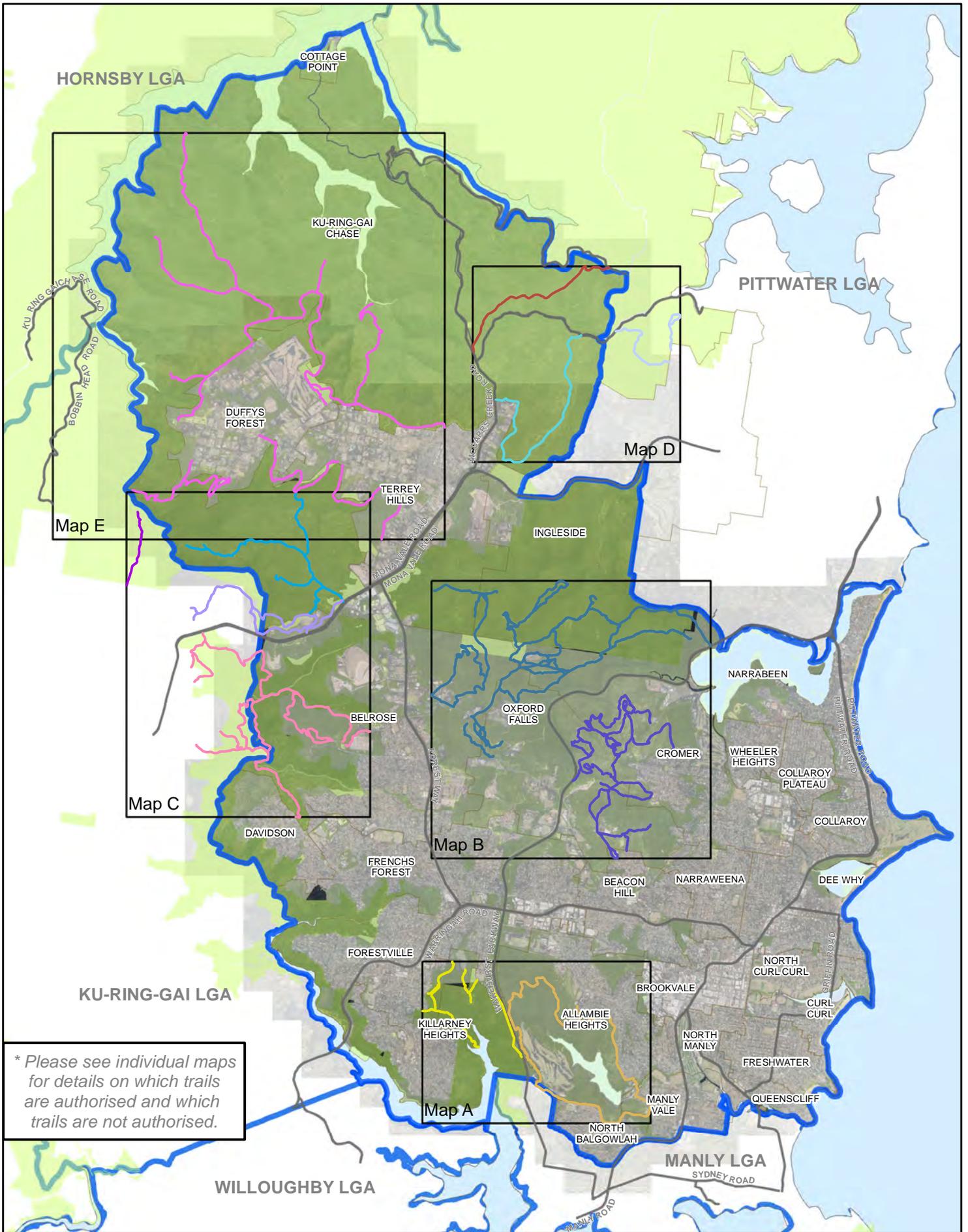








Appendix G Maps



* Please see individual maps for details on which trails are authorised and which trails are not authorised.

Current Trails being used for Mountain Biking in Warringah Local Government Area *



Scale: 1:85,000

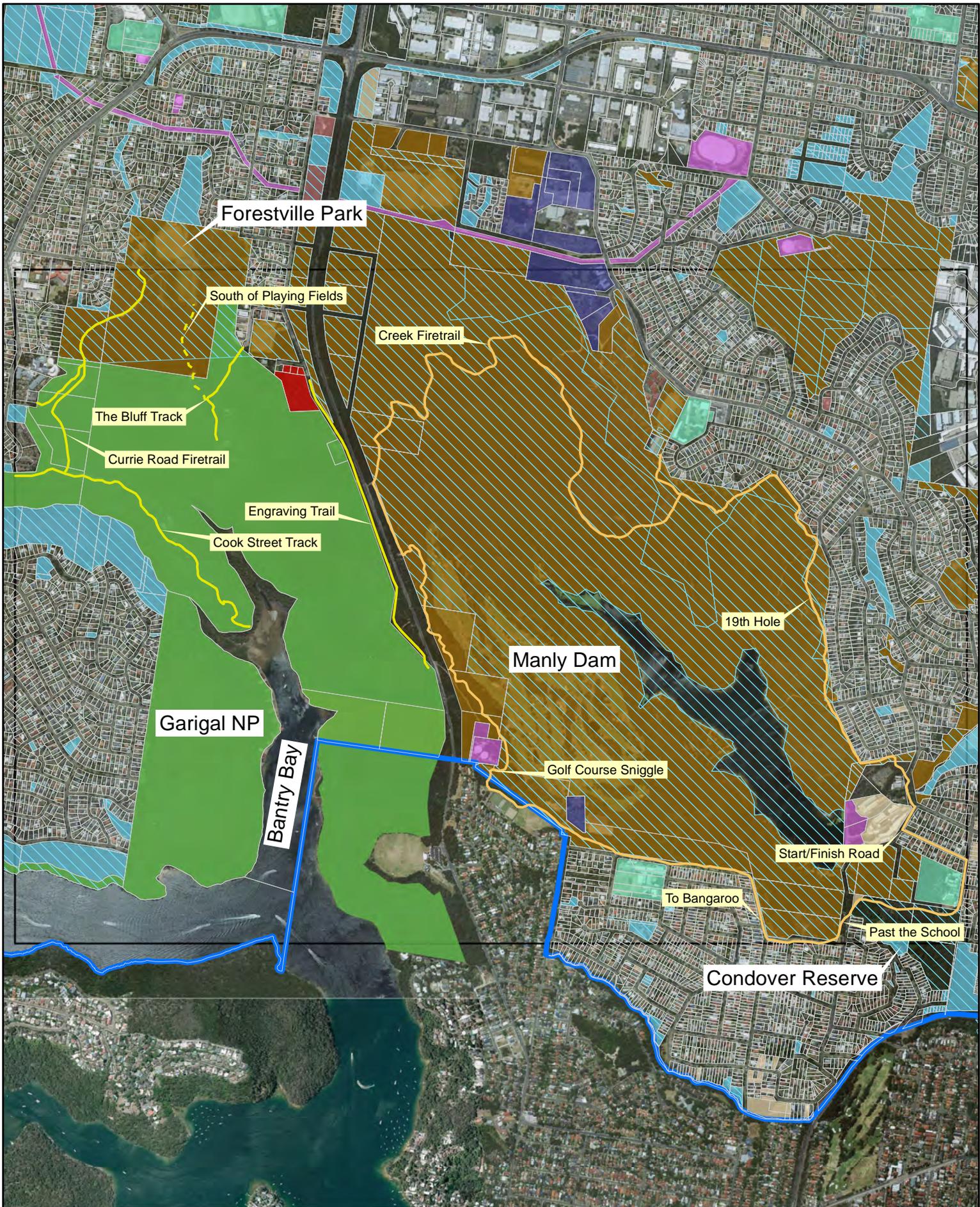
0 1.5 km

- | | | | | |
|----------------|------------------------------|----------------|---------------|-----------------|
| Trails | Duck Hole/Terrey Hills Trail | Showground | National Park | Suburb Boundary |
| Bantry Bay | Manly Dam | Terrey Hills | Core Bushland | LGA Boundary |
| Cascades | Oxford Falls (Morgan Road) | Warrimoo Track | Urban Areas | |
| Centre Track | Red Hill | Arterial Road | | |
| Chiltern Track | Ryland | | | |

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Trails	Property Owners 15/9/2010
Bantry Bay, Authorised	Government Agencies
Bantry Bay, Unauthorised	Crown Land
Manly Dam, Authorised	Dept Education
Manly Dam, Unauthorised	Warringah Council
National Park	Private Other
Warringah Council Managed Land	Services
Warringah LGA	Dept Lands Leases
	Dept Of Lands & Warringah Council
	Metropolitan Local Aboriginal Land Council

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Map A - Land Tenure Manly Dam & Bantry Bay Area

Scale 1: 20,000 (A4)
GDA 94 MGA Zone 56

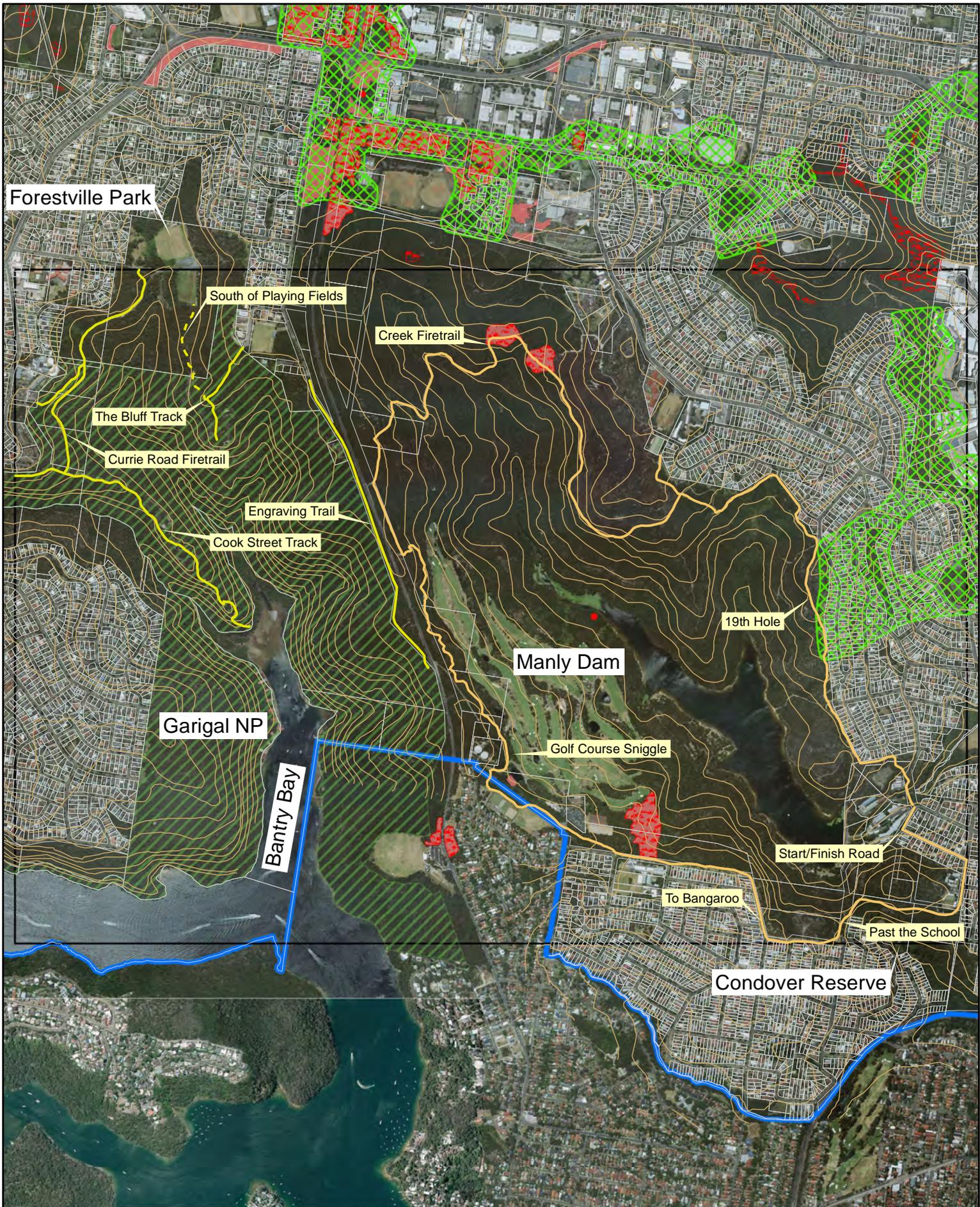


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0 195 390 780 Meters

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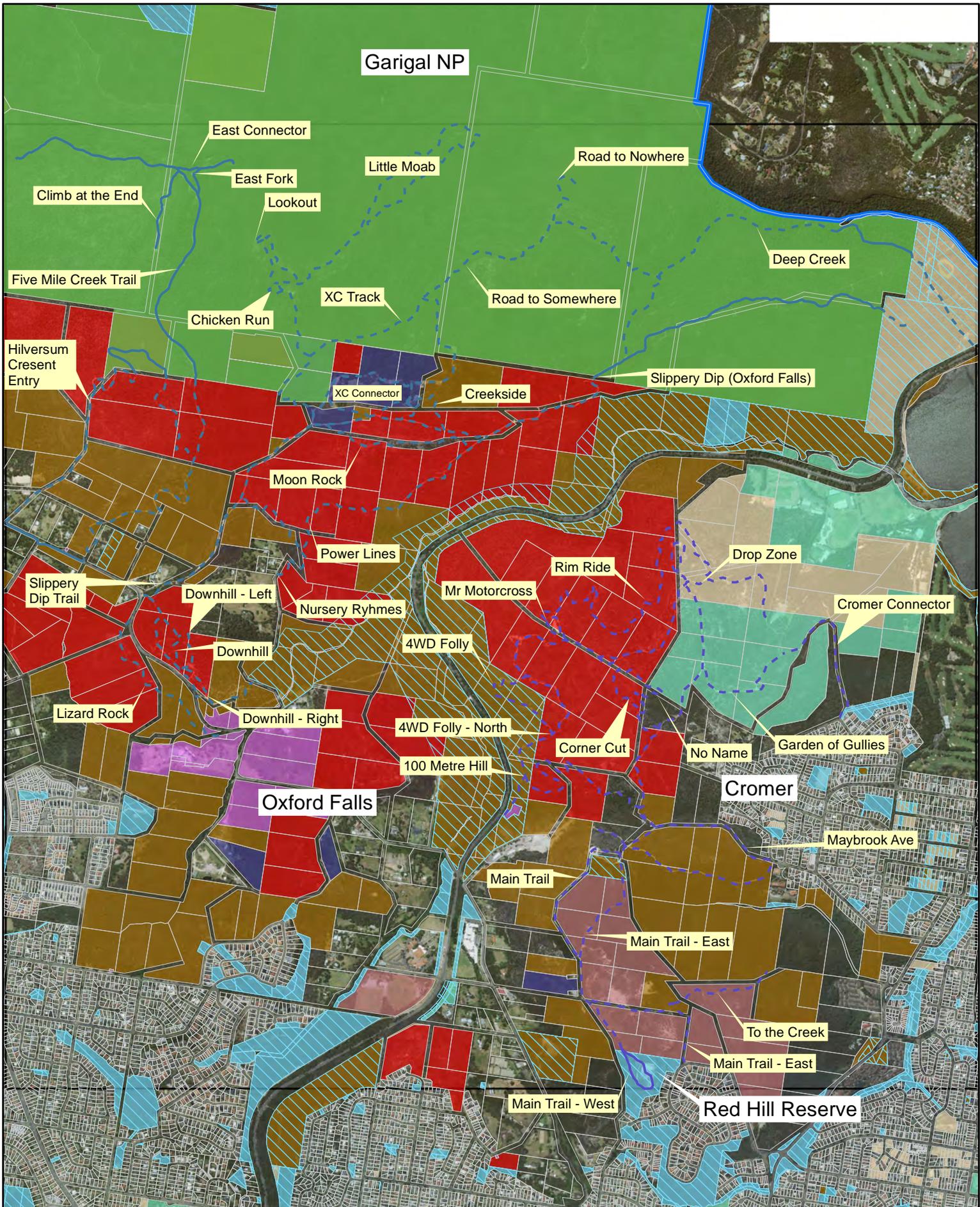
- Trails**
- Bantry Bay, Authorised
 - Bantry Bay, Unauthorised
 - Manly Dam, Authorised
 - Manly Dam, Unauthorised
 - 10m Contours
 - Cadastre
 - National Park
 - Warringah LGA
- Threatened Species Points
 - DCP Draft Threatened & High Conservation Habitat
 - DCP Draft Wildlife Corridors
 - Threatened Species Area

Map A - Environmental Factors Manly Dam & Bantry Bay Area

Scale 1: 20,000 (A4)
GDA 94 MGA Zone 56



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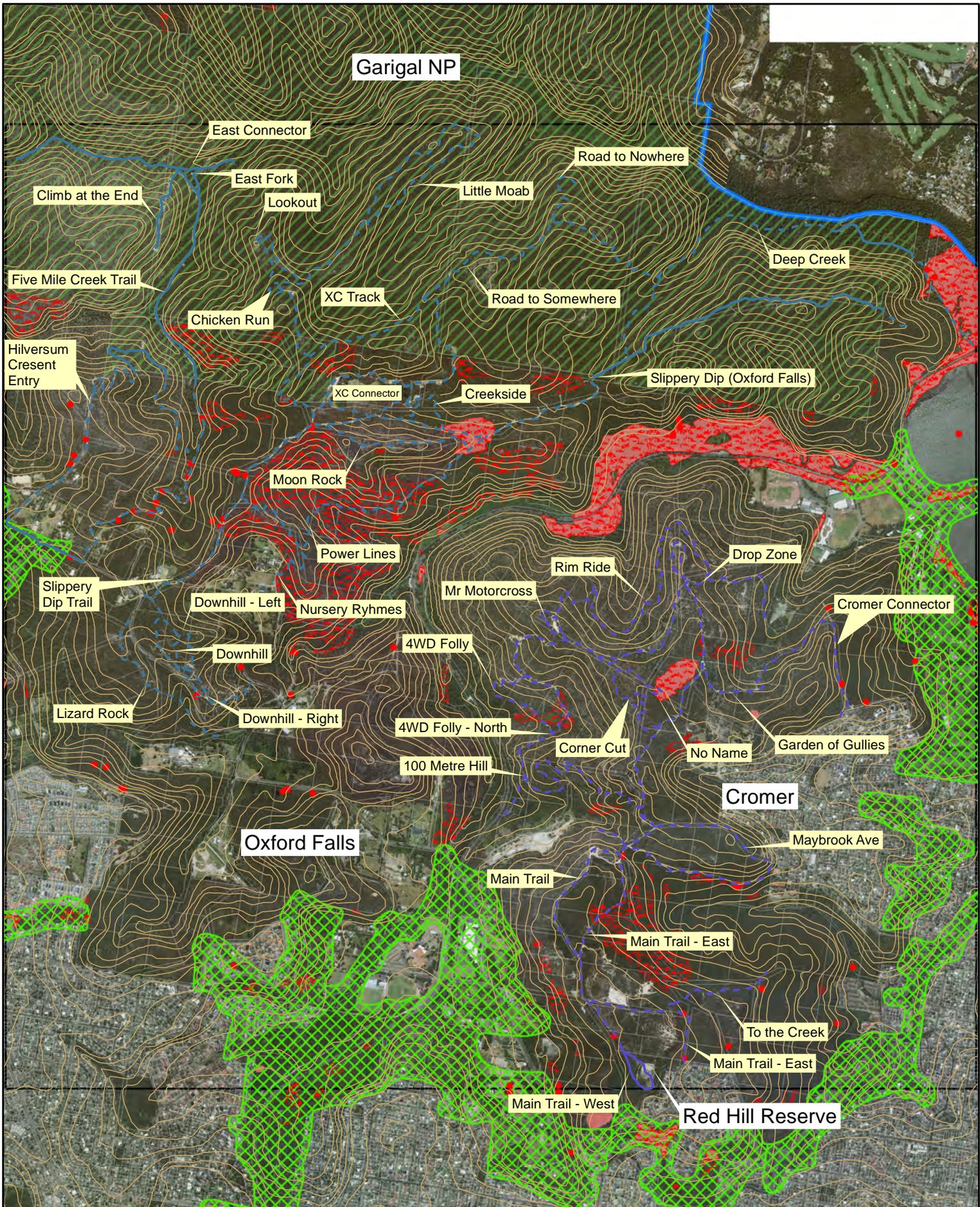
Trails		Property Owners 15/9/2010	
	Oxford Falls (Morgan Road), Authorised		Government Agencies
	Oxford Falls (Morgan Road), Unauthorised		Crown Land
	Red Hill, Authorised		Dept Education
	Red Hill, Unauthorised		Warringah Council
	Cadastral		Private Other
	National Park		Services
	Warringah Council Managed Land		Dept Lands Leases
	Warringah LGA		Dept Of Lands & Warringah Council
			Metropolitan Local Aboriginal Land Council

Map B - Land Tenure Oxford Falls & Red Hill Area

Scale 1: 24,000 (A4)
GDA 94 MGA Zone 56



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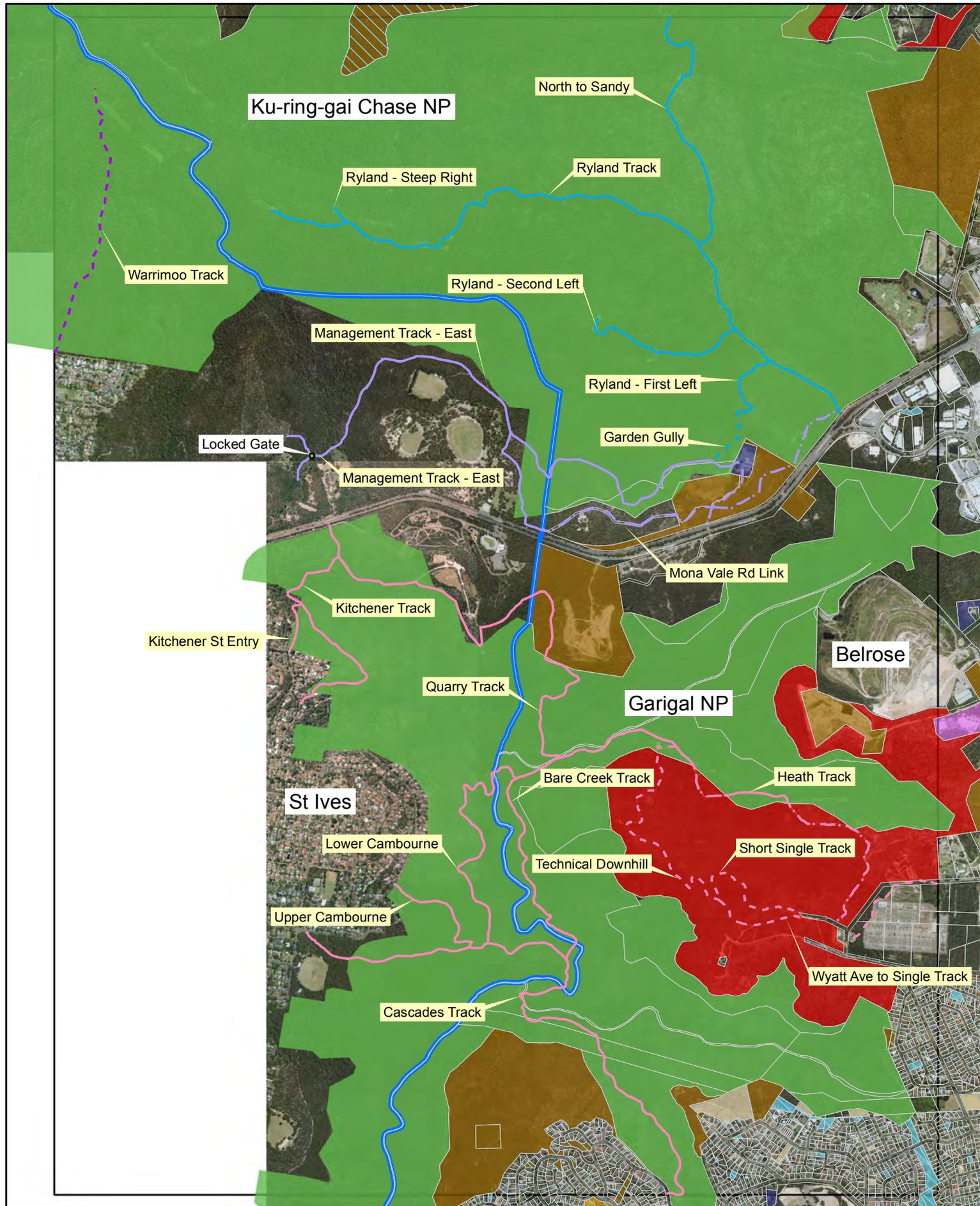
- Trails**
- Oxford Falls (Morgan Road), Authorised
 - Oxford Falls (Morgan Road), Unauthorised
 - Red Hill, Authorised
 - Red Hill, Unauthorised
 - 10m Contours
 - Cadastre
 - National Park
 - Warringah LGA
- Threatened Species Points
 - DCP Draft Threatened & High Conservation Habitat
 - DCP Draft Wildlife Corridors
 - Threatened Species Area

Map B - Environmental Factors Oxford Falls & Red Hill Area

Scale 1: 24,000 (A4)
GDA 94 MGA Zone 56



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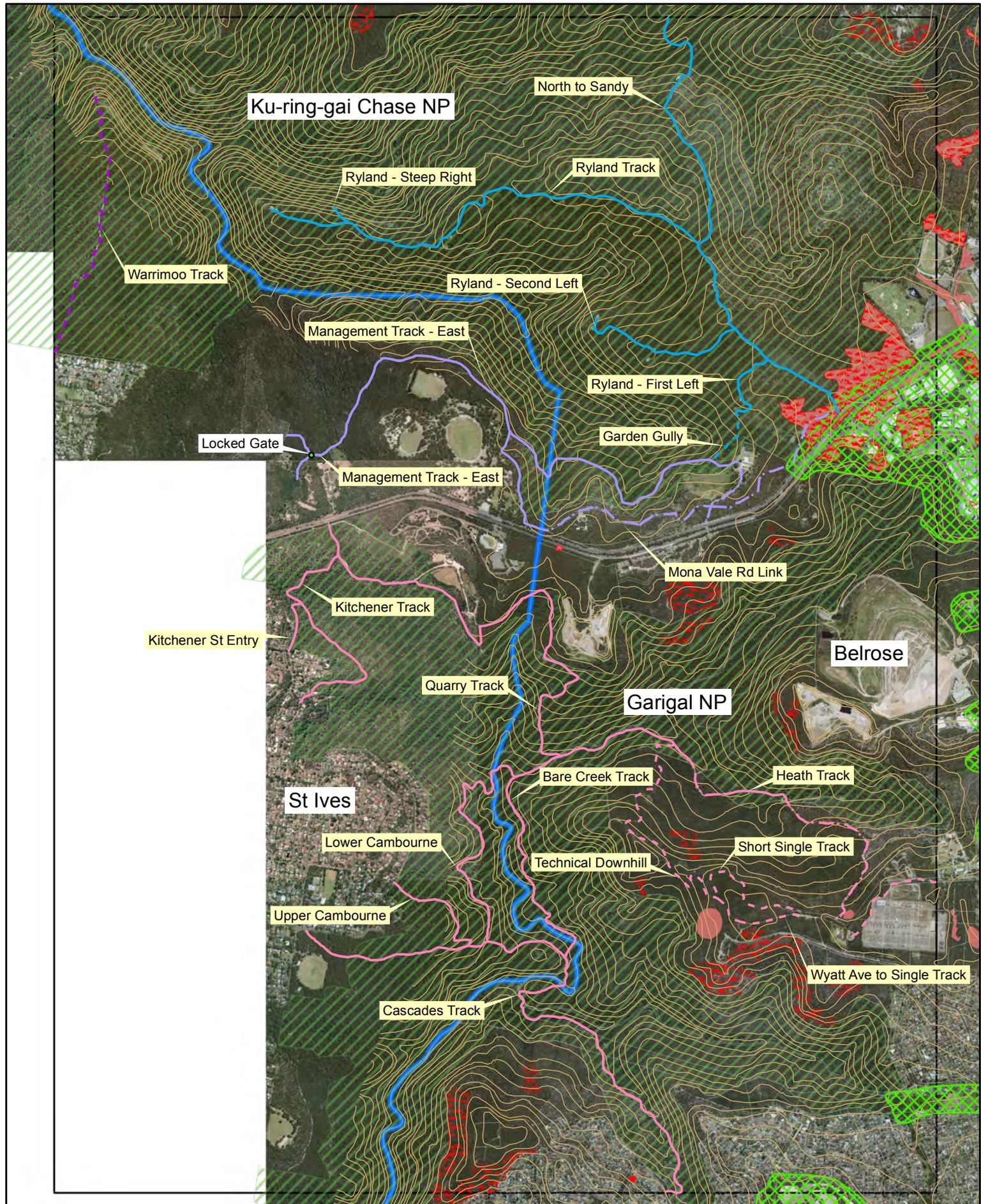
Trails		Property Owners 15/9/2010	
	Cascades, Authorised		Government Agencies
	Cascades, Unauthorised		Crown Land
	Cascades, Unknown		Dept Education
	Ryland, Authorised		Warringah Council
	Ryland, Unauthorised		Private Other
	Showground, Authorised		Services
	Showground, Unauthorised		Dept Lands Leases
	Showground, Unknown		Dept Of Lands & Warringah Council
	Warrimoo Track, Unauthorised		Metropolitan Local Aboriginal Land Council
	Cadastre		Warringah Council Managed Land
	National Park		Warringah LGA

Map C - Land Tenure Belrose & St Ives Area

Scale 1: 23,000 (A4)
GDA 94 MGA Zone 56



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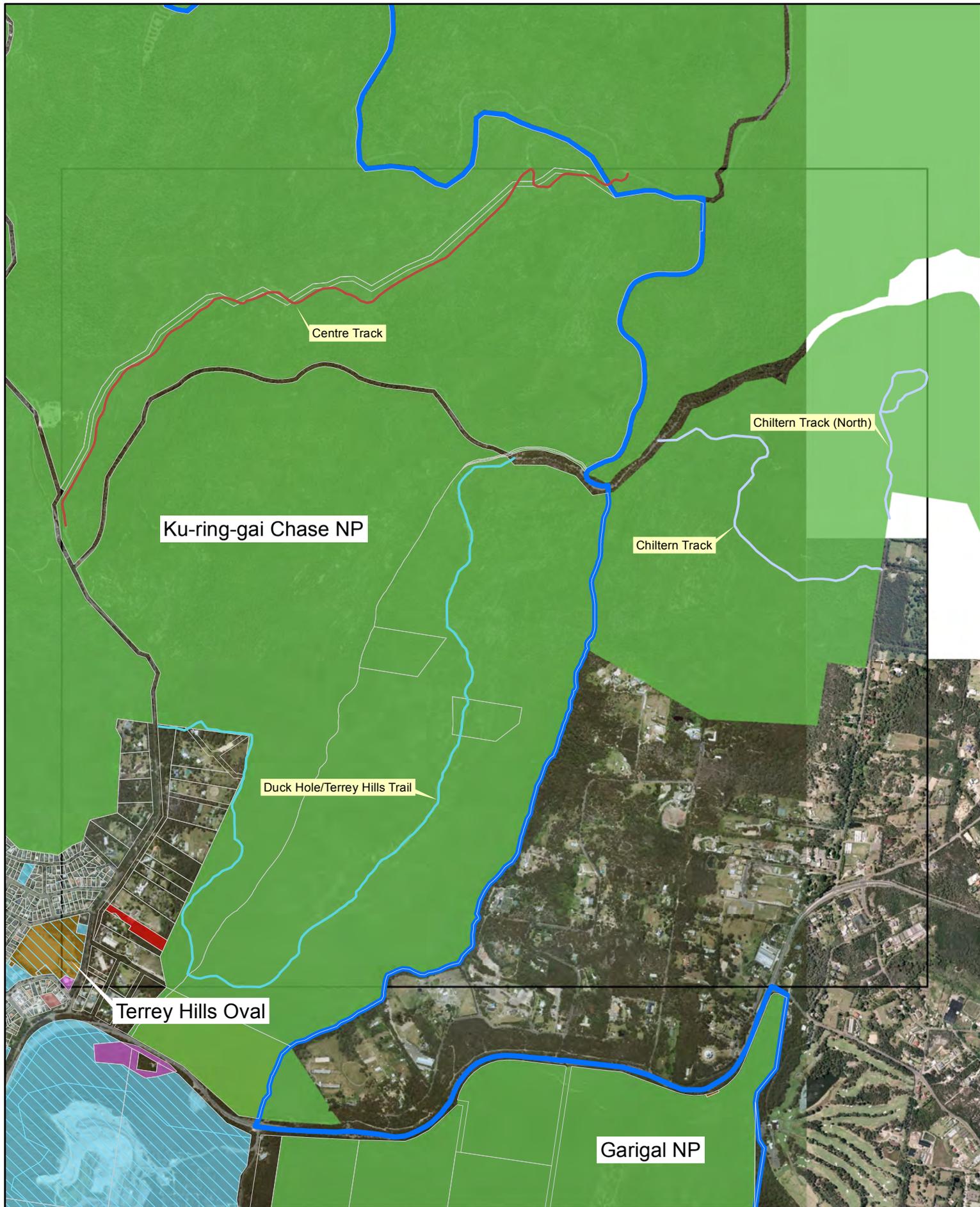
- Trails**
- Cascades, Authorised
 - Cascades, Unauthorised
 - Cascades, Unknown
 - Ryland, Authorised
 - Ryland, Unauthorised
 - Showground, Authorised
 - Showground, Unauthorised
 - Showground, Unknown
 - Warrimoo Track, Unauthorised
- Threatened Species Points
 - DCP Draft Threatened & High Conservation Habitat
 - DCP Draft Wildlife Corridors
 - Threatened Species Area
 - 10m Contours
 - Cadastre
 - National Park
 - Warringah LGA

Map C - Environmental Factors Belrose & St Ives Area

Scale 1: 23,000 (A4)
GDA 94 MGA Zone 56



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Ku-ring-gai Chase NP

Chiltern Track (North)

Chiltern Track

Duck Hole/Terrey Hills Trail

Terrey Hills Oval

Garigal NP



Trails

- Centre Track, Authorised
- Chiltern Track, Authorised
- Duck Hole/Terrey Hills Trail, Authorised
- Cadastre
- National Park
- Warringah Council Managed Land
- Warringah LGA

Property Owners 15/9/2010

- Government Agencies
- Crown Land
- Dept Education
- Warringah Council
- Private Other
- Services
- Dept Lands Leases
- Dept Of Lands & Warringah Council
- Metropolitan Local Aboriginal Land Council

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**Map D - Land Tenure
Terrey Hills East Area**

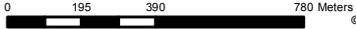
Scale 1: 20,000 (A4)

GDA 94 MGA Zone 56

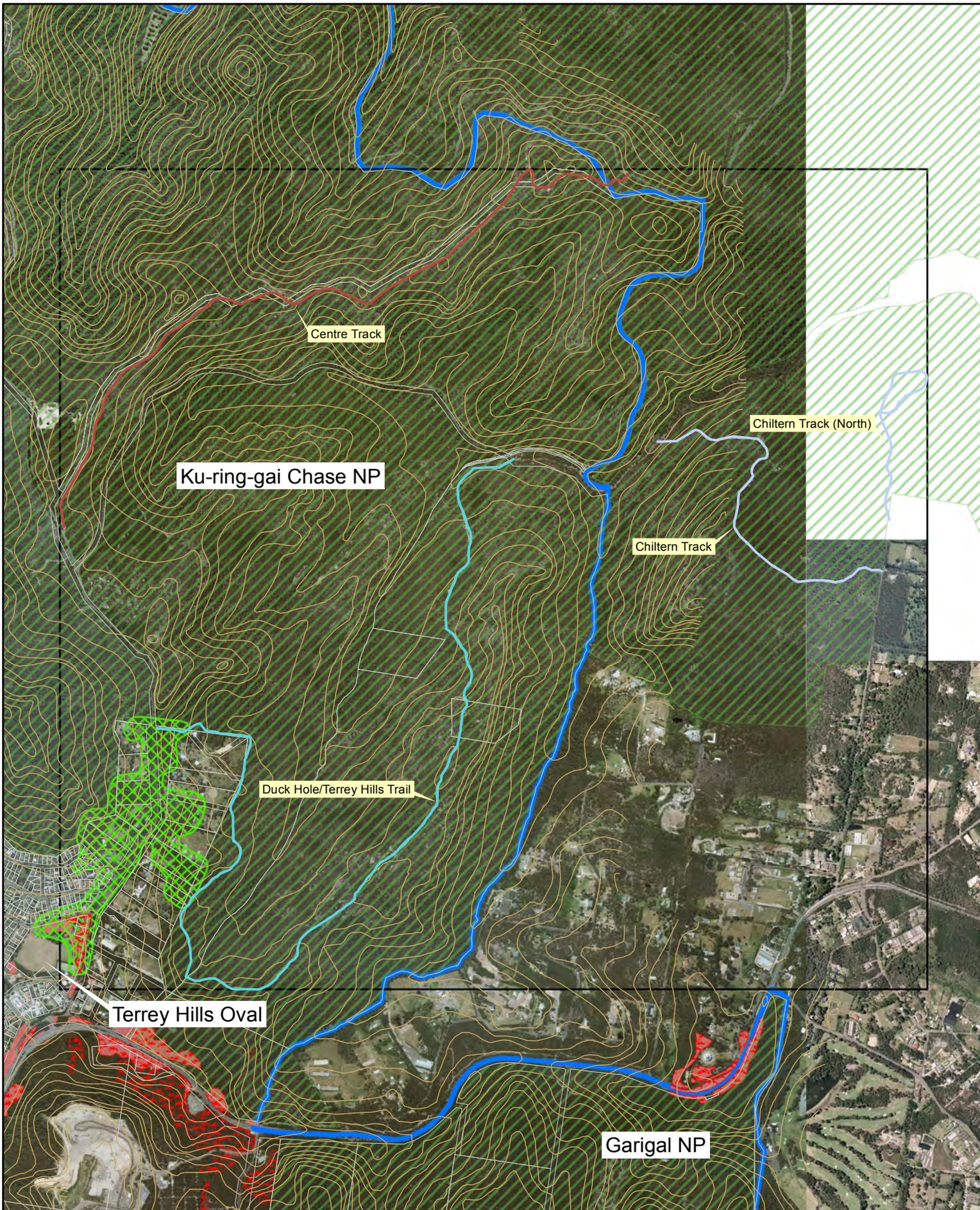


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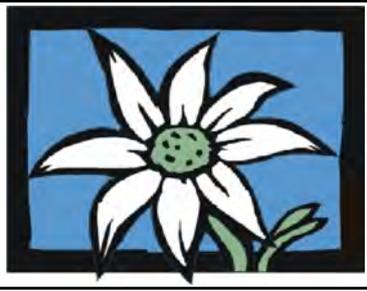
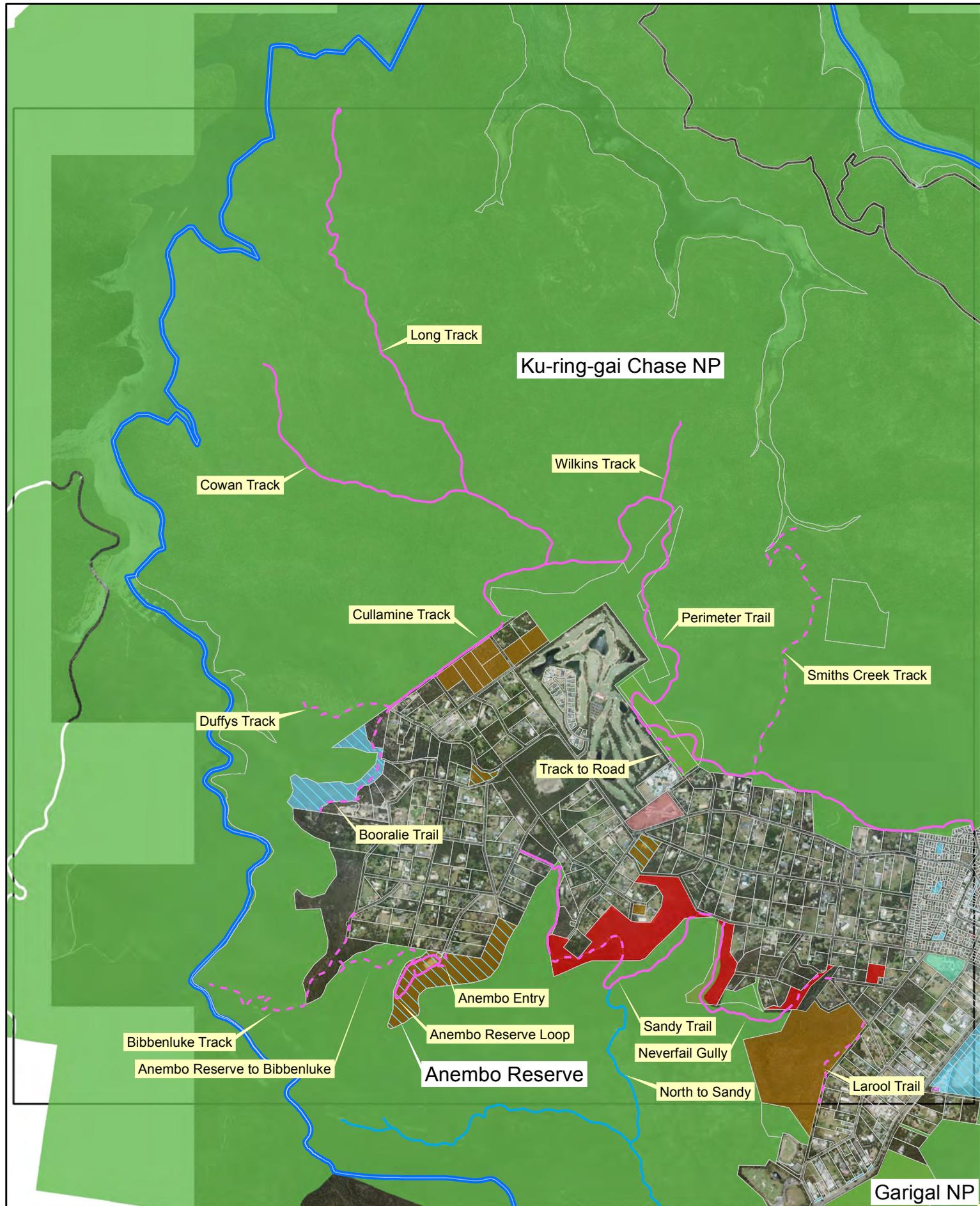
- Trails**
- Centre Track, Authorised
 - Chiltern Track, Authorised
 - Duck Hole/Terrey Hills Trail, Authorised
 - 10m Contours
 - Cadastre
 - National Park
 - Warringah LGA
- Threatened Species Points
 - DCP Draft Threatened & High Conservation Habitat
 - DCP Draft Wildlife Corridors
 - Threatened Species Area

Map D - Environmental Factors Terrey Hills East Area

Scale 1: 20,000 (A4)
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Trails	Property Owners 15/9/2010
Terrey Hills, Authorised	Government Agencies
Terrey Hills, Unauthorised	Crown Land
Ryland, Authorised	Dept Education
Cadastre	Warringah Council
National Park	Private Other
Warringah Council Managed Land	Services
Warringah LGA	Dept Lands Leases
	Dept Of Lands & Warringah Council
	Metropolitan Local Aboriginal Land Council

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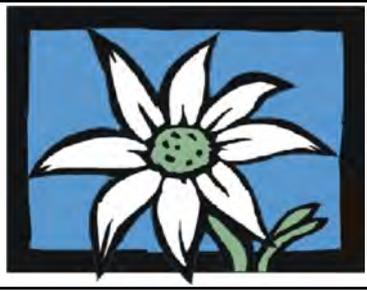
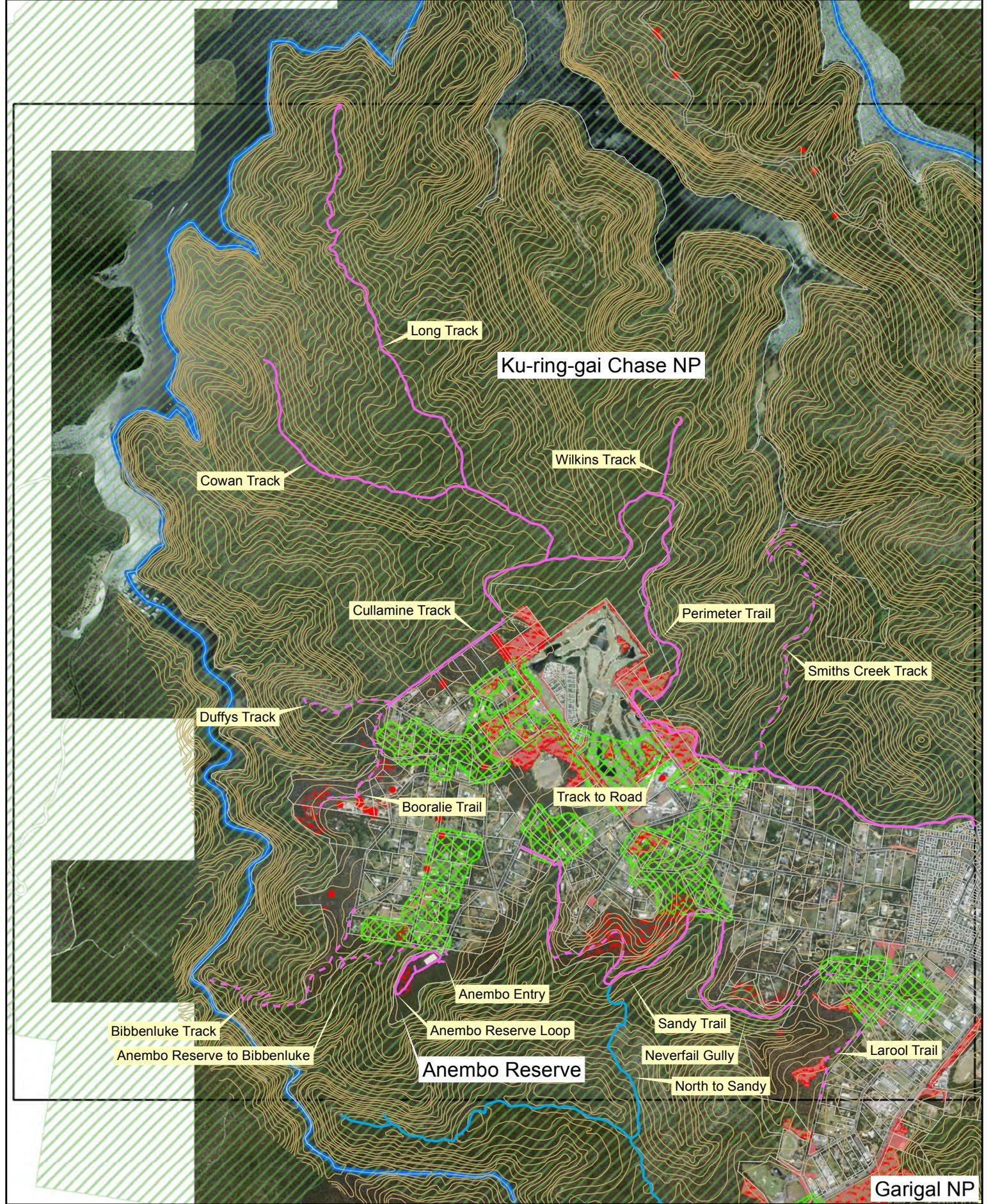
Map E - Land Tenure Terrey Hills & Duffys Forest Area

Scale 1: 34,000 (A4)
GDA 94 MGA Zone 56

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- | | |
|----------------------------|--|
| Trails | Threatened Species Points |
| Terrey Hills, Authorised | DCP Draft Threatened & High Conservation Habitat |
| Terrey Hills, Unauthorised | DCP Draft Wildlife Corridors |
| Ryland, Authorised | Threatened Species Area |
| 10m Contours | |
| Cadastre | |
| National Park | |
| Warringah LGA | |

Map E - Environmental Factors Terrey Hills & Duffys Forest Area

Scale 1: 34,000 (A4)
GDA 94 MGA Zone 56



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