

97/1528

FLORA AND FAUNA ASSESSMENT

PROPOSED CLAY TARGET RANGE AT MURRAH SOUTH OF BERMAGUI, NSW

Report Prepared for: Bermagui Clay Target club

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August 1997

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1. INTRODUCTION

Southern Ecological Services were appointed by the Bermagui Clay Target Club to complete a flora and fauna survey of a proposed Clay Target range at Murrah, south of Bermagui, NSW.

1.1 DESCRIPTION OF PROPOSAL

The Bermagui Clay Target Club proposes to set up a Clay Target Range on private land adjoining Murrah State Forest 9 kilometres south west of the township of Bermagui.

1.2 OBJECTIVES

The objectives of this flora and fauna assessment is to:

- (i) carry out a flora and fauna survey to determine species present at the proposed Clay Target Range.
- (ii) review all available information and determine threatened species which may be present at or in the near vicinity of the proposed Clay Target Range.
- (iii) review all legislation regarding threatened flora and fauna that is relevant to the land surrounding the proposed Clay Target Range.
- (iv) identify threatened species and any habitat that may be critical to these species so that they may be taken into consideration in planning decisions.
- (v) assess the impact that the proposed activities may have on threatened flora and fauna and where necessary suggest measures which may ameliorate any adverse impacts on threatened species which may be affected by the proposed activities.

2. RELEVANT LEGISLATION

2.1 *Threatened Species Conservation Act 1995 (TSCA)*

The TSCA 1995 amends the *National Parks and Wildlife Act 1974* (NSW Act) and the *Environmental Planning and Assessment Act 1979* (EPA Act) and certain other acts and repeals the *Endangered Fauna (Interim Protection) Act, 1991*. This legislation has introduced the need to complete a Species Impact Statement (SIS) in certain circumstances.

Section 5A Significant effect on threatened species, populations or ecological communities, or their habitats.

For the purposes of this Act and, in particular, in the administration of sections 77, 90 and 112, the following factors must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

- (a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed in danger of extinction.*
- (b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*
- (c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.*
- (d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.*
- (e) *whether critical habitat will be affected.*
- (f) *whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation regions (or similar protected areas) in the region.*
- (g) *whether the development proposed is of a class of development or activity that is recognised as a threatening process.*
- (h) *whether any threatened species, population or ecological community is at the limit of its known range.*

2.2 State Environmental Planning Policy No. 14 - Coastal Wetlands

Under State Environmental Planning Policy 14, (SEPP 14) coastal wetlands have been designated in a number of local governmental areas. The aim is to "ensure that the coastal wetlands are preserved and protected in the environmental and economic interests of the state". To this end, development consent is required for a number of activities:

- * land clearing;
- * land draining;
- * land filling; and
- * the construction of levees.

Consent may be granted to undertake the above mentioned works, only when a mutual agreement has been reached between the council and the Director of the Department of Planning. A copy of the application must also be sent to the Director of National Parks and Wildlife, and where consent is granted, consideration must be given to a number of issues that relate to the conservation of native flora and fauna.

2.3 State Environmental Planning Policy No.44 - Koala Habitat Protection

State Environmental Planning Policy No. 44 - Koala Habitat Protection, began on 13 February 1995. The aim of the policy is to ensure that:

- (a) *for any development application (DA) to which the policy applies, consent is not issued without investigation of the presence of core koala habitat.*

Core koala habitat is defined as "an area of land with a resident population of koalas, evidence of attributes such as breeding females (ie. females with young) and recent sightings of and historical records of koala population."

- (b) *that any identification of core koala habitat will requires that a plan of management must accompany any DA relating to such areas before council consider the granting of consent.*
- (c) *that in respect to re-zoning, other than to environmental protection, involves an area of potential or core koala habitat then the Director of Planning may require that a local environmental study be prepared (Department of Planning, 1995).*

The policy affects the DA process by requiring that land is assessed for potential koala habitat, that is land that contains at least 15% of the "total number of trees in the upper or lower stratum" of the tree types listed in schedule 2 of the policy. If land is potential koala habitat further investigation to determine if core habitat is present is required. If investigations reveal that core habitat is not present no further provisions of the policy apply. If core habitat is present a plan of management for the site must be prepared prior to development taking place.

3 Description of the Study Site

The site of the proposed Clay Target Range is situated in dry sclerophyll forest along a ridge line approximately 60m above sea level. The canopy is dominated Yellow Stringybark, *Eucalyptus muellerana*, White Stringybark, *Eucalyptus globoidea*, Coastal Grey Box, *Eucalyptus bosistoana* and Rough-barked Apple, *Angophora florabunda*. There is a sparse understorey consisting mainly of Black Sheoak, *Allocasuarina littoralis*, Broad-leaved Hickory, *Acacia falciformis*, Black Wattle, *Acacia mearnsii* and Sweet Pittosporum, *Pittosporum undulatum*. The groundcover is also sparse and dominated by Kangaroo Grass, *Themeda australis*, Native Parsnip *Platysace lanceolata* and Rough Guinea Flower, *Hibbertia aspera*.

The actual site is proposed to be approximately 200 metres X 100 metres and is situated in an area that has been logged in the past. There is also evidence of recent timber cutting within 100m of the proposed range. The stand consists mainly of regrowth trees.

It is proposed that no removal of trees and very little disturbance of the understorey will taken place at the site.

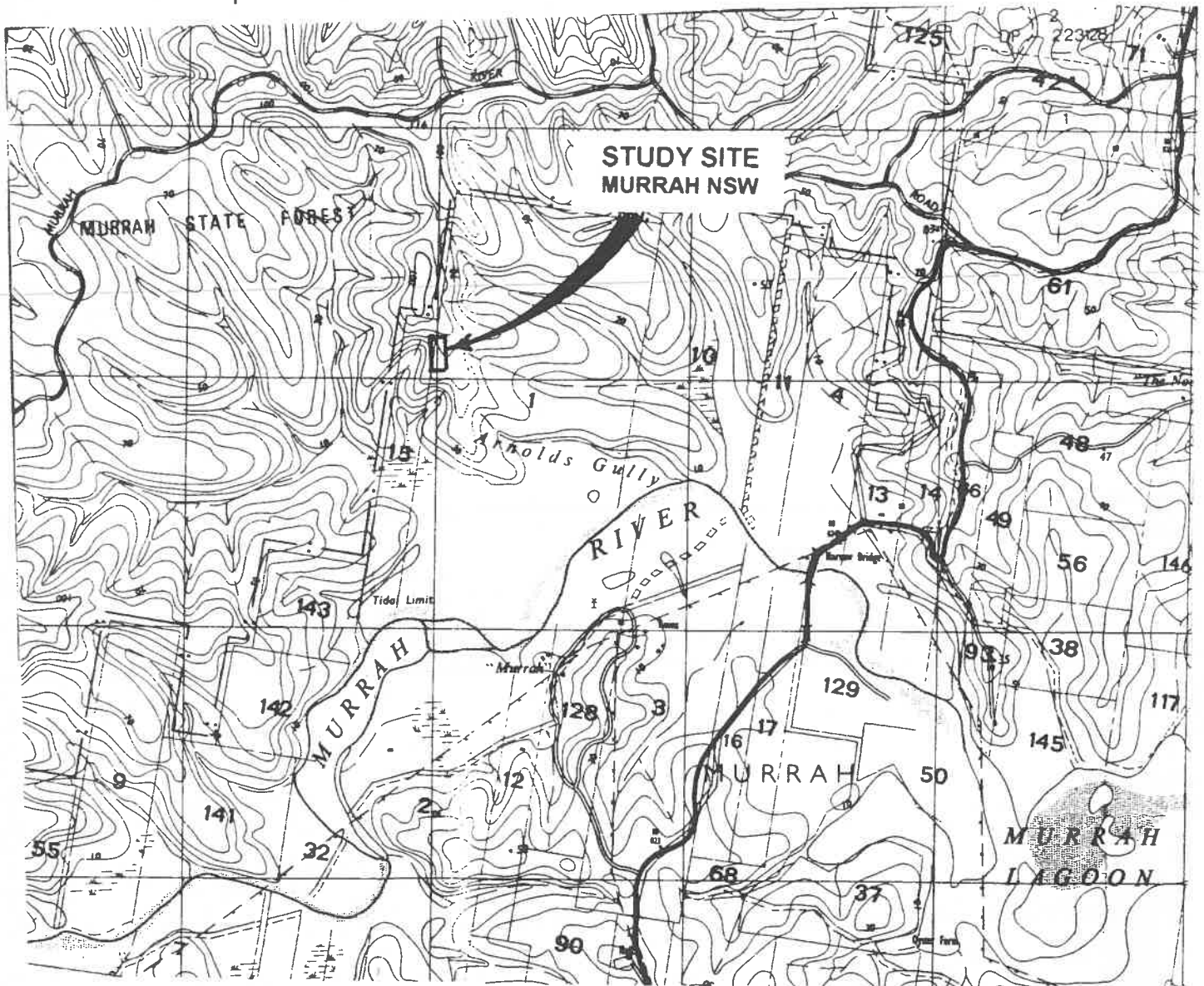


Figure 1 The site in relation to surrounding land at Murrah NSW.



Figure 2: The proposed site looking south from the northern boundary of the site



Figure 3: The proposed site looking north from the southern boundary of the site.

4. Literature Review - Endangered Flora and Fauna

Records held in the New South Wales National Parks and Wildlife Service Atlas of NSW Wildlife Database for 8824 Bega, 8825, Cobargo and 8925, Narooma 1 : 100,000 Map Sheets were searched for records of endangered flora and fauna in the vicinity of the site. As well, other previously published records pertaining to the study area and the wider region were also reviewed for this assessment.

Fifteen fauna species currently listed in the Threatened Species Conservation Act have been recorded in the vicinity of the site. All are classified as Vulnerable.

One species of plant currently listed in the Threatened Species Conservation Act has been recorded in the vicinity of the site.

Table 1. Endangered Fauna Species Recorded within the Region

Species	Reported Localities	Source
Vulnerable		
Australasian Bittern	Bobundara Swamp.	1,2
Osprey	Wallaga Lake.	1
Powerful Owl	Murrah SF. Corunna SF.	1,2
Masked Owl	Murrah SF. Corunna SF. Bodalla FS.	1
Sooty Owl	Murrah SF. Corunna SF. Bodalla SF.	1
Olive Whistler	Mt. Dromedary.	1
Ground Parrot	Akolele.	1
Tiger Quoll	Murrah SF. Little Dromedary.	1
Koala	Murrah SF. Goura Nature Reserve. Mt. Dromedary.	1
Glossy Black-Cockatoo	Murrah SF. Akolele, 6km.	1
Yellow-bellied Glider	Murrah SF. Corunna SF.	1

Squirrel Glider	Goura Nature Reserve.	1
Long-nosed Potoroo	Murrah SF. Goura Nature Reserve. Bodalla SF.	1
Common Bent-winged Bat	Murrah State Forest	1
Brush-tailed Rock Wallaby	Little Dromedary	1

Sources:

1. NSW National Parks & Wildlife Atlas.
2. Whiter, J. - Nature in Eurobodalla Nos. 1 - 10

Australasian Bittern *Botaurus poiciloptilus*

This species is widely, but sparsely distributed in SE and SW Australia, with most records from the Riverina region of NSW. It inhabits shallow freshwater wetlands, particularly where dense reed cover is present. The species has suffered over time through the drainage of wetlands and freshwater swamps. There are two confirmed records of this species in this region.

Osprey *Pandion haliaetus*

The species inhabits coastal seas, estuaries, rivers and mangroves and occasionally large inland rivers, along almost all of the Australian coast. The Osprey feeds almost exclusively on fish. It starts breeding in August in the southern part of its range in large well used nests usually very close to water. This species does not breed any further south than the mid-north coast of NSW. The Osprey is irregularly recorded in coastal locations on the south coast. These birds are usually juveniles.

Glossy Black Cockatoo *Calyptorhynchus lathami*

The Glossy Black-Cockatoo has a thin distribution along the east coast of NSW with the highest population densities in SE Queensland and NE New South Wales. It inhabits forests, coastal woodlands and trees bordering water courses in areas with *Allocasuarina* trees. The major threats to this species are the removal of large mature trees with suitable nesting hollows and mature stands of *Allocasuarina littoralis* which constitutes its major food source. The species is regularly recorded in low numbers in suitable habitat in this region.

Powerful Owl *Ninox strenua*

The Powerful Owl is found along the east coast of NSW mainly on the east of the Great Dividing Range. It has a large home range of up to 1,000ha. It is found in rainforest and wet and dry sclerophyll forests. It roosts and breeds in closed forest and forages in woodland and open forest mainly on medium sized arboreal mammals. The main threat to this species is logging practices which result in the removal of old growth forest elements containing large tree hollows. The Powerful Owl is regularly recorded in forests in this region.

Masked Owl *Tyto novaehollandiae*

The Masked Owl occurs in low densities in forest and woodland along the coast of eastern and southern Australia. It frequents the margins of forests, using the forest for breeding and roosting and more open areas for foraging. It feeds mainly on small terrestrial mammals. Clearance of forests for agriculture and the removal of large hollow-bearing trees and the use of pesticides in areas where territories overlap adjacent agricultural land are seen as threats to this species. The Masked Owl is regularly recorded in suitable habitat in Forests in the region.

Sooty Owl *Tyto tenebricosa*

This species is thinly distributed in the tall wet forest of SE Australia. The species prefers tall wet old-growth forest on fertile soils with a dense understorey and tall emergent eucalypts. This habitat is usually confined to gullies. Its prey includes arboreal and terrestrial mammals as well as birds. The loss of old growth elements of forest and habitat fragmentation are seen as threats to this species. It is regularly recorded in suitable areas of forest in this region.

Olive Whistler *Pachycephala olivacea*

This species occurs east of the Great Dividing Range along the NSW coast. It is relatively abundant in suitable patches of rainforest and moist sclerophyll forest, which constitutes its preferred habitat in this region. The population in this region is small but common in patches of suitable habitat. There are several records of this species in the region almost all in areas of higher altitude such as Mt. Dromedary.

Ground Parrot *Pezoporus wallicus*

The Ground Parrot has a patchy distribution in NSW. It is usually associated with low heath, swampy sedge with tea tree. It is occasionally found in estuarine environments. It is terrestrial, usually encountered singly or in pairs. It is active at night, and is infrequently encountered. It is highly specialised and sensitive to habitat modification. The only record in this area is from low swampy heath at Akolele near Bermagui.

Tiger Quoll *Dasyurus maculatus*

The range of this species extends along the entire eastern seaboard of NSW and is sparsely distributed throughout its range. It is recorded from a wide range of habitats, including rainforest, open forest, woodland and coastal heath. It takes a wide range of live prey and also scavenges. Current threats to the species include competition with introduced predators, logging practices and poisoning from wild dog and fox baiting programs. The Tiger Quoll has been irregularly recorded in this region.

Koala *Phascolarctos cinereus*

The Koala has a widespread distribution in SE Australia. Its population has been depleted by deforestation for agriculture, urbanisation, disease and wildfire. The species occupies timbered areas with suitable eucalypt food trees. There are 216

records of this species on the Bega 1:100,000 data from the NSW NPWS Wildlife Atlas, with several recent records from Murrah SF.

Yellow-bellied Glider *Petaurus australis*

The Yellow-bellied Glider has a patchy distribution along the east coast of NSW. It is found in tall mature eucalypt forests with a mosaic of habitats that includes species that flower in winter. This species lives in small family groups which occupy an exclusive home range of 30-65ha. Yellow-bellied Gliders are regularly recorded in areas of suitable habitat in this region.

Long-nosed Potoroo *Potorous tridactylus*

The Long-nosed Potoroo is usually found in forested areas of thick undergrowth on light sandy soils, where it feeds almost exclusively on underground fungi. There are six records of this species in this region.

Squirrel Glider *Petauris norfolcensis*

The squirrel Glider is distributed along the great dividing range and the western slopes and plains from north Queensland to The SA/Vic border. It inhabits dry sclerophyll forest and woodland and is absent from dense coastal ranges. It has similar habitat requirements to that of the Sugar Glider, feeding on insects, gum produced by acacias, the sap of certain eucalypts, nectar and pollen. It nests in leaf-lined hollows in trees. The clearing of open woodland for agriculture and forestry operations which have reduced the number of tree hollows have had a negative impact on this species.

Brush-tailed Rock Wallaby *Petrogale pencillata*

This species occurs from southern Queensland to eastern Victoria from the coastal region to the ranges. In parts of NSW its range extends into the centre of the state. The species occupies suitable rocky areas in sclerophyll forests of inland and sub SE Australia. The population has declined severely as a result of disturbance by humans and predation by foxes, dogs and dingoes. The Brush-tailed Rock Wallaby is almost at the limit of its range in this area.

Common Bent-winged Bat *Miniopterus schreibersii*

The Common Bent-winged Bat has a world-wide distribution. In Australia occurs along the east coast from Cape York to southern Victoria. It favours well timbered valleys where it forages above the canopy. The species is an obligate cave dweller and relies on caves and mines for hibernation and maternity. Disturbance and destruction to roosting and maternity caves are seen as the main threats to this species. Common Bent-winged Bats are regularly recorded throughout their range in this region.

**Table 2. Endangered Flora Species Recorded within the Region
from the NSWNPWS ROTAP Data Base**

Family	Species	Reported Localities
Rutaceae	<i>Correa baeuerlenii</i>	Murrah State Forest

Correa baeuerlenii

This small shrub, 1-2.25m high has ovate to elliptic leaves 2.2-6.5cm. long. It flowers in winter and sporadically at other times of the year, producing greenish-yellow flowers. It is restricted to wet sclerophyll forests and the margins of rainforests. It is also known to occur along the wet margins of creeks. It occurs from the Clyde River to Bega. There are 34 records of this species from this area on the NPWS Database and 68 records from the NSW State Forests database.

5.FLORA

5.1 Methods

A survey of flora was carried out on 29 June 1997. A single quadrat, 200m X 100m encompassing all the proposed range was surveyed.

In the quadrat the following data was recorded:

- (i) vegetation type
- (ii) location
- (iii) altitude
- (iv) aspect
- (v) slope

The floristic data along each transect was recorded at four different levels, if present, -canopy, sub-canopy, understorey and ground cover. Any vines, ferns or epiphytes present were also recorded. The percentage cover and height of each level were recorded and all species present were noted and an abundance rating given for each species: 1- rare to 5- dominant.

Only native and naturalised species were recorded. Harden (1990 -1994) describes naturalised species as those which have origins outside Australia but are now established in the wild and are reproducing as though native. Ornamental plantings and garden escapes were not recorded.

All data were recorded on survey sheets, completed in the field. These sheets are shown in Appendix 4.

5.2 Results

46 species of vascular plants were recorded during the survey.

The canopy, previously described in the description of the study site, consisted of 7 species of eucalypt, the most common being Yellow Stringybark. As well, Rough-barked Apple was also common. The site has been logged in the the last 10 years and there was evidence of recent timber cutting at the site. Consequently, the entire stand of consists of regrowth. No large habitat trees are located at the site.

The understorey is sparse and consists mainly of Black Sheoak, *Allocasuarina littoralis*, and four species of wattle. Both Sweet Pittosporum, and Rough-fruited Pittosporum are present.

The groundcover is also sparse and consists mainly of Kangaroo Grass, *Themeda australis*, Native Parsnip *Platysace lanceolata* and Rough Guinea Flower, *Hibbertia aspera*. Blady Grass, *Imperata cylindrica*, and Mat Rush, *Lomandra longifolia* were also common

No plant species currently listed in the Threatened Species Conservation Act was located during the survey.

6. FAUNA

6.1 Methods

6.1.1 Diurnal Fauna Survey

A diurnal fauna was conducted on 29 June 1997 in conjunction with the flora survey and was carried out in the previously described quadrat:

Mammals: Any mammals seen or heard in the vicinity of the site were noted. As well any other evidence eg. tracks, scratchings, dreys, faecal pellets and scats were recorded and identified where possible.

Birds: Any birds seen or heard in the vicinity of the site were noted during the survey.

Reptiles and Amphibians: The reptile and amphibian survey consisted of ground searches for sheltering animals. Rocks, leaf litter, fallen logs and other potential shelter materials were overturned and the animals beneath identified. A frog search was conducted in the early evening of the same day.

Any other animals seen or heard were noted. Because of the nature of the site no spotlighting survey was carried out.

6.1.2 Nocturnal Call Playback Survey

A nocturnal taped playback survey was conducted on 30 June 1997 between 2030 and 2200.

Nocturnal birds and mammals are often only detected when they vocalise for territory proclamation or social contact. Broadcasting pre-recorded calls to elicit a response can identify these species.

At one-kilometre intervals within the survey site the calls of:

Yellow-bellied Gliders, *Petaurus australis*,
Koala, *Fascolarctus cinereus*
Powerful Owl, *Ninox strenua*,
Masked Owl, *Tyto novaehollandiae*, and
Sooty Owl, *Tyto tenebricosa*

were broadcast using a standard NSW NPWS pre-recorded tape (Stewart, 1992). The call for each species was played for 3 minutes, followed by a two minute listening period. Any responses to calls were noted.

6.1.3 Spotlighting Survey

A survey for nocturnal arboreal marsupials was conducted on the 30 June 1997. This was conducted, using two 50W spotlights and covered the entire area of the study site. All fauna seen or heard were noted and their locations recorded.

6.2 Results

6.2.1 Diurnal Survey

No native or introduced species of mammal were recorded during this survey.

Twenty species of birds were identified during the surveys. All species are regularly recorded in this habitat and are common in the area. These species are listed in Appendix 2.

Two species of reptiles were recorded in the study site. A single Lace Monitor *Varanus varius* was recorded in a Yellow Stringybark and two Grass Skinks, *Lampropholis delicata* were seen on the ground. These species are listed in Appendix 3.

No species of frogs were recorded.

6.2.2 Nocturnal Call Playback Survey

Only one species was recorded during the nocturnal taped playback survey. A Sugar Glider responded to the Powerful Owl call and also the Masked Owl call. Both calls came from the one location, west of the broadcast location. There was no response from Large Forest Owls or Yellow-bellied Gliders. This species is listed in Appendix 1.

Table 3 **Nocturnal Call Playback Survey**

Playback Details	Species Response				
	Response Species Site One	Site Two	Observation Type	Number of Observations	Notes
Koala	No Response	No Response			
Powerful Owl	No Response	Sugar Glider	Vocal	One	100m west of broadcast site.
Masked Owl	No Response	Sugar Glider	Vocal	One	100m west of broadcast site.
Sooty Owl	No Response	No Response			
Yellow-bellied Glider	No Response	No Response			

6.2.3 Spotlighting Survey

The spotlighting survey was conducted throughout the survey site. Two species were recorded. A Common Brush-tailed Possum in a Rough-barked Apple and a Sugar Glider call was recorded. These results are listed in Table 4.

Table 4 **Spotlighting Survey**

Species	Number of Individuals	Type of Observation
Brush-tailed Possum	One	In Rough-barked Apple
Sugar Glider	One	Call

No species, listed under the Threatened Species Conservation Act were recorded during the survey.

6.2.4 Results of Forestry Surveys in Adjacent Land

The subject land adjoins Compartment 2046 of Murrumbidgee State Forest. This compartment was surveyed by NSW State Forests in September 1994, prior to harvesting operations. There was no response to any Owl taped playbacks, and a Koala search did not reveal any evidence of this species. A hair tube survey identified Ring-tailed Possums. Spotlighting located a Yellow-bellied glider. Two species of frogs, the Common Froglet and Peron's Tree Frog were also detected during this survey.

7. DISCUSSION

7.1 Significance of the Habitat

The subject land has been modified by clearing, agriculture and urban development. Very little natural vegetation remains at the site. The few Southern Mahogany trees at the site do not contain holes in the trunk or limbs and could not be considered habitat trees. No species of plant present at the site could be regarded as essential for any threatened species that occur in the area.

7.2 Significant Flora

Because of past use no significant flora exists on the land. There are small patches of *Allocasuarina littoralis* at the site, but the proposal does not intend to remove any of these species. No species listed in Schedule 2 of SEPP 44 occur at the site.

The one ROTAP species that is known to occur in the vicinity would be unlikely to occur on this site. *Correa baeuerienii* is listed on Schedule 2 of the TSC Act 1995 as vulnerable. There are 11 records of this species within 8 kilometres of the site all to the west and south-west in Murrumbidgee State Forest. The lack of suitable wet sclerophyll or creek-side habitat at the site makes it unlikely that this species would occur there.

7.3 Significant Fauna

Fourteen species of endangered fauna have been recorded as occurring in this region. Table 5 lists these species and their potential to occur on the subject land.

8.2 Powerful Owl *Ninox strenua*

N. strenua is listed on Schedule 2 of the Threatened Species Conservation Act 1995 as *Vulnerable*.

Distribution: The Powerful Owl is found between SE Victoria and southern Queensland. Most of the population lives in the coastal side of the Great Dividing Range, but in some places the distribution extends inland. There has been no documented contraction of range.

Population: Population data on size and density is based largely on calling birds rather than on marked individuals. Estimates of home range vary from 600 – 1000ha, but requires more substantiation. In NSW and Queensland it is considered 'uncommon' rather than rare (Garnett, 1993). There is a high fidelity to nesting sites; adults appear to remain within one large home range all their lives.

Habitat: The Powerful Owl occupies both wet and dry sclerophyll forests. In southern NSW it favours unlogged or lightly logged forests, roosting in a variety of sites from dense canopy to open forest. The preference roost sites in dense vegetation indicates a need for seclusion. Powerful Owls tend to be found in areas with high prey diversity.

Breeding: Breeds from April - September, with eggs being laid May - June. Females do most of incubating while male does most of the hunting. Often only one young is raised. Powerful Owls nest in the hollows of branches or trunks of tall eucalypt trees, with the same nest site being used repeatedly.

Diet: The main prey is medium sized arboreal marsupials, particularly Common Ring-tailed Possums Sugar Gliders and Greater Gliders. Birds are also included in the diet as well as other mammals such as Flying foxes.

Threats: The main threat to this owl is that modern intensive forestry practices result in the loss of old-growth forest elements particularly tree containing hollows large enough for nesting. Widespread clearing for agriculture and pastoralism has also contributed to reduction in the population.

Local Records: This species is regularly recorded in suitable habitat in the region. There are 123 records of this species on the Bega 1:100,000 Map Sheet. There are six records of this species within eight kilometres of the site. All are in Murrah State Forest to the west and south-west of the study site.

Effect of the Proposed Development on the Species: The study site is likely to form part of the foraging territory. The lack of suitable habitat trees and roosting sites at the site. The proposal does not intend to modify the existing vegetation structure at the site, and will not have any adverse effect on prey species at the site.

8.3 Masked Owl *Tyto novaehollandiae*

T. novaehollandiae is listed on Schedule 2 of the Threatened Species Conservation Act 1995 as *Vulnerable*.

Distribution: The Masked Owl occurs in forest and woodland in a broad coastal strip around southern and eastern Australia and along wooded watercourses inland.

Population: The Masked owl occurs throughout its range in rather low densities. It may be more common than believed because the species is often misidentified as a Barn Owl (*Tyto alba*). and is often silent and does not readily respond to taped playbacks. Its status is regarded as uncommon; resident (Garnett, 1993)

Habitat: This species is resident and territorial and widespread in forest and woodland. It is considered a species of forest margins and also lives in isolated stands of trees in agricultural land (Hollands, 1991). It is the least common of the three large owls (Powerful, Sooty and Masked Owls) in forested habitats. Because it relies heavily on ground-dwelling prey it is more often recorded foraging in disturbed areas of forest. By day the Masked Owl roosts in tree hollows, caves, cliffs and in thick foliage in dense gullies and along creek lines.

Breeding: Breeds at any time of the year, using hollows in living eucalypts in open or tall open forest, including emergents in rainforest.

Diet: Mainly terrestrial mammals - rodents, rabbits, bandicoots and other small marsupials. Also takes arboreal possums and gliders. Also roosting birds and, less often reptiles and insects (Shields, 1994)

Threats: The clearance of land for agriculture and some forestry practices may be affecting the availability of nest trees. This species only occurs in forests where tree hollows are present (Garnett, 1993). The maintenance of suitable tree hollows for breeding and roosting and a suitable foraging habitat (a mosaic of dense and sparse ground cover) are seen as essential for this species.

Local Records: The species is regularly recorded in suitable habitat in forested areas and ecotones between forests and cleared land in this region. Thirty-one records of this species on the Bega 1:100,000 Map Sheet held in the NPWS Database. There are three from 4 kilometre west and 4 kilometres SW of the site in Murrah State forest.

Effect of the Proposed Development on the Species: The habitat surrounding the study site is suitable for this species. However, the lack of any records close to the site and the fact that there was no response from this species during the taped playback surveys of the study site make it unlikely that the site contains habitat essential for this species. The proposed activities will not remove any habitat or roosting trees and will not affect the foraging substrate. It is unlikely that the proposal will adversely affect this species in the vicinity of the study site.

8.4 Sooty Owl *Tyto tenebricosa*

T. tenebricosa is listed on Schedule 2 of the Threatened Species Conservation Act 1995 as *Vulnerable*.

Distribution: Coastal eastern Australia, mainly east of the Great Dividing Range, from the Dandenongs in eastern Victoria to southeastern Queensland. There is an isolated population around Townsville in Queensland.

Population: The Sooty Owl is thinly distributed in suitable habitat throughout its range. There is no measure of the home range of individuals using marked birds, so no measure of abundance is valid. Home range is thought to be in the order of 200 - 800ha. The population is believed to be underestimated because of its cryptic habits, dense and remote habitat and low observer effort.

Habitat: Adults are sedentary and territorial roosting by day in tree hollows or in dense foliage. It is generally found in dense sub-tropical or wet sclerophyll forest on fertile soils, favouring tall forest overhanging creeks, with an understorey of small trees and ferns. Suitable habitat is confined usually to gullies. Occasionally hunts along roads and in forest clearings.

Breeding: Nesting is usually in the trunks of tall Eucalypts with the same nest being used repeatedly. Breeding takes place once a year, but timing is opportunistic with a peak between February and April. The female chooses the hollow and incubates the eggs while the male delivers food to the female and nestlings.

Diet: A range of mammals and birds, mainly possums, gliders, dasyruids and bandicoots.

Threats: Historically the main threat has been the clearance of habitat for agriculture, particularly the clearance of creekside vegetation. Forestry practices such as clearfelling may also pose a threat. The habitat of the Sooty Owl is also vulnerable to fire, either wildfire or proscribed burns that are allowed to burn into rainforest fringes.

Local Records: The species is regularly recorded in suitable habitat in forested areas in this region. There are 121 records of this species on the Bega 1:100,000 Map Sheet held in the NPWS Database. There are six records within 8 kilometres of the site. All are from Murrah State Forest to the west and south-west of the site. The closest record is 3 kilometres SW of the site.

Effect of the Proposed Development on the Species: The absence of or wet sclerophyll forest with tall trees overhanging creeks, and an understorey of small trees and ferns in gullies makes it unlikely that the site contains any breeding or roosting areas for this species. The site may form part of the foraging territory. The proposal does not intend to alter any habitat that may adversely impact upon prey species for Sooty Owls.

8.5 Yellow-bellied Glider *Petaurus australis*

P. australis is listed on Schedule 2 of the Threatened Species Conservation Act 1995 as *Vulnerable*.

Distribution: Generally patchily spread in tall, mature eucalypt forests on the east coast from the South Australian border to central Queensland (Strahan 1983).

Population: The population has been reduced over the years by the clearance of forests for agriculture, pastoralism and clear felling forestry operations. It occurs in low densities (0.05 - 0.14 animals per ha.) in its preferred habitat. It has a widespread distribution, which has been reduced by an estimated 10% since European settlement (Kennedy cited in Eden EIS, 1994).

Habitat: Preferred habitat is tall mature eucalypt forest with a complex mosaic of habitat including species that flower in winter (Menkhorst, 1995). The major components of the diet include invertebrates, nectar, pollen, manna, honeydew and eucalypt sap, which is extracted from tree with characteristic incisions in the bark. On the NSW south coast and in Victoria, Manna Gums, *Eucalyptus viminalis* and Brown Barrel, *E. fastigata* provide a major component of the diet with Swamp Gum, *E. ovata*, Mountain Grey Gum, *E. cypellocarpa* and the winter flowering Spotted Gum, *E. maculata* providing important food sources when little other food is available (Eden EIS, 1994; Menkhorst, 1995). *P. australis* uses hollows in tall mature trees as dens.

Social Organisation: *P. australis* lives in small family groups of 2 to 5 animals in each group. In NSW and Victoria each family group occupies an exclusive home range of 30 to 65 ha (Goldingay and Kavanagh cited in Eden EIS, 1994; Menkhorst, 1995). The large home range appears to be related to the ephemeral and seasonal nature of food sources.

Local Records: The species is regularly recorded in this region. There are 147 records for this species on the Bega 1:100,000 Map Sheet held in the NPWS Database. No response was elicited from taped playbacks during surveys and none of the characteristic incisions on trees were located during the diurnal fauna survey. It is likely that Yellow-bellied Gliders occur in forested areas surrounding the study site. The nearest record is from Compartment 2046 of Murrah State forest two kilometres west of the site.

Effect of the Proposed Development on the Species: No old hollow bearing habitat trees are located at the study site. The proposal does not intend to remove any natural vegetation at the site. It is unlikely that the proposal will have any significant impact on this species in the region.

8.6 Koala *Phascolarctos cinereus*

P. cinereus is listed on Schedule 2 of the Threatened Species Conservation Act 1995 as Vulnerable.

Distribution: Widespread throughout SE of Australia from southern Queensland NSW, Victoria and South Australia.

Population: Populations have decreased markedly over the last century, due to hunting pressure, deforestation for agriculture and urbanisation and by wildfire and disease. There are numerous records in SE New South Wales but the population tends to be scattered and at low population

Habitat: The species inhabits timbered areas with acceptable eucalypt food trees, although non-eucalypt species are known to contribute to the diet. In New South Wales at least 55 species of eucalypt are known to be used as a food source. Preferences vary between sites, seasons and individual koalas. This species has been recorded in most State Forests in the region.

Breeding: Seasonal breeders with most births occurring in early summer, when much new leaf growth is available.

Diet: Over 55 species of eucalypt have been recorded feed trees. The most common utilised in this region are *E. viminalis*, *E. ovata*, and *E. tereticornis*. Non-eucalypt species such as *Leptospermum laevagatum* and *Pinus radiata* have been recorded as feed species.

Local Records: The species is regularly recorded in suitable habitat in the region. There are 215 records of this species on the Bega 1:100,000 Map Sheet held in the NPWS Database. There are six records of this species close to the site, all to the west and south-west in Murrah State Forest. The closest record is two and a half kilometres west.

Effect of the Proposed Development on the Species: The site does not contain any tree species listed in Schedule 2 of SEPP 44 as Feed Tree Species. Although no evidence of koalas was detected during surveys, the proximity of records to the west makes it likely that koalas may pass through the site and may be disturbed by intermittent noise. The impact of intermittent noise is dealt with in section 9.

8.7 Common Bent-wing Bat *Miniopterus schreibersii*

M. schreibersii is listed on Schedule 2 of the Threatened Species Conservation Act 1995 as Vulnerable.

Distribution: this species has an almost world-wide distribution. In Australia it occurs along the entire eastern seaboard from Queensland around to South Australia.

Population: It is a common species in Australia. There is concern at reduced numbers in caves previously used and loss of caves. Protection of caves used for roosting is necessary to assure security for this species. Estimates of bats emerging at dusk at Wee Jasper NSW were given at 50,000 - 100,000 (Eden EIS, 1994)

Habitat: Prefers well timbered valleys where it forages above the canopy. Flight is level and fast punctuated by swift dives upon prey (Strahan, 1983).

Roost: This species is the dominant cave dweller in SE Australia (Hall & Richards, 1979). It roosts in caves, old mines, stormwater channels and similar structures including buildings (Strahan, 1983). Where conditions are favourable, colonies are often large.

Patterns of movement vary in response to local climatic conditions. Cool roost caves are sought for hibernation in winter. Breeding takes place in a small number of suitable caves where large numbers of females congregate (Strahan, 1983).

Breeding: Mating takes place in May and June (Mankhorst, 1995). In spring, females move to specific nursery caves that provide high temperature and humidity. In nursery caves densities of bats can reach 3,000 per square metre (Strahan, 1983). Young are born in December. Nursery colonies disperse between February and March with the wide dispersal of juveniles (Strahan, 1983)

Diet: Feeds principally on moths above the canopy, but also takes other insects.

Threats: This species is totally dependent on a few traditional breeding and overwintering caves (Menkhorst, 1995). The frequent disturbance of roosts used for hibernation can seriously increase winter mortality. Because of its dependence on a small number of nursery caves, threats to these locations may place the survival of widespread populations in jeopardy (Strahan, 1983)

Local Records: Regularly trapped in surveys down the entire length of the NSW South Coast. There are 18 records of this species on the Bega 1:100,000 Map Sheet held in the NPWS Database. There is one record of this species from 6 kilometres SW of the study site.

Effect of the Proposed Development on the Species: The main threat to this species is disturbance at nursery and hibernation caves. The site does not contain any suitable sites for breeding or hibernation. The proposal is unlikely to have any adverse impact on this species in the region.

9. Impact of Proposed Development

9.1 Impact of Intermittent Noise on Threatened Species

It is estimated that significant noise may carry for at least half a kilometre from the site during meetings (Mr. R. McLachlan, NSW Game Bird Advisory Committee, pers comm.). The impact of this noise on threatened species that may occur at the site is not well known.

The three large forest owls that occur in the vicinity of the site could be affected at their roost and breeding sites. Powerful Owls are known to occur close to and within urban areas in the Sydney region where they are subjected to loud intermittent noise. Similarly they exist in forests throughout the region including Murrah State Forest where they are subjected to similar noise from, periodic harvesting operations, trail bikes and chain saw noise from private firewood gathering. In this area, Powerful Owls tend to roost in dense wet sclerophyll gullies or in dense tree canopies. There are no suitable sites within 0.5 kilometres of the study site..

Masked Owls roost in tree hollows, caves, crevices in cliffs and in thick foliage in dense gullies. This species is also known to exist in habitats that are subject to human disturbance to loud intermittent noise. A roost site a Kioloa occurs within 100m of the Princes Highway (pers obs.). They occur in forests throughout the region including Murrah State Forest where they are subjected noise regimes similar to those mentioned above. There is no suitable roosting habitat within 0.5 kilometres of the site.

Sooty Owls primarily roost in large hollows in habitat trees or in dense rainforest gullies. These are absent from the study site and do not occur within 0.5 kilometres of the site. They also exist in Murrah State Forest where they are subjected to similar noise from, harvesting operations, trail bikes and chain saw noise from private firewood gathering.

The proposal does not intend to remove any foraging substrate or habitat suitable for prey species for any of these owls.

No evidence of Yellow-bellied Gliders were found at the site and the site does not contain any suitable habitat trees. However, there are a number of records from the near vicinity of the site, indicating that this species may be present. The lack of any large trees with hollows suitable for dens, the nocturnal habits of Yellow-bellied Gliders and their presence in forest that has been subjected to intermittent noise appears to indicate that this species would be little affected by the proposals.

Koalas are known to occur close to and within urban areas where they are subjected to loud intermittent noise from household activities, traffic etc. This species is found on the Field and Game Range at Geelong, Vic. Where it is apparently undisturbed by gunshots (Mr. R. McLachlan, NSW Game Bird Advisory Committee, pers comm.).

The site provides only marginal habitat for Glossy Black-cockatoos. Only a small amount of *Allocasuarina littoralis* is present at the site and higher quality habitat can be found in surrounding forested areas. The high mobility of this species and the fact

that no *Allocasuarina littoralis* will be removed by the proposal make it unlikely that Glossy Black-Cockatoos will be adversely affected by this proposal. Similarly, the high mobility and nocturnal

9.2 SEPP 14 Wetlands

The subject land does not contain nor adjoin any wetland protected by this legislation.

9.3 SEPP 44 - Koala Habitat Protection

Taped Playback surveys of the study site did not produce any responses from koalas.

No evidence of their presence was found during diurnal surveys of the area.

Of the tree species present none are listed in Schedule 2 of SEPP 44 as Feed Tree Species.

It is concluded that core habitat does not exist at the site.

9.4 Threatened Species Conservation Act - 8 point test.

For the purposes of this Act and, in particular, in the administration of sections 77, 90 and 112, the following factors must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities or their habitats.

- (a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed in danger of extinction.*

The **Glossy Black-Cockatoo** is only found in forested locations where mature stands of *Allocasuarina littoralis* exists. Some *Allocasuarina littoralis* occurs at the site, but this does not form a significant component of the flora, and higher quality habitat is found in nearby forested areas. There are no habitat trees at the study site suitable for breeding. The mobile nature of the species makes it unlikely to be adversely impacted upon by noise. It is unlikely that the proposal will have a significant impact on this species in the region such that a local population is likely to be placed in danger of extinction.

There are several records for **Masked Owls** near the site. There was no response to taped playbacks for this species during surveys. The site does not contain any roost trees and will not affect the foraging substrate for this species. The nocturnal nature of this species and the lack of roosts near the study site makes it unlikely that proposal would disrupt the life cycle of this species such that a local population is likely to be placed in danger of extinction.

Records of **Powerful Owls** indicate that the study site may occur within the territory of this species. The site does not contain any roosting or breeding sites. The lack of these sites in the near vicinity and the nocturnal nature of this species indicates that noise would not adversely affect this species. The proposal will not remove the habitat of any prey species for Powerful Owls. The proposals would be unlikely to disrupt the life cycle of this species such that a local population is likely to be placed in danger of extinction.

There are no records of **Sooty Owls** in the near vicinity of the study site and the site lacks the type of habitat preferred by this species. The lack of these sites in the near vicinity and the nocturnal nature of this species indicates that noise would not adversely affect this species. There was no response from this species during taped playback surveys. The proposed activities would be unlikely to disrupt the life cycle of this species such that a local population is likely to be placed in danger of extinction.

No evidence of **Koalas** was found at the survey site and the site lacks any of any tree species listed as Koalas feed species in Schedule 2 of SEPP 44. There are a number of records of this species in the near vicinity of the site indicating koalas may occasionally utilise the site. There is some evidence to suggest that noise does not adversely impact upon this species. Whilst the proposed activities are unlikely to disrupt the life cycle of this species such that a viable population is likely to be placed in danger of extinction, care will have to be exercised to ensure that no Koalas are present at or in the near vicinity of the site, prior to commencing any meetings.

Yellow-bellied Gliders are regularly recorded in the area and there are several records in the vicinity of the study site. There was no response from this species during taped playback surveys, nor were any of the characteristic tree incisions found during diurnal surveys of that site. No mature habitat trees occur at the site. The lack of these sites in the near vicinity and the nocturnal nature of this species indicates that noise would not adversely affect this species. The proposed activities would be unlikely to disrupt the life cycle of this species such that a local population is likely to be placed in danger of extinction.

The site contains suitable foraging area for the **Common Bent-winged Bat**. The proposals do not intend to disturb or alter any part of the site that is critical for this species. The nocturnal nature of this species indicates that noise would not adversely affect this species. The life cycle of this species is not likely to be disrupted such that a viable population of this species is likely to be placed in danger of extinction.

There are 11 records of **Correa baeuerienii** within 8 kilometres of the site all to the west and south-west in Murrah State Forest. The lack of suitable wet sclerophyll or creek-side habitat at the site makes it unlikely that this species would occur at the site or that the life cycle of this species would be disrupted such that a local population is likely to be placed in danger of extinction.

- (b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

At this time, no populations have been listed in schedule 1 part 2 of the Threatened Species Conservation Act.

- (c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.*

No known area of habitat of a threatened species is likely to be modified or removed by the proposal.

- (d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.*

No known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat by this proposal.

- (e) *whether critical habitat will be affected.*

At this time no critical habitat have been identified.

- (f) *whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation regions (or similar protected areas) in the region.*

All threatened species that may occur at the study site are regularly recorded throughout the region in suitable habitat. The floristic associations that occur at the Bermagui Clay Target Range study site are abundant in surrounding local and regional forests. The land has already been modified. Any loss of habitat that will result from the proposal will have no effect on the regional availability of this habitat for threatened species, populations or ecological communities.

- (g) *whether the development proposed is of a class of development or activity that is recognised as a threatening process.*

No threatening processes have been identified, as yet in Schedule 3 of the Endangered Species Conservation Act.

- (h) *whether any threatened species, population or ecological community is at the limit of its known range.*

No threatened species, population or ecological community is at the limit of its range.

10. Conclusions and Recommendations

The proposed Clay Target Range is situated in dry sclerophyll forest on a ridge line which has been disturbed by logging in the recent past.

Seven species of threatened fauna have been recorded in the near vicinity of the site and have the potential to occur there. While the site lacks any large roost trees or other essential habitat it almost certainly form part of the foraging territory for some of these species.

While the proposal does not intent to remove or modify any of the existing habitat, thus preserving the foraging substrate, the impact of intermittent noise from gunshots during meetings may affect some species. Five of these species, - the three large forest owls, Yellow-bellied Gliders and Common Bent-wing Bats are nocturnal and would not be active at times when meetings were taking place. The lack suitable roost or breeding sites for these species in the near vicinity indicates that their daytime retreats may be far enough away so as to be not disturbed by noise during meeting.

The site contains only a small amount of *Casuarina littoralis*, the preferred feed species for Glossy Black-Cockatoos and does not contain any suitable breeding trees. Higher quality habitat exists in nearby forests. The mobility of this species indicates that it is unlikely to be adversely affected by the proposal.

It is likely that Koalas could occur at the site. While anecdotal evidence suggests that this species is tolerant to noise, their lack of mobility and cryptic nature indicates that they could be adversely affected if due care was not taken prior to any meeting. It is recommended that before any meeting, when the target selection process is taking place, a thorough search of the site is carried out to ensure that Koalas or any other threatened species are not present at the site.

While the impact of intermittent noise is difficult to assess, it is felt that the proposal is unlikely to disrupt the life cycle of any species likely to occur at the site such that a viable local population of the species is likely to be placed in danger of extinction. Similarly no known area of habitat of a threatened species is likely to be modified or removed by the proposal.

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Appendix 4 VASCULAR PLANTS RECORDED AT BERMAGUI CLAY TARGETCLUB SITE .

Floristic Survey Sheet

Vegetation Type: Dry Sclerophyll Forest

Date: 2 July 1997

Quadrat Size: 200m X 100m

Altitude : 60m ASL

Aspect : 180 degrees

Slope: 5 degrees

Vegetation
Abundance: 1- Rare to 5 - Dominant

Canopy

Species	% Cover: 70%	Height: 20 - 30metres	Abundance
<i>Eucalyptus muellerana</i>			4
<i>Eucalyptus globoidea</i>			2
<i>Eucalyptus bosistoana</i>			2
<i>Eucalyptus longifolia</i>			1
<i>Eucalyptus cypellocarpa</i>			2
<i>Eucalyptus tricarpa</i>			1
<i>Eucalyptus sieberi</i>			2
<i>Angophora florabunda</i>			3

Sub- Canopy and Understorey

Species	% Cover: 10%	Height:: 5 - 10 metres	Abundance
<i>Allocasuarina littoralis</i>			3
<i>Acacia falciformis</i>			3
<i>Acacia subporosa</i>			2
<i>Acacia mearnsii</i>			2
<i>Acacia implexa</i>			2
<i>Pittosporum undulatum</i>			2
<i>Pittosporum revolutum</i>			2

Ground Cover

Species	% Cover: 30%	Height:: 0 - 1.0 metres	Abundance
<i>Macrozamia communis</i>	2	<i>Poa Siberian</i>	3
<i>Themeda australis</i>	4	<i>Microlaena stipoides</i>	3
<i>Imperata cylindrica</i>	3	<i>Lomandra longifolia</i>	3
<i>Lomandra multiflora</i>	2	<i>Lomandra confertifolia</i>	
		<i>ssp. rubiginosa</i>	2
		<i>ssp. similis</i>	3
<i>Platysace lanceolata</i>	4	<i>Oxylobium ilicifolium</i>	3
<i>Lepidosperma laterale</i>	2	<i>Hibbertia aspera</i>	4
<i>Correa reflexa</i>	2	<i>Dichondra repens</i>	3
<i>Dianella caerulea</i>	2	<i>Viola hederacea</i>	2
<i>Gahnia clarkei</i>	2	<i>Solanum prinophyllum</i>	1
<i>Ozothamnus diosmifolium</i>	2	<i>Senecio linearifolius</i>	2
<i>Indigophora australis</i>	2	<i>Goodinia ovata</i>	2