Application for a

NSW GOVERNMENT | Office of Environment & Heritage

Section 91 Licence

under the *Threatened Species Conservation Act 1995* to harm or pick a threatened species, population or ecological community* or damage habitat.

1. Applicant's Name ^: *(if additional persons require authorisation by this licence, please attach details of names and addresses)*	*Ann Prendergast General Manager Wingecarribee Shire Council *Delegated staff.	
2. Australian Business Number (ABN):	49 546 344 354	
3. Organisation name and position of applicant ^: *(if applicable)*	Wingecarribee Shire Council	
4. Postal address ^:	PO Box 141 Moss Vale NSW 2577	Telephone ^: B.H. [redacted] A.H.
5. Location of the action *(including grid reference and local government area and delineated on a map).*	Jordan's Crossing Park and Bundanoon Oval, Bundanoon (the Subject Site). The township of Bundanoon is within the Wingecarribee LGA. A map of the general area is attached (Figure 1). The oval and park contains open grassland areas, a mitigation area, grassed walking paths, a concrete cycleway, a BMX track, vehicular access tracks, netball courts, and playing fields.	

* A threatened species, population or ecological community means a species, population or ecological community identified in Schedule 1, 1A or Schedule 2 of the *Threatened Species Conservation Act 1995.*

^The personal details of all Section 91 licences will be displayed in the register of Section 91 licences required under Section 104 of the *Threatened Species Conservation Act 1995.* See notes.

6. Full description of the action and its purpose *(e.g. environmental assessment, development, etc.)*	The vegetation occurring at Jordan's Crossing Park and Bundanoon Oval is recognised as belonging to the Southern Highlands Shale Woodland endangered ecological community in the Sydney Basin Bioregion (SHSW EEC) The action is to continue to conduct: • routine mowing of the open grassland areas within the park and surrounding the oval complex (Figure 2, Area 1, 1a and 1b); • routine mowing of a 1 m wide walking track/bike track through the mitigation area to provide public access (Figure 2, Area 2a); and • routine mowing of exotic grassland areas in the mitigation area between the concrete cycle path and vehicular access track (Figure 2, Area 2b). The works form part of the Council's services for park management, public amenity and safety, and bushfire protection. Routine mowing has been conducted at this site for over 30 years.
7. Details of the area to be affected by the action *(in hectares)*.	Total area under mowing is as follows: • Area 1, 1a and 1b is approx. 2.57 ha • Area 2a mown walking track approx. 0.04 ha • Area 2b is approx. 0.2 ha Please refer to the attached map detailing these areas (Figure 2).
8. Duration and timing of the action *(including staging, if any)*.	This action will be on-going as part of the routine management of this public park and sporting facility.
9. Is the action to occur	

on land declared as critical habitat*? *(tick appropriate box)*	☐ Yes ☑ No

10. Threatened species, populations or ecological communities to be harmed or picked.	Scientific name *Southern Highlands Shale Woodlands in the Sydney Basin Bioregion*	Common name *(if known)* Southern Highlands Shale Woodlands in the Sydney Basin Bioregion	Conservation status *(i.e. critically endangered, endangered or vulnerable)* Endangered	Details of no. of individual animals, or proportion and type of plant material *(e.g. fertile branchlets for herbarium specimens or whole plants or plant parts)* Approx. 9 ha overall within the boundary of the Jordan's Crossing Park and Bundanoon Oval. (Stone 2011)

11. Species impact: *(please tick appropriate box)* a) For action proposed on land declared as critical habtat; or b) For action proposed on land not declared as critical habitat.	an SIS is attached ☐ Yes ☐ No Items 12 to 25 have been addressed ☑ Yes ☐ No

N.B: Provision of a species impact statement is a statutory requirement of a licence application if the action is proposed on critical habitat.
The provision of information addressing items 12 to 17 is a statutory requirement of a licence application if the action proposed is not on land that is critical habitat. Information addressing any of the questions below must be attached to the application.

12. Describe the type and condition of habitats in and adjacent to the land to be affected by the action.	Habitat condition in land to be affected: There are two main areas currently under mowing management as follows: **Area 1** This area is highly modified and comprises a mix of eucalypts and horticultural plantings over an exotic dominated grassland: • The canopy is dominated by scattered Mountain Grey Gum

* Critical habitat means habitat declared as critical habitat under Part 3 of the *Threatened Species Conservation Act 1995.*

(*Eucalyptus cypellocarpa*), *Eucalyptus radiata* subsp. *radiata,* and *Eucalyptus globoidea* with scattered *E. piperita, and E obliqua,* species typical of SHSW EEC.

Native trees and shrubs are few but include *Pittosporum undulatum* and *Acacia melanoxylon* occurring mostly along the eastern boundary fence line, and *Kunzea ambigua* planted along the southern fence line which abuts Edith Street.

Most of the smaller trees and shrubs are dominated by horticultural plantings including *Fraxinus* spp.*, *Populus* spp.*, *Acer* spp.* and a variety of exotic conifer species.

The ground layer is dominated exotic grasses and herbs, with scattered native species present.

The vegetation of Area 1 to be impacted (mown) comprises the exotic dominated ground layer.

The majority of Area 1 is considered to be in poor condition due to the predominance of exotic grasses and forbs in the ground layer and the lack of native shrubs species typical of the SHSW as a result of long term park management and horticultural plantings.

Areas 1a and 1b

Areas 1a adjacent to the mitigation area, and Area 1b west of the oval (Figure 2) comprise a native canopy over grassland dominated by native species and are in better condition than Area 1. Area 1b includes areas of mulched garden beds around the bases of the canopy trees and include both native and exotic small trees and shrubs (*Pittosporum undulatum, Arbutus* sp.*, *Cotoneaster* sp.*, *Ilex aquifolium**, *Acacia stricta, Polyscias sambucifolia, Lomandra longifolia* and *Hardenbergia violacea*).

Area 2

Area 2 comprises eucalypt species over a predominantly grassy understory and represents the mitigation area set aside for the regeneration of the SHSW EEC in this park (Stone 2011).

- Similar to Area 1, the canopy is dominated by Mountain Grey Gum (*Eucalyptus cypellocarpa*), *Eucalyptus radiata* subsp. *radiata,* and *Eucalyptus globoidea* with scattered *E. piperita,* and *E obliqua.*
- In Area 2a, scattered smaller trees and shrubs are present, including a number of regenerating eucalyptus species.

  The ground layer is dominated by native grasses and forbs, with some areas of exotic grasses and forb infestation present.
- In Area 2b, a good canopy of eucalypt species is present.

  Shrubs are absent and the ground layer is dominated by exotic grasses and forbs.

Mowing within the mitigation area consists of the following:

- A 1m wide mown pathway providing a public walking access/bike track (Area 2a) (Figure 2);
- Exotic grassland areas (Area 2b) (Figure 2) as illustrated in Figure 2.

	The condition of Area 2a is considered to be moderate with natural regeneration occurring. It is understood that Council is also assisting natural regeneration in this area by way of weed control and removal. The condition of Area 2b is considered to be in poor condition due to the presence of exotic dominated grassland under the canopy. <u>Habitat condition in adjacent lands:</u> The southern boundary of the park is boarded by Edith Street. Land to the east and north of the site has been cleared for subdivision, with access roads already in place. Land to the north and northwest of the site comprises residential dwellings and more playing fields. Land to the west of the site comprises residential dwellings and the Bowling Club.
13. Provide details of any known records of a threatened species in the same or similar known habitats in the locality *(include reference sources)*.	The following threatened species have been recorded at the site (Stone 2011): • Gang-gang Cockatoo (*Callocephalon fimbriatum*); and • Camden Woollybutt (*Eucalyptus macarthurii*). A review of the relevant databases found that there have been no new threatened flora and fauna recorded for the site, and no new records were recorded during the current site inspection (Department of the Environment 2014; NSW Office of Environment and Heritage 2014).
14. Provide details of any known or potential habitat for a threatened species on the land to be affected by the action *(include reference sources)*.	Gang-gang Cockatoo (*Callocephalon fimbriatum*): • Presence of regenerating eucalypt woodland with acacia species in the understory available for foraging; • Tree hollows for nesting and roosting. (Stone 2011; NSW Office of Environment and Heritage 2014a). Camden Woollybutt (*Eucalyptus macarthurii*): • Presence of grassy woodland; • Presence of Southern Highlands Shale Woodland EEC, a community in which it is known to occur. (NSW Office of Environment and Heritage 2014c, 2014d).
15. Provide details of the amount of such habitat to be affected by the action proposed in relation to the known distribution of the species and its habitat	Gang-gang Cockatoo(*Callocephalon fimbriatum*) : • Within the locality, the local population is extensive and ranging over private lands of the Bundanoon area and in the adjacent forests of Morton National Park. • The site comprises a small proportion of the habitat occupied by the local population (Stone 2011).

in the locality.	Camden Woollybutt (*Eucalyptus macarthurii*): • This species is known to occasionally occur in SHSW, a largely cleared community that is now found in scattered patches of less than 5 ha in area (Eco Logical Australia 2010). • Within the locality, this species often occurs as scattered paddock trees, or as small stands or linear remnants along roads or drainage lines (NSW Office of Environment and Heritage 2014c, 2014d). • Within the site the amount of habitat to be affected in relation to the known distribution is small. The mitigation area at the site provides habitat available for potential recruitment of this species.
16. Provide an assessment of the likely nature and intensity of the effect of the action on the lifecycle and habitat of the species.	Gang-gang Cockatoo(*Callocephalon fimbriatum*): • As the local population is known to range over an extensive area including Morton National Park, it is unlikely that routine mowing at the site will impact the life cycle of this species, given the on-going management and regeneration of the mitigation area, enhancing the habitat at the site. Camden Woollybutt (*Eucalyptus macarthurii*): • Within the site routine mowing will prevent recruitment of this species where it occurs outside the mitigation area. • Recruitment will be possible within the mitigation where mowing is not undertaken and seed regeneration can occur.
17. Provide details of possible measures to avoid or ameliorate the effect of the action.	With respect to the SHSW EEC, possible measures include the following: • From the current survey, there is the potential to increase the size of the mitigation area by the addition of a smaller adjoining area (Area 1a), as it contains a predominantly native ground layer; • Introduce scattered provenance plantings of canopy and shrub species to mown areas within Area 1. This will enhance existing and replace senescing trees in the future; • Introduce scattered provenance plantings of canopy and shrub species to garden bed areas within Area 1b; • Remove non-indigenous tree species from mitigation area; • Continue weed control in mitigation area to encourage further regeneration of native species. With respect to the Gang-gang Cockatoo (*Callocephalon fimbriatum*) possible measures include those above for the SHSW EEC and the following: • Assist the regeneration of the mitigation area to allow for the recruitment of tree and shrub species to improve the quality

	of foraging habitat. • Control weeds that may inhibit regeneration. With respect to Camden Woollybutt (*Eucalyptus macarthurii)*, possible measures include the following: • Investigate seed collection for provenance plantings; • Cease mowing around any individuals not within the mitigation area to allow for recruitment.

N.B: The Director-General must determine whether the action proposed is likely to significantly affect threatened species, populations or ecological communities, or their habitats. To enable this assessment the Applicant is required to address items 18 to 24. Any additional information referred to in addressing these items must be attached to the application.

18. In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	Gang-gang Cockatoo(*Callocephalon fimbriatum*): • As the local population is known to range over an extensive area including Morton National Park, it is unlikely that routine mowing at the site will have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction, given: o The on-going management and regeneration of the mitigation area, enhancing the habitat at the site; o That routine mowing has been undertaken over number of years, and the local population remains present within the locality. Camden Woollybutt (*Eucalyptus macarthurii*): • Within the site routine mowing will prevent recruitment of this species where it occurs outside the mitigation area. • Recruitment will be possible within the mitigation where recruitment can occur in the absence of mowing. The on-going management and regeneration of the mitigation area will provide habitat for these species and the ecological community at the site.
19. In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	Not applicable.

20. In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	Mowing of the SHSW community at the site has been undertaken over 30 years and much of the area subject to routine mowing is highly modified. Despite this, native species have persisted in the less disturbed areas. Together with the mitigation area, the following is considered: I. that it is unlikely that the local occurrence of the community will be put at the risk of extinction as a result of the action; II. that much of the site is already highly modified, in particular Area 1 and Area 2b. Areas 1a, 1b, and 2a (mitigation area) are substantially native dominated in the ground layer and have remained this way despite long term mowing. The action, therefore, is unlikely to substantially and adversely modify the composition of the community, given the regeneration works occurring at the site.
21. In relation to the habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	I. No habitat is to be removed as part of the action. Habitat at the site is already highly modified in Areas 1 and 2b. Habitat in Area 2a, the mitigation area, is modified by an existing mown track where both exotic and native grassland species are surviving. Habitat in Areas 1a and 1b have been retained as open grassland areas for public amenity and safety. These areas are largely native dominated grasses and forbs. II. The proposed action will not fragment or isolate habitat from other areas of habitat. III. The minimal area of native grasses and forbs to be removed as a result of the action will not affect the long term survival of the SHSW ecological community, particularly taking into consideration the establishment of the mitigation area and its future contribution to the survival of the community in the locality.

22. Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	No critical habitat is present at the subject site.
23. Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	No Recovery Plan or Threat Abatement Plan has been prepared for the SHSW EEC. The NSW Office of Environment and Heritage (2014b) have identified a number of management actions for this community, as follows: • Undertake surveys on public and private land; • Develop mapping of extent of EEC; • Protect and enhance EEC sites on private land through targeted management and incentive payments; • Develop guidelines for EEC identification, enhancement and management; • Identify key sites for protection and development of management plans; • Develop and distribute EIA guidelines.
24. Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	Schedule 3 of the *Threatened Species Conservation Act 1995,* lists 'clearing of native vegetation' as a key threatening process. Routine mowing of the community over exotic grassland is limited to • 2.08 ha in Area 1 • 0.22 ha in Area 2b Routine mowing of the community over native-dominated grassland is limited to: • 0.13 ha in Area 1a, adjoining the mitigation area; • 0.36 ha in Area 1b • 0.04 ha (372 m2) of walking track within the mitigation area where both native and exotic grasses have been mown for many years. Given the long history of mowing at the site, the presence of native ground layer species persisting within the mown areas, the establishment of the mitigation area within the park, and the limited amount of mowing within the mitigation area and other areas dominated by native grassland species, it is considered that the action would not increase the impact of this key threatening process at this site.

Important information for the applicant

Processing times and fees

The *Threatened Species Conservation Act 1995* provides that the Director-General must make a decision on the licence application within 120 days where a species impact statement (SIS) has been received. No timeframes have been set for those applications which do not require a SIS. The Director-General will assess your application as soon as possible. You can assist this process by providing clear and concise information in your application.

Applicants may be charged a processing fee. The Director-General is required to advise prospective applicants of the maximum fee payable before the licence application is lodged. Therefore, prospective applicants should contact the Office of Environment and Heritage (OEH) prior to submitting a licence application.

A $30 licence application fee must accompany a licence application.

Protected fauna and protected native plants*

Licensing provisions for protected fauna and protected native plants are contained within the *National Parks and Wildlife Act 1974.* However, a Section 91 Licence may be extended to include protected fauna and protected native plants when these will be affected by the action.

If you are applying for a licence to cover both threatened and protected species please provide the information requested in Item 10 *as well as* a list of protected species and details of the number of individuals animals or proportion and type of plant material which are likely to be harmed or picked.

Request for additional information

The Director-General may, after receiving the application, request additional information necessary for the determination of the licence application.

Species impact statement

Where the application is not accompanied by a SIS, the Director-General may decide, following an initial assessment of your application, that the action proposed is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats. In such cases, the *Threatened Species Conservation Act 1995* requires that the applicant submit a SIS. Following initial review of the application, the Director-General will advise the applicant of the need to prepare a SIS.

Director-General's requirements for a SIS

Prior to the preparation of a SIS, a request for Director-General's requirements must be forwarded to the relevant OEH Office. The SIS must be prepared in accordance with section 109 and 110 of the TSC Act and must comply with any requirements notified by the Director-General of OEH.

Disclosure of Personal Information in the Public Register of s91 Licences

The Public Register provides a list of licence applications and licences granted. A person about whom personal information is contained in a public register may request that the information is removed or not placed on the register as publicly available.

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* Protected fauna means fauna of a species not named in Schedule 11 of the *National Parks and Wildlife Act 1974.*
Protected native plant means a native plant of a species named in Schedule 13 of the *National Parks and Wildlife Service 1974.*

Copies of all applications and licences issued under section 91 and certificates issued under section 95 of the Act are available on the OEH website at www.environment.nsw.gov.au/threatenedspecies/S91TscaRegisterByDate.htm or in hardcopy form from The Librarian, OEH, 59 Goulburn St, Sydney.

Certificates

If the Director-General decides, following an assessment of your application, that the proposed action is not likely to significantly affect threatened species, populations or ecological communities, or their habitats, a Section 91 Licence is not required and the Director-General must, as soon as practicable after making the determination, issue the applicant with a certificate to that effect.

N.B: An action that is not required to be licensed under the Threatened Species Conservation Act 1995, may require licensing under the National Parks and Wildlife Act 1974, if it is likely to affect protected fauna or protected native plants.

I confirm that the information contained in this application is correct. I hereby apply for a licence under the provisions of Section 91 of the *Threatened Species Conservation Act 1995.*

Ann Prendergast

Applicant's name
(Please print)

Acting General Manager, Wingecarribee Shire Council

Applicant's Position & Organisation *(if relevant)*
(Please print)

Applicant's signature

Prendergast

Date
21/3/19

For more information or to lodge this form, contact the nearest branch of OEH's Conservation and Regulation Division:

Metropolitan Branch
P: 02 9995 6802
F: 02 9995 6900
PO Box 668
Parramatta
NSW 2124

North East Branch
P: 02 6640 2500
F: 02 6642 7743
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NSW 2460

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NSW 2830

South Branch
Biodiversity Conservation Section
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Office of Environment and Heritage (NSW)
PO Box A290, Sydney South NSW 1232
Phone: 131 555 (Environment Line) Fax: 9995 5999
Email: info@environment.nsw.gov.au

References

Department of the Environment - Protected Matters Search Tool. Search performed March 17th March 2014. http://www.environment.gov.au/epbc/pmst/

Eco Logical Australia (2010) *Climate change vulnerability assessment: key natural assets in the Hawkesbury-Nepean catchment.* Report to Hawkesbury-Nepean Catchment Management Authority, Penrith Westfield, NSW

NSW Office of Environment and Heritage (2014) NSW BioNet Atlas Searches. Search performed March 17th March 2014.http://www.bionet.nsw.gov.au/

NSW Office of Environment and Heritage (2014a) NSW Scientific Committee: Gang-gang Cockatoo Vulnerable species listing. Accessed March 17th March 2014. http://www.environment.nsw.gov.au/resources/nature/schedules/Ganggang.pdf

NSW Office of Environment and Heritage (2014b) *Southern Highlands Shale Woodlands in the Sydney Basin Bioregion – Action Statement.* Accessed March 17th March 2014. http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10766

NSW Office of Environment and Heritage (2014c) *Southern Highlands Shale Woodlands in the Sydney Basin Bioregion – endangered ecological community listing.* Accessed March 17th March 2014. http://www.environment.nsw.gov.au/determinations/SouthernHighlandsShaleWoodlandsSydneyEndComListing.htm

NSW Office of Environment and Heritage (2014d) *Southern Highlands Shale Woodlands in the Sydney Basin Bioregion – profile.* Accessed March 17th March 2014. http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10766

Stone, G. (2011) *Environmental Assessment (Flora and Fauna) for a proposed development at Bundanoon Oval and Jordan's Crossing Park, Parish of Sutton, Bundanoon,* NSW.

Figure 1 - Locality

Legend

- Subject Site
- Pedestrian track
- Cycleway
- Vehicular track

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 56

N

ecological AUSTRALIA
www.ecoaus.com.au

Prepared by: TB Date:17/03/2014

Figure 2 - Management Zone

Legend

- Subject Site
- Pedestrian track
- Cycleway
- Vehicular track

Management Zone

- 1
- 1a
- 1b
- 2a
- 2b
- BMX track

0 25 50 100
Metres
Datum/Projection:
GDA 1994 MGA Zone 56

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Prepared by: XX Date:00/00/0000

Environmental Assessment (Flora and Fauna) for a Proposed Development at Bundanoon Oval and Jordan's Crossing Park, Parish of Sutton Forest, Bundanoon, NSW

Prepared for:
Micris Management Services Pty Ltd
PO Box 338
Campsie NSW 2194

Prepared by:
G.J. Stone
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December, 2011

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Appendix 5: Consideration of impacts on threatened and migratory species for which potential habitat occurs in the study area.
Appendix 6: Consideration of potential threatened species occurrences in the study area.
Appendix 7: Survey Methodology and Assessment – Flora and Fauna
Appendix 8: Certification

Environmental Assessment (Flora and Fauna) for a Proposed Development at Bundanoon Oval and Jordan's Crossing Reserve, Bundanoon, NSW

Prepared by G.J. Stone, Woodlands Environmental Management, 133 Forest Road, Wingello, NSW 2579 for Micris Management Services Pty Ltd, PO Box 338, Campsie NSW 2194.

Introduction
Micris Management Services Pty Ltd has been contracted by Wingecarribee Shire Council to prepare a Plan of Management for Bundanoon Oval and Jordan's Crossing Reserve, Bundanoon, NSW.

The subject site is presently utilised for a range of passive and active uses in addition to the annual 'Brigadoon' event. Wingecarribee Shire Council additionally proposes the construction and operation of a Mountain Bike Track within the subject site.

The subject site supports remnant vegetation and a survey and assessment is therefore required for the purpose of assessing the likely effects of the existing 'Brigadoon' event and the proposed Mountain Bike Track development upon on flora and fauna at the site with particular regard to threatened species, populations or ecological communities, or their habitats.

Conclusions:
It is concluded that:

I. *Southern Highlands Shale Woodland Endangered Ecological Community* is present within the subject site

II. Habitat for the Threatened Species *Callocephalon fimbriatum* (Gang-gang Cockatoo) is present within the subject site

III. The subject site includes numerous tree hollows suitable for a range of fauna species

IV. The existing development is the staging of the annual 'Brigadoon' event and the associated maintenance of the subject site to facilitate this activity

V. The proposed development includes the construction and operation of a Mountain Bike Track within the subject site

VI. The proposed development includes the protection, rehabilitation and revegetation of a mitigation area of 4.5ha of remnant vegetation within the subject site

VII. A Southern Highlands Shale Woodland Management Plan, based on the principles of best practice techniques in bush regeneration, will be prepared to guide the management of the 4.5ha mitigation area

VIII. If recommendations for conditions of development are adopted and enforced, the existing 'Brigadoon' event and proposed Mountain Bike Track development are unlikely to have a significant effect on Endangered Ecological Communities, Threatened Species or their habitats

IX. The existing management and maintenance of the subject site is contributing to the degradation of remnant *Southern Highlands Shale Woodland Endangered Ecological Community*

Recommendations:
It is recommended that:

I. The Mountain Bike Track be located outside of the canopy extent or 'drip-line' of existing *Eucalyptus* trees

II. Sections of the Mountain Bike Track located within or alongside the 4.5ha mitigation area should include measures designed to ensure the protection of remnant vegetation from access by bikes

III. The Southern Highlands Shale Woodland Management Plan to guide the management of the 4.5ha mitigation area be prepared prior to the commencement of construction and operation of the Mountain Bike Track

IV. *Eucalyptus* spp. characteristic of Southern Highlands Shale Woodland at the subject site be planted along the eastern boundary of the southern portion of the subject site (i.e. Bundanoon Oval) as a long-term replacement of existing mature to senescent trees

1. Location and Site Description

1.1 Location

The existing and proposed developments are located at Bundanoon Oval and Jordan's Crossing Reserve, approximately 1.5km north-west from Bundanoon village. The property is located within the Parish of Sutton Forest, County of Camden, the Wingecarribbee LGA. The property is located within the Sydney Basin IBRA Bioregion and the Moss Vale Sub-region of the Hawkesbury-Nepean CMA (Figure 1: Location Map).

1.2 Description

1.2.1 Landform and Topography

The subject site is located on gently sloping to level land with a generally northerly aspect. Drainage is via two waterways to the north-west into Currabunda Wetlands. Elevation of the site ranges from 655m to 680m asl..

1.2.2 Geology and Soils

The subject site is situated on a geological base of Wianamatta Shale of the Liverpool Sub-group. Soils include loams and clay-loams of moderate depth, well-drained and moderately fertile.

1.2.3 Climate

Bundanoon is in a cool-sub humid zone, experiencing an average annual rainfall of 895mm with a fairly even distribution. Winters are cold with a mean minimum of -1o to 2oC with frequent frosts and the occasional light snowfalls. Summers are cool to warm with a mean maximum of 23o to 25oC. Prevailing winds are from the south-west during winter and spring, with north and north-westerly winds becoming more frequent in summer.

1.2.4 Vegetation

The northern portion of the subject site (i.e. Bundanoon Oval) supports a remnant Forest / Woodland with an overstorey of *Eucalyptus* spp. over a grassy and

herbaceous groundcover of exotic and native species. The southern portion of the subject site supports open grassland dominated by exotic species and isolated, fragmented remnants of Forest / Woodland (i.e. Jordan's Crossing Reserve).

1.2.5 Landuse and Adjacent Landuse

The subject site is presently utilised for a range of passive activities. Infrastructure at the subject site includes a paved pathway and unpaved vehicle track..

The study area is presently utilised for active sporting activities (within Bundanoon Oval) and a proposed residential subdivision to the east.

The northern and western boundaries of the subject site adjoin Bundanoon Oval sporting facilities and private residential properties. The southern boundary adjoins Erith Street. The eastern boundary adjoins cleared land proposed for a residential subdivision.

1.3 Key Attributes and Description of the Existing and Proposed Development

The existing development is the staging of the annual 'Brigadoon' event and the associated maintenance of the subject site to facilitate this activity. During 'Brigadoon' the southern and central portions of the Forest / Woodland remnant is occupied by tents, stalls and vehicles for a period of approximately four days. Present maintenance of the subject site includes regular mowing of the Forest / Woodland groundcover.

The development as proposed includes the construction and operation of a Mountain Bike Track within remnant Forest / Woodland and grassland throughout the subject site. The bare earth track will be less than one metre in width and will be located outside of the canopy extent or 'drip-line' of existing *Eucalyptus* trees.

The development as proposed includes the protection, rehabilitation and revegetation of an area of 4.5ha of remnant Forest / Woodland in the northern and north-western portion of the subject site.

1.3.1 The Subject Site

The subject site is the area to be directly affected by the existing and proposed developments (Figure 2: Site Map).

1.3.2 The Study Area

The study area includes the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly (Figure 2: Site Map).

2. Statutory Requirements

2.1 Legislation

Relevant legislation for the assessment of the existing and proposed developments includes:

Threatened Species Conservation Act 1995 & Threatened Species Conservation Amendment Act 2002

The *Threatened Species Conservation Act 1995* provides for the protection of all threatened plants and animals native to New South Wales (with the exception of fish and marine plants). The Act contains the lists of species, populations and ecological communities that have been classified as threatened.

Native Vegetation Act 2003
Clearing remnant native vegetation or protected regrowth requires approval under the *Native Vegetation Act 2003* (NV Act) unless the clearing is a permitted activity. Under the *NV Act* the local Catchment Management Authority (CMA) can only approve the clearing of remnant vegetation or protected regrowth when the clearing will improve or maintain environmental outcomes.

***National Parks and Wildlife Act 1974* (NPW Act)**
The objects of this Act are the conservation of the conservation of habitat, ecosystems and ecosystem processes, and biological diversity at the community, species and genetic levels, and landforms of significance, including geological features and processes, and landscapes and natural features of significance including wilderness and wild rivers. The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including places, objects and features of significance to Aboriginal people, and places of social value to the people of New South Wales, and places of historic, architectural or scientific significance, fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation. The objects of this Act are to be achieved by applying the principles of ecologically sustainable development.

Environmental Planning and Assessment Act 1979
The Environmental Planning and Assessment Act 1979 (EP&A) Act established the environmental planning system in NSW. The Act outlines land use planning, development controls and environmental impact assessment framework in NSW. Section 5A of the EP&A Act outlines the eight factors to be considered when determining whether a proposal is likely to have a significant effect on threatened species, populations and ecological communities, or their habitats, and whether a Species Impact Statement is required.

Commonwealth Environment Protection and Biodiversity Act 1999
The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects the environment, particularly matters of National Environmental Significance (Protected matters). It streamlines national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places.

2.2 Wingecarribee Shire Council policies
Relevant policies for the assessment of the proposed development are as follows:

Wingecarribee Shire Council aims 'To establish and implement measures to effectively *conserve, protect, enhance* and *rehabilitate the biodiversity* within our shire' (WSC, 2009 p.4).

Council supports a policy of Ecologically Sustainable Development which includes the principle that 'new development must ensure that there is no loss of biological diversity or ecological integrity' (WSC draft DCPs, 2011)

Council also supports a policy to avoid, minimise, or mitigate impacts. Proposals for new developments should therefore be supported by a report of 'all measures proposed to avoid, minimise or mitigate impacts to threatened species detailing how, when and where they will be implemented and their likely effectiveness.' (WSC, 2009 p.47)

Council's assessment of new developments also includes the consideration of any direct, indirect and cumulative impacts associated with the proposal.

3. Survey Methodology and Assessment

A fauna survey and habitat assessment was undertaken on the site during the 22nd and 23rd November 2011. A flora survey was undertaken at the site on Friday 18th November 2011.

Field work and data collection for fauna was undertaken by Peter Irish (Irish Environmental Consultancy). Field work and data collection for flora was undertaken with the assistance of Dr. Steven Douglas (Ecological Surveys and Planning).

Details of survey methodology and assessment for flora and fauna are included in Appendix 7.

4. Flora Survey Results

4.1 Database Search

4.1.1 Threatened Communities

Six communities occurring in the Moss Vale Sub-region of the Hawkesbury-Nepean CMA are listed by the NSW Office of Environment and Heritage as Endangered Ecological Communities (Table 1)

Two communities occurring within 20km of the subject site are listed by the Department of Sustainability, Environment, Water, Population and Communities as Threatened Ecological Communities within the list of Matters of National Environmental Significance (Table 1)

4.1.2 Threatened Species

The NSW Office of Environment and Heritage records the presence of eleven Threatened Species of flora within the Moss Vale Sub-region of the Hawkesbury-Nepean CMA. The NPWS Atlas of NSW Wildlife records eight of these species as occurring within a 20km radius of the subject site (Table 1).

The Department of Sustainability, Environment, Water, Population and Communities lists twenty-eight species of flora as Matters of National Environmental Significance within 20 km of the subject site (**Table 1**).

4.2 Field Survey

The preliminary survey identified two stratification units within the subject site:

> *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin*
>
> *Exotic-dominated Grassland*

4.2.1 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland

The Forest / Woodland community occupies c. 9ha and includes an overstorey association of *Eucalyptus cypellocarpa* (Mountain Grey Gum), *E. radiata subsp. radiata* (Narrow-leaved Peppermint), *E. globoidea* (White Stringybark), *E. ovata* (Swamp Gum), *E. piperita ssp. urceolaris* (Urn-fruited Peppermint), *E. obliqua* (Messmate) and *Angophora floribunda* (Rough-barked Apple).

The understorey is very sparse and includes small trees such as *Acacia melanoxylon* (Blackwood), *A. mearnsii* (Black Wattle), *Exocarpus cupressiformis* (Native Cherry) and *Pittosporum undulatum* (Sweet Pittosporum).

The grassy and herbaceous groundcover includes areas dominated by exotic species, areas of native and exotic species and areas dominated by native species. Native species include *Microlaena stipoides* (Weeping Grass), *Dichondra repens* (Kidney Weed), *Poa sieberiana* (Snow Grass) and *Viola hederacea* (Ivy-leaved Violet). Exotic species include *Acetosella vulgaris* (Sheep Sorrel), *Arctotheca calendula* (Capeweed), *Ehrharta longiflora* (Annual Veldtgrass), *Hypochaeris radicata* (Catsear) and *Plantago lanceolata* (Plantain).

The Hawkesbury-Nepean CMA classifies this community as *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin,* the vegetation formation as Wet Sclerophyll Forests (Grassy subformation) and the vegetation class as Southern Tableland Wet Sclerophyll Forests (Biometric 2008).

The vegetation community within the subject site appears to be a highly modified remnant within a developed recreational area, however the NSW Scientific Committee's assessment is that 'much of the remaining area of Southern Highlands Shale Woodlands is highly fragmented with much of it occurring on private land. Many remnants are in poor condition, including in some reserves, with aging trees, lack of regeneration and weed invasion' (NSW Scientific Committee 2001).

Consequently, the Scientific Committee has determined that 'disturbed Southern Highlands Shale Woodlands remnants are considered to form part of the community including areas where the vegetation would respond to assisted natural regeneration, such as where the natural soil and associated seedbank is still at least partially intact' (NSW Scientific Committee 2001).

The above is an appropriate description of the vegetation community within the subject site.

It is therefore concluded that the remnant vegetation community within the subject site meets the criteria to be classified as *Southern Highlands Shale Woodland in the Sydney Basin Bioregion* listed as an Endangered Ecological Community under Schedule 1 of the NSW *Threatened Species Conservation Act 1995*.

4.2.2 Exotic-dominated Grassland

The southern portion of the subject site within Jordan's Crossing Reserve supports a grassland dominated by exotic species include *Trifolium repens* (White Clover), *Acetosella vulgaris* (Sheep Sorrel), *Poa annua* (Winter Grass), *Arctotheca calendula* (Capeweed), *Ehrharta longiflora* (Annual Veldtgrass), *Cynodon dactylon* (Common Couch), *Hypochaeris radicata* (Catsear) and *Plantago lanceolata* (Plantain).

Isolated, fragmented remnants of *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland* are present around the perimeter of the Reserve.

The Office of Environment and Heritage classifies the vegetation in this area as *Highly disturbed areas with no or limited native vegetation.*

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4.2.3 Study Area Vegetation

On land to the west of the subject site the original vegetation community has been removed as a result of past clearing and grazing and the dense groundcover (>90% cover) is comprised of introduced pasture species with a very low incidence of native species.

Isolated remnant overstorey trees include *E. radiata subsp. radiata* (Narrow-leaved Peppermint), and *E. globoidea* (White Stringybark). Grass and herbs present include *Acetosella vulgaris* (Sorrel), *Dactylis glomerata* (Cocksfoot), *Lolium perenne* (Perrenial Rye), *Paspalum distichum* (Paspalum) and *Phalaris aquatica* (Canary Grass).

Introduced species at the site include windbreaks of *Pinus radiata* (Radiata Pine), *Cupresses* spp. (Cypress) and scattered specimens of *Crataegus spp.* (Hawthorn).

The above communities were mapped (**Figure 4: Vegetation Map**) and a list of native flora species located within the plots at the subject site was recorded in **Appendix 2.**

4.3 Data Analysis and Discussion

4.3.1 Condition and Integrity of Vegetation

Within *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland* the majority of the overstorey trees are mature or at a stage of late maturity. No natural regeneration of the overstorey was observed other than several small saplings which occur at a site where the grass layer has been disturbed.

The natural shrubby understorey of the community has been cleared with only a small number of plants remaining. No natural regeneration of the understorey was observed. Within a number of areas the natural grassy and herbaceous groundcover has been modified by the introduction of exotic grasses.

As noted above (4.2.1) vegetation community within the subject site nevertheless meets the criteria to be classified as *Southern Highlands Shale Woodland in the Sydney Basin Bioregion Endangered Ecological Community*

An assessment of the vegetation at the site against the benchmarks for the community prescribed in OEH's Biometric (2008) indicates a 'moderate' condition.

The site is maintained by regular mowing which precludes the natural regeneration of the community. Under existing management practices, the overstorey trees and understorey will eventually become senescent and die, creating a mixed native-exotic grassland.

4.3.2 Pre-settlement Vegetation

Prior to European settlement it is likely that the subject site and the study area would have supported *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland*.

4.3.3 Representation of Communities in Conservation Reserves

Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highland Shale Woodlands EEC is not well-represented within conservation reserves in the region. This community occurs in various forms across the Southern Highlands (NSW Scientific Committee, 2001) and the small remnant located in Cecil Hoskins Nature Reserve at Bong Bong is dissimilar to the form present at the subject site.

4.3.4 Regional Cleared Estimates

The Office of Environment and Heritage *BioMetric: Terrestrial Biodiversity Tool* includes vegetation type classifications which have been developed for the Hawkesbury-Nepean CMA area. Most of the vegetation types comprise the original vegetation types (i.e. pre-clearing, or pre-1750) in the CMA area. A per cent cleared estimate (rounded to nearest 5 per cent) is provided for each vegetation type.

An overcleared vegetation type is a vegetation type of which more than 70% has been cleared from within the CMA area.

Vegetation type	% cleared	Overcleared
Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland	*90%*	*Yes*
Exotic-dominated Grassland	*N/A*	*N/A*

4.3.5 Vulnerable Land

Under the *Native Vegetation Act 2003,* the former State Protected Land has been more accurately mapped and is known as Vulnerable Land. Vulnerable Land includes Steep or Highly Erodible Land and Protected Riparian Land.

The subject site does not include Vulnerable Land.

4.3.6 Potential Threatened Species

The NSW Office of Environment and Heritage database of Threatened Species within the Moss Vale Sub-region of the Hawkesbury-Nepean CMA and the Department of Sustainability, Environment, Water, Population and Communities database of Matters of National Environmental Significance within a 20km radius of the subject site were cross-referenced to *Vegetation types of Hawkesbury-Nepean CMA and associated threatened species.* The Threatened Species of flora potentially present within the habitat types at the subject site are listed in **Table 1: Summary of *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* Threatened Species within a 20km radius of the site and within the Moss Vale Sub-region occurring in habitats present at Lot 60 DP 909008, Parish of Sutton Forest, Bundanoon, NSW.**

4.4 Assessment of impacts on vegetation

4.4.1 'Brigadoon' and associated maintenance

The existing development is the staging of the annual 'Brigadoon' event and the associated maintenance of the subject site to facilitate this activity.

During 'Brigadoon' the southern and central portions of the *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* remnant is occupied by tents, stalls and vehicles for a period of approximately four days. The event occupies 2.8ha of the remnant vegetation community. It is unlikely that these activities have a significant impact on the remnant vegetation.

The subject site – including c. 9ha of *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* is presently maintained by regular mowing which precludes the natural regeneration of the overstorey and understorey of the community. Under these existing management practices, the overstorey trees will eventually become senescent and die, creating a mixed native-exotic grassland.

It is concluded that although the 'Brigadoon' event is unlikely to have a significant impact on vegetation within the subject site, the existing management and maintenance regime to facilitate the event is contributing to the degradation of remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC.*

4.4.2 Construction and operation of Mountain Bike Track

The development as proposed includes the construction and operation of a <1m width earthen Mountain Bike Track within remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* and grassland throughout the subject site.

The bare earth track will be less than one metre in width and will be located outside of the canopy extent or 'drip-line' of existing *Eucalyptus* trees.

Clearing of native vegetation for the construction of the track will be restricted to small areas of native groundcover including patches dominated by exotic species, patches of native and exotic species and patches dominated by native species.

If recommendations for conditions of development are adopted and enforced, it is concluded that the construction and operation of the Mountain Bike Track is unlikely to have a significant impact on vegetation within the subject site.

4.4.3 Protection, rehabilitation and revegetation of remnant vegetation

The development as proposed includes the protection, rehabilitation and revegetation of an area of 4.5ha of remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* in the northern and north-western portion of the subject site.

A Southern Highlands Shale Woodland Management Plan (SHSWMP) will be prepared to guide the management of the conservation area. The SHSWMP will be based on the principles of 'best practice' techniques in bush regeneration and address issues such as goals, methods and timing for protection, restoration, revegetation, weed management, maintenance and monitoring.

Sections of the Mountain Bike Track will be located within or alongside the conservation area, however the design and management of the track will include measures designed to ensure the protection of remnant vegetation.

It is concluded that protection, rehabilitation and revegetation of remnant vegetation within the conservation area will improve the condition, and maintain the long-term viability of 4.5ha of *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC.*

4.4.4 Summary of assessment of impacts on vegetation

If recommendations for conditions of development are adopted and enforced, the existing 'Brigadoon' event and the proposed Mountain Bike Track are unlikely to have a significant effect on *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* within the subject site.

Existing management and maintenance of the subject site is contributing to the degradation of remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC*

4.5 Assessments of Significance

Threatened species impact assessment is an integral component of environmental impact assessment. The *Threatened Species Conservation Amendment Act 2002*, lists the factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, populations or ecological communities, or their habitats.

An Assessment of Significance is undertaken if:

1. A species is listed on NSW Department of Environment, Climate Change and Water database of Threatened species known or predicted to occur in the the CMA sub-region

or

A species is recorded in the NPWS Atlas of NSW Wildlife as being located within a 20km radius of the site

or

A species is listed on the Department of the Environment, Water, Heritage and the Arts database of Matters of National Environmental Significance as potentially occurring within a 20km radius of the site

and

2. The species is listed within vegetation types present at the site on the NSW Office of Environment and Heritage database of Threatened species known or predicted to occur in the CMA sub-region

or

The species is located at the site during the survey

See Table 1: Summary of Assessment for Threatened Species.

5. Fauna Survey Results

5.1 Threatened Species

The NSW Office of Environment and Heritage records the presence of twenty-one Threatened Species of fauna within the Moss Vale Sub-region of the Hawkesbury-Nepean CMA. The NPWS Atlas of NSW Wildlife records twelve of these species as occurring within a 20km radius of the subject site (Table 1).

The Department of Sustainability, Environment, Water, Population and Communities lists twenty-three species of fauna as Matters of National Environmental Significance within 20 km of the subject site (Table 1).

5.2 Field Survey

5.2.1 Fauna habitats

Three broad fauna habitat types were identified on the site: open forest, grassland and wetland. These are described below with respect to their values as habitat for native fauna.

5.2.2 Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland habitat

Forest habitats covered approximately 40% of the site and are dominated by Mountain Grey Gum and Stringybark trees greater than 20 m in height. The understorey is most commonly managed native and exotic grassland but an intact native sub-canopy and understorey are present along the creeks in the south-western and north-eastern parts of the site, as several small patches along the eastern and northern boundaries. Un-mown and re-vegetated areas provide a denser groundcover of native and exotic species along creeks and in some open forest

areas. Tree hollows of a range of sizes are relatively common. Logs were observed in one location only. The litter layer is mostly thin – thicker in un-mown areas.

5.2.3 Grassland
Around 60% of the site is covered by regularly mown grassland without tree cover, comprised of predominantly exotic species. Some areas are inundated at the time of the survey and provided ephemeral wetland habitat.

5.2.4 Riparian Habitat
Two creeks flow through the western and north-eastern parts of the site and join before entering a concrete culvert and passing beneath the lower playing field and entering the Culburra wetland. Both creeks are partly vegetated with wetland plants and contain small pools and faster-flowing stretches where the banks had often eroded. Both are flanked by forest for most of their length. Two additional culverts exist in the far west of the site and also discharge storm water into the Culburra wetland.

5.2.5 Tree Hollows
The number of hollow-bearing trees recorded on the site totaled 41, supporting 80 hollows of various sizes, suitable for a range of fauna. One hollow contained two Laughing kookaburra nestlings. Two Common brushtail possums and an unidentified species of microchiropteran bat were detected on the site at early dusk, suggesting these animals were sheltering in hollows on the site. Results are recorded Appendix 4.

5.2.6 Fauna Observations
Fauna species observed during the survey are recorded in Table 2: Fauna observed at Lot 60 DP 909008, Parish of Sutton Forest, Bundanoon, NSW

5.3 Data Analysis and Discussion
5.3.1 Wildlife Corridors
The subject site is located within a wildlife corridor consisting of 'canopy corridor' made up of scattered remnants of Woodland and Forest throughout residential and rural areas surrounding Bundanoon.

5.3.2 Potential Threatened Species
The NSW Office of Environment and Heritage database of Threatened Species within the Moss Vale Sub-region of the Hawkesbury-Nepean CMA and the Department of Sustainability, Environment, Water, Population and Communities database of Matters of National Environmental Significance within the Wingecarribbee LGA were cross-referenced to *Vegetation types of Hawkesbury-Nepean CMA and associated threatened species.* The Threatened Species of fauna potentially present within the habitat types at the subject site are listed in Table 1: Summary of *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* Threatened Species within a 20km radius of the site and within the Moss Vale Sub-region.

5.3.3 SEPP No. 44 – Koala Habitat Protection
State Environmental Planning Policy No. 44 – Koala Habitat Protection requires that land in relation to which a development application has been made and which has an area of more than 1 hectare is subject to an assessment of whether it contains potential Koala habitat. Potential Koala habitat is an area of native vegetation where Koala feed tree species listed under Schedule 2 of SEPP No. 44 constitute at least 15% of the total number of trees in the upper and lower strata of the tree component.

None of the trees listed under Schedule 2 occur on the site, therefore the native vegetation does not constitute potential Koala habitat under SEPP No. 44. However, survey techniques targeting the Koala were employed during the fauna survey as a precaution.

5.4 Assessment of Impacts on Fauna and Habitats

The potential for threatened and migratory species to occur in the study area and/or be affected by the proposal is considered in Appendix 5. A summary table addressing species for which potential habitat occurs in the study area is provided below (Table 4). Particular consideration is given to the potential of the habitats present on the site to meet key life-cycle requirements of each species, the potential for those habitats to be adversely affected by the proposal and therefore whether an assessment of significance is required.

Consideration of potential impacts is based on the bicycle track being <1m in width; unsealed; positioned to avoid impacting on areas with a high proportion of native understorey and groundcover vegetation, and crossing creek/s via a specially constructed narrow wooden bridge.

Detailed consideration of the potential for threatened and migratory species to occur in the study area, and potential adverse impacts of the proposal, is provided in Appendix 5. Nine species were considered to have some potential to occur in the study area, based on the results of the field survey and the habitats present within and adjacent to the site. The likelihood of these species occurring on the site and the potential for adverse impacts is summarized in Appendix 5.

5.4.1 'Brigadoon' and associated maintenance

The existing development is the staging of the annual 'Brigadoon' event and the associated maintenance of the subject site to facilitate this activity.

During 'Brigadoon' the southern and central portions of the *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* habitat is occupied by tents, stalls and vehicles for a period of approximately four days. The event occupies 2.8ha of the remnant vegetation community. It is unlikely that these activities have a significant impact on the habitat provided by remnant vegetation.

The subject site – including c. 9ha of *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* habitat is presently maintained by regular mowing which precludes the natural regeneration of the overstorey and understorey of the community. Under these existing management practices, the overstorey trees will eventually become senescent and die, creating a mixed native-exotic grassland. This will have a significant impact on fauna, especially species dependant on tree hollows for shelter and nesting and for species utilising the tree canopy for foraging, nesting and movement.

It is concluded that although the 'Brigadoon' event is unlikely to have a significant impact on vegetation within the subject site, the existing management and maintenance regime to facilitate the event is contributing to the degradation of remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* habitat.

5.4.2 Construction and operation of Mountain Bike Track

The development as proposed includes the construction and operation of a <1m width earthen Mountain Bike Track within remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* and grassland habitats throughout the subject site.

The bare earth track will be less than one metre in width and will be located outside of the canopy extent or 'drip-line' of existing *Eucalyptus* trees.

Clearing of habitat for the construction of the track will be restricted to small areas of native groundcover including patches dominated by exotic species, patches of native and exotic species and patches dominated by native species.

If recommendations for conditions of development are adopted and enforced, it is concluded that the construction and operation of the Mountain Bike Track is unlikely to have a significant impact on habitat for fauna within the subject site.

5.4.3 Protection, rehabilitation and revegetation of remnant vegetation

The development as proposed includes the protection, rehabilitation and revegetation of an area of 4.5ha of remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* habitat in the northern and north-western portion of the subject site.

A Southern Highlands Shale Woodland Management Plan (SHSWMP) will be prepared to guide the management of the conservation area. The SHSWMP will be based on the principles of 'best practice' techniques in bush regeneration and address issues such as goals, methods and timing for protection, restoration, revegetation, weed management, maintenance and monitoring.

Sections of the Mountain Bike Track will be located within or alongside the conservation area, however the design and management of the track will include measures designed to ensure the protection of fauna habitat.

It is concluded that protection, rehabilitation and revegetation of remnant vegetation within the conservation area will improve the condition, and maintain the long-term viability of 4.5ha of *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* habitat.

5.4.4 Summary of assessment of impacts on vegetation

If recommendations for conditions of development are adopted and enforced, the existing 'Brigadoon' event and the proposed Mountain Bike Track are unlikely to have a significant effect on *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* fauna habitat within the subject site.

Existing management and maintenance of the subject site is contributing to the degradation of remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* fauna habitat.

5.5 Assessments of Significance for Fauna

Threatened species impact assessment is an integral component of environmental impact assessment. The *Threatened Species Conservation Amendment Act 2002*, lists the factors to be considered when determining whether an action, development

or activity is likely to significantly affect threatened species, populations or ecological communities, or their habitats.

An Assessment of Significance is undertaken if:

1. A species is listed on NSW Department of Environment, Climate Change and Water database of Threatened species known or predicted to occur in the the CMA sub-region

or

A species is recorded in the NPWS Atlas of NSW Wildlife as being located within a 20km radius of the site

or

A species is listed on the Department of the Environment, Water, Heritage and the Arts database of Matters of National Environmental Significance as potentially occurring within a 20km radius of the site

and

2. The species is listed within vegetation types present at the site on the NSW Office of Environment and Heritage database of Threatened species known or predicted to occur in the CMA sub-region

or

The species is located at the site during the survey

and

3. Suitable breeding, nesting, feeding or foraging habitat for the species is present within the site

See Table 1. Summary of Assessment for Threatened Species

6. Assessment in accordance with Wingecarribee Shire Council policies
Relevant policies for the assessment of the proposed development are as follows:

6.1 Conserve, protect, enhance and rehabilitate the biodiversity
Wingecarribee Shire Council aims 'To establish and implement measures to effectively conserve, protect, enhance and rehabilitate the biodiversity within our shire' (WSC, 2009 p.4). The development as proposed conserves, protects, enhances and rehabilitates 4.5ha of *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* and associated fauna habitat.

6.2 No loss of biological diversity or ecological integrity
Council supports a policy of Ecologically Sustainable Development which includes the principle that 'new development must ensure that there is no loss of biological diversity or ecological integrity' (WSC draft DCPs, 2011). The mitigation measures included in the proposed development ensure that there is no loss of biological diversity or ecological integrity but rather improve biodiversity values at the subject site.

Existing management and maintenance of the subject site undertaken by Council is contributing to the degradation of remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC*

6.3 Avoid, minimise, or mitigate impacts

Council also supports a policy to avoid, minimise, or mitigate impacts. Proposals for new developments should therefore be supported by a report of 'all measures proposed to avoid, minimise or mitigate impacts to threatened species detailing how, when and where they will be implemented and their likely effectiveness.' (WSC, 2009 p.47)

6.3.1 Avoid

The development has not sought to avoid all impacts as a consequence of 'Brigadoon', regular maintenance or the construction and operation of the Mountain Bike Track.

6.3.2 Minimise

The development seeks to minimise impacts by ensuring that, although sections of the Mountain Bike Track will be located within or alongside the conservation area, the design and management of the track will include measures designed to ensure the protection of remnant vegetation e.g. the track will be constructed of bare earth, less than one metre in width and located outside of the canopy extent or 'drip-line' of existing *Eucalyptus* trees.

6.3.3 Mitigation

As a mitigation measure, the development as proposed includes the protection, rehabilitation and revegetation of an area of 4.5ha of remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* in the northern and north-western portion of the subject site.

A Southern Highlands Shale Woodland Management Plan (SHSWMP) will be prepared to guide the management of the conservation area. The SHSWMP will be based on the principles of 'best practice' techniques in bush regeneration and address issues such as goals, methods and timing for protection, restoration, revegetation, weed management, maintenance and monitoring.

6.4 Direct, indirect and cumulative impacts

Council's assessment of new developments also includes the consideration of any direct, indirect and cumulative impacts associated with the proposal. The assessment of the proposed development and recommendations for conditions of development have taken into consideration direct, indirect and cumulative impacts.

7. Summary of Assessment for Threatened Species

It is concluded that if recommendations for conditions of development are adopted and enforced, the existing and proposed developments are unlikely to have a significant effect on the following Threatened Species or their habitats. (Appendix 1: Assessments of Significance for a complete assessment)

Scientific Name	**Common Name**
Southern Highlands Shale Woodland	*Southern Highlands Shale Woodland*
Callocephalon fimbriatum	Gang Gang Cockatoo

The full assessment for all species is included in **Appendix 1: Assessments of Significance**.

8. Conclusion and recommendations

8.1 Conclusions

It is concluded that:

I. *Southern Highlands Shale Woodland Endangered Ecological Community* is present within the subject site

II. Habitat for the Threatened Species *Callocephalon fimbriatum* (Gang-gang Cockatoo) is present within the subject site

III. The subject site includes numerous tree hollows suitable for a range of fauna species

IV. The existing development is the staging of the annual 'Brigadoon' event and the associated maintenance of the subject site to facilitate this activity

V. The proposed development includes the construction and operation of a Mountain Bike Track within the subject site

VI. The proposed development includes the protection, rehabilitation and revegetation of a mitigation area of 4.5ha of remnant vegetation within the subject site

VII. A Southern Highlands Shale Woodland Management Plan, based on the principles of best practice techniques in bush regeneration, will be prepared to guide the management of the 4.5ha mitigation area

VIII. If recommendations for conditions of development are adopted and enforced, the existing 'Brigadoon' event and proposed Mountain Bike Track development are unlikely to have a significant effect on Endangered Ecological Communities, Threatened Species or their habitats

IX. The existing management and maintenance of the subject site is contributing to the degradation of remnant *Southern Highlands Shale Woodland Endangered Ecological Community*

8.2 Recommendations

It is recommended that:

I. The Mountain Bike Track be located outside of the canopy extent or 'drip-line' of existing *Eucalyptus* trees

II. Sections of the Mountain Bike Track located within or alongside the 4.5ha mitigation area should include measures designed to ensure the protection of remnant vegetation from access by bikes

III. The Southern Highlands Shale Woodland Management Plan to guide the management of the 4.5ha mitigation area be prepared prior to the commencement of construction and operation of the Mountain Bike Track

IV. *Eucalyptus* spp. characteristic of Southern Highlands Shale Woodland at the subject site be planted along the eastern boundary of the southern portion of the subject site (i.e. Bundanoon Oval) as a long-term replacement of existing mature to senescent trees

9. References

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Figure 1: Location Map

Map source: Department of Lands

Figure 2: Site Map

Map source: Department of Lands

Figure 3: Vegetation Map

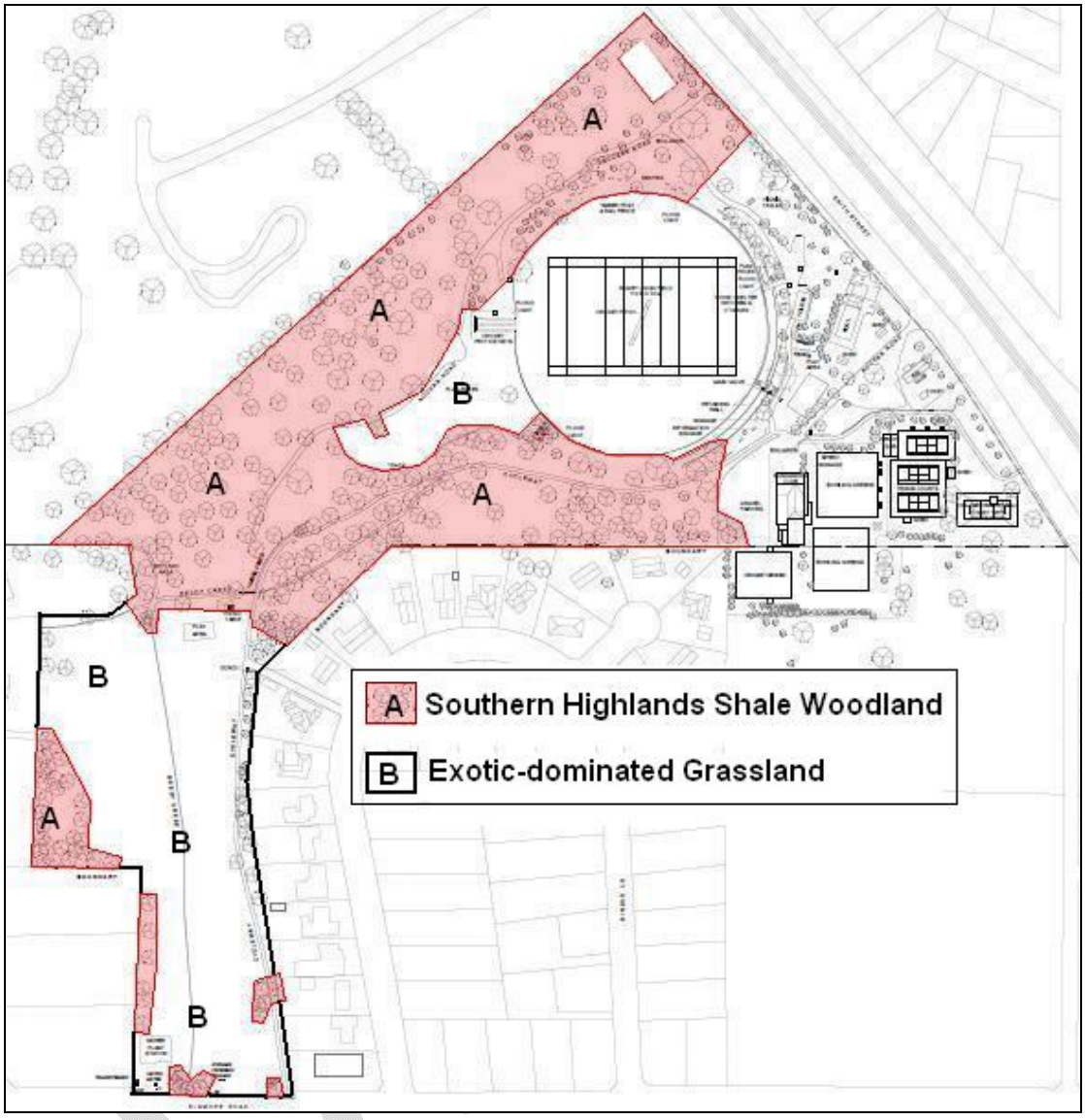

Figure 4: Mitigation Area

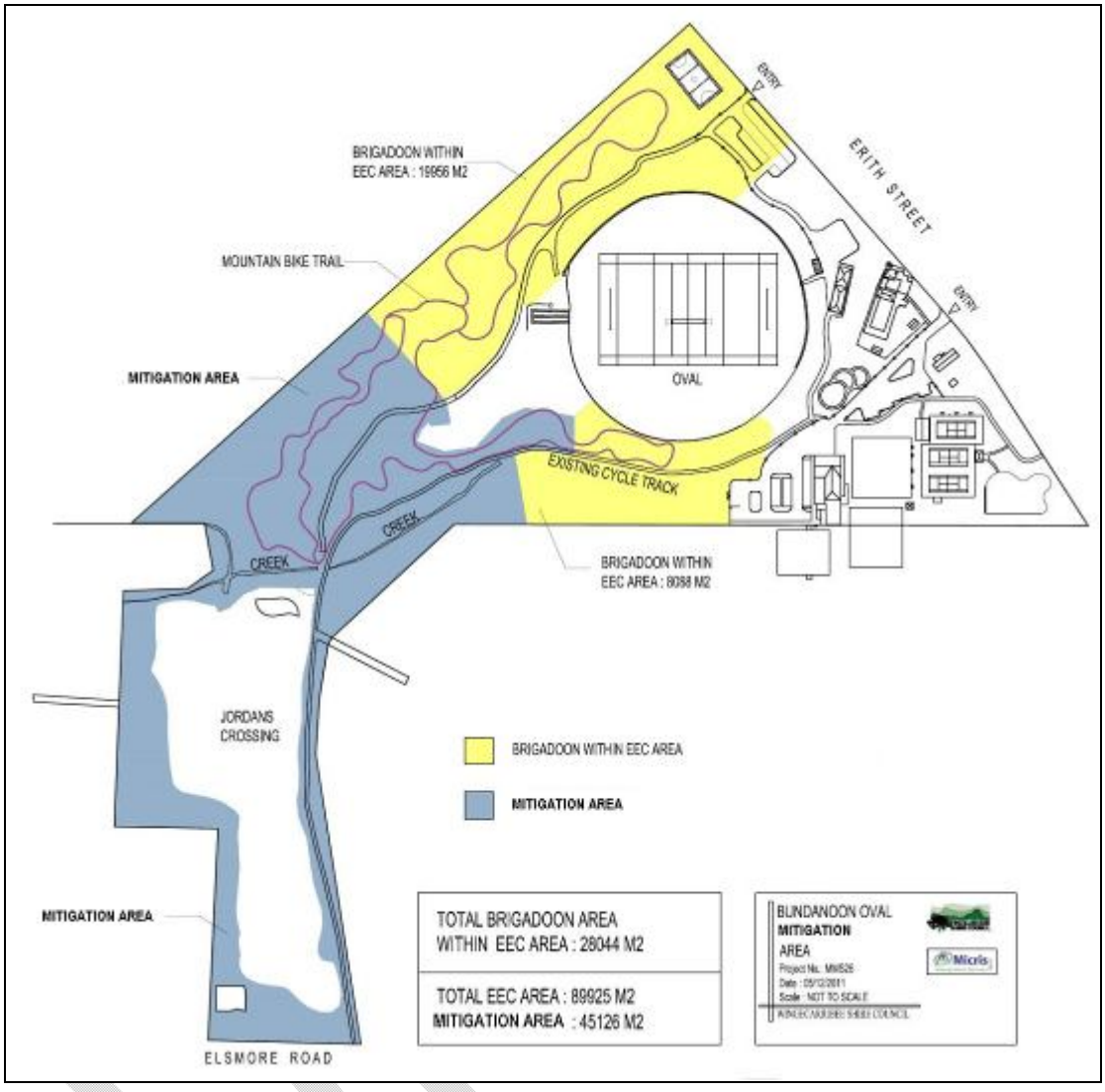

Table 1: Summary of *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* Threatened Species within a 20km radius of the site and within the Moss Vale Sub-region.

Scientific Name	Common Name	Type of species	TSC Act Species listed for CMA sub-region	TSC Act Conservation Status	NPWS Atlas of NSW Wildlife within 20km radius	EPBC Act Matters of National Environmental Significance within 20km radius (*)	EPBC Act Conservation Status	Species listed for vegetation type/s present at the site
Fauna								
Heleioporus australiacus	Giant Burrowing Frog	Amphibians	●	V		●	V	
Litoria aurea	Green and Golden Bell Frog	Amphibians	●	E		●	V	
Litoria littlejohni	Littlejohn's Tree Frog	Amphibians	●	V	●	●	V	
Mixophyes balbus	Stuttering Barrred Frog	Amphibians	●	E		●	V	
Pseudophryne australis	Red-crowned Toadlet	Amphibians	●	V				

Macquaria australasica	Macquarie Perch	Fish		V		●	E	
Prototroctes maraena	Australian Grayling	Fish				●	V	
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	Bats		V		●	V	
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	Bats	●	V	●			●
Myotis macropus (formally Myotis adversus)	Large-footed Myotis	Bats	●	V				
Pteropus poliocephalus	Grey-headed Flying-fox	Bats	●	V	●	●	V	
Scoteanax rueppellii	Greater Broad-nosed Bat	Bats	●	V				
Anthochaera phrygia	Regent Honeyeater	Birds				●	E	
Botaurus poiciloptilus	Australasian Bittern	Birds	●	V				
Callocephalon fimbriatum	Gang-gang Cockatoo	Birds		V	●			●
Daphoenositta chrysoptera	Varied Sittella	Birds		V	●			
Lathamus discolor	Swift Parrot	Birds				●	E	
Calyptorhynchus lathami	Glossy Black-Cockatoo	Birds		V	●			
Ninox strenua	Powerful Owl	Birds		V	●			●
Petroica boodang	Scarlet Robin	Birds		V	●			●
Pyrrholaemus saggitatus	Speckled Warbler	Birds		V		●		
Rostratula australis	Australian Painted Snipe	Birds				●	V	
Tyto tenebricosa	Sooty Owl	Birds	●	V				
Petalura gigantea	Giant Dragonfly	Invertebrates	●	E				
Cercartetus nanus	Eastern Pygmy-possum	Marsupials	●	V	●		E	●
Dasyurus maculatus	Spotted-tailed Quoll	Marsupials	●	V		●	E	●

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Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Marsupials		V	●	●		
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Marsupials	●	E		●	E	
Macropus parma	Parma Wallaby	Marsupials	●	V				
Petaurus australis	Yellow-bellied Glider	Marsupials		V	●		V	●
Petaurus norfolcensis	Squirrel Glider	Marsupials	●	V		●		
Petrogale penicillata	Brush-tailed Rock-wallaby	Marsupials		E		●	V	
Phascolarctos cinereus	Koala	Marsupials	●	V	●		V	●
Pseudomys fumeus	Konoom, Smoky Mouse	Marsupials				●	E	
Potorous tridactylus	Long-nosed Potoroo	Marsupials	●	V		●	V	
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	Marsupials		V		●	E	
Pseudomys novaehollandiae	New Holland Mouse	Marsupials				●	V	
Chelonia mydas	Green Turtle	Reptiles		V		●		
Hoplocephalus bungaroides	Broad-headed Snake	Reptiles	●	E		●	V	
Varanus rosenbergi	Rosenberg's Goanna	Reptiles	●	V				
Communities								

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Montane Peatlands and Swamps of the New England Tableland; NSW North Coast; Sydney Basin; South East Corner; South Eastern Highlands and Australian Alps	Montane Peatlands and Swamps	Threatened Ecological Communities	●	EEC				
Mount Gibraltar Forest in the Sydney Basin Bioregion	Mount Gibraltar Forest in the Sydney Basin Bioregion	Threatened Ecological Communities	●	EEC				
Robertson Basalt Tall Open-forest in the Sydney Basin Bioregion	Robertson Basalt Tall Open-forest in the Sydney Basin Bioregion	Threatened Ecological Communities	●	EEC				
Robertson Rainforest in the Sydney Basin Bioregion	Robertson Rainforest in the Sydney Basin Bioregion	Threatened Ecological Communities	●	EEC				
Southern Highlands Shale Woodlands in the Sydney Basin Bioregion	Southern Highlands Shale Woodlands in the Sydney Basin Bioregion	Threatened Ecological Communities	●	EEC				●
Temperate Highland Peat Swamps on Sandstone	Temperate Highland Peat Swamps on Sandstone	Threatened Ecological Communities				●	E	
Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Tableland Basalt Forest	Threatened Ecological Communities	●	EEC				

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White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland			EEC	●	●	CE	
Flora								
Acacia bynoeana	Bynoe's Wattle	Plants	●	E	●			
Bossiaea oligosperma	Few-seeded Bossiaea	Plants		V		●		
Chorizema parviflorum	Chorizema parviflorum	Plants		E		●		
Cryptostylis hunteriana	Leafless Tongue-orchid	Plants		V	●	●	V	
Cynanchum elegans	White-flowered Wax Plant	Plants						
Caladenia tessellata	Thick-lipped Spider-orchid,	Plants				●	V	
Diuris aequalis	Daddy Long-legs	Plants	●	E			V	
Epacris purpurascens var. purpurascens		Plants		V		●		
Melaleuca deanei	Deane's Melaleuca	Plants				●	V	
Eucalyptus aquatica	Broad-leafed Sallee	Plants	●	V		●	V	
Eucalyptus macarthurii	Camden Woollybutt	Plants	●	V				●
Leucochrysum albicans var. Tricolor	Hoary Sunray	Plants				●	E	
Gentiana wingecarribiensis	Wingecarribee Gentian	Plants	●	E		●		
Grevillea molyneuxii	Wingello Grevillea	Plants		V	●	●	E	
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	Plants		V	●			
Kunzea cambagei		Plants				●	V	
Grevillea rivularis	Carrington Falls Grevillea	Plants		E	●			

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Haloragis exalata subsp. exalata var. laevis		Plants		V		●		
Irenepharsus trypherus	Illawarra Irene	Plants		E		●		
Lysimachia vulgaris var. davurica	Yellow Loosestrife	Plants	●	E			V	
Melaleuca biconvexa	Biconvex Paperbark	Plants				●		
Persicaria elatior	Tall Knotweed	Plants	●	V				
Persoonia glaucescens	Mittagong Geebung	Shrubs	●	E			V	
Persoonia hirsuta	Hairy Geebung	Plants		E		●		
Phyllota humifusa	Dwarf Phyllota	Shrubs	●	V	●	●	V	
Pomaderris cotoneaster	Cotoneaster Pomaderris	Plants		E		●		
Pterostylis pulchella	Pretty Greenhood	Plants				●	V	
Pomaderris sericea	Silky Pomaderris	Plants		E	●	●	V	
Thesium australe	Austral Toadflax, Toadflax	Plants				●	V	
Prasophyllum uroglossum	Wingecarribee Leek Orchid	Plants	●	CE			V	
Pterostylis gibbosa	Illawarra Greenhood	Plants		E		●		
Pultenaea aristata	Prickly Bush-pea	Plants		V		●	E	
Pultenaea elusa	Elusive Bush-Pea	Plants		E		●	V	
Rulingia prostrata	Dwarf Kerrawang	Plants	●	E		●	E	
Solanum celatum		Plants		E		●	CE	
Triplarina nowraensis	Nowra Heath-myrtle	Plants				●	V	
Thelymitra sp. Kangaloon (D.L.Jones 18108)	Kangaloon Sun-orchid	Plants				●	CE	
Zieria granulata	Illawarra Zieria	Plants		E		●		
Zieria murphyi	Velvet Zieria	Plants		V	●	●	V	

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Appendix 1: Assessments of Significance at Lot 60 DP 909008, Parish of Sutton Forest, Bundanoon, NSW

Introduction

Threatened species impact assessment is an integral component of environmental impact assessment. The *Threatened Species Conservation Amendment Act 2002*, lists the factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, populations or ecological communities, or their habitats. This report therefore assesses the likely impacts of the existing and proposed developments on the following species:

Scientific Name	**Common Name**
Southern Highlands Shale Woodland	*Southern Highlands Shale Woodland*
Callocephalon fimbriatum	Gang Gang Cockatoo

Assessment for *Southern Highlands Shale Woodland*

Introduction

The NSW Scientific Committee (2001) states that Southern Highlands Shale Woodland is confined to a small area in the Southern Highlands. It occurs roughly within an area bounded by the Illawarra Escarpment in the east, Burrawang and Bundanoon in the south, Canyonleigh in the west and Berrima and Colo Vale in the north. Occurs in the Wingecarribee local government area, but may occur elsewhere in the Sydney Basin Bioregion.

The community is:

- Restricted to clay soils derived from Wianamatta Shale.
- Occurs at elevations of between 600 to 800 m.
- Generally found on gently rolling hills, though sometimes on steeper slopes in some areas.
- Found in areas where rainfall ranges from 1400 mm in the east to 900 mm in the west.

The community occurs mostly in scattered patches of less than 5 hectares in area, remnants are extensively fragmented; about 2000 hectares, or less than 5% of the original extent now remains.

Disturbed remnants are considered to form part of the community, including where the vegetation would respond to assisted natural regeneration.

Southern Highlands Shale Woodland is scattered throughout a highly modified habitat of Bundanoon's residential areas, within small parks and on roadsides. The future viability of the community within the local area is considered to be low due to the senescence of the remnants and the inability for the community to regenerate in the developed, highly-managed, urban environment.

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Comments:

Assessments for individual species are found below.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Comments:

No endangered population is present at the subject site.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Comments:
Southern Highlands Shale Woodland endangered ecological community occupies 9ha of the subject site.

(d) in relation to the habitat of a threatened species, population or ecological community:
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Comments:
The development as proposed includes:

- An existing development of the staging of the annual 'Brigadoon' event and the associated maintenance of the subject site to facilitate this activity. During 'Brigadoon' the southern and central portions of the *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* remnant is occupied by tents, stalls and vehicles for a period of approximately four days. The event occupies 2.8ha of the remnant vegetation community.

- The subject site – including c. 9ha of *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* is presently maintained by regular mowing which precludes the natural regeneration of the overstorey and understorey of the community. Under these existing management practices, the overstorey trees will eventually become senescent and die, creating a mixed native-exotic grassland.

- The construction and operation of a <1m width earthen Mountain Bike Track within remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* and grassland throughout the subject site. The bare earth track will be less than one metre in width and will be located outside of the canopy extent or 'drip-line' of existing *Eucalyptus* trees. Clearing of native vegetation for the construction of the track will be restricted to small areas of native groundcover including patches dominated by exotic species, patches of native and exotic species and patches dominated by native species.

- The protection, rehabilitation and revegetation of an area of 4.5ha of remnant *Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland / Southern Highlands Shale Woodland EEC* in the northern and north-western portion of the subject site. A Southern Highlands Shale Woodland Management Plan (SHSWMP) will be prepared to guide the management of the conservation area. The SHSWMP will be based on the principles of 'best practice' techniques in bush regeneration and address issues such as goals, methods and timing for protection, restoration, revegetation, weed management, maintenance and monitoring. Sections of the Mountain Bike Track will be located within or alongside the conservation area,

however the design and management of the track will include measures designed to ensure the protection of remnant vegetation.

If recommendations for conditions of development are adopted and enforced:
(i) a minimal area of habitat (associated with the Mountain Bike Track) for Southern Highlands Shale Woodland is likely to be removed or modified as a result of the action proposed and
(ii) no area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action. Therefore (iii) the minimal area of native grasses and forbs to be removed, modified, fragmented or isolated will not effect the long-term survival of Southern Highlands Shale Woodland in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Comments:
No critical habitat is present at the subject site.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Comments:
No recovery plan or threat abatement plan has been prepared for the Southern Highlands Shale Woodlands EEC however the NSW Office of Environment and Heritage recommends the following management strategies to recover the community:

- Do not harvest firewood from remnants (this includes living or standing dead trees and fallen material).
- Erect on-site markers to alert maintenance staff to the presence of a high quality remnant.
- Encourage regeneration by fencing remnants, controlling stock grazing and undertaking supplementary planting, if necessary.
- Undertake weed control (taking care to remove only target species).
- Protect all sites from further clearing and disturbance.
- Mark remnants onto maps (of the farm, shire, region, etc) and use to plan activities (e.g. remnant protection, rehabilitation or road, rail and infrastructure maintenance work).

The SHSWMP included in the proposed mitigation measures will be based on the principles of 'best practice' techniques in bush regeneration and address issues such as goals, methods and timing for protection, restoration, revegetation, weed management, maintenance and monitoring and will serve to assist in the recovery of 4.5ha of Southern Highlands Shale Woodlands EEC at the subject site.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Comments:
Under Schedule 3 of the TSC Act (1995) 'clearing of native vegetation' is listed as a Key Threatening Process.

Clearing of vegetation will be limited that required for the construction of the Mountain Bike Track i.e. an earth track of <1m width.

Conclusion
It is concluded that if recommendations for conditions of development are adopted and enforced, the existing and proposed developments are unlikely to have a significant effect on Southern Highlands Shale Woodlands EEC or its habitat.

References

NSW NPWS (2003) *Saving out threatened native animals and plants: Recovery and threat abatement in action - 2003 update* NSW National Parks and Wildlife Service, Hurstville, NSW

http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10766

http://www.environment.nsw.gov.au/determinations/SouthernHighlandsShaleWoodlandsSydneyEndComListing.htm

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Assessment for *Callocephalon fimbriatum* (Gang-gang Cockatoo)

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Comments:

The action proposed is for the construction and use of a <1 m wide bicycle track within forest that is potential Gang-gang cockatoo habitat. The potential for adverse effects on this species is as a result of increased levels of human activity in this habitat at times when the bicycle track is being constructed, maintained and used. The local population of the Gang-gang cockatoo is extensive and includes most of the locality of Bundanoon and adjacent forest in Morton National Park and private lands. The study area comprises a very small portion of the habitat occupied by the local population of the Gang-gang cockatoo (< 4 ha out of thousands of hectares) and this habitat will not be modified in a way that degrades the physical habitat of the species. Increased human activity at the site may result in decreased usage by Gang-gang cockatoos, particularly at times of high activity, but this level of impact would not have an adverse effect on the life cycle of the species such that the local population would be placed at risk of extinction. Further, proposed mitigation measures would be expected to increase the quality of Gang-gang cockatoo habitat at the site.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Comments:
No endangered population is present at the subject site.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Comments:
Southern Highlands Shale Woodland Endangered Ecological Community is assessed above..

(d) in relation to the habitat of a threatened species, population or ecological community:
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Comments:
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed; There is approximately 4 ha of potential habitat for the Gang-gang cockatoo on the site, mostly consisting only of Eucalypts due to the lack of understorey vegetation, and the proposed bicycle track would be constructed through almost all of this area. No trees would be removed or modified by the

proposed action. The habitat would be modified in a broader sense, where the major modification would be an increase in human activity on the site. This activity would occur throughout almost all of the potential Gang-gang cockatoo habitat on the site, but would be likely to occur in pulses, interspersed with regular periods of little or no activity. Proposed revegetation works would modify an area approximately 40% of the size of the existing potential habitat, both within this area and outside, creating new habitat for the species.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;

No potential habitat for the Gang-gang cockatoo would become fragmented or isolated from other areas of habitat as a result of the proposal. The proposal does not include the physical removal of Gang-gang cockatoo habitat, and potential disturbance to habitat would be relatively low in relation to the species tolerance levels, on the basis that it frequently inhabits suburban areas.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

The habitat present in the study area is most likely to be used by the Gang-gang cockatoo for foraging only, at times when sufficient food resources are available. This habitat makes up a very small portion of the total area of habitat occupied by the local population of this species and its importance to its long-term survival is likely to be very low.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Comments:

No critical habitat is present at the subject site.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Comments:

There is no recovery plan or threat abatement plan relating directly to the Gang-gang cockatoo. However, the proposed action would result in an increase in potential habitat for the Gang-gang cockatoo on the site, and since 'clearing of vegetation and degradation of habitat' has been identified as a major threat to this species, this outcome would probably make a positive contribution to its recovery. The proposal would also increase levels of human activity on the site, and this may dilute the benefits of additional habitat to some extent.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Comments:

The proposed action would constitute the key threatening process 'clearing of native vegetation' to the extent that native grasses and forbs in particular would be directly removed to enable the construction of the bicycle track. However, the proposed revegetation works would adequately compensate for those losses.

The proposed action could result in the operation of, or increase the impact of, the following key threatening processes:

1) 'Competition and grazing by the feral European rabbit' – through provision of additional shelter sites in understorey vegetation;

2) 'Invasion and establishment of exotic vines and scramblers' and 'Invasion of native plant communities by exotic perennial grasses'– through importation and/or disturbance to soil. However, it is expected that these potential impacts would be appropriately managed through the implementation of a vegetation management plan for the site.

Conclusion

While the proposed action could adversely affect the use of habitat by the Gang-gang cockatoo in the study area, through periodic increases in human activity, it would also increase the quality of the habitat for this species through extensive revegetation proposed in the mitigation measures. Based on the factors considered above, the proposed action would not have a significant impact on the Gang-gang cockatoo and a Species Impact Statement is not required.

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NSW NPWS (2003) *Saving out threatened native animals and plants: Recovery and threat abatement in action - 2003 update* NSW National Parks and Wildlife Service, Hurstville, NSW

http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10975

http://www.environment.nsw.gov.au/determinations/GanggangCockatooVulSpListing.htm

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Appendix 2: Flora Field Data

On the 18th November, 2011, three nested quadrats were surveyed. Each quadrat was 20 x 20 metres, with the inner nest 1 square metre, the middle nest 99 square metres, and the outer nest 300 square metres; a total of 400 square metres.

Cover abundance scores were allocated using the six-tiered Blaun Blanquet system:

1 =< 5 % of the quadrat nest and uncommon
2 = < 5 % of the quadrat nest and common
3 = 6-20% of the quadrat nest
5 = 21-50% of the quadrat nest
6 = 75-100% of the quadrat nest

* Denotes species characteristic of Southern Highlands Shale Woodland Endangered Ecological Community as per the relevant Final Determination.
'C.A.' denotes Cover Abundance
All co-ordinates are derived from GPS in GDA 94 datum.

SITE 1: >50% estimated indigenous species cover and diversity

Centre point of Site 1: Easting 253011: Northing 6162499

Comment: Kookaburra nesting (feeding chicks) in hollow in *Eucalyptus cypellocarpa* – see Photo 3. 5% of this quadrat is bare dirt where prospective bike tracks have been sprayed with herbicide. Compaction and erosion in this area is apparent, and weeds are colonising this area. Some of those weeds occur only or primarily in these herbicide affected areas.

This site appears not to have been mown for at least some weeks, though regeneration is still at an early stage. Part of the site contains a section of fallen Eucalyptus ovata canopy and branches. That area has been unmown for a longer period than has the rest of the site.

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Site 1 data

Scientific Name Native Species	**Common Name**	**C.A Nest 1**	**C.A Nest 2**	**C.A. Nest 3**
**Acacia melanoxylon*	Blackwood			1
**A. stricta*	Straight Wattle			1
Acaena novae-zelandiae	Bidgee -widgee			1
**Asperula conferta*	Woodruff		1	2
**Austrodanthonia sp.*	Wallaby Grass			1
**Austrostipa sp.*	Spear Grass			1
**Dianella longifolia* var. *longifolia* syn. *D. laevis*	Smooth Flax Lily			1
Dichondra repens	Kidney Weed	3	4	4
Entolasia stricta	Wiry Panic	1	1	1
**Eucalyptus cypellocarpa*	Mountain Grey Gum	1	3	4
**E. globoidea*	White Stringybark			1
**E. obliqua*	Messmate Stringybark			1
**E. ovata*	Swamp Gum			1
**E. radiata* ssp. *radiata*	Narrow-leaved Peppermint		2	3
**Geranium solanderi*	Geranium			2
Glycine tabacina	Twining Glycine		1	2
**Gonocarpus ?tetragynus*			2	2
**Hardenbergia violacea*	False Sarsparilla			2
**Hypericum gramineum*	Small St. John's Wort	1		
**Lomandra longifolia*	Wattle Mat-rush			1
L. multiflora ssp. *multiflora*	Many flowered Mat-rush			1
**Microlaena stipoides*	Weeping Grass	3	5	3
Oxalis perennans			1	2
**Pittosporum undulatum*	Sweet Pittosporum			2
Poa sieberiana	Snow Grass		3	2
**Poranthera microphylla*	Small Poranthera			2
Pseudognaphalium luteoalbum	Jersey Cudweed		2	1
**Pteridium esculentum*	Bracken			1
Ranunculus lappaceus	Common Buttercup		1	
Schoenus sp.	Bog-rush		1	2
Solanum aviculare	Kangaroo Wattle			1
**Tricoryne simplex*	Rushlily			1
Veronica calycina	Hairy Speedwell		1	2
**V. plebeia*	Trailing Speedwell			1
**Viola hederacea*	Ivy-leaved Violet		3	2
Exotic Species				
Acer negundo	Box-elder Maple			1
Acetosella vulgaris	Sheep Sorrel		1	2
Aira sp.	Hairgrass		1	

Anagallis arvensis	Scarlet Pimpernel	1		1
Anthoxanthum odoratum	Sweet Vernal Grass		2	3
Briza maxima	Giant Shivery Grass			1
Bromus sp.	Brome	2	2	
Cerastium glomeratum	Mouse-eared Chickweed		1	
Conyza canadensis	Fleabane		1	1
Crataegus monogyna	Hawthorn		1	
Dactylis glomerata	Cocksfoot			1
Daucus carota	Wild Carrot			2
Ehrharta longiflora	Annual Veldtgrass			1
Galium murale	Small Bedstraw			1
Holcus lanatus	Yorkshire Fog		1	1
Hypochaeris radicata	Catsear	2	3	3
Modiola caroliniana	Red-flowered Mallow		1	
Phalaris aquatica	Phalaris			2
Plantago lanceolata	Plantain	3	2	3
Poa annua	Winter Grass		2	2
Romulea sp.	Onion Grass		1	
Rubus anglocandicans	Blackberry			1
Sisyrinchium spp.	Scourweed		1	
Soliva anthemifolia	Burrweed		1	
Sonchus oleraceus	Common Sowthistle		1	1
Stenotaphrum secundum	Buffalo Grass	1	1	
Trifolium repens	White Clover		1	2

Photo 1 (Site 1; herbicide-created tracks evident; other SHSW evident off-site in background)

Photo 2 (Site 1, showing sprayed track)

Photo 3 (occupied nest hollow)

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SITE 2: <50% estimated indigenous species cover and diversity

Centre point of Site 2: Easting 252960: Northing 6162173

1% of this quadrat is gravel, and the footpath runs through the third nest, amounting to 5% of total area. This area probably has not been mown for up to a month.

Scientific Name Native Species	**Common Name**	**C.A Nest 1**	**C.A Nest 2**	**C.A. Nest 3**
**Acacia mearnsii*	Black Wattle			1
**A. melanoxylon*	Blackwood			1
**Angophora floribunda*	Rough-barked Apple		3	4
Cymbonotus lawsonianus	Bears-ear			1
Dichondra repens	Kidney Weed		4	3
Entolasia stricta	Wiry Panic		2	2
**Eucalyptus cypellocarpa*	Mountain Grey Gum			1
**E. globoidea*	White Stringybark			3
**E. radiata* ssp. *radiata*	Narrow-leaved Peppermint	1	1	1
**Geranium solanderi*	Geranium			1
**Hardenbergia violacea*	False Sarsparilla			1
**Lomandra longifolia*	Wattle Mat-rush			1
**Microlaena stipoides*	Weeping Grass			2
Oplismenus aemulus	Australian Basket Grass			1
Oxalis perennans		1	2	2
Pseudognaphalium luteoalbum	Jersey Cudweed	1	1	2
Ranunculus lappaceus	Common Buttercup			1
Schelhammera undulata	Lilac Lily			1
Schoenus sp.	Bog-rush		2	2
Exotic Species				
Acetosella vulgaris	Sheep Sorrel		3	2
Anagallis arvensis	Scarlet Pimpernel		1	1
Arctotheca calendula	Capeweed	1	1	1
Avena fatua	Wild Oats	1	2	1
Bromus sp.	Brome	1		1
Carduus sp.				1
Cerastium glomeratum	Mouse-eared Chickweed			1
Conyza canadensis	Fleabane		1	
Cynodon dactylon	Common Couch		1	1
Daucus carota	Wild Carrot			1
Duchesnea indica	Wild Strawberry			1

Ehrharta longiflora	Annual Veldtgrass		3	3
Fumaria sp.	Fumitory			1
Hedera helix	English Ivy			1
Hypochaeris radicata	Catsear		2	2
Phalaris aquatica	Phalaris			1
Pinus radiata	Radiata Pine			3
Plantago lanceolata	Plantain	1	2	1
Poa annua	Winter Grass		2	3
Prunella vulgaris	Self-heal		1	2
Romulea sp.	Onion Grass		1	1
Rumex sp.	Dock		1	1
Soliva anthemifolia	Burrweed		2	1
Trifolium repens	White Clover		2	2
Viola odorata	Sweet Violet			1

Photo 4 (Site 2 – a mix of native and exotic species under patchy, mostly native canopy)

SITE 3: <10% estimated indigenous species cover and diversity

Centre point for Site 3: Easting 252952: Northing 6162456

Comment: A crayfish hole was noted in this quadrat (floodplain of creek). A uncommonly-observed waterbird was observed in the creekline vegetation. The species is tentatively identified as a Spotted Crake. This sampling area has probably been mown in the last 3 weeks.

Site 3 data

Scientific Name Native Species	**Common Name**	**C.A Nest 1**	**C.A Nest 2**	**C.A. Nest 3**
**Acacia mearnsii*	Black Wattle			1
Anthoxanthum odoratum	Sweet Vernal Grass		2	2
Dactylis glomerata	Cocksfoot	1	1	1
Dichondra repens	Kidney Weed		1	1
**Eucalyptus ovata*	Swamp Gum		1	3
Epilobium sp.	Willow Herb			2
Oxalis perennans		2	2	2
Pseudognaphalium luteoalbum	Jersey Cudweed	1	1	2
Schoenus sp.	Bog Rush		2	2
Exotic Species				
Acetosella vulgaris	Sheep Sorrel		1	1
Anagallis arvensis	Scarlet Pimpernel	1	1	1
Axonopus affinis	Carpet Grass	3	2	3
Carduus sp.				1
Cerastium glomeratum	Mouse-eared Chickweed			2
Daucus carota	Wild Carrot		1	2
Festuca sp.		3	3	3
Holcus lanatus	Yorkshire Fog		1	1
Hypochaeris radicata	Catsear	2	2	2
Lolium perenne	Perennial Ryegrass	2	2	3
Myosotis sylvatica	Forget-me-not	2	1	
Paspalum distichum	Paspalum	2	2	3
Pinus radiata	Radiata Pine			1
Plantago lanceolata	Plantain	2	1	3
P. major	Large Plantain		1	
Poa annua	Winter Grass		1	2
Prunella vulgaris	Self-heal	2	3	3
Romulea sp.	Onion Grass	1	2	1
Sisyrinchium spp.	Scourweed		1	1
Trifolium repens	White Clover	1	3	4

Photo 5 (Site 3, mostly mown exotics with sparse to no native canopy)

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Appendix 3: Fauna observed at Lot 60 DP 909008, Parish of Sutton Forest, Bundanoon, NSW

Common Name	Scientific Name	Cons. Status	Detection Method	Habitat
Birds				
Sulphur-crested cockatoo	*Cacatua galerita*	P	O, W	F
Magpie lark	*Grallina cyanoleuca*	P	O, W	A
Indian peafowl**	*Pavo cristatus*	P	W	A
Pied currawong	*Strepera graculina*	P	O, W	F
Noisy miner	*Manorina melanocephala*	P	O, W	F, G
Australian magpie	*Cracticus tibicen*	P	O, W	F, G
Welcome swallow	*Hirundo neoxena*	P	O, W	F, G
Australian raven	*Corvus coronoides*	P	O, W	F, G
Willie wagtail	*Rhipidura leucophrys*	P	O, W	A
Eastern Rosella	*Platycercus eximius*	P	O, W	F
Laughing kookaburra	*Dacelo novaeguineae*	P	O, W	F
Australasian grebe	*Tachybaptus novaehollandiae*	P	O	A
Galah	*Eolophus roseicapillus*	P	O, W	F, G
Dusky moorhen	*Gallinula tenebrosa*	P	O, W	A
Wood duck	*Chenonetta jubata*	P	O, W, S	F, G
Grey butcherbird	*Cracticus torquatus*	P	W	F
Common myna**	*Sturnus tristis*	P	W	A
Common starling**	*Sturnus vulgaris*	P	O, W	A
Crested pigeon	*Ocyphaps lophotes*	P	O, W	F
Crimson Rosella	*Platycercus elegans*	P	O, W	F
Little black cormorant	*Phalacrocorax sulcirostris*	P	O	L
White-faced heron	*Egretta novaehollandiae*	P	O	Gw
Eastern spinebill	*Acanthorhynchus tenuirostris*	P	W	A
Sacred kingfisher	*Todiramphus sanctus*	P	W	A
King parrot	*Alisterus scapularis*	P	O, W	F
Gang-gang cockatoo	*Callocephalon fimbriatum*	P, V	W	A
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	P	O, W	F
Rufous night heron	*Nycticorax caledonicus*	P	O	A
Masked lapwing	*Vanellus miles*	P	W	A
Buff-banded rail	*Gallirallus philippensis*	P	O	F, C
Eastern koel	*Eudynamys orientalis*	P	W	A
Dollarbird	*Eurystomus orientalis*	P	O	L
Mammals				
Common brushtail possum	*Trichosurus vulpecula*	P	O, W, S	F
Sugar glider	*Petaurus breviceps*	P	O	F
Common wombat	*Vombatus vombatus*	P	S	F
White-striped freetail	*Tadarida australis*	P	W	F, G

bat				
European rabbit**	*Oryctolagus coniculus*	U	O, S	F
European hare**	*Lepus europeaus*	U	O	F, G
Red fox**	*Vulpes vulpes*	U	O	G
Dog**	*Canis familiaris*	U	O, S	F, G
Frogs				
Common froglet	*Crinia signifera*	P	W	C
Striped marsh frog	*Limnodynastes peroni*	P	W	Gw
Spotted marsh frog	*Limnodynastes tasmaniensis*	P	W	Gw
Smooth toadlet	*Uperoleia laevigata*	P	W	A
Peron's tree frog	*Litoria peronii*	P	W	A
Verreaux's tree frog	*Litoria verreauxii*	P	W	A
Reptiles				
Copperhead	*Austrelaps superbus*	P	O	F

Appendix 3. Fauna species detected, method of detection and habitat in which they were recorded during the survey. V=vulnerable in NSW, P=protected in NSW, U=unprotected in NSW, O=visual observation, W=call, S=scat, F=forest, G=grassland, Gw= inundated grassland, C=creek, L=flying over site, A=adjacent to study area.

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Appendix 4: Tree Hollow Survey

Tree no.	Tree Species	Diameter at breast height (cm)	Hollow Entrance Diameter (cm)			
			0-3	3-10	10-20	>20
1	*Eucalyptus cypellocarpa*	100		1	1	
2	*Eucalyptus cypellocarpa*	75		1		
3	*Eucalyptus cypellocarpa*	200			2	1
4	*Eucalyptus sp. box*	80		1	1	
5	*Eucalyptus cypellocarpa*	160			1	
6	*Eucalyptus globoidea*	80			1	
7	*Eucalyptus cypellocarpa*	55			2	
8	*Eucalyptus globoidea*	55		1		
9	*Eucalyptus cypellocarpa*	Not recorded			1	1
10	*Eucalyptus cypellocarpa*	120		1	2	
11	*Eucalyptus cypellocarpa*	135		1		
12	*Eucalyptus cypellocarpa*	205		1	2	
13	*Eucalyptus cypellocarpa*	100		1	3	
14	*Eucalyptus cypellocarpa*	65			1	
15	*Eucalyptus cypellocarpa*	75		2	1	
16	*Eucalyptus cypellocarpa*	40		2		
17	*Angophora floribunda*	80			2	
18	*Eucalyptus cypellocarpa*	70		1		
19	*Angophora floribunda*	55	1	5		
20	*Eucalyptus cypellocarpa*	170			1	
21	*Eucalyptus cypellocarpa*	65		2		
22	*Eucalyptus cypellocarpa*	70			2	
23	*Eucalyptus cypellocarpa*	285	1	1		
24	*Eucalyptus cypellocarpa*	200	1	3		
25	*Eucalyptus cypellocarpa*	55			1	
26	*Eucalyptus cypellocarpa*	170		1		
27	*Eucalyptus cypellocarpa*	160			1	
28	*Eucalyptus cypellocarpa*	100		1	1	1
29	*Eucalyptus cypellocarpa*	80			1	
30	*Eucalyptus cypellocarpa*	120		1	2	1
31	*Eucalyptus cypellocarpa*	45		1		
32	*Eucalyptus cypellocarpa*	50	1			
33	*Eucalyptus cypellocarpa*	95		1	1	
34	*Eucalyptus cypellocarpa*	80		1	1	1
35	*Eucalyptus cypellocarpa*	85			1	
36	*Eucalyptus cypellocarpa*	70			2	
37	*Eucalyptus cypellocarpa*	110	1		1	1
38	*Eucalyptus cypellocarpa*	75		1		
39	*Eucalyptus globoidea*	55			1	
40	*Eucalyptus globoidea*	80		1		
41	*Eucalyptus globoidea*	25	1			

Appendix 4. The number and size of hollows recorded in trees on the site.

Appendix 5: Consideration of impacts on threatened and migratory species for which potential habitat occurs in the study area.

Species	Suitability of habitats present on the site for			Likelihood occurrence on site	Likelihood of adverse impacts	Assess. of Signif. required?
	Foraging	Shelter	Breeding			
Green and golden bell frog	Moderate	Low	Not present	Very low	Low	No
Eastern bentwing bat	Moderate	Moderate	Not present	High	Low	No
Large-footed myotis	Low	Moderate	Moderate	Low-moderate	Low	No
Grey-headed flying-fox	Moderate-high	Not present	Not present	High	Low	No
Regent honeyeater	Low	Low	Not present	Low	Low	No
Gang-gang cockatoo	Moderate-high	Low	Low	Very high	Moderate	Yes
Swift parrot	Low	Low	Not present	Very low	Low	No
Powerful owl	Low	Low	Not present	Low	Low	No
Squirrel glider	Low	Moderate-high	Moderate	Very low	Low	No

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Appendix 6. Consideration of potential threatened species occurrences in the study area.

Species	Ecology, habitat requirements, likelihood of occurrence and potential for adverse impacts	Study area contains habitat suitable for:			Potential for adverse impacts on habitat?	Assessment of significance required?
		Foraging	Shel ter	Breeding		
Giant burrowing frog *Heleioporus australiacus*	Inhabits dry Eucalypt forest, usually associated with Hawkesbury Sandstone and coastal sand deposits. Breeds in permanent or ephemeral creeks, often with rock ledges and associated pools. *The study area contains tight, clay-based soils and wet Eucalypt forest with a predominantly disturbed groundcover and is not suitable habitat for the Giant burrowing frog.*	N	N	N	N	N
Green and golden bell frog *Litoria aurea*	Inhabits permanent swamps and ponds with emergent vegetation, especially bulrushes. Basks on vegetation during the day and forages nocturnally in wetlands and adjacent forest and grassland. Shelters beneath rocks and logs when away from breeding pond. *Potential breeding ponds exist to the north-west in the form of a large dam, and north-east at the wetland. If this species occurred at either wetland, it is possible that it could forage on and use the site as a passage between the two wetlands. There is a limited amount of potential sheltering habitat on the site. The proposal would affect a small area of potential foraging habitat on the site(by replacing grassland with a track), but probably not adversely. Proposed revegetation works would probably increase the amount of suitable foraging and sheltering habitat on the site for this species. The most direct passageway between the wetlands on the two neighbouring sites would not be affected. The proposal would be unlikely to adversely affect the habitat of the Green and golden bell frog if it occurred, and an assessment of significance is not required.*	Y	Y	N	N	N

Littlejohn's tree frog *Litoria littlejohni*	Inhabits heath-based forest and woodland where it shelters and forages in litter and low vegetation. Breeds in still or slow flowing pools after heavy rain. *Forests in the study area have predominantly grassy and herbaceous understorey/groundcover vegetation and are substantially modified from their natural state. Suitable habitat for Littlejohn's tree frog is not present in the study area.*	N	N	N	N	N
Stuttering barred frog *Mixophyes balbus*	Inhabits rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Forage and shelter in deep litter on the forest floor. Breeding is in small, flowing streams after heavy rain, when eggs are laid on rock shelves or shallow riffles. *The forest habitat and creeks occurring on the site do not represent suitable habitat for the Stuttering barred frog due to openness of canopy, lack of litter and lack of rocks and riffles in creek morphology.*	N	N	N	N	N
Red-crowned toadlet *Pseudophryne australis*	Restricted to the Sydney Basin, it inhabits open forests associated with Hawkesbury and Narrabeen Sandstones. It is closely associated with periodically wet drainage lines below sandstone ridges. Breeds near ephemeral creeks and gutters, eggs are laid in moist leaf litter and washed into pools by heavy rain. *Suitable habitat for the Red-crowned toadlet is not present in the study area, with the geology being shale rather than sandstone based and other habitat features being subsequently absent.*	N	N	N	N	N
Macquarie Perch *Macquaria australasica*	A riverine, schooling species, it prefers clear water and deep rocky holes with lots of cover. Spawning occurs just above riffles in stream bed. A population exists in the lower Shoalhaven catchment. *The aquatic habitats present on the site are not sufficiently large or connected to riverine habitats to be suitable for the Maquarie perch. The proposal would not affect downstream habitats if this species.*	N	N	N	N	N

Australian Grayling *Prototroctes maraena*	Migrates between riverine and oceanic aquatic habitats. Recorded in clear, gravel-bottomed streams and muddy-bottomed, heavily silted habitats. Spawning is in freshwater, larvae drift downstream and juveniles return from the ocean to mid-reaches of the river where they remain. A population occurs in the Shoalhaven River. *Aquatic habitats present on the site are unsuitable as habitat for the Australian grayling and downstream habitats would not be affected by the proposal.*	N	N	N	N	N
Large-eared pied bat *Chalinolobus dwyeri*	Inhabits well-timbered areas containing gullies and is associated with extensive cliffs and caves. Thought to forage below the canopy. Roosts and breeds in caves, rock crevices and old mine workings. *The Large-eared pied bat is likely to occur within several kilometres of the study area based on the occurrence of extensive areas of suitable habitat. However, habitats present on the site are not those characteristically used by this species and are disjunct from suitable habitat to the south in Morton National Park. Therefore, it is considered unlikely that the Large-eared pied bat would inhabit the study area with any regularity, if at all.*	N	N	N	N	N
Eastern bentwing bat *Miniopterus schreibersii oceanensis*	Forages in a wide range of habitats, from rainforest to grasslands. Flies fast, above the canopy, with moths making up the main part of the diet. Roosts in caves, mine shafts and other man-made structures including storm water culverts. Forms maternity colonies of hundreds or thousands of individuals in suitable caves during spring and summer. *Suitable foraging habitat for the Eastern bentwing bat occurs in the study area in the form of forest and grassland. Storm water culverts in the northern part of the study area may be used for roosting by this species. However, the proposed bicycle track would not adversely affect the habitat of the Eastern bentwing bat on the site and an assessment of significance is not required.*	Y	Y	N	N	N

Large-footed myotis *Myotis macropus*	Forages mainly over large streams and pools by raking feet across the water's surface. Also an aerial forager. Roosts in small groups, close to water, in caves, under bridges, in storm water culverts, tree hollows and in dense vegetation. *The wetland immediately to the north-west of the study area represents potential foraging habitat for the Large-footed myotis, and possible roosting and breeding habitat is present in the form of storm water culverts and possibly tree hollows. Assuming the presence of this species, the proposed bicycle track would not adversely affect its habitat and an assessment of significance is not required.*	Y	Y	Y	N	N
Grey-headed flying-fox *Pteropus poliocephalus*	Inhabits a range of vegetation types along the coast and ranges of south-eastern Australia, including rainforest, Eucalypt and paperbark forest and heathland, foraging mainly on seasonal blossom and fruits. Shelters by day in colonies of up to several thousand individuals which disperse at dusk, traveling up to 50 km in a night. *Blossom of Mountain grey gum and other Eucalypts on the site represent potential food sources for the Grey-headed flying-fox and this species is expected to occur on the site from time to time. No roost sites for this species occur in or nearby to the study area. The proposed bicycle track would not adversely affect the foraging habitat of the Grey-headed flying-fox and an assessment of significance is not required.*	Y	N	N	N	N
Greater broad-nosed bat *Scoteanax ruepellii*	Prefers gullies in mature coastal forest, also occurs in rainforest, sclerophyll forest and woodland (below 500 m elevation in south-eastern Australia). Roosts mainly in tree hollows, particularly large, old trees in forest. Forms maternity colonies in summer prior to females giving birth. Feeds on slow-flying prey such as large moths, beetles and probably other bats. *The study area is unlikely to provide suitable habitat for the Greater broad-nosed bat based on its high elevation (700 m) alone, and also its disjuncture from large areas of mature forest.*	N	N	N	N	N

Regent honeyeater *Anthochaera phrygia*	Mainly inhabits dry open forest and woodland on the inland slopes of south-east Australia. Feeds mainly on blossom of Eucalypts and mistletoes, also lerps, insects and honeydew. May range nomadically in response to seasonal flowering patterns. Sometimes flocks on coast in response to Swamp Mahogany and Spotted Gum flowering. Known to breed in just three locations, two in NSW (Barraba and Capertee Valley). *The forest habitats on the site are not those characteristically used by the Regent honeyeater and any occurrence of this species in the study area would be considered a rare visit during a nomadic foray. Potential foraging and roosting habitat would not be adversely affected by the proposal and an assessment of significance is not required.*	Y	Y	N	N	N
Australasian bittern *Botaurus poiciloptilus*	Inhabits permanent freshwater wetlands with tall, dense vegetation. Feeds nocturnally on a range of invertebrates and small vertebrates. Breeds spring-summer in dense wetland vegetation. *Densely vegetated permanent wetland habitat is not present in the study area, and therefore there is no habitat for the Australasian bittern. There is very limited potential for this species to occur in the adjacent Currabunda wetlands and the large damt to the north-east of the site. The proposal would not affect the habitat of this species.*	N	N	N	N	N

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Gang-gang cockatoo *Callocephalon fimbriatum*	Prefers taller, wet sclerophyll forest at higher altitudes during summer, in winter may move to lower altitudes and inhabit drier forest and woodland. Feeds on the seeds of a wide range of native plants, including Eucalypts. Nests in large tree hollows. *The Gang-gang cockatoo was recorded adjacent to the study area during the survey and would be expected to visit the site to forage when food is available. Due to the openness of the site and regular human visitation, it is unlikely that this species would roost or nest in the study area, although this is possible and potential roost sites and nest hollows are present. The proposal would affect the habitat of the Gang-gang cockatoo to the extent that increased human visitation and activity within potential habitat could increase disturbance to bird, making it less suitable; although proposed revegetation works could increase the availability of food resources and have an overall beneficial effect for this species. Since the habitat of the Gang-gang cockatoo may be adversely affected by the proposal, an assessment of significance will be undertaken as a precaution.*	Y	Y	Y	Y	Y
Varied sittella *Daphoenositta chrysoptera*	Inhabits Eucalypt forests and woodlands where it actively forages along the trunk and upper branches for arthropods. A sedentary species which nests in an upright tree fork high in the forest canopy. *The forest habitats on the site could be suitable for the Varied sittella if adjacent high quality forest was present. However, the relative isolation of the forest, simplification of the understorey and dominance of the Noisy miner on the site render the habitat unsuitable for a range of native insectivorous birds, including the Vaired sittella. The proposal is not likely to affect the habitat of this species.*	N	N	N	N	N

Swift parrot *Lathamus discolor*	Breeds in Tasmania during summer and migrates to south-east mainland Australia during March-October. Visits areas where Eucalypts are flowering profusely or where lerp infestations are abundant. *Potential foraging and roosting habitat occurs on the site, although visits by the species would be a rare event. The proposal would not affect the habitat of the Swift parrot and an assessment of significance is not required.*					
Glossy black-cockatoo *Calyptorhyncus lathami*	Inhabits Eucalypt forests and woodlands where it feeds almost exclusively on the seeds of species in the Casuarina family of plants. Breeds in large tree hollows. *Potential foraging habitat for the Glossy black-cockatoo is not present in the study area. This species would not be affected by the proposal.*	N	N	N	N	N
Powerful owl *Ninox strenua*	Occurs in wet and dry Eucalypt forests and preys mainly on arboreal mammals but will also eat bats and other birds. Inhabits a home range area of around 1000 ha depending on the quality of the habitat. Breeds in large tree hollows. *The Powerful owl occurs in the Bundanoon locality and could visit the site occasionally to forage. Suitable roosting and nesting habitat is not present. The proposal would not adversely affect the habitat of the Powerful owl and an assessment of significance is not required.*	Y	N	N	N	N
Sooty owl *Tyto tenebricosa*	Prefers dark gullies in wet sclerophyll forest and rainforest. Feeds mainly on arboreal mammals and nests in large tree hollows. *The forest habitats on the site are unlikely to be suitable for the Sooty owl based on their distance from its preferred habitat. The proposal would not adversely affect the habitat of the Sooty owl.*	N	N	N	N	N

Speckled warbler *Pyrrholaemus saggitatus*	A sedentary which inhabits open forests and woodlands in south-east Australia, predominantly on the hills and tablelands of the Great Dividing Range. Occupies a home range of >10 ha in areas of relatively intact habitat. Feeds on seeds and insects and builds a nest close to the ground. *The study area does not contain habitat suitable for the Speckled warbler due to its relatively small size, level of understorey disturbance and disjuncture from nearby woodland habitats. The proposal would not affect the habitat of the Speckled warbler.*	N	N	N	N	N
Australian painted snipe *Rostratula benghalensis australis*	Inhabits the fringes of freshwater wetlands with vegetation cover, predominantly in the Murray-Darling Basin. Forages nocturnally on flats and in shallow water and nests on the ground amongst tall vegetation. *Wetland habitat suitable for the Australian painted snipe does not occur in the study area and the proposal would not affect this species.*	N	N	N	N	N
Giant dragonfly *Petalura gigantea*	Inhabits wetlands with peat and other organic substrates. Larvae dig long branching burrows and are thought to emerge at night to feed on invertebrates. Adult dragonflies feed on flying insects and lay eggs in moist substrate. *Suitable wetland habitat for the Giant dragonfly does not occur in the study and the proposal would not affect this species.*	N	N	N	N	N
Eastern pygmy-possum	Inhabits a wide range of forest types including rainforest and woodland, and heathland in south-east Australia. Feeds on nectar and pollen, soft fruits and insects. Shelters in tree hollows, burrows, abandoned bird nests and dense thickets of vegetation. Tree hollows are favoured for breeding, where the female builds a spherical nest of leaves and other plant material. *Suitable habitat for the Eastern pygmy-possum does not occur in the study area due to the modified state of the understorey and relative isolation and disjuncture from larger areas of forest. The proposal would not affect the habitat of the Eastern pygmy-possum.*	N	N	N	N	N

Spotted-tailed quoll *Dasyurus maculatus*	Occurs in a range of habitat types including rainforest, open forest, woodland and heath. Hunts nocturnally, mainly on the ground. Prey includes gliders, possums, birds, insects, rats etc. Den and breeding sites are tree hollows, hollow logs, rock crevices and caves. Females occupy home ranges up to 750 ha and males up to 3500 ha. *It is possible that the Spotted-tailed quoll could visit the study area occasionally although the modified structure of the forest habitat and disjuncture from other areas of forest make the study area largely unsuitable as habitat for this species. The proposal would not adversely affect the habitat of the Spotted-tailed quoll.*	N	N	N	N	N
Southern brown bandicoot *Isoodon obesulus obesulus*	Inhabits heath and forest with a heathy understorey on friable sandy soils. Feeds nocturnally, mainly on ground-dwelling invertebrates and hypogeous fungi. Females occupy a home range of 2-3 ha and males 5-20 ha. Nests are built on the ground in a sheltered location and mating can occur at any time of the year. *The study area does not contain heath vegetation or friable soils and does not represent suitable habitat for the Southern brown bandicoot.*	N	N	N	N	N
Parma wallaby *Macropus parma*	Prefers moist Eucalypt forest with thick, shrubby understorey, often with nearby grassy areas and rainforest margins. Feeds nocturnally on grasses and herbs in open areas and forest edges. Shelters in dense cover during the day. *The study area does not contain habitat suitable for the Parma wallaby.*	N	N	N	N	N
Yellow-bellied glider *Petaurus australis*	Inhabits mature Eucalypt forest on the coast and ranges of eastern Australia. Lives in family groups which occupy home ranges of 30-65 ha. Feeds on nectar and pollen, sap, honeydew, manna and arthropods. Shelters in communal tree hollows. *The study area does not contain suitable habitat for the Yellow-bellied glider on the basis of its isolation and disjuncture from larger areas of forest containing suitable habitat and the level of human activity on the site.*	N	N	N	N	N

Squirrel glider *Petaurus norfolcensis*	Inhabits mature Eucalypt forest and woodland, usually mixed species stands, with a heathy understorey in coastal areas. Lives in small family groups and feeds on nectar, pollen, sap, mann, honeydew and invertebrates. Shelters and breeds in tree hollows. *The study area contains marginal habitat for the Squirrel glider, in that the core area is small and the midstorey has been highly simplified by clearing. The closely related Sugar glider was recorded during the survey and it is highly improbable that both species would co-occur on the site. Sugar/Squirrel glider habitat would not be adversely affected by the proposal but would be enhanced by revegetation. The proposal would therefore not adversely affect the habitat of the Squirrel glider.*	Y	Y	Y	N	N
Brush-tailed rock-wallaby *Petrogale penicillata*	Occupies rocky escarpments, outcrops and cliffs along the Great Dividing Range. Browses on grasses, forbs and shrubs in and adjacent to rocky areas, mainly at night. Shelters by day in rocky retreat sites, often sun-exposed. *There is no suitable rocky escarpment habitat for the Brush-tailed rock-wallaby in the study area and the proposal would not adversely affect this species.*					
Koala *Phascolactos cinereus*	Inhabits Eucalypt forest and woodland in eastern Australia. Feeds on Eucalyptus foliage, mostly at night when it is most active. Rests and shelters in trees. Home range area varies from less than 2 ha to several hundred ha, depending on habitat quality. *The level of disturbance and fragmentation of the forest habitats in the study area and its locality are probably the major factors accounting for the absence of the Koala in this area.*	Y	Y	Y	N	N
Smoky mouse *Pseudomys fumeus*	Prefers heath habitat on ridge tops and slopes in sclerophyll forest, also recorded in ferny gullies. Feeds on seeds, fruits, fungi and invertebrates. Known to nest in rocky areas and under grass tree foliage. Breeding is in spring. *There is no heath-based habitat or ferny gullies suitable for the Smoky mouse on the site and this species would not be affected by the proposal.*	N	N	N	N	N

Long-nosed potoroo *Potorous tridactylus tridactylus*	Inhabits coastal heaths and dry and wet sclerophyll forest with a densely vegetated understorey and some open areas. Fruits of hypogeous fungi, tubers, roots and soft-bodied invertebrates make up the major part of the diet. Shelters by day in dense vegetation. Home range is 2-5 ha. *There is insufficient intact forest with a dense understorey present on the site to support the Long-nosed potoroo, which would also not tolerate the level of human/dog disturbance.*	N	N	N	N	N
New Holland mouse *Pseudomys novaehollandie*	Associated with sandy soils and heathland, this species seems to favour sites with high floristic diversity at mid-stages of succession after fire. Feeds mainly on seeds, although leaves, fungi and invertebrates are eaten. Home range is up to 1.4 ha. *The soils and vegetation present in the study area are not suitable to support the New Holland mouse and this species would not be affected by the proposal.*	N	N	N	N	N
Broad-headed snake *Hoplocephalus bungaroides*	Confined to areas of extensive outcropping sandstone, the Broad-headed snake lives in rock crevices and preys mainly on other reptiles in these habitats. During summer the snakes move to shelter in tree hollow in close proximity to sandstone outcrops. *There is no sandstone outcrops on the site and the habitat is not suitable for the Broad-headed snake.*	N	N	N	N	N
Rosenberg's goanna *Varanus rosenbergi*	Inhabits heath, open forest and woodland. Requires termite mounds for construction of nesting burrows. Shelters in hollow logs, rock crevices and burrows, which it may dig. Feeds on carrion, birds eggs, reptiles and small mammals. *The forest habitats on the site are not suitable for Rosenberg's goanna, being too lacking in understorey vegetation, connectivity to suitable habitat, and the level of regular disturbance on the site.*	N	N	N	N	N

Appendix 7: Survey Methodology and Assessment – Flora and Fauna

1. Flora

1.1 Data Search

A search of existing data relevant to the subject site was undertaken. Data consulted included aerial photographs and satellite images, topographic, vegetation, geological and soil maps, electronic databases and internet sources and previous flora surveys. The NSW Office of Environment and Heritage database of Threatened Species within the Moss Vale sub-region of the Hawkesbury-Nepean CMA was consulted to provide lists of threatened species, populations or ecological communities, or species of regional significance and literature about the ecology of the species, communities and habitats found or likely to be found in the study area, including relevant Recovery and Threat Abatement Plans.

The Department of Sustainability, Environment, Water, Population and Communities database of Matters of National Environmental Significance within the Wingecarribbee LGA was consulted to provide lists of threatened species, populations or ecological communities, or species of regional significance and literature about the ecology of the species, communities and habitats found or likely to be found in the study area

1.2 Field survey

1.2.1 Stratification or Preliminary Survey

A preliminary survey of the subject site in the form of a driving or walking transect was undertaken through any area requiring a vegetation survey for the purpose of:
a) stratifying the survey area on (i) biophysical attributes (e.g. landform, geology, elevation, slope, soil type, aspect) (ii) vegetation structure (e.g. forest, woodland, shrubland) and (iii) floristics (e.g. species)
b) identifying potential locations for detailed traverse or plot sampling within the various stratification units,
c) identifying sites of preferred habitat for known or predicted threatened species and
d) recording opportunistic flora sightings.

Stratified units identified were described and mapped.

1.2.2 Potential Threatened Species

On the basis of preliminary flora and fauna habitat surveying, the NSW Office of Environment and Heritage database of Threatened Species within the Moss Vale Sub-region of the Hawkesbury-Nepean CMA and the Department of Sustainability, Environment, Water, Population and Communities database of Matters of National Environmental Significance were cross-referenced to *Vegetation types of Hawkesbury-Nepean CMA and associated threatened species* and a list established of Threatened Species of flora potentially present at the subject site.

1.2.3 Sampling or Detailed Survey

Three nested quadrats were surveyed. Each quadrat was 20 x 20 metres, with the inner nest 1 square metre, the middle nest 99 square metres, and the outer nest 300 square metres; a total of 400 square metres.
Cover abundance scores were allocated using the six-tiered Blaun Blanquet system:
1 =< 5 % of the quadrat nest and uncommon
2 = < 5 % of the quadrat nest and common
3 = 6-20% of the quadrat nest
5 = 21-50% of the quadrat nest
6 = 75-100% of the quadrat nest

1.2.3.3 Targeted Threatened Plants

At sites of preferred habitat for threatened biodiversity, areas were searched by the random meander technique involving traversing areas of suitable habitat in no set pattern, but roughly back and forth, whilst searching for a particular, or several, threatened plant species.

Quadrats for random meanders were selected at sites representative of the stratification unit with survey effort in accordance with the minimum DEC guidelines (DEC, 2004) i.e. 30 minutes for each quadrat sampled within the same stratification unit as the quadrat

1.3 Data Analysis and Discussion

Analysis of the data collected included a discussion of the condition and integrity of vegetation, an estimate of the pre-settlement vegetation, the representation of the communities in conservation reserves, regional cleared estimates of the communities and Threatened Species potentially present at the subject site. An assessment of potential impacts on vegetation was also considered.

1.4 Survey Limitations and Constraints

Vegetation mapping attempts to simplify the distribution patterns of flora – at some sites over an extensive area. Plant communities do not have clear-cut boundaries but grade into each other to form ecotones – sometimes covering a broad area.

2. Survey Methodology and Assessment - Fauna

2.1 Data Search

A search of existing data relevant to the subject site was undertaken. Data consulted included aerial photographs and satellite images, topographic, vegetation, geological and soil maps, electronic databases and internet sources and previous fauna surveys. The NSW Office of Environment and Heritage database of Threatened Species within the Moss Vale sub-region of the Hawkesbury-Nepean CMA was consulted to provide lists of threatened species, populations or ecological communities, or species of regional significance and literature about the ecology of the species, communities and habitats found or likely to be found in the study area, including relevant Recovery and Threat Abatement Plans.

The Department of Sustainability, Environment, Water, Population and Communities database of Matters of National Environmental Significance within the Wingecarribbee LGA was consulted to provide lists of threatened species, populations or ecological communities, or species of regional significance and literature about the ecology of the species, communities and habitats found or likely to be found in the study area.

2.2 Field Survey

2.2.1 Preliminary Survey

A preliminary survey of the subject site was undertaken in conjunction with the preliminary flora survey for the purpose of:
a) locating major fauna habitats i.e. vegetation communities (e.g. woodlands, grasslands etc.), wetlands, rocky outcrops etc.
b) identifying suitable sites for detailed surveying i.e. representative of major fauna habitats
c) identifying sites of preferred habitat for known or predicted threatened species for detailed surveying and
d) recording opportunistic fauna sightings

Fauna or evidence of fauna observed throughout the survey was recorded in **Table 2.**

2.2.2 Potential Threatened Species

On the basis of preliminary flora and fauna habitat surveying, the NSW Office of Environment and Heritage database of Threatened Species within the Moss Vale Sub-region of the Hawkesbury-Nepean CMA and the Department of Sustainability, Environment, Water, Population and Communities database of Matters of National Environmental Significance were cross-referenced to *Vegetation types of Hawkesbury-Nepean CMA and associated threatened species* and a list established of Threatened Species of fauna potentially present at the subject site.

2.2.3 Fauna and Habitat Assessments

Target fauna species were identified based on the literature and database search as species with special conservation status that had some potential to occur on the site based on the habitats present. The fauna survey was designed to ensure the most appropriate methods were used for the detection of these species, with an emphasis on species with potential to be impacted upon by the proposal.

Fauna survey techniques included passive observation and searches for evidence of inhabitation by fauna species. The methods employed were: bird survey; scat search; frog search; tree hollow survey and spotlighting, as well as habitat suitability assessments for target fauna species. Reptile searches were not undertaken due to time and weather constraints; none of the target species were reptiles. All survey methods were undertaken by a single observer and are described below.

Bird Census

A single 90-minute walking traverse of the site was undertaken during the early morning to record the bird species present. Birds were identified and recorded based on visual and call identification, assisted by the use of 10 x 40 binoculars. Additional opportunistic records of birds were made throughout the duration of fieldwork on the site.

Koala Scat Search

Searches for scats of the Koala and other species were conducted within two plots each containing 20 trees. The area of ground within one metre of each tree base was inspected for the presence of animal scats, which were identified to species.

Tree Hollow Survey

A visual inspection of all trees on the site was undertaken to record the presence and size of tree hollows, which represent potential shelter and nesting sites for fauna. Hollow size was categorised based on the diameter of the hollow entrance visible from the ground.

Frog Search

An active search and listening survey for frogs was undertaken during one evening for a period of 85 minutes. A 12 volt 50 watt spotlight and LED head torch were used to illuminate potential frog habitats. The areas surveyed included flowing creeks, depressions containing ponding water, open grasslands and forest. Opportunistic records of frogs, based on call identification, were also made during other fieldwork.

Spotlighting

Spotlighting surveys were conducted on two consecutive nights, for 30 minutes and 65 minutes, respectively. The second spotlighting survey was preceded by a 15-minute listening and observation period. A 12 volt 50 watt spotlight was used to detect nocturnal fauna in trees and on the ground, aided by 10 x 40 binoculars.

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Appendix 8: Certification

Woodlands

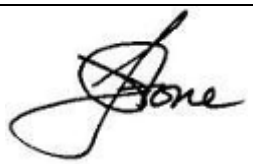
Environmental Management

Forest Road, Wingello, NSW, 2579

Tel. (02) 488 44255 Mob. 0422279946

E-mail: woodlandsenvironmental@yahoo.com.au

ABN 93036995658

Submission of environmental assessment (EA) under section 75H of the *Environmental Planning and Assessment Act 1979*	
Report title	Environmental Assessment (Flora and Fauna) for a Proposed Development at Bundanoon Oval and Jordan's Crossing Park, Parish of Sutton Forest, Bundanoon, NSW
Report prepared by:	Greg Stone, Woodlands Environmental Management
Qualifications:	B.App.Sc. (Charles Sturt University) Grad. Cert. Sci. Comm. (Australian National University) Adv. Dip. Land Management (University of Sydney), Ass. Dip. Land Management (University of New England).
Address:	Woodlands Environmental Management 133 Forest Road, Wingello, NSW 2579
Applicant Name:	Micris Management Services Pty Ltd
Applicant Address:	PO Box 338 Campsie NSW 2194
Land to be developed:	Bundanoon Oval and Jordan's Crossing Park
Proposed development:	'Brigadoon'and Mountain Bike Track
Certification:	I certify that I have prepared the contents of this report and to the best of my knowledge: • It reports on the potential impacts of the proposal as generally outlined in the concept application; • It is true in all material particulars and does not, by its presentation or omission of information, materially mislead.
Signature:	
Name:	Gregory John Stone
Date:	12th December 2011